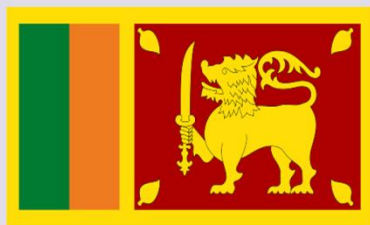
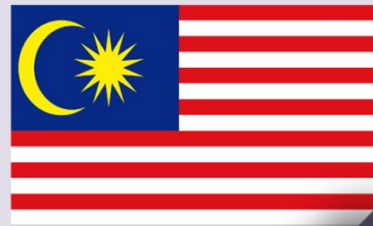




Bay of Bengal Large Marine Ecosystem Project



Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

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FAO/BOBLME Secretariat

Final report

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Submitted by

MRAG

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Thai fishing vessels in port (R Wakeford)

Mixed species (trash fish) for fish meal – Thailand (R Wakeford)

Detained illegal fishing vessel --BIOT (D Hughes)

Illegally caught swordfish landed during inspection – BIOT (D Hughes)

Table of contents

Table of contents	i
List of tables	vii
List of figures	xiii
Acronyms	xvi
1 Executive summary	1
2 Introduction	4
3 Scope 7	
3.1 Geographical scope	7
3.2 Time period	8
3.3 Species	8
4 Methodology	9
4.1 Overview of the methodology	9
4.2 Base level data collection	10
4.2.1 Catch data	10
4.2.2 Price data	11
4.3 Data collection on IUU influencing factors	11
4.3.1 IUU influencing factors.....	11
4.3.2 IUU events.....	13
4.4 The original proposed breakdown of national catch by fishery/fleet segment	13
4.5 Risk assessment approach	16
4.5.1 Likelihood.....	16
4.5.2 Impact	17
4.6 Quantitative estimation based on outputs of risk assessment	21
4.7 Regional IUU database model development	22
5 National analysis	25
5.1 Introduction	25
5.2 Bangladesh	27
5.2.1 Introduction	27
5.2.2 Fleet breakdown	27
5.2.3 Catch breakdown by fleet	28
5.2.4 IUU influencing factors.....	28
5.2.5 Summary of IUU incidences	32

5.2.6	IUU risk identification	35
5.2.7	Risk assessment	36
5.2.8	Impacts of IUU.....	39
5.2.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	40
5.2.10	Quantification of Illegal, Unreported and Unregulated fishing	43
5.3	British Indian Ocean Territory	46
5.3.1	Introduction	46
5.3.2	Fleet breakdown	46
5.3.3	Catch breakdown by fleet	47
5.3.4	IUU Influencing factors	48
5.3.5	Summary of IUU incidences	50
5.3.6	IUU risk identification	53
5.3.7	Risk assessment	57
5.3.8	Impacts of IUU.....	60
5.3.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	61
5.3.10	Quantification of Illegal, Unreported and Unregulated fishing	64
5.4	Brunei.....	67
5.4.1	Introduction	67
5.4.2	Fleet breakdown	67
5.4.3	Catch breakdown by fleet	68
5.4.4	IUU Influencing factors	68
5.4.5	Summary of IUU incidences.....	70
5.4.6	IUU risk identification	72
5.4.7	Risk assessment	74
5.4.8	Impacts of IUU.....	76
5.4.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	77
5.4.10	Quantification of Illegal, Unreported and Unregulated fishing	80
5.5	Cambodia	83
5.5.1	Introduction	83
5.5.2	Fleet breakdown	83
5.5.3	Catch breakdown	85
5.5.4	IUU influencing factors.....	85
5.5.5	Summary of IUU incidences	90
5.5.6	IUU risk identification	94
5.5.7	Risk assessment	96
5.5.8	Impacts of IUU.....	99
5.5.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	100
5.5.10	Quantification of Illegal, Unreported and Unregulated fishing	102
5.6	East Timor.....	105
5.6.1	Introduction	105
5.6.2	Fleet breakdown	105
5.6.3	Catch breakdown by fleet	106
5.6.4	IUU influencing factors.....	107
5.6.5	Summary of IUU incidences	109
5.6.6	IUU risk identification	110

5.6.7	Risk assessment	112
5.6.8	Impacts of IUU.....	114
5.6.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	114
5.6.10	Quantification of Illegal, Unreported and Unregulated fishing	117
5.7	India	121
5.7.1	Introduction	121
5.7.2	Fleet breakdown	121
5.7.3	Catch breakdown	123
5.7.4	IUU influencing factors.....	124
5.7.5	Summary of IUU incidences.....	131
5.7.6	IUU risk identification	139
5.7.7	Risk assessment	142
5.7.8	Impacts of IUU.....	145
5.7.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	146
5.7.10	Quantification of Illegal, Unreported and Unregulated fishing	150
5.8	Indonesia	155
5.8.1	Introduction	155
5.8.2	Fleet breakdown	156
5.8.3	Catch breakdown by fleet	156
5.8.4	IUU influencing factors.....	157
5.8.5	Summary of IUU incidences	168
5.8.6	IUU risk identification	173
5.8.7	Risk assessment	176
5.8.8	Impacts of IUU.....	179
5.8.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	179
5.8.10	Quantification of Illegal, Unreported and Unregulated fishing	182
5.8.11	Relevant legislation	186
5.9	Malaysia	187
5.9.1	Introduction	187
5.9.2	Fleet breakdown	187
5.9.3	Catch breakdown by fleet	188
5.9.4	IUU influencing factors.....	189
5.9.5	Summary of IUU incidences.....	192
5.9.6	IUU risk identification	194
5.9.7	Risk assessment	195
5.9.8	Impacts of IUU.....	198
5.9.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	200
5.9.10	Quantification of Illegal, Unreported and Unregulated fishing	203
5.10	Maldives	207
5.10.1	Introduction	207
5.10.2	Fleet breakdown	207
5.10.3	Catch breakdown by fleet	208
5.10.4	Analysis of IUU related factors.....	210
5.10.5	Summary of IUU incidences	212

5.10.6	IUU risk identification	213
5.10.7	Risk assessment	215
5.10.8	Impacts of IUU.....	219
5.10.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	220
5.10.10	Quantification of Illegal, Unreported and Unregulated fishing	224
5.11	Myanmar	228
5.11.1	Introduction	228
5.11.2	Fleet breakdown	228
5.11.3	Catch breakdown by fleet	229
5.11.4	IUU influencing factors.....	230
5.11.5	Summary of IUU incidences	233
5.11.6	IUU risk identification	235
5.11.7	Risk assessment	236
5.11.8	Impacts of IUU.....	239
5.11.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	240
5.11.10	Quantification of Illegal, Unreported and Unregulated fishing	243
5.12	Pakistan	247
5.12.1	Introduction	247
5.12.2	Fleet breakdown	248
5.12.3	Catch breakdown by fleet	250
5.12.4	IUU influencing factors.....	250
5.12.5	Summary of IUU incidences	253
5.12.6	IUU risk identification	255
5.12.7	Risk assessment	257
5.12.8	Impacts of IUU.....	259
5.12.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	261
5.12.10	Quantification of Illegal, Unreported and Unregulated fishing	264
5.13	Papua New Guinea (Indian Ocean only)	268
5.13.1	Introduction	268
5.13.2	Fleet breakdown	269
5.13.3	Catch breakdown by fleet	269
5.13.4	Analysis of IUU related factors.....	270
5.13.5	IUU risk identification	273
5.13.6	Summary of IUU incidences	275
5.13.7	Risk assessment	275
5.13.8	Impacts of IUU.....	277
5.13.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	279
5.13.10	Quantification of Illegal, Unreported and Unregulated fishing	281
5.14	The Philippines.....	285
5.14.1	Introduction	285
5.14.2	Fleet breakdown	286
5.14.3	Catch breakdown by fleet	287
5.14.4	IUU influencing factors.....	288
5.14.5	Summary of IUU incidences	292
5.14.6	IUU risk identification	294

5.14.7	Risk assessment	295
5.14.8	Impacts of IUU.....	298
5.14.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	300
5.14.10	Quantification of Illegal, Unreported and Unregulated fishing	303
5.15	Singapore.....	307
5.15.1	Introduction	307
5.15.2	Fleet breakdown	307
5.15.3	Catch breakdown by fleet.....	308
5.15.4	IUU influencing factors.....	309
5.15.5	Summary of IUU incidences.....	311
5.15.6	IUU risk identification	312
5.15.7	Risk assessment	313
5.15.8	Impacts of IUU.....	315
5.15.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	316
5.15.10	Quantification of Illegal, Unreported and Unregulated fishing	318
5.16	Sri Lanka	322
5.16.1	Introduction	322
5.16.2	Fleet breakdown	323
5.16.3	Catch breakdown by fleet.....	324
5.16.4	IUU influencing factors.....	324
5.16.5	Summary of IUU incidences.....	331
5.16.6	IUU risk identification	333
5.16.7	Risk assessment	335
5.16.8	Impacts of IUU.....	338
5.16.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	339
5.16.10	Quantification of Illegal, Unreported and Unregulated fishing	343
5.16.11	Fines and penalties	348
5.17	Thailand.....	353
5.17.1	Introduction	353
5.17.2	Fleet breakdown	353
5.17.3	Catch breakdown by fleet.....	354
5.17.4	Analysis of IUU related factors.....	355
5.17.5	Summary of IUU incidences.....	359
5.17.6	IUU risk identification	360
5.17.7	Risk assessment	362
5.17.8	Impacts of IUU.....	364
5.17.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	366
5.17.10	Quantification of Illegal, Unreported and Unregulated fishing	369
5.18	Vietnam.....	373
5.18.1	Introduction	373
5.18.2	Fleet breakdown	374
5.18.3	Catch breakdown by fleet.....	375
5.18.4	IUU influencing factors.....	376
5.18.5	Summary of IUU incidences.....	379

5.18.6	IUU risk identification	381
5.18.7	Risk assessment	382
5.18.8	Impacts of IUU.....	385
5.18.9	Estimation of rates of Illegal, Unreported and Unregulated fishing.....	387
5.18.10	Quantification of Illegal, Unreported and Unregulated fishing	390
6	Regional analysis	395
6.1	Summary	395
6.2	Illegal fishing.....	395
6.3	Unreported fishing	395
6.4	Unregulated fishing	395
6.5	Species (or species group) related analysis across the region	402
6.6	Analysis of risks.....	403
7	Future planning and recommendations.....	407
7.1	Catch data.....	407
7.2	Fleet data.....	408
7.3	Catch compositions	408
7.4	MCSE information	409
Annex 1	References.....	411
Annex 2	BOBLME IUU database model	472
Annex 3	Identified species of interest for study countries	473
Annex 4	RFMO membership for study countries.....	487
Annex 5	Status with respect to relevant multi-lateral agreements for study countries.	489
Annex 6	IUU risk assessment categories	492
Annex 7	World Bank governance indicators for regional coastal states	501

List of tables

Table 1 Summary of press publications searched by country.	15
Table 2 Example likelihood evaluation matrix.	17
Table 3 Example impact evaluation matrix.	18
Table 4 Example risk (impact – likelihood) evaluation matrix.	19
Table 5 Example risk categories and specific risks that could be utilised.	20
Table 6 Matching risks to fleets.	21
Table 7 Example quantitative estimates of IUU based on estimated risk levels.	22
Table 8 Example output query of IUU catch and value.	23
Table 9 Fleet breakdown for Bangladesh.	27
Table 10 Specific risks identified for Bangladesh.	36
Table 11 Assessment of risk likelihood – Bangladesh.	37
Table 12 Assessment of risk impact – Bangladesh.	37
Table 13 Assessment of inherent risk – Bangladesh.	38
Table 14 Summary of estimated rates – Bangladesh.	42
Table 15 Summary of estimated IUU by year in Bangladesh (1990 – 2013).	43
Table 16 Summary of the estimated value of IUU (USD) by year in Bangladesh (1990 – 2013).	44
Table 17 Fleet breakdown for the British Indian Ocean Territory Fishery.	47
Table 18 Summary of IUU incidences in the British Indian Ocean Territory by year.	53
Table 19 Specific risks identified for the British Indian Ocean Territory.	57
Table 20 Assessment of risk likelihood – British Indian Ocean Territory.	58
Table 21 Assessment of risk impact – British Indian Ocean Territory.	59
Table 22 Assessment of inherent risk – British Indian Ocean Territory.	60
Table 23 Summary of estimated rates – British Indian Ocean Territory.	63
Table 24 Summary of estimated IUU by year 1990 – 2013 (British Indian Ocean Territory).	64
Table 25 Summary of the estimated value of IUU (USD) by year in BIOT (1990 – 2013).	65
Table 26 Fleet breakdown for Brunei.	67
Table 27 Specific risks identified for Brunei.	74

Table 28 Assessment of risk likelihood – Brunei.	74
Table 29 Assessment of risk impact – Brunei.	75
Table 30 Assessment of inherent risk – Brunei.	76
Table 31 Summary of estimated rates – Brunei.	79
Table 32 Summary of estimated IUU by year in Brunei (1990 – 2013).	80
Table 33 Summary of the estimated value of IUU (USD) by year in Brunei (1990 – 2013).	81
Table 34 Number of marine fishing vessels by vessel type, 2009 (Source: FAO, 2011)	84
Table 35 Fleet breakdown for Cambodia	84
Table 36 Specific risks identified for Cambodia.	96
Table 37 Assessment of risk likelihood – Cambodia.	97
Table 38 Assessment of risk impact – Cambodia.	97
Table 39 Assessment of inherent risk – Cambodia.	98
Table 40 Summary of estimated rates – Cambodia.	101
Table 41 Summary of estimated IUU by year in Cambodia (1990 – 2013).	102
Table 42 Summary of the estimated value of IUU (USD) by year in Cambodia (1990 – 2013).	103
Table 43 Fleet breakdown for the East Timor Fishery.	105
Table 44 Specific risks identified East Timor.	111
Table 45 Assessment of risk likelihood – East Timor.	112
Table 46 Assessment of risk impact – East Timor.	112
Table 47 Assessment of inherent risk – East Timor.	113
Table 48 Summary of estimated rates – East Timor.	116
Table 49 Summary of estimated IUU by year in East Timor (1999 – 2013).	117
Table 50 Summary of the estimated value of IUU (USD) by year in East Timor (1999 – 2013).	119
Table 51 Fleet breakdown for India.	123
Table 52 Fisheries management duties/actions and the corresponding responsible body	124
Table 53 Marine fishing violations in Orissa’s territorial waters and marine sanctuaries (As presented in Pramod, 2010)	135
Table 54 Specific risks identified for India and the fleets to which risks apply.	141
Table 55 Assessment of risk likelihood – India.	142

Table 56 Assessment of risk impact – India.....	143
Table 57 Assessment of inherent risk – India.....	144
Table 58 Summary of estimated rates – India.....	148
Table 59 Summary of estimated IUU by year in India (1990 – 2013).....	150
Table 60 Summary of the estimated value of IUU (USD) by year in India (1990 – 2012).....	152
Table 61 Fleet breakdown for the Republic of Indonesia.....	156
Table 62 Indonesian Port State Measures, August 2015.....	164
Table 63 Inspections and arrests related to IUU fishing of Indonesian Fishing Vessels (IFV) and foreign fishing vessels.....	170
Table 64 Type and number of fisheries violation in Indonesia, 2013.....	170
Table 65 Specific risks identified for Indonesia.....	176
Table 66 Assessment of risk likelihood – Indonesia.....	176
Table 67 Assessment of risk impact – Indonesia.....	177
Table 68 Assessment of inherent risk – Indonesia.....	178
Table 69 Summary of estimated rates – Indonesia.....	181
Table 70 Summary of estimated IUU by year in Indonesia (1990 – 2013).....	182
Table 71 Summary of the estimated value of IUU (USD) by year in Indonesia (1990 – 2013).....	184
Table 72 Fleet breakdown for Malaysia.....	188
Table 73 Specific risks identified for Malaysia.....	195
Table 74 Assessment of risk likelihood – Malaysia.....	196
Table 75 Assessment of risk impact – Malaysia.....	197
Table 76 Assessment of inherent risk – Malaysia.....	198
Table 77 Summary of estimated rates – Malaysia.....	201
Table 78 Summary of estimated IUU by year In Malaysia (1990 – 2013).....	203
Table 79 Summary of the estimated value of IUU (USD) by year in Malaysia (1990 – 2013).....	205
Table 80 Fleet breakdown for Maldives.....	207
Table 81 Breakdown of total catch by fleet and species in the Maldives.....	209
Table 82 Specific risks identified for Maldives.....	215
Table 83 Assessment of risk likelihood – Maldives.....	216

Table 84 Assessment of risk impact – Maldives.	217
Table 85 Assessment of inherent risk – Maldives.....	218
Table 86 Summary of estimated rates-Maldives.....	222
Table 87 Summary of estimated IUU by year in the Maldives (1990 – 2013).	224
Table 88 Summary of the estimated value of IUU (USD) by year in the Maldives (1990 – 2013).	226
Table 89 Fleet breakdown for Myanmar.	229
Table 90 Specific risks identified for Myanmar.	236
Table 91 Assessment of risk likelihood – Myanmar.	237
Table 92 Assessment of risk impact – Myanmar.	238
Table 93 Assessment of inherent risk – Myanmar.	239
Table 94 Summary of estimated rates – Myanmar.	242
Table 95 Summary of estimated IUU by year in Myanmar (1990 – 2013).	243
Table 96 Summary of the estimated value of IUU (USD) by year in Myanmar (1990 – 2013).	245
Table 97 Fleet breakdown for Pakistan.	249
Table 98 Specific risks identified for Pakistan.....	256
Table 99 Assessment of risk likelihood – Pakistan.....	257
Table 100 Assessment of risk impact – Pakistan.	258
Table 101 Assessment of inherent risk – Pakistan.....	259
Table 102 Summary of estimated rates-Pakistan	262
Table 103 Summary of estimated IUU by year in Pakistan (1990 – 2013).	264
Table 104 Summary of the estimated value of IUU (USD) by year in Pakistan (1990 – 2013).	266
Table 105 Fleet breakdown for Papua New Guinea.	269
Table 106 Specific risks identified for Papua New Guinea.	274
Table 107 Matching risks to fleets (Papua New Guinea).	274
Table 108 Assessment of risk likelihood – Papua New Guinea.	276
Table 109 Assessment of risk impact – Papua New Guinea.	276
Table 110 Assessment of inherent risk – Papua New Guinea.	277
Table 111 Summary of estimated rates – Papua New Guinea “dogleg”.	280
Table 112 Summary of estimated IUU by year in the Papua New Guinea “dogleg” (1990 – 2013).	281

Table 113 Summary of the estimated value of IUU (USD) by year in the Papua New Guinea “dogleg” (1990 – 2013).....	283
Table 114 Fleet breakdown for the Philippines.....	286
Table 115 Catch breakdown for the Philippines national catch.	288
Table 116 Specific risks identified for the Philippines.	295
Table 117 Assessment of risk likelihood – The Philippines.....	296
Table 118 Assessment of risk impact – The Philippines.	297
Table 119 Assessment of inherent risk – The Philippines.....	298
Table 120 Summary of estimated rates – Philippines.	301
Table 121 Summary of estimated IUU by year in the Philippines (1990 – 2013).	303
Table 122 Summary of the estimated value of IUU (USD) by year in the Philippines (1990 – 2013).	305
Table 123 Fleet breakdown for Singapore.....	308
Table 124 Specific risks identified for Singapore.	313
Table 125 Assessment of risk likelihood – Singapore.	313
Table 126 Assessment of risk impact – Singapore.....	314
Table 127 Assessment of inherent risk – Singapore.....	315
Table 128 Summary of estimated rates-Singapore.	317
Table 129 Summary of estimated IUU in Singapore by year 1990 – 2013.	318
Table 130 Summary of the estimated value of IUU (USD) by year in Singapore (1990 – 2013).....	320
Table 131 Fleet breakdown for Sri Lanka.	323
Table 132 Specific risks identified for Sri Lanka.....	335
Table 133 Assessment of risk likelihood – Sri Lanka.....	336
Table 134 Assessment of risk impact – Sri Lanka.	337
Table 135 Assessment of inherent risk – Sri Lanka.....	338
Table 136 Summary of estimated rates – Sri Lanka.	341
Table 137 Summary of estimated IUU by year in Sri Lanka (1990 – 2013).....	343
Table 138 Summary of the estimated value of IUU (USD) by year in Sri Lanka (1990 – 2013).	345
Table 139 Sri Lankan fishery management measures and penalties for non-compliance.	348
Table 140 Fleet breakdown for Thailand.	354

Table 141 Specific risks identified for Thailand.	361
Table 142 Assessment of risk likelihood – Thailand.	362
Table 143 Assessment of risk impact – Thailand.	363
Table 144 Assessment of inherent risk – Thailand.	364
Table 145 Summary of estimated rates – Thailand.	367
Table 146 Summary of estimated IUU by year in Thailand (1990 – 2013).	369
Table 147 Summary of the estimated value of IUU (USD) by year in Thailand (1990 – 2013).	371
Table 148 Fleet breakdown for Vietnam.	375
Table 149 Specific risks identified for Vietnam.	381
Table 150 Assessment of risk likelihood – Vietnam.	383
Table 151 Assessment of risk impact – Vietnam.	384
Table 152 Assessment of inherent risk – Vietnam.	385
Table 153 Summary of estimated rates – Vietnam.	388
Table 154 Summary of estimated IUU by year in Vietnam (1990 – 2013).	390
Table 155 Summary of the estimated value of IUU (USD) by year in Vietnam (1990 – 2013).	392
Table 156 Average and percentage weight (t) (reported, illegal and unreported) by country.	400
Table 157 Average and percentage value (USD millions) (reported, illegal and unreported) by country.	401
Table 158 Summary of reported catch (t) and estimates of illegal and unreported fishing by ISSCAAP group (1990-2013).	402
Table 159 Summary of risks identified that have not been assessed as directly contributing to the quantitative assessment by country.	405
Table 160 Summary of World Bank governance indicators showing rank (out of 212) and percentile for regional study countries.	502

List of figures

Figure 1. Summary of the extended study area.	7
Figure 2 Hypothetical single species output from the study IUU database.	24
Figure 3 IUU Catch Profile (Bangladesh) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	45
Figure 4 IUU Catch Value Profile (Bangladesh) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	45
Figure 5 IUU Catch Profile (BIOT) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	66
Figure 6 IUU Catch Value Profile (BIOT) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	66
Figure 7 IUU Catch Profile (Brunei) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	82
Figure 8 IUU Catch Value Profile (Brunei) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	82
Figure 9: Organisational structure of the FiA.	86
Figure 10 IUU Catch Profile (Cambodia) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	104
Figure 11 IUU Catch Value Profile (Cambodia) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	104
Figure 12 IUU Catch Profile (East Timor) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1999-2013.	120
Figure 13 IUU Catch Value Profile (East Timor) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1999-2013.	120
Figure 14 Number of fishing vessels from Sri Lanka arrested in the Indian EEZ (1981-2008). (Source: GIFl Database © Ganapathiraju Pramod, as presented in Pramod, 2010).....	132
Figure 15 Number of Bangladeshi fishing vessels arrested in the Indian EEZ (1981-2008), No data are available for the years 1988 – 1999 (Source: GIFl Database © Ganapathiraju Pramod, as presented in Pramod, 2010).....	133
Figure 16 IUU Catch Profile (India) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	153
Figure 17: Catch Value Profile (India) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	154
Figure 18 Fisheries management regions of Indonesia. (Source: Indonesia NPOA for IUU fishing)	158

Figure 19 Procedure for Issuance, renewal and modification of Fisheries Business Licence (SIUP) (Source: Indonesian NPOA for IUU fishing)	159
Figure 20 Procedure for Issuance, renewal and modification of Catch License (SIPI) and Fish Carrier Licence (SIKI).....	160
Figure 21 Indonesian MCS procedures for marine capture fisheries.	162
Figure 22 Catch Profile (Indonesia) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	185
Figure 23 IUU Catch Value Profile (Indonesia) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	185
Figure 24 IUU Catch Profile (Malaysia) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	206
Figure 25 IUU Catch Value Profile (Malaysia) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	206
Figure 26 IUU Catch Profile (Maldives) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	227
Figure 27 IUU Catch Value Profile (Maldives) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	228
Figure 28 IUU Catch Profile (Myanmar) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	246
Figure 29 IUU Catch Value Profile (Myanmar) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	247
Figure 30 IUU Catch Profile (Pakistan) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	267
Figure 31 IUU Catch Value Profile (Pakistan) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	268
Figure 32 IUU Catch Profile (Papua New Guinea “dogleg”) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.....	284
Figure 33 IUU Catch Value Profile (Papua New Guinea “dogleg”) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.....	285
Figure 34 IUU Catch Profile (Philippines) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	306
Figure 35 IUU Catch Value Profile (Philippines) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	307
Figure 36 IUU Catch Profile (Singapore) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t).	321
Figure 37 IUU Catch Value Profile (Singapore) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD).	322

Figure 38 IUU Catch Profile (Sri Lanka) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	346
Figure 39 IUU Catch Value Profile (Sri Lanka) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	347
Figure 40 IUU Catch Profile (Thailand) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	372
Figure 41 IUU Catch Value Profile (Thailand) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	373
Figure 42 IUU Catch Profile (Vietnam) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.	393
Figure 43 IUU Catch Value Profile (Vietnam) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.	394
Figure 44 Estimated levels of IUU fishing by weight (t) (minimum and maximum) compared to reported catch for the region (1990-2013).	396
Figure 45 Estimated levels of IUU fishing by value (USD millions) (minimum and maximum) compared to reported value for the region (1990-2013).	397
Figure 46 Estimated levels of illegal fishing by weight (t) (minimum and maximum) compared to reported catch for the region (1990-2013).	397
Figure 47 Estimated levels of illegal fishing by value (USD millions) (minimum and maximum) compared to reported value for the region (1990-2013).	398
Figure 48 Estimated levels of unreported fishing by weight (t) (minimum and maximum) compared to reported catch for the region (1990-2013).	398
Figure 49 Estimated levels of unreported fishing by value (USD millions) (minimum and maximum compared to reported value for the region (1990-2013)).	399
Figure 50 Breakdown of reported catch as "Marine fishes nei" (MZZ) by country aggregated for 1990-2013.	409
Figure 51 IUU database entity relationship diagram	472
Figure 52 World Bank governance indicators for regional coastal states.	501

Acronyms

AIS	Automatic Identification System
APEC	Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fishery Commission
ASEAN	Association of Southeast Asian Nations
ATSEF	Arafura and Timor Seas Forum
AVA	Agri-Food and Veterinary Authority of Singapore (SG)
BFAR	Bureau of Fisheries and Aquatic Resources (PH)
BIOT	British Indian Ocean Territory (Chagos Archipelago)
BOBLME	Bay of Bengal Large Marine Ecosystem
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCCIF	Command Centre for Combatting Illegal Fishing (TH)
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CI	Conservation International
CITES	Convention on International Trade in Endangered Species (of Wild Fauna and Flora)
CMMs	Conservation and Management Measures
CPUE	Catch per unit effort
DAHD&F	Department of Animal Husbandry Dairying and Fisheries (IN)
DFAR	Department of Fisheries and Aquatic Resources (LK)
DIGP	Department of General Fisheries Inspection (TL)
DKP	District Fisheries Services- <i>Dinas Kelautan dan Perikanan</i> (ID)
DoF	Department of Fisheries (TH)
DoF	Department of Fisheries (BD)
DoF	Department of Fisheries (TH)
DoFM	Department of Fisheries Malaysia (MY)
DoFS	Department of Fisheries Sabah (MY)
EEZ	Exclusive Economic Zone
EFZ	Exclusive Fishery Zone (PK)
EJF	Environmental Justice Foundation
EPPZ	Environmental preservation and protection zone (IO)
ETP	Endangered, threatened or protected
EU	European Union
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organisation of the United Nations
FARA	Fisheries and Aquatic Resources Act (LK)
FARMC	Fisheries And Aquatic Resources Management Councils (PH)
FCMZ	Fisheries Conservation and Management Zone (IO)
FFA	(Pacific Islands) Forum Fisheries Agency
FiA	Fisheries Administration (KH)
FOC	Flag of Convenience
FONC	Flag of Non-Compliance
FV	Fishing Vessel
GDP	Gross domestic product

GPS	Global positioning system
GT	Gross Tonnage/Tonnes
HSB&I	High Seas Boarding and Inspection
IATTC	Inter-American Tropical Tuna Commission
IBM	Inboard Motor
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMACS	Indonesia Marine and Climate Support (Project)
IMUL	Multi-day boat (LK)
IOTC	Indian Ocean Tuna Commission
IPOA	International Plan of Action
ISSCAAP	International Standard Statistical Classification of Aquatic Animals and Plants
IUU	Illegal, Unreported and Unregulated (Fishing)
LGU	Local Government Unit (PH)
LoP	Letter of Permit Fleet (IN)
MAF	Ministry of Agriculture and Fisheries (TL).
MARINA	Maritime Industry Authority (PH)
MCS	Monitoring, Control and Surveillance
MCSE	Monitoring, Control, Surveillance and Enforcement
MFD	Marine Fisheries Department (PK)
MFRA	Maritime Fishing Regulation Act (IN)
MinFAL	Ministry of Food, Agriculture and Livestock (PK)
MIPR	Ministry of Industry and Primary Resources
MMAF	Ministry of Agriculture, Forestry and Fisheries (KH)
MMAF	Ministry of Marine Affairs and Fisheries (ID)
MMEA	Malaysia Maritime Enforcement Agency (MY)
MNDF	Maldives National Defense Force (MV)
MoA	Ministry of Agriculture (IN)
MoCI	Ministry of Commerce & Industry (IN)
MoEF	Ministry of Environment and Forests (IN)
MoES	Ministry of Earth Sciences (IN)
MOFI	Ministry of Fisheries Vietnam (VN)
MOFL	Ministry of Fisheries and Livestock (BD)
MOLFRD	Ministry of Livestock, Fisheries and Rural Development (MM)
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MRAG	Marine Resources Assessment Group
NDFA	National Directorate for Fisheries and Aquaculture (TL)
NFA	National Fisheries Authority (PG)
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
NPOA	National Plan of Action
NTZ	No Take Zone
OBM	Outboard Motor
OECD	Organisation for Economic Co-operation and Development

PFDA	Philippine Fisheries Development Authority (PH)
PONC	Port of Non-Compliance
PPC	Provincial People's Committees (VN)
PSMA	Port State Measures Agreement
PZJA	(Torres Strait) Protected Zone Joint Authority (PG)
RAV	Record of Authorised Vessels (IOTC)
RFMO	Regional Fisheries Management Organisation
RPOA	Regional Plan of Action
SAU	Sea Around Us
SCUBA	Self-contained underwater breathing apparatus
SEAFDEC	Southeast Asia Fisheries Development Centre
SIKI	Fish Carrier Vessel Licence (ID)
SIPI	Catch Licence (ID)
SIUP	Fisheries Business Licence (ID)
SOFIA	State of World Fisheries and Aquaculture
TED	Turtle exclusion device
THB	Thai Bhat (TH)
TIB	Traditional Inhabitant boat licence (PG)
TSPZ	Torres Strait Protected Zone (PG)
UK	United Kingdom (of Great Britain and Northern Ireland)
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFSA	United Nations Fish Stocks Agreement
US	United States of America
USD	United States Dollar
VMS	Vessel Monitoring System
WBGI	World Bank Governance Index
WCPFC	Western and Central Pacific Fisheries Commission
WWF	World Wildlife Fund

1 Executive summary

Illegal, Unreported and Unregulated fishing has been shown to contribute to the overexploitation of fish stocks and is clear a hindrance to the management and recovery of those fish populations and ecosystems that are already overexploited.

This study uses a risk based analysis, using a likelihood-impact framework, to estimate the levels of illegal and unreported fishing for 17 countries and territories in South and Southeast Asia between 1990 and 2013. Unregulated fishing, typically takes place beyond waters of national jurisdiction where no RFMO is in place to manage and regulate the fishery. It was found not to be applicable for any of the countries studied. Each of the States in the region have a legal framework and management authorities in place and therefore unregulated fishing is not an issue.

This assessment uses a qualitative approach to identify and quantify risks that contribute to IUU combined with an anchor point and influencing factor based approach to estimate a range of lower and upper estimates of Illegal, Unreported and Unregulated fishing for each country. A wide range of influencing factors were considered based around six common categories each of which can influence the level of IUU (i.e. Fishing vessels, legal personalities and companies, Fisheries and factors relating to the flag, coastal, port and market aspects of a country).

Overall, the total average value of illegal and unreported losses in the region are estimated at between USD 6 bn and USD 20.75 bn annually, representing between 4.5 and 14.4 million tonnes. These confirm and extend the results of the previous global estimate of Agnew *et al.* (2009) and reinforce the idea that developing countries are most at risk from both illegal fishing and underestimation of the total removals from fisheries from unreported catches. Illegal catches were estimated at between USD 3.35 bn and USD 10.400 bn and unreported at between USD 2.7 bn and USD 10.35 bn annually, compared to a regional first landed value of approximately USD 25.5 bn.

Illegal and unreported catches varied greatly between States in the region with those dominated by large scale industrial tuna fisheries generally having the lower rates as these fisheries come with increased control, enforcement and reporting requirements.

Illegal fishing contributes between 16.07 and 50.86% by weight and 13.13 and 40.78% by value to the overall level of IUU across the period 1990 – 2013 in the region. The regional profiles of illegal catch and catch value against time can be seen in Figure 46 and Figure 47 respectively.

Those countries in the region showing the lowest estimated levels of illegal fishing are those with high proportions of legal tuna fisheries i.e. the British Indian Ocean Territory (0.62%-2.79%) and the Maldives (0.90% – 9.81%) where high levels of legal catch dominate the catch histories. Those countries with the highest rates of illegal fishing are often typified by a weaker control and enforcement regime in a State that is surrounded by neighbours with large fishing fleets. Those with the highest estimated levels of illegal fishing include Cambodia (50%-200%), Pakistan (13.17%-38.74%), East Timor (30%-81%), Thailand (26.73%-89.11%) and Vietnam (23.12%-70.96%). In each of these cases the countries listed are bordered by nations that fish illegally within the coastal State waters contributing to the high levels of illegal fishing. In terms of catch volume, the country in the study region with highest estimated illegal fishing was Indonesia with an estimated annual loss to

illegal fishing of between 1.5 and 2.4 million tonnes. The large losses to illegal fishing are in the case of Indonesia due to the overall size of Indonesian fisheries. The next highest estimated losses to illegal fishing are found in Thailand with losses of 0.6 to 2.1 million tonnes and Vietnam with losses of 0.3 to 1.1 million tonnes. These losses represent estimated values of between USD 1.1m and USD 2.5m for Indonesia, USD 0.6 and 1.9m in Thailand and USD 0.5m to 1.4 for Vietnam.

Unreported fishing contributes between 11.03 and 36.53% by weight and 10.60 and 40.43% by value to the overall level of IUU across the period 1990-2013 in the region. The regional profiles of unreported catch and catch value against time can be seen in Figure 48 and Figure 49.

Those countries in the region showing the lowest estimated levels of unreported fishing are again those with high proportions of legal tuna fisheries and good national catch monitoring and recording i.e. the Maldives or the British Indian Ocean Territory. Those with the highest estimated under-reporting in terms of percentage of the reported catch are often found to have weaker national monitoring regimes and hence poorer data collection and analysis for their national fleets. These include Cambodia (21%-205%), Myanmar (10%-70%), and Sri Lanka (10%-103%) where problems in non- or under-reporting by national fleets have been described. In terms of value five countries in the region have estimates of losses to unreported fishing that exceed USD 1bn at their maximum estimate. These include India (USD 0.58 – 1.76bn), Indonesia (USD 0.49 – 1.48bn), Myanmar (USD 0.41 – 1.22bn), Sri Lanka (USD 0.09 – 1.00bn) and Thailand (USD 0.39 – 1.16bn).

Full details of the losses to illegal and unreported fishing for all regional States can be found in Table 156 (catch in t) and Table 157 (catch value in USD millions).

Estimates of the level of IUU fishing conducted on different species and species groups (ISSCAAOP group) were conducted and highlighted the problems related to catch reporting in the region. The most prominent ISSCAAP group in the region in terms of catch is not surprisingly “39 – Marine fishes not identified” which combines in this analysis all those reported directly as “Marine fishes nei” and the part of the catch that is made up of species that do not contribute over 2% to a national catch. This group makes up 44.36% of all catches in the region (see Table 158) and an estimated 16.06-49.93% illegal and 10.40%-37.05% unreported.

Those species groups with the highest percentages of illegal or unreported catch include “Squids, cuttlefishes, octopuses” that show an estimated rate of between 20.39 and 66.34% illegally caught, “Shads” 16.85%-71.78, “Miscellaneous aquatic invertebrates” at between 27.94 and 93.09%, “Miscellaneous marine molluscs” 25.78 to 79.43% and “Clams, cockles, arkshells” at between 25.83 and 77.70% The highest estimated rates for unreported catches by species group are “Miscellaneous marine crustaceans” (28.02 – 70%), and “Sharks, rays, chimaeras” 13.23-52.80% unreported with 10.21 – 36.34% illegal.

A number of risks identified do not independently contribute to the quantitative assessment but have been used to adjust the quantitative assessment of illegal and unreported fishing. Of these risks five occur in over 50% of the country risk assessments conducted including “Illegal fishing related to spatio-temporal closures (industrial fisheries into restricted, artisanal zones)”, “Illegal harvest/possession of sharks or other protected species”, “Illegal transshipment”, “Landing of catch in unauthorised foreign ports” and the “Use of prohibited gear”.

It should be noted that recent improvements in fisheries management in the region (i.e. introduction of Port State Measures, expansion of VMS and AIS in fleet management and measures to address excess and unrecorded fleet capacity, better internal governance and management within coastal States) may have had and will continue to have positive effects on reducing the level of illegal and unreported fishing in the region but were considered outside the scope of this project and their effects have not yet been measured.

Recommendations for the future monitoring of IUU are suggested including improvements to the collection and monitoring of catch, effort and control and enforcement data to ensure better (i.e. more precise and accurate) estimates can be developed in the future.

2 Introduction

It is widely acknowledged that Illegal, Unreported and Unregulated (IUU) fishing contributes to the overexploitation of fish stocks, is a hindrance to the recovery of fish populations and ecosystems to more productive levels and can have large negative impacts on food security, socio-economically and environmentally. These are of particular importance to South and Southeast Asia where many coastal communities rely on fisheries for livelihoods and food security.

This study builds upon the first world-wide analysis of illegal and unreported fishing conducted by Agnew *et al.* (2009), which reviewed the situation in 54 countries and on the high seas leading to an estimate of losses worldwide between USD 10 bn and USD 23.5 bn annually, representing between 11 and 26 million tonnes. This report provides an updated quantitative estimate of the level of IUU found throughout South and Southeast Asia, providing more detailed estimation and identification of the risks facing each State in the region compared to the estimate for the Eastern Indian Ocean of 44% (USD 421 – 874 m) and Western Central Pacific Ocean of 36% (USD 707 – 1,557 m) as calculated by Agnew *et al.* (2009).

Recent measures to reduce IUU have been successful in some respects although there is a long way to go before the problem could be said to be solved. Indeed, the concept of IUU has itself changed from an issue of trying to understand the size and scale of the problem initially during the 1990s when the term “IUU” was first used in a more general context. International bodies first addressed the issues with the development of the 1992 UN Agenda 21, chapter 17 on the “protection of the oceans” and the 1995 FAO Code of Conduct for Responsible Fisheries and initiated an international framework for addressing this problem, recently termed ‘fishery crime’ and recognition of the problem as an example of transboundary international crime.

Many different attempts at controlling the level of IUU fishing both on national and international levels have been made, from improving national Monitoring, Control, and Surveillance (MCS) activities, through to the UN Port State Measures Agreement that is nearing the critical number of signatories to enter into force. The combined efforts of the activities of States individually and through RFMOs have reduced the level of IUU fishing in some areas but significant IUU fishing still occurs in many areas with little or no restriction.

The recent Interpol Working Group on Fisheries Crime¹ identified a number of significant fisheries issues that contribute to the underlying IUU fishing problem facing many States:

- Lack of political willingness to prioritize environmental crime and specifically illegal fishing;
- Limited capacity and resources in several coastal states committed to reducing illegal fishing;

¹<http://www.interpol.int/Crime-areas/Environmental-crime/Environmental-Compliance-and-Enforcement-Committee/Fisheries-Crime-Working-Group>

- Need to identify points of contact in order to better coordinate law enforcement actions among relevant fisheries enforcement agencies;
- Socio-economic impacts and revenue loss due to illegal fishing;
- Need to avoid overlap with other international efforts and initiatives;
- Need to recognize that each country has different national legislation that defines “crime”
- Need to expand INTERPOL’s tools and services to fit fisheries crime needs; and
- Identification of linkages between fisheries crime and other crimes (i.e. tax evasion, corporate crime, document fraud, money laundering).

Many of these underlying issues facilitate the ease by which IUU fishing is undertaken and also the ease by which IUU fish are then allowed to enter the supply chains to legitimate markets.

The 1995 FAO Code of Conduct for Responsible Fisheries and the 1992 UN Agenda 21 (chapter 17) created a framework for addressing the problem of IUU fishing, although it is clear that this has not proven successful. The fishery management improvements have concentrated on improvement of MCS activities in ports, through the FAO Port State Measures Agreement and measures such as the EU IUU Regulation². The activities have substantially improved the ability of mainly developed countries to address IUU fishing and limit the ability of fishers to allow IUU fish to enter markets. However, in the study region, these measures have not been implemented to the same level and standard and IUU fishing is still occurring at a large scale. It should be noted that recent improvements, after the scope of this report was written, to the control of fisheries within the region have occurred, often under the threat of export bans to the European Union. These include increased cooperation with neighbouring States (i.e. Indonesia and Australia)³ and internal improvements (i.e. Thailand)⁴.

This report provides an estimate of the level of IUU fishing for a subset of South and Southeast Asian countries from Pakistan in the west through to Vietnam and the Philippines in the east. This selection of countries covers a wide range in terms of size of fisheries sector and population from Singapore and the British Indian Ocean Territory to India and Indonesia and includes seven of the top 18 countries with respect to marine capture fisheries according to the State of World Fisheries and Aquaculture report (FAO, 2014).

Estimation of IUU is difficult with the best available data. It is the estimation of something that by definition could be illegal, not recorded and not observed and takes place at sea potentially thousands of miles away from the eyes of fisheries inspectors. One of the difficulties in estimating IUU fishing in developing countries as typified by those in Asia is that quantitative estimates of the

² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:286:0001:0032:EN:PDF>

³ <http://www.intrafish.com/news/article1421694.ece>

⁴ <http://fis.com/fis/worldnews/worldnews.asp?l=e&id=77998&ndb=1>

scale of IUU fishing are very difficult to obtain. IUU fishing is considered widespread and complex and a threat to the status of fish stocks and fisheries economies of many developing states, yet historically resources have rarely been directed at fisheries control and enforcement. IUU therefore remains to the most part unknown and unmeasured. As such estimates are typically wide ranging, i.e. Agnew *et al.* (2009) and Pramod *et al.* (2014) and are best presented as a range between which the true value is estimated to lie rather than a single point estimate that cannot be justified. The quantity and quality of data used to generate the estimates and in particular the contrast in data over time are often limiting factors. Data on illegal and unreported fishing are often not freely available even if they exist and when they are may be highly aggregated. This is compounded in the study region by a lack of clear quantitative data defining fleet segments and their catches which allow fine level estimates of rates of illegal and unreported catches to be assigned to relatively well defined subsets of a national fleet. Catch statistics themselves are highly problematic with the basic level of aggregation for many countries being restricted to five or six common species or species groups with some countries reporting over 80% of their national catch as “Marine fish nei”.

The standard methodology used throughout the study is presented in section 4, with individual elements of the methodology presented in the following sections:

- Base Level Data Collection (see Section 4.2);
- Data Collection on IUU Influencing Factors (see Section 4.3);
- Catch Data (see Section 4.2.1);
- Breakdown of national catch by fishery/fleet segment (see Section 4.4);
- Risk Assessment Approach (see Section 4.5);
- Taking the qualitative assessment of risk and turning it into a quantitative estimate (see Section 4.6) and
- Regional IUU Database Model Development (see Section 4.7).

National studies conducted for each of the countries outlined in the scope are then presented in section 5 with a summary of the regional outcomes across countries and species groups and conclusions presented in section 6.

3 Scope

In providing a quantitative estimate of the level of Illegal, Unreported and Unregulated fishing a clearly defined scope demarcated by area, time and species covered has been developed as follows:

3.1 Geographical scope

In 2015, the FAO IUU Workshop raised the potential to include other Southeast Asian States into the same evaluation system as that required by the original collaboration with the BOBLME project. The agreed expansion to other States was technically feasible given the current flexible structure of the model. For example, the inclusion of additional States, fleet segments, species etc. is just an expansion of the datasets and would not require changes to the model. The inclusion of freshwater fisheries was discussed but a decision was taken to limit the current scope to marine fisheries in the waters of the named coastal States i.e. Pakistan, Maldives, British Indian Ocean Territory, India, Sri Lanka, Bangladesh, Myanmar, Thailand, Malaysia, Singapore, Indonesia, East Timor, Brunei, Papua New Guinea (limited coverage), the Philippines, Cambodia and Vietnam. The geographical scope is summarised in Figure 1. Where disputed claims occur between neighbouring States, i.e. islands in the South China Sea, these waters have not been included in the study to avoid any issues of double counting. Although this may exclude waters that would be considered by coastal States as part of their own EEZ, the manner in which this study has been implemented, i.e. from a coastal State point of view, would effectively enforce double counting if these areas were considered.

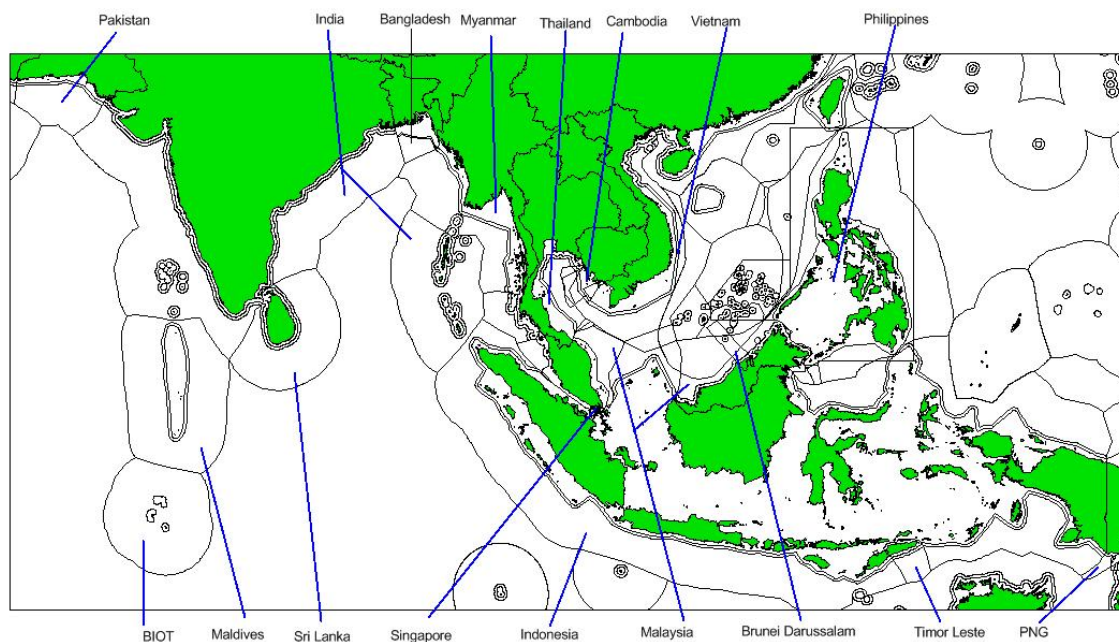


Figure 1. Summary of the extended study area.

NB: Boundaries data from <http://www.marineregions.org>

3.2 Time period

The standard time period covered by the study for catch data is 1990 – 2013, although for some countries the 2013 data were not available and in these cases only 1990 – 2012 were used. The dates are based on the availability of national catch data from the FAO via FISHSTAT (i.e. FAO reported data). The reliability of these data for some States has been widely questioned in terms of the level of accuracy of estimated catches, the level of aggregation, and political factors affecting the reported catch versus the actual catch. However, a single reliable source was required to act as a baseline and the FAO data, although flawed, provided such a baseline in which a level of confidence could be maintained.

It should be noted, however, that information related to IUU events, legislation and changes in the control and enforcement in study countries has been sourced up to the date of presentation of this report (2015). The collection of information from outside the study period has been conducted to ensure that as much information to guide estimation as possible was available. This information may not have been publicly available before the few most recent years as IUU fishing was not as high a profile issue. In these cases the relationship of IUU over time has been evaluated to ensure that the background situation in each country has not changed dramatically over time.

3.3 Species

All species could be considered in this study, although limitations on the risk assessment data within the database acted to restrict the total number of individual species. Any species in the top twenty species in the catch time series data (over the whole period) for a country would be analysed separately. The remaining species and species groups were combined into a single class of other species (separate to the officially recorded “Marine fishes nei”) for analysis.

The lists of species considered during the study for each of the study countries can be found in Annex 3.

4 Methodology

This section describes the approach undertaken within the study. An overview is provided with specific descriptions of the individual methodologies and database-related descriptions in the following sections;

- Data collection – base data on catches; (See Section 4.2)
- Data collection – factors influencing IUU; (see Section 4.3)
- Breakdown of national catches by fleet; (See Section 4.4)
- Risk assessment process; (See Section 4.5); and
- Database model development (see Section 4.6).

4.1 Overview of the methodology

Previously published analyses (Pitcher *et al.* (2002), Ainsworth and Pitcher (2005), Tesfamichael and Pitcher (2007), Agnew *et al.* (2009) and Varkey *et al.* (2010)) have established the “anchor point and influence” methodology to estimate and examine illegal and unreported catches. This method has been adapted to focus on illegal and unreported catches for specific fisheries in each of the States in the study. Unregulated fishing, which typically is conducted beyond waters of national jurisdiction when there is no RFMO in place to manage and regulate the fishery is not applicable for any of the countries studied. Each of the States in the region have a legal framework and management authorities in place and therefore unregulated fishing is not an issue and therefore estimates of unregulated fishing have not been made..

As a first stage in the process, empirical data from a standard source were used to establish “anchor point” estimates of the catches (by species) made in each of the States, from which estimates of illegal and unreported fishing in State (and for each fishery with each State) can be made.

Qualitative and quantitative data were subsequently used to generate “influencing factors” that then scale the extrapolations from or interpolations between the original anchor point estimates. The influence factors for each analysis reflect the overall and relative incentives and disincentives to fish illegally, misreport catches or fish in an unregulated manner. These influencing factors are grouped into a few general risk categories each with a number of specific risks that would potentially add to the level of IUU fishing. These risk categories are described in section 4.3.1 in detail.

A large and varied number of sources were consulted to obtain information on the influencing factors, including academic papers, fisheries association reports and articles, national government or provincial authorities’ reports, official RFMO data or publications, industry data, NGO publications, and press reports. In some cases, information and data were gathered through the use of local experts with knowledge of local fisheries and access to information that may not be publically available.

Due to the volume of reference materials used for this study to provide information to feed into the estimates of illegal activity an online reference tool (Zotero)⁵ has been used to bring all the reference material for the study into one place and provide effective reference management for the study overall.

A database has been developed to store collated baseline data, risks and estimates of IUU for each fishery identified in each State. These data have then been processed to provide summaries of the estimates across the region, by State and by species.

4.2 Base level data collection

In order to populate the model described, a number of data series have been imported into a MS Access database to allow estimates of IUU to be made. The three critical series are reported (official) catches, price data (to estimate value of the losses to coastal States) and the estimated levels of IUU applicable to each fleet. Each of these data series should be aggregated at the level of State, year, species (or species group) and fleet segment where possible.

4.2.1 Catch data

A common recognised baseline for catch data is required in order to estimate the percentage of IUU exhibited in a fishery. The baseline used at this point of the project has been taken from the FAO FishStat database of world catches (1950-2012). The latest year for which catches have been reported globally is 2013 at the start of the project and therefore a time period of 1990 – 2013 has been selected to give an accurate representation of the recent status and changes in the levels of IUU. These catch data have a number of advantages of disparate data sets that could alternatively be used:

- Single source;
- Submitted by States to FAO (therefore official figures); and
- Catch by species and year and able to be obtained for FAO Area 57 (i.e. Indian Ocean East catches).

It has been identified that the actual levels of catch made by the fisheries in the study region may not be represented accurately within the figures reported by the States of the region. It is believed that in addition to the expected under-representation of catches due to missing data, any reported figures of illegal, unreported or unregulated catch have a huge over-representation of the actual catch levels. There are a number of reasons suggested for this including the requirement for local officials to continually show positive progress even if no real increase in catch exist. This would therefore not fit the model as it is presented, as the model uses a methodology based on projection of the additional IUU catch based on the official reported catch histories. Where this may have occurred it will be noted in the relevant section.

⁵ <https://www.zotero.org/>

Using the baseline catch data, data have been aggregated to enable those species in the catch histories that make up more than a minimum defined percentage (2%) of the national catch for each country to be identified. These species will be analysed in detail, and those that make up less than 2% individually will be aggregated into a separate category in addition to the generic “Marine fish nei” (thereafter referred to as ‘MZZ’) classification that is reported within FAO statistics. These mixed categories will be assigned a default IUU rate based on other catches in the fleet segment. A summary of the individual country species combinations can be found in Annex 3.

4.2.2 Price data

Species highlighted for analysis as described in Annex 3 have been assigned price information by year from 1990-2012 where possible. Price data will be sourced from recognised sources (i.e. Infofish, Eurofish) and gaps filled in with average prices where no exact match is possible.

An important consideration relating to the fish price data is that these are international market price data. They are not local price data from local markets, which may differ greatly. International market price data have been used for two main reasons, they can be referenced and obtained from a standardised set of verifiable sources and they would reflect the maximum level of losses to a coastal State in terms of the loss in resources from illegal fishing. Price data for fish are highly volatile and changeable between fleets, countries, over time and between grades of product. We recommend that this approach is noted for guidance on approximate values only and should be referenced as such throughout the reporting and for other users quoting this report. It will not track the myriad of changes across each country of capture (or landing) and time period for each species.

The ‘mixed’ categories of species, either those that are reported in the national reported catches as mixed species or those individual species or species groups within the reported catches that make up less than 2% of a national catch and are combined within our methodology, have been assigned a default average price in the database model of USD 900/t. This is a relatively low price, but higher than many high volume, low value species and is an estimated average price for lower value mixed species consistent with previous estimates.

4.3 Data collection on IUU influencing factors

All bibliographic references relating to IUU in the study region that have been collected so far as part of the project have been stored internally within the MRAG Zotero referencing system. In addition, any grey literature that has been obtained has been added.

4.3.1 IUU influencing factors

Where information or evidence of IUU fishing has not been able to be collected in sufficient detail or quantity, there are a wide range of factors that have previously been identified as having an influence on the level of IUU. These have been categorised and updated for this study into the standard six categories that have been used for IUU risk assessment:

1. Fishing vessels, legal personalities and companies (IUU and whitelists);
2. Fisheries (sustainability, impacts);
3. Flag State (corruption, control systems in place);

4. Coastal State (corruption, control systems in place);
5. Port States (control systems in place, PSMA provisions in place); and
6. Market State (traceability and national requirements).

Within each of these classifications a number of subsidiary elements have been defined. For example, examination of flag State control (category 3 above) identify there are twelve subsidiary elements:

- 3.1. Flag of non-Compliance (FONC)
- 3.2. Non-Cooperating
- 3.3. Flag of convenience
- 3.4. Corruption
- 3.5. Licensing
- 3.6. Fair transparent fisheries agreements
- 3.7. RFMO
- 3.8. Multi-lateral organisations i.e. FAO Guidelines or UNCLOS
- 3.9. NPOAs (IUU + others)
- 3.10. Flag State Control
- 3.11. Observer Programme
- 3.12. Cooperation on MCS issues.

Further to this, each subsidiary element has a series of underlying questions that can easily be answered. For example under 3.1 (FONC), we would identify if the flag of any of the study countries had been used as a flag of non-compliance (convenience) by any operators in the past (3.1.1), if these vessels have been seen to commit IUU and if this has been recorded by other coastal States and RFMOs (3.1.2), and finally if and how the flag State had responded to this (3.1.3).

A full set of the criteria that were used in the analysis can be found in Annex 6 although it should be noted that data were not available to assess all the criteria for each State.

Within the IUU Influencing factors a number of important elements are covered by RFMO membership and requirements and by the accession, ratification and signature of a number of binding and voluntary international agreements including:

- FAO Port State Measures Agreement;
- FAO Code of Conduct for Responsible Fisheries;
- FAO Agreement to Promote Compliance with International CMMs by fishing vessels on the High Seas ;
- UNFSA Convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks;
- UNCLOS United Nations Convention on the Law of the Sea; and
- National Plans of Action against IUU (NPOA IUU).

A table of RFMO membership and the status of each study countries with respect to these agreements has been prepared and can be found in Annex 3.

4.3.2 IUU events

References of IUU events have been recorded based on web searches of press cuttings, RFMO IUU records and written reports that are in the public domain or obtained during the project. To ensure efficiency and transparency when searching and screening evidence from press sources, a detailed **information search strategy** has been utilised. The form of the strategy consisted of a discrete protocol detailing the keywords to be searched, the sources to search, screening procedures, inclusion and exclusion criteria and recording procedures.

A series of search terms of relevance were identified. These included the following:

- IUU + Fishing;
- Illegal fishing;
- Fishing illegally;
- + Fishermen;
- + Fishermen court case;
- + Fishermen fine/fined;
- + Fishermen arrested/detained;
- + Arrested fishermen;
- + Fishing boats seized;
- Unreported fishing; and
- Unregulated fishing.

Species specific searches (Search: “illegal” or “unreported”) plus species of interest for each study country, for example the fish below could be the dominant in the catch of a State and would be added to the search terms for that State:

- Threadfin bream;
- Ponyfish;
- Drums;
- Croakers;
- Jacks;
- Trevally;
- Lizardfish; and
- Indian mackerel.

The sources for press references included online English language press in the study region, those publications chosen in each study country are listed in Table 1. All references collected of interest to the study are then maintained in the Zotero reference system noted in section 4.1 to enable efficient searching, filtering and referencing.

4.4 The original proposed breakdown of national catch by fishery/fleet segment

Methodology addressed the catches by States at the overall level and aggregated by species. After initial analysis it appeared that this may be too broad for an effective analysis and further

disaggregation to the level of a fleet segment may be required. These fleet segments would still remain relatively broad (i.e. industrial tuna purse seine, artisanal inshore demersal) and not be as defined as, for instance, an EU fleet segment definition would be, which would include a tight definition of vessel size and gear.

Catches, currently reported at the national level, would therefore need to be broken down from the current national catch level into catches by fleet segment. Any differences in the totals between summing segments and the overall national catch would need to be documented and understood before estimating the IUU levels. This may already be done at a national level for some States but the better the breakdown the better the overall estimate will be as different levels of control may be exercised on different fleet levels.

We have, where possible, employed local experts to collect these data and have included these in the database. Where local experts were not available or it was not possible to break the national catch into appropriate fleet segments, it was necessary to calculate estimates of IUU based on the national catch as reported.

Table 1 Summary of press publications searched by country.

Country	Publication	Hyperlink
Bangladesh	The Daily Star	http://www.thedailystar.net/
	bdnews24	http://bdnews24.com/
British Indian Ocean Territory	n/a	No national press.
Brunei	The Brunei Times	http://www.bruneitimes.com.bn/
	Borneo Bulletin	http://borneobulletin.com.bn/
Cambodia	Cambodia Daily	https://www.cambodiadaily.com/
	The Phnom Penh Post	http://www.phnompenhpost.com/
East Timor	Guide Post East Timor	http://www.guideposttimor.com/
	Suara Timor Lorosae	http://www.suara-timor-lorosae.com/
India	The Asian Age	http://www.asianage.com/
	The Indian Express	http://indianexpress.com/
	The Times of India	http://timesofindia.indiatimes.com/
Indonesia	The Jakarta Post	http://www.thejakartapost.com/
	Daily Indonesia	http://www.dailyindonesia.com/
Malaysia	The Star Online	http://www.thestar.com.my/
	New Straits Times	http://www.nst.com.my/
Maldives	The Maldives Chronicle	http://themaldiveschronicle.com
Myanmar	Myanmar Times	http://www.mmtimes.com/
	The Irrawaddy	http://www.irrawaddy.org/
Pakistan	The News	http://www.thenews.com.pk/index.html
	The Nation	http://nation.com.pk/
	Daily Times	http://www.dailytimes.com.pk/
Papua New Guinea	Post Courier	http://www.postcourier.com.pg/
	The National	http://www.thenational.com.pg/
Philippines	Manila Bulletin	http://www.mb.com.ph/
	Philstar	http://www.philstar.com/
Singapore	The Straits Times	http://www.straitstimes.com/
	Today	http://www.todayonline.com/
Sri Lanka	Daily Mirror	http://www.dailymirror.lk/
	Daily News	http://www.dailynews.lk/
Thailand	Bangkok Post	http://www.bangkokpost.com/
	Thai PBS	http://englishnews.thaipbs.or.th/
Vietnam	Vietnam News	http://vietnamnews.vn/
	ThanhNien News	http://www.thanhniennews.com/

4.5 Risk assessment approach

In order to identify where the main risks are i.e. which combination of illegal, unreported or unregulated fishing occurs, one approach that has been used successfully in identifying and focussing efforts has been to use a risk based approach using a simple impact – likelihood matrix. Here, a simple non-parametric scale of likelihood can be assigned to a number of risks for the various fleet segments assessed (see Table 2) based on the incentives to fish in an IUU manner and the deterrents in place. Risks at this stage would likely be divided up relevant categories, with any unreported and illegal catch being included as “illegal” with the assumption that illegal catches are not reported through official channels.

The two elements considered in a risk assessment are likelihood and impact.

4.5.1 Likelihood

When considering the level of incentives for a particular risk, we are primarily looking at the financial incentive to fish in an IUU manner. This may be due to the simple high volume or high value of the fish taken or a gradient in availability of the resource between a number of locations, i.e. fishers may also be tempted to fish inside an MPA where the biomass of certain fish species is higher. The level of incentives are estimated based on a simple qualitative 5 level scale from “Very Low” to “Low”, “Moderate”, “High” and “Very High”

Incentives are likely to be influenced by a number of factors including *inter alia*:

Positive factors	Negative factors
High value	Low value i.e. trash fish
Ease of access to the resource	Long distance to travel
Multiple gear access to the resource	Other low-risk fisheries close by
Easy market access	No ready market for the product

The incentives are counter-balanced in the estimation of likelihood by the level of deterrence in a particular fishery. There are two clear aspects to the level of deterrence that need to be considered when performing a risk analysis. The first is the level of sanctions that are available to a fisheries regime as established by the relevant legal and regulatory framework in place that may include, fines, seizure of gear, catch and vessels and at the upper end imprisonment of the master, owner and sometimes crew. The second aspect to be considered is the level and variety of monitoring, control and surveillance available to address each of the risks assessed. The greater the level, variety and coordination of means and measures available for enforcement the lower the level of risk. Deterrents are estimated based on a similar 5 level scale from “Very Strong” to “Strong”, “Moderate”, “Weak” and “Very Weak”. The likelihood is then determined using Table 2.

Deterrents are likely to be influenced by a number of factors including *inter alia*:

Positive factors	Negative factors
High WBGI “Control of Corruption” score	Low WBGI “Control of Corruption” score
High conviction : prosecution ratio	Evidence of poor court procedures
High sanctions	Low (non-incremental sanctions)
Effective MCS with variety of means, units and measures in place	Poor or lacking MCS Single faceted MCS (i.e. just vessels)
Coordination with neighbouring States	Little or no coordination
Active in regional coordination	

Table 2 Example likelihood evaluation matrix.

		Incentives				
		Very Low	Low	Moderate	High	Very High
Deterrents	Very Strong	Rare	Rare	Unlikely	Unlikely	Moderate
	Strong	Rare	Unlikely	Unlikely	Moderate	Likely
	Moderate	Unlikely	Unlikely	Moderate	Likely	Likely
	Weak	Unlikely	Moderate	Likely	Likely	Almost Certain
	Very Weak	Moderate	Likely	Likely	Almost Certain	Almost Certain

4.5.2 Impact

Impact is assessed as a combination of the level of catch, relative to the overall catch of that species/fishery as appropriate, that would be taken as a result of the behaviour and the vulnerability is the level of risk assessed to be associated with this removal, though it should be noted that this may be associated with the target species, bycatch species, incidental mortality of ETP species or damage to habitats and ecosystems. Catch and vulnerability are both assessed on similar five step scales as shown in Table 3.

Vulnerability is likely to be influenced by a number of factors including *inter alia*:

Positive factors	Negative factors
Gears used have minimal impacts	Gears catch increased bycatch
Resilient species	Species vulnerable to high level extraction (i.e. sea cucumbers)
Resilient habitats	Sensitive habitats (i.e. coral reefs, seagrass)
Gears do not target high trophic level species (i.e. sharks)	High trophic levels impacted severely.

The potential impact of these risks can then also be assessed according to the matrix in Table 3 that defines the potential impact based on the level of catch and the vulnerability of the resource.

Table 3 Example impact evaluation matrix.

		Level of catch				
		Very Low	Low	Moderate	High	Very High
Vulnerability	Highly Resilient	Insignificant	Insignificant	Minor	Minor	Moderate
	Resilient	Insignificant	Minor	Minor	Moderate	Major
	Moderate	Minor	Minor	Moderate	Major	Major
	Vulnerable	Minor	Moderate	Major	Major	Serious
	Highly Vulnerable	Moderate	Major	Major	Serious	Serious

Finally a risk level based on the combined impact and likelihood can be determined according to the matrix in Table 4. Only those risks that have a moderate or higher negative impact would need to be evaluated in detail. Those with little or no impact or those with a low likelihood could be excluded from the analysis.

Table 4 Example risk (impact – likelihood) evaluation matrix.

		Impact				
		Insignificant	Minor	Moderate	Major	Serious
Likelihood	Rare	Low	Low	Minor	Moderate	Moderate
	Unlikely	Low	Minor	Moderate	Moderate	High
	Moderate	Minor	Moderate	Moderate	High	High
	Likely	Moderate	Moderate	High	High	Severe
	Almost Certain	Moderate	High	High	Severe	Severe

A default list can be found in Table 5 but this would be verified and tailored to the specific cases for each State in the region.

Table 5 Example risk categories and specific risks that could be utilised.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed fishing in EEZs by national boats
	Unlicensed fishing in EEZs by boats from regional States
	Unlicensed fishing in EEZs by boats from outside the BOBLME region
Non-compliance with reporting obligations by licensed/authorised vessels	Under-reporting target species
	Misidentifying target species
	Misreporting of bycatch species
	Misreporting catch position
	Non-or delayed logbook submission
	Failure to operate VMS inside an EEZ where required
	Failure to provide prompt reporting to coastal State.
Non-compliance with other licence conditions by licensed/authorised vessels	Use of non-prescribed gear
	Fishing inside closed waters
	Falsification/misuse of licence documents
	Failure to carry an observer when required.
Post-harvest IUU	Illegal transshipping
	Bunkering (refuelling) at sea
	Landing of catch in unauthorised foreign ports
Other offences	Illegal harvest/possession of sharks or other protected species.
	Damage to essential habitats in contravention of national laws.
	Bribery/obstruction/mistreating of observers or fisheries officers.

Within each country study these risks would then be tabulated against the fisheries to which they apply in the format in Table 6 below. Here each individual risk that has been identified as applying to a country has been matched up to the individual fleets to which that risk will apply. This ensures that when calculating the volume and values for individual species that only those species that are caught by those particular fleets have been taken into consideration.

Table 6 Matching risks to fleets.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India).	3
	Unlicensed fishing in EEZs by boats from outside the region (Taiwan and Japan).	1 and 2
Non-compliance with reporting obligations by licensed/authorised vessels	Under-reporting target species	1, 2 and 3
	Misidentifying target species	1, 2 and 3
	Misreporting of bycatch species	4 and 5
	Failure to provide prompt reporting to coastal State.	1, 2, 3, 4 and 5
Non-compliance with other licence conditions by licensed/authorised vessels	Use of non-prescribed gear	1 and 5
	Fishing inside closed waters	1 and 5

4.6 Quantitative estimation based on outputs of risk assessment

Once the risk assessment process has been conducted, a number of specific risks have been identified with an approximate level for each study country and the appropriate fleets. These qualitative risks have then been assigned a quantitative level based on a combination of the risk level and expert judgement of the risk assessment team based on the influencing factors and any applicable evidence of quantitative examples of actual IUU events.

Quantitative estimates have been developed as a range from a minimum to a maximum level in a manner similar to previous studies. The range of typical values that have been given to IUU risks can be found in Table 7. The width of the range of estimated IUU will vary based on the evidence available. If a clearly defined quantitative estimate is already available then the range of the estimate will be clearly defined and is likely to be a narrow range. Where little or no clear evidence is available then the range of the IUU estimate is likely to be wider.

It should be noted that a number of risks either have zero catch allocated to them as they are complicating factors to illegal or unreported fishing that has already been accounted for. These factors are highly important and therefore need to be highlighted and are taken into consideration when assigning the quantitative ranges as they may have multiplicative effects by enhancing IUU that has already occurred i.e. Obstruction against fisheries officers and illegal transshipment .

Table 7 Example quantitative estimates of IUU based on estimated risk levels.

Risk Level	Example Quantitative Values of IUU Assigned
Low	0.0 – 0.5% 0.0 – 2.0%
Minor	1.0 – 2.0% 2.0 – 5.0%
Moderate	2.0 – 10.0% 5.0 – 10.0% 5.0 – 15.0%
High	5.0 – 20.0% 10.0 – 25.0% 10.0 – 30.0%
Severe	15.0 – 30.0% 20.0 – 40.0% 25.0 – 100.0%

4.7 Regional IUU database model development

As a tool for providing a quantitative IUU estimate for the study region a database model has been developed building upon and extending the principles previously used in developing the global IUU estimate (Agnew *et al.* 2009).

In this model a series of estimates of the rates of illegal, unreported and regulated fishing would be generated for the following combination of factors:

- Country
- Species
- Year
- Fleet Segment
- Rate of “I”-Illegal fishing (Minimum and Maximum)
- Rate of “U” – Unreported fishing (Minimum and Maximum)
- Rate of “U” – Unregulated fishing (Minimum and Maximum)

These individual rates are combined to estimate the loss of each species by year for each country and fleet segment (where applicable). Alongside the catch data are estimated price data for each species by year.

Where prices for a specific combination of the year, country and species have not been available, a mean price from other similar sources has been used, initially for all prices for that species in a five year wide range around the required target year, and an average price over the entire period where this is not available. Price data on a finer scale for each fleet segment would not be possible to include for the wide range of seventeen countries and hundreds of species, country and fleet

combinations without extensive market based field work and it would not be possible to collect these data historically except for the most high profile and valuable stocks that are traded internationally (i.e. tuna, shrimp or bêche-de-mer).

Database queries were developed to automatically generate the necessary final outputs, for example, the overall levels of IUU in regional countries or for a subset (i.e. here an example for the original eight candidate BOBLME countries can be seen in Table 8.

Table 8 Example output query of IUU catch and value.

Country	Catch (t)			Value (USD)		
	Catch	IUU (Min)	IUU (Max)	Value	IUU (Min)	IUU (Max)
Bangladesh	192568	1925.68	19256.8	173.31	1.73	17.33
India	4294169	42941.69	429416.9	3864.75	38.65	386.48
Indonesia	10474110	104741.1	1047411	9426.7	94.27	942.67
Malaysia	3300113	33001.13	330011.3	2970.1	29.7	297.01
Maldives	100868	1008.68	10086.8	90.78	0.91	9.08
Myanmar	685537	6855.37	68553.7	616.98	6.17	61.7
Sri Lanka	447215.5	4472.15	44721.55	402.49	4.02	40.25
Thailand	3948500	39485	394850	3553.65	35.54	355.37

NB: These data are example data based on default rates by species and FAO catch data and should not be used.

Queries have been developed using standard formats applied throughout the database to summarise, compare and contrast the results. For example, summaries have been produced to generate results for a specific country, for a specific fleet segment or species across countries. This is illustrated in Figure 2 and shows a hypothetical output detailing the reported catch, and the lower and upper estimates of IUU catch (over and above the reported catch) for a single species across all regional countries.

The main aim of this approach is that at any time during the study, new information, i.e. catches and prices, can be added or estimates of IUU updated within the database given new or updated information. The end-point queries can then be simply updated and a revised estimate obtained. In this way, it is possible to fill the database from the start with catch and price information based on known standards and default values that would be used in the absence of known data for IUU rates. As specific IUU rates are updated the estimate would become more and more accurate.

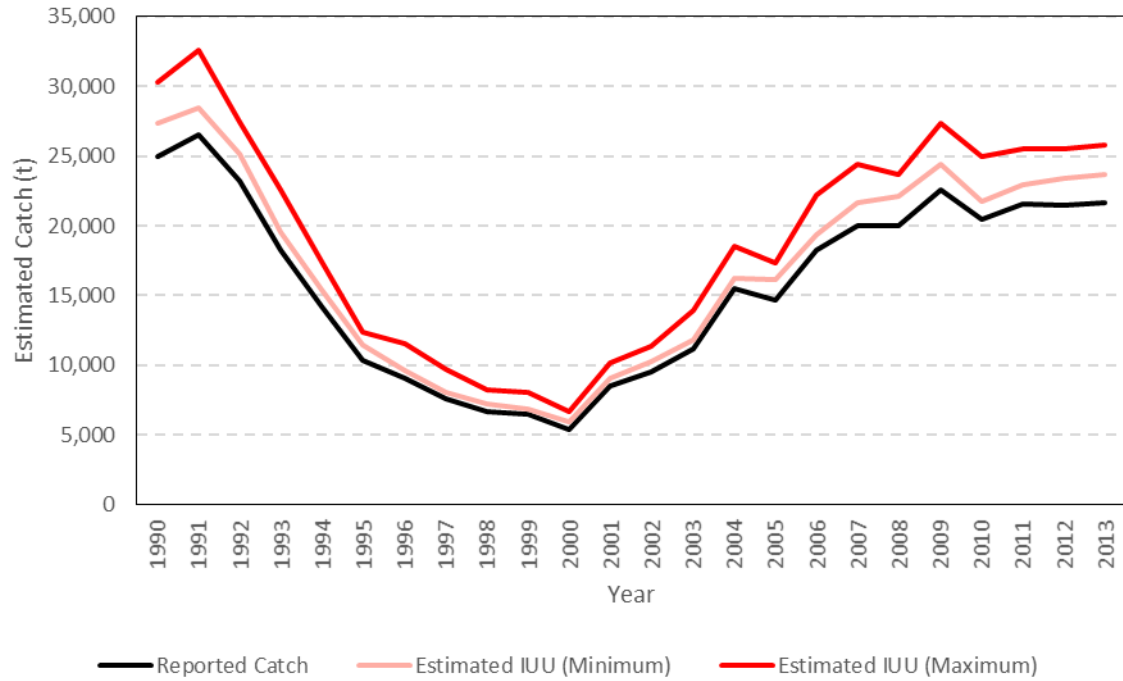


Figure 2 Hypothetical single species output from the study IUU database.

NB: This graphic has been developed using default example data and should not be published.

5 National analysis

5.1 Introduction

This section of the report provides the individual national analyses for each of the study countries. For each country, the following subsections have been defined with the following content:

Sub-section	Description
Introduction	An introduction to the State concerned, the relative size of its EEZ and territorial sea and boundaries it shares with other States. Please note that the figures here have been extracted from the Global Maritime Boundaries Database (http://www.globalgisdata.com/10974.html) as calculated areas based on the maritime claims. Where disputed claims exist the areas quoted may not match those claimed elsewhere (i.e. www.MarineRegions.org).
Fleet breakdown	Simple breakdown of the fleets operating (up to a maximum of 5-6) by flag State (and nationalities of owners and other legal personalities), gear types, target species, <i>modus operandi</i> , drivers of IUU activity, trade routes).
Catch breakdown by fleet	Where possible a percentage breakdown of the catch by species by fleet of the overall catch. Where available reported catches (i.e. National data submitted to the FAO available through FISHSTAT) have been compared against the Sea Around Us (SAU) catch reconstructions. A number of these the catch reconstructions were commissioned by the BOBLME Project and carried out on behalf of BOBLME by SAUP. Coastal States have had an opportunity to comment on these reports but these comments have not yet been fully integrated into the versions online. It has been noted that these reports should only be considered at a draft stage and are still being reviewed by the coastal States concerned although they are publicly available through the SAU website (i.e. Pauly and Budimartono, 2015) http://www.seaaroundus.org/doc/publications/wp/2015/Pauly-and-Budimartono-Indonesia.pdf).
Analysis of IUU related factors	A summary of IUU related factors that would influence the level of risk IUU
Summary of IUU incidences	A summary of the reported IUU incidences in each country, highlighting the fleets (gear and flag State(s)) that commit the IUU, frequency, catch (by species where possible) and any additional relevant information (i.e. where significant environmental damage is caused).
IUU risk identification	Identification of IUU risks that would appear for each fleet operating in a country.

Risk assessment	The results of a likelihood impact assessment to identify the estimated level of IUU.
Impacts of IUU	Any specific identified impacts of IUU fishing broken up into social, economic and environmental impacts.
Estimation of rates of Illegal, Unreported and Unregulated fishing	An estimation of the rates of Illegal, Unreported and Unregulated (no unregulated fishing appears in this report due to the definition of the scope being within EEZs) over time for each of the fisheries listed for each country.
Quantification of Illegal, Unreported and Unregulated fishing	A quantification of the amount of IUU over time for each of the fisheries listed for each country in terms of tonnage (t) and value (USD).

5.2 Bangladesh

5.2.1 Introduction

The Bangladeshi EEZ covers an area of only 37,800 km² with an additional area of 39,860 km² defined as territorial sea and 4,133 km² as contiguous zone (NB: Marine Regions gives a total of 84,340 km²). The Bangladeshi EEZ shares borders with India to the west and Myanmar to the east, and the EEZ does not extend to the full 200nm from shore as it is restricted by the EEZs of Indian and Myanmar that meet at approximately 150nm from shore. Bangladesh with its mixture of freshwater and marine habitats is rich in aquaculture and aquatic resources with 475 marine fish species and a number of commercially exploited prawn and shrimp species (DoF (Bangladesh), 2001).

The fisheries sector of Bangladesh is integral to the national economy and makes significant contributions to livelihoods and food security: Fisheries are responsible for about 4% of the national gross domestic product (GDP) (and represent 7% of total exports) (FAO, 2010) and provide livelihoods to millions of rural poor. Contemporary fisheries capture production in Bangladesh is reported as approximately 3 million tonnes, annually (FAO, 2015). The majority of this production comes from traditional, small-scale fishing, and it is estimated that up to 7% of the population is engaged in fisheries, aquaculture and associated activities (FAO, 2010). Fisheries capture production is dominated by freshwater species; for example, in 2010-11 Bangladesh produced 3.06 million tonnes of fish, of which 0.55 million tonnes came from the marine sub sector.

5.2.2 Fleet breakdown

The Bangladesh fishing fleet is dominated by small-scale vessels and operations which are responsible for about 93% of national catches (FAO, 2010). The most commonly used gears in the small-scale sector include setbag nets, gill nets and longlines, and vessels used typically range from 6 to 12 m in length. In addition to the small-scale fishing fleet, there is a semi-industrial gill net fleet, fishing with mechanized vessels up to 20 m and operating in waters deeper than 10 m, and an industrial trawl (shrimp and finfish) fleet (FAO, 2010).

Table 9 Fleet breakdown for Bangladesh.

#	Description	Gear	Flag(s)	Target species	Comment
1	Coastal Artisanal	Set bag nets	Bangladesh	Mixed	Majority of the nation's marine wild capture production
2	Shrimp fry fishery	Drag and push nets	Bangladesh	Shrimp fry	Illegal fishery
3	Semi industrial gill net	Gill net	Bangladesh	Mixed	Operate in waters deeper than 10m
4	Industrial Domestic	Double rigged shrimp	Bangladesh	Shrimp Finfish	

		trawl and stern trawl			
5	India Trawl	Trawl	India	Shrimp	Illegal fleet
6	Foreign Industrial from other regional states	Trawl	Thailand Myanmar Sri Lanka	Mixed	Illegal fleet

5.2.3 Catch breakdown by fleet

Official catch records reported for Bangladesh by the FAO indicate a total marine capture production of 9,713,725 tonnes for the 1990-2010 catch period (FAO, 2015). FAO catch statistics are poorly defined with only “marine crustaceans nei”, hilsa shad, “seerfishes nei” and “marine fishes nei” being recorded between 1990 and 2008, when additionally Bombay-duck, “sea catfishes nei”, Indian threadfin and “sharks, rays, skates, etc. nei” were nominally reported. Of these reported species and species groups “marine fishes nei” made up 45% of the catch and hilsa shad 41%.

Catch reconstructions for Bangladesh are presented in the Sea Around Us database which account for illegal, unregulated and unreported (IUU) catch in the form of under-reported commercial catch, discarded by-catch and subsistence catches (Ullah *et al.*, 2014). The catch reconstruction indicates a total catch of 17,111,678 tonnes for the 1990-2010 catch period, approximately 1.75 times larger than the FAO reported catch statistics. Of the total catch the most prominent species groups are hilsa shad (*Tenualosa ilisha*; 22% of the total reported catch), marine fishes not elsewhere included (19%), Bombay duck (*Harpadon nehereus*; 8%), Sergestidae (5%), Gobiidae (4%), Ariidae (4%), Engraulidae (4%), Miscellaneous marine crustaceans (4%), Sciaenidae (4%), and Bivalvia (3%). The species groups presented in the catch reconstructions and the FAO reported catches indicates that Bangladesh’s catch records are poorly defined as a substantial quantity of catches are not reported to species level.

5.2.4 IUU influencing factors

5.2.4.1 Legislation and governance

Bangladesh’s Department of Fisheries (DoF) operates under The Ministry of Fisheries and Livestock (MOFL) and is the main government body charged with fisheries management. Responsibilities of the DOF therefore include the conservation and development of marine fisheries as well as the licensing of marine fishing in the Bangladeshi waters. The DoF is composed of the head office in Dhaka, 64 District Fisheries Offices (13 are coastal) each headed by a District Fisheries Officer, and 460 Sub-District Offices (Upazilla Offices) headed by Upazilla Fisheries Officers (UFO) (Flewwelling

and Hosch, 2006). In addition to the DoF there are at least twelve other government departments involved in the management fisheries or their development (Khan *et al.*, 1997)

The legal framework by which the DoF manages Bangladesh's fisheries is contained within The Marine Fisheries Ordinance (1983)⁶, as implemented by the Marine Fisheries Rules (1983). This regulation stipulates specific fisheries management tools to be utilised by the DoF, such as vessels licences, gear restrictions, and provisions for demarcating marine reserves. Fines and penalties associated with violations of fisheries laws are also clearly stated. However, this legislation is acknowledged to be out dated and in need of revision⁷. Other legislation relevant to fisheries management includes the following Acts and Codes of conduct:

- The Environmental Conservation Act, 1995;
- The Territorial Waters & Maritime Zones Act, 1974 Territorial Waters and Maritime Zones Rules, 1977;
- Bangladesh Merchant Shipping Ordinance, 1983;
- Bangladesh Code of Conduct for Responsible Fishing; and,
- Bangladesh Coastal Zone Policy, 2005 by Min. of Water Resources

Bangladesh sits as one of the lowest ranked countries in the study region according to the World Bank Governance Indicators (175th out of 212 – 83rd percentile). As such, any risks relating to direct corruption or a weak regulatory framework would be significantly increased, i.e. Obstruction or bribery of fisheries officers and Falsification of documents (See Table 159).

5.2.4.2 Licensing and reporting requirements

Licensing requirements for vessels fishing within Bangladeshi waters are provided by Part III of the Marine Fisheries Ordinance of 1983. All trawl vessels are mandated to obtain a fishing license for a year which grants them permission to fish within the EEZ. Since the adoption of the Marine Fisheries Ordinance, licensing requirements have been extended to all mechanised and non-mechanised boats: Mechanised vessels were brought under a licensing system in 1992⁸, whereas non-mechanized boats were included under the licensing system in January 2001 (Khatun *et al.*, 2004)

Rules for licensing foreign fishing vessels are presented in Part V of the Marine Fisheries Ordinance of 1983. Foreign fishing vessels are required to obtain a fishing licence from Bangladeshi authorities if they are to fish, tranship fish, or load or unload any fuel supplies within Bangladeshi waters.

⁶ <http://faolex.fao.org/docs/pdf/bgd1037b.pdf>

⁷ <http://iwlearn.net/iw-projects/1252/reports/IWS-09%20Country%20Report%20-%20Bangladesh.pdf>

⁸ The Marine Fisheries Rules (Amendment), 1992 (No. S.R.O. 275 - Rule/92, December 1992 of the Ministry of Fisheries and Livestock).

Fishers which are apprehended undertaking any of the aforementioned activities are liable to an imprisonment not exceeding three years and a fine not exceeding 100,000 Taka (USD 1,250).

Reporting obligations for national and foreign fishing vessels are detailed within Regulation 14 of the Marine Fisheries Ordinance of 1983. This regulation stipulates that the holder of any fisheries licence is required to keep detailed information of catches as well as sales in such form as may be prescribed and a copy of this information shall be furnished to the director; records to be transmitted to Director monthly or at request of Director or authorized officer⁹.

5.2.4.3 Restrictions fines and penalties

Restrictions – Destructive gear

The use of explosives, poisons and other noxious substances are prohibited by Article 26 of the Marine Fisheries Ordinance of 1983. Fines associated with the use of these fishing methods are specified as a fine not exceeding 100,000 Taka (USD 1,250) or fifteen times the value of the fish, whichever is greater.

Restrictions – Small mesh sizes

The use of small-meshed nets is prohibited under Article 27 of the Marine Fisheries Ordinance of 1983: Shrimp trawl nets are required to have a minimum 45 mm mesh size at the cod end. For gillnets the minimum mesh size is 60 mm (FAO, 2010). Fines associated with the use of these fishing methods are specified as a fine not exceeding 100,000 Taka (USD 1,250) or fifteen times the value of the fish, whichever is greater. The use of monofilament nets is also banned in Bangladesh (FAO, 2010).

Restrictions – Marine reserves, zoning and closed seasons

Article 28 of Marine Fisheries Ordinance of 1983 provides the legal framework for the demarcation of marine reserves. Article 29 specifies that within marine reserves demarcated under article 28 that fishing, dredging and construction are illegal. Fines associated with illegally undertaking these activities in a marine reserve are fines not exceeding 100,000 Taka (USD 1,250).

Under Article 28 the Government of Bangladesh has established a number of Marine Reserves. For example, in 2000 a marine reserve was established which extended for 698 km² at Middle Ground and South Patches, and two Marine Parks have been established at St. Martin's Island and in the Sundarbans mangrove forest (FAO, 2010). Four sites in the coastal area have been established as hilsa sanctuaries.

The Marine Fisheries Ordinance (1983) contains provisions stipulating specific depth zones for specific types of fishing gear. Small scale fishers are given limited priority in allocation of rights to

⁹ <http://www.fao.org/docrep/v9982e/v9982e0i.htm>

fishery resources through Marine Fisheries Ordinance, 1983 which has special provisions allocating coastal waters up to 50 metres depth exclusively for small scale fisheries.

The government of Bangladesh also implements temporal bans on fishing in order to conserve specific fish stocks: A short banned period for fishing hilsa shad (10-12 days) on major spawning grounds during the breeding season (FAO, 2010). Furthermore, there is a months-long ban on the capture of juvenile hilsa (called Jatka) (Mohammed and Wahab, 2013).

Restrictions – Protected species

Harvesting of 25 species of shark is currently prohibited under the Wildlife (Conservation & Protection) Act 2012. Furthermore, the harvesting of any shark species is prohibited around the Sundarbans under the Bangladesh Forest Act 1927¹⁰.

Marine turtles have recently been included in the protected list of the Bangladesh Wildlife (Preservation) (Amendment) Act of 1974. However, sources indicate that the amendment still exists as a draft form and has not been officially gazetted¹¹.

Restrictions – Discards

The Bangladesh trawl fishery has regulations imposed which are designed to limit discard of bycatch species: Shrimp trawlers are permitted to fish for 30 days and must have at least 30 percent fish in the total catch (FAO, 2010). However, Rahman (2001) notes that the trawl fisheries do not observe these regulations.

Penalties

Offences are clearly defined in Bangladesh's fisheries legislation and, although they are relatively low in terms of a financial deterrent (i.e. one lakh taka (₳) which is the equivalent of approximately USD 1370) internationally, they are considered to provide a significant local and regional deterrent if enforced. Sanctions also include the threat of imprisonment for some fisheries related offences (i.e. obstruction of fisheries officers – up to three years). Sanctions may also include the seizure of fishing vessels, fishing gear and catch.

5.2.4.4 Monitoring, Control and Surveillance protocols and capacity

A review by Pramod and Pitcher (2006) of Bangladesh's compliance with Article 7 of the UN Code of Conduct for Responsible Fisheries provides insight into the effectiveness of components of Bangladesh's MCS programme. The study indicates that the nation's monitoring of fisheries is very poor as capabilities to monitor vessels, both national and foreign, are restricted to port state

¹⁰ http://bdlaws.minlaw.gov.bd/pdf_part.php?id=144

¹¹ http://seaturtlesofindia.org/?page_id=182

controls and that the country has no at-sea boarding and inspection capabilities. Furthermore, Flewwelling (2001) states that port state inspections lack formalised procedures for inspection reports and that there is an absence of a data management system.

5.2.4.5 Port state

Bangladesh does not have extensive at sea inspection capabilities and is limited to port inspections for the monitoring and control of its fisheries. Bangladeshi law stipulates that licensed fishing vessels must land at designated ports in the presence of a Department of Fisheries Officer. There are six major fish landing centres in the coastal districts at Chittagong, Cox's Bazar, Khulna, Barisal, Patherghata and Khepupara, and the Marine Fisheries Resources Survey Unit (FRSU) collects data at 14 points along the coast. However, it is concluded by Pramod and Pitcher (2006) that port state measures are relatively ineffective given there are few trained personnel, poor infrastructure and shortage of financial support for monitoring beyond coastal waters.

Bangladesh applied for Cooperating Non-Contracting Party status to IOTC in 2014. As such they are not bound by any IOTC Resolutions such as IOTC 10/11 on Port State Measures¹² nor are they currently signatories to the FAO Port State Measures Agreement (See Annex 5).

5.2.5 Summary of IUU incidences

5.2.5.1 Coastal artisanal

IUU fishing activities associated with Bangladesh's domestic artisanal fleet includes, fishing without licences, poaching in protected areas and violating spatio-temporal fishing bans.

For artisanal fisheries the majority of legal provisions designed to govern and control the sector are considered not to be implemented effectively in the field (Flewwelling and Hosch, 2006). With regards to vessel licences, a review of Bangladesh's fishery sector by Flewwelling and Hosch (2006) indicates that licensing was, at the time of the study, not enforced. This is partly attributed to inadequacies with the Ministry responsible for the registration of vessels: the system in place was unable to register vessels as required and, as vessel registration is pre-requisite to the issuance of a fisheries licence it is stated that the majority of the artisanal sector operated without licences.

The small-scale fishers of Bangladesh are reported to fish illegally within the nation's inland and marine protected areas. For example, Islam and Chuenpagdee (2013) report that people are fishing and poaching in no-take-areas in the Sundarbans; Kabir and Muzaffar (2002) state that fishing methods practiced in the Teknaf Game Reserve are often against regulations; and, despite fishing activity being banned in Sundarban Reserved Forest (SFR) estuaries there is apparently a multitude of reports stating that rampant fishing takes place throughout the SRF (Kabir and Muzaffar, 2002).

¹² <http://www.iotc.org/cmm/resolution-1011-port-state-measures-prevent-deter-and-eliminate-illegal-unreported-and>

Bangladeshi fishers have also been implicated in violating temporal fishing bans designed to protect populations of hilsa (*Tenualosa ilisha*): In October 2013 it was reported by the Dhaka Herald that fishers in the southern region of the country ignored the 11-day fishing ban. A crackdown by Bangladeshi authorities led to the seizure of 7 tonnes of illegally caught hilsa and 26 fishing boats, and the filing of 280 court cases¹³. Similarly, in April 2015, the authorities seized 5 tonnes of hilsa and fined 6 traders¹⁴; and in March 2008, 14 fishers were fined 28,000 Taka (USD 350) for netting juvenile hilsa (*Tenualosa ilisha*) during the closed season.

5.2.5.2 Shrimp fry fishery

Shrimp fry fishing represents both an important livelihood in Bangladesh and substantial form of IUU fishing. Shrimp seed collection began in the 1970s (Mazid 1994) using push nets and is considered to be practiced by thousands of coastal people (Ahmed *et al.*, 2010). However, concerns that the indiscriminate fishing of wild larvae and the resulting high levels of bycatch may have significant negative impacts on coastal ecosystems has led to the government of Bangladesh recently (September 2000) imposing a ban on wild fry collection (Ahamed *et al.*, 2012). It is acknowledged, however, that the ban has not been effectively enforced due to the limited availability of hatchery-raised larvae, the lack of alternative livelihoods, and weak enforcement power (Alam *et al.*, 2005).

5.2.5.3 Industrial domestic

Bangladesh's industrial fisheries are reported to undertake a variety of activities which violate national fisheries law, such as misreporting, discarding and fishing within/during spatio/temporal closures.

Previous studies indicate that significant under-reporting occurs in Bangladesh's commercial fisheries. For example, Ullah *et al.* (2014) estimate that a substantial proportion (50%) of Bangladeshi industrial trawlers under-report or completely fail to report their catch (Ullah, H. WorldFish Center. pers. obs. as presented in Ullah *et al.*, 2014), and this is somewhat corroborated by Rahman (2001) who states that shrimp trawlers provide little information pertaining to their landings. This is in contradiction of Regulation 14 of the Marine Fisheries Ordinance of 1983, which stipulates that licenced vessels must keep detailed records of catches and report them to the Fisheries Director at monthly intervals or when requested.

Evidence suggests that measures introduced to limit the discarding of bycatch are not adhered to by the domestic fishing fleet. Trawl fishers are required to ensure that 30% of their total catch is composed of finfish (FAO, 2010). However, despite this regulation, it is acknowledged that the industrial trawl fisheries do not adhere to this requirement (Rahman, 2001) and are associated with large quantities of bycatch. Rahman *et al.* 2003 estimate that discards constitute up to 80% of the

¹³ <http://www.dhakaherald.com/news/metropolitan/illegal-hilsa-fishing-goes-unabated/>

¹⁴ <http://www.thedailystar.net/city/5000kg-hilsa-fry-seized-capital-again-75827>

actual catch (equivalent to 30,000–35,000 t annually), and this is corroborated by Kamal (2000) who states that bycatch of the shrimp trawl fisheries are 80-90% of the total catch volume.

Bangladesh's domestic trawlers are also considered to regularly violate the depth restrictions imposed on them: Trawling is meant to be limited to waters deeper than 40m, however Islam (2003) reports that trawlers regularly fish in shallower waters up to 20 m depth.

5.2.5.4 Foreign industrial

India is regarded as the foreign nation which most frequently violates Bangladesh's maritime sovereignty¹⁵, and numerous arrests of Indian nationals for such offences are documented in the media. For example, in May 2015, two Indian fishers were arrested for illegal fishing in the Bay of Char Montaj¹⁶; in April 2015 two Indian fishing trawlers were seized and detained in Montaj for illegally entering the Bangladeshi EEZ; in February 2015, the Bangladesh Navy arrested a total of 65 Indian fishers and seized 5 trawlers for illegal fishing¹⁷; in November 2014, 28 Indian fishers were arrested for illegal fishing within the Bangladeshi maritime boundary¹⁸; and, in October 2014, 14 fishers were imprisoned for illegally entering and fishing within Bangladeshi waters¹⁹. The exact scale of illegal fishing by Indian vessels is unknown; however, it was recently stated by the former major, Zia Uddin (Chairman of Dubla Fisherman Group, the country's largest marine fishing organisation), that between 30 and 100 fishing boats from India venture into Bangladesh waters and flee with hundreds of tonnes of marine fish daily¹⁵. Additionally, illegal fishers from India are thought to use gears which are prohibited in Bangladesh. Even though the majority of reports are from the previous two or three years, and therefore outside of the focal study period, they provide clear examples of the nature of illegal fishing from India.

Other nations have also been implicated in fishing illegally in Bangladeshi waters, including Thailand, Myanmar and Sri Lanka. For example, in April 2014 the fisheries minister of Bangladesh, Sayedul Haq, stated that fishers from Myanmar and Thailand were illegally fishing within Bangladeshi waters²⁰; in October 2014 the Bangladesh Navy arrested 20 Sri Lankan fishers and impounded four fishing trawlers; and, in April 2010, Bangladesh coast guard seized a fishing boat carrying Thai and Myanmar nationals for fishing illegally near Karnaphuli Bridge ghat in Chittagong. The regular

¹⁵ <http://newagebd.net/60898/illegal-marine-fishing-by-foreigners-causing-staggering-losses/>

¹⁶ <http://www.thedailystar.net/country/indian-boat-seized-13-held-80330>

¹⁷ <http://www.thedailystar.net/38-indian-trespassing-fishermen-held-in-bagerhat-63587>; <http://www.thedailystar.net/27-indian-fishermen-held-in-bay-63898>

¹⁸ <http://www.thedailystar.net/28-indian-fishermen-held-for-intrusion-into-bangladesh-waters-48341>

¹⁹ <http://www.thedailystar.net/14-indian-fishermen-held-sent-to-jail-46992>

²⁰ <http://www.dhakatribune.com/bangladesh/2014/apr/18/hard-line-illegal-fishing>

incursion of Thai and Myanmar fishing boats into Bangladeshi waters is also acknowledged within technical reports published by UNEP (Khatun, 2004).

5.2.6 IUU risk identification

5.2.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone

There is an evident risk of unlicensed/unauthorised fishing within Bangladeshi waters, both from foreign fleets and domestic fleets. Vessels originating from India, Thailand, Myanmar and Sri Lanka have all been implicated in illegal fishing in Bangladesh, with India regarded as the most frequent offender. Indeed, incidents of Indian fishers being arrested by the Bangladeshi authorities have commonly featured in news articles in recent history. With regards to domestic vessels, previous reviews of the fishery sector in Bangladesh indicates that inadequacies in the vessel registration system and poor MCS capacity has led to the majority of the artisanal sector operating without licences, despite the necessary legislative provisions being in place.

5.2.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Evidence suggests that there is significant under reporting of fisheries catches by Bangladesh's commercial fisheries, despite requirements for licensed vessels to maintain detailed catch records and to submit them at regular intervals. Previous studies have estimated that approximately 50% of Bangladeshi trawlers are under-reporting or fail to report their catch.

5.2.6.3 Non-compliance with other licence conditions and/or legislation

There is a significant risk of non-compliance with other licence conditions and/or legislation. Specifically, it has been reported that the domestic industrial fleets violate fisheries rules on discards and spatial and temporal closures. Evidence also indicates that prohibited and destructive gears are widely employed in Bangladesh, and therefore the risk posed by such practices will be evaluated. A further risk has been identified under this category, specifically violations with regard to legislation on discards, as some fisheries in Bangladesh are acknowledged to cause illegally high levels of discards due to the fishing techniques employed.

5.2.6.4 Post-harvest IUU

Fishing vessels originating from Bangladesh are acknowledged to frequently illegally fish within India's waters: Interviews conducted by Pramod (2010) indicates that Bangladeshi trawlers frequently trawled the inshore region of West Bengal. Thus, it is prudent to suggest that illegal catches originating from India's EEZ may be commonly landed within Bangladeshi ports.

Bribery and corruption is also considered an issue which negatively impacts fisheries control and management in Bangladesh. Islam (2003) states that there are regular claims that the fisheries management bodies are sometimes engaged in illegal actions.

Table 10 Specific risks identified for Bangladesh.

Risk category	Specific risk	Fleets at Risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed fishing in EEZs by national boats	1,2,3,4
	Unlicensed fishing in EEZs by boats from regional States (India, Thailand, Sri Lanka, Myanmar)	5,6
Non-compliance with reporting obligations by licensed/authorised vessels	Under-or non-reporting target species (artisanal and industrial domestic fleets)	1,2,3,4
	Misreporting of bycatch species	4
Non-compliance with other licence conditions and/or legislation	Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons)	1,2,3,4
	Violation of rules on discards (30% of Catch must be finfish)	4
	Use of prohibited/destructive gear	All
Post-harvest IUU	Landing of illegal catch from India into Bangladeshi ports.	4
Other offences	Illegal harvest/possession of vulnerable species (shrimp fry)	3
	Illegal fishing related to spatio-temporal closures (protected areas)	1,2,3,4
	Bribery/obstruction/mistreating of observers or fisheries officers	1,2,3,4

5.2.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 11), impact (Table 12) and level of inherent risk (Table 13) for Bangladesh based on the risks identified in Table 10.

Table 11 Assessment of risk likelihood – Bangladesh.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZs by national boats	Moderate	Weak	Likely
Unlicensed fishing in EEZs by boats from regional States (India, Thailand, Sri Lanka, Myanmar)	High	Very Weak	Almost Certain
Under-or non-reporting target species (artisanal and industrial domestic fleets)	High	Weak	Likely
Misreporting of bycatch species	Very High	Very Weak	Almost Certain
Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons)	Very High	Weak	Almost Certain
Violation of rules on discards (30% of Catch must be finfish)	Very High	Weak	Almost Certain
Use of prohibited gears	Very High	Weak	Almost Certain
Landing of illegal catch from India into Bangladeshi ports	Very High	Very Weak	Almost Certain
Illegal harvest/possession of vulnerable species (shrimp fry)	Very High	Weak	Almost Certain
Illegal fishing related to spatio-temporal closures (protected areas)	High	Weak	Likely
Bribery/obstruction/mistreating of observers or fisheries officers	High	Weak	Likely

Table 12 Assessment of risk impact – Bangladesh.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZs by national boats	High	Vulnerable	Major
Unlicensed fishing in EEZs by boats from regional States (India, Thailand, Sri Lanka, Myanmar)	High	Vulnerable	Major

Under-or non-reporting target species (artisanal and industrial domestic fleets)	Very High	Moderate	Major
Misreporting of bycatch species	Very High	Highly Vulnerable	Serious
Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons)	High	Highly Vulnerable	Serious
Violation of rules on discards (30% of Catch must be finfish)	High	Highly Vulnerable	Serious
Use of prohibited gears	High	Vulnerable	Major
Landing of illegal catch from India into Bangladeshi ports	Moderate	Vulnerable	Major
Illegal harvest/possession of vulnerable species (shrimp fry)	High	Highly Vulnerable	Serious
Illegal fishing related to spatio-temporal closures (protected areas)	High	Vulnerable	Major
Bribery/obstruction/mistreating of observers or fisheries officers	Moderate	Vulnerable	Major

Table 13 Assessment of inherent risk – Bangladesh.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing in EEZs by national boats	Likely	Major	High
Unlicensed fishing in EEZs by boats from regional States (India, Thailand, Sri Lanka, Myanmar)	Almost Certain	Major	Severe
Under-or non-reporting target species (artisanal and industrial domestic fleets)	Likely	Major	High
Misreporting of bycatch species	Almost Certain	Serious	Severe
Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons)	Almost Certain	Serious	Severe

Violation of rules on discards (30% of Catch must be finfish)	Almost Certain	Serious	Severe
Use of prohibited gear	Almost Certain	Major	Severe
Landing of illegal catch from India into Bangladeshi ports	Almost Certain	Major	Severe
Illegal harvest/possession of vulnerable species (shrimp fry)	Almost Certain	Serious	Severe
Illegal fishing related to spatio-temporal closures (protected areas)	Likely	Major	High
Bribery/obstruction/mistreating of observers or fisheries officers	Likely	Major	High

5.2.8 Impacts of IUU

There are clear impacts of unlicensed fishing by national and foreign vessels in Bangladesh's EEZ. For example, the management of stocks will be negatively affected due to the consequential unknowns relating to harvest rates and stock status. There will also be direct losses to the Bangladeshi economy through the loss of licensing revenues from national and foreign boats, and indirect losses associated with the depletion of commercially exploited stocks. Furthermore illegal fish caught by foreign vessels are unlikely to be landed in Bangladesh, and it is more likely they will be landed in ports in India, Thailand, Myanmar and Sri Lanka. This will result in a loss of national revenue in the form of potential taxation and other potential benefits to local industry.

Under- or non-reporting target species by the artisanal and industrial domestic fleets, misreporting of bycatch species, and non- or delayed submission of logbooks will have similar impacts as previously mentioned, in terms of unknown harvests and stocks. Again there is the potential loss of national revenue from potential taxation on landings.

Illegal fishing related to spatio-temporal closures of depth zone restrictions and hilsa shad closed seasons is likely to have profound impacts. The use of trawl gear in the inshore zone may damage sensitive habitats and may result in conflict between artisanal and industrial fishers. The violation of the hilsa shad closed season, a temporal fishing ban designed to conserve an important fisheries species, will contribute to the further exploitation of an extensively exploited species. Similarly, Illegal fishing related to spatio-temporal closures (protected areas) is likely to significantly impact highly vulnerable species.

Violation of rules on discards (30% of trawler catch must be finfish) is acknowledged to occur in Bangladesh and is likely to have serious impacts on marine ecosystems as substantial quantities of bycatch will be discarded at sea.

The use of prohibited gear and the illegal harvest/possession of shrimp fry in Bangladesh are considered to have significant negative impacts on shrimp, finfish and other marine populations where prohibited gears are used. The extent of extraction of shrimp fry conducted with small mesh size nets is thought to remove significant proportions of shrimp and other species groups before spawning age.

Bribery/obstruction/mistreating of observers or fisheries officers is another factor which may have significant impacts on fish stocks and the marine environment. Fisheries officials in Bangladesh have been previously implicated in corruption which may serve to undermine the effectiveness of implemented management measures.

5.2.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

Illegal unlicensed fishing by the domestic fleet is acknowledged to occur within Bangladesh and improvements to the nation's licensing system and MCS capabilities are required. The licensing system is reported to be cumbersome and deterrents for violations are regarded as weak. Historically the licensing system has largely excluded small scale vessels, but in January 2001 all types of non-mechanised boats were included under the licensing system. Considering these points and the risk scores allocated it is estimated that an extra 5-15% of the total reported catch is taken illegally by domestic fleets.

Unlicensed fishing in Bangladesh's EEZ by boats from regional States (India, Thailand, Sri Lanka, and Myanmar) is widely acknowledged to occur in the Bangladeshi waters, with shrimp trawlers from India regarded as the most common offender. Catches from these vessels are hard to estimate. Given the high frequency of the offence, nature of fishing practice (trawling for shrimp by Indian vessels is likely to have significant discard rates) and the relatively weak deterrents in place, it is estimated that an additional 5-20% over the total national reported catch is taken.

Significant under- or non-reporting target species (artisanal and industrial domestic fleets) is reported to occur in Bangladesh. For example, it has been reported that for the industrial trawl fisheries that 50% of the fleet under- or non-report their catch. Furthermore, unreported artisanal catch has been considered a significant proportion of previous catch reconstructions (Ullah *et al.*, 2014) for Bangladesh. Given the high rates of non-reporting coupled with the weakness of the deterrents in place it is estimated that an additional 20-40% of the national reported catch is unreported.

Misreporting of bycatch species by the domestic fleets is estimated to contribute significantly to the unreported catch. This is due to the significant discards acknowledged to occur in the national trawl fisheries. Considering these factors it is estimated that an additional 20-40% of the reported catch is unreported. An additional 50-200% of "Marine fish nei" has been added based on the volume of the shrimp catch due to the high bycatch levels observed.

Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons) is reported to extensively occur in Bangladesh and is estimated to contribute to the national illegal catch. Specifically, the hilsa shad fishery closed seasons are acknowledged to be regularly violated. Given the high incentives, high catch volumes, and frequently reported violations it is estimated that an additional 10-50% of the reported hilsa shad catch is taken illegally.

Use of prohibited gear although being a complicating factor and illegal in Bangladeshi waters would not add to the estimated level of IUU fish as it will be already accounted for under the “unlicensed fishing” categories.

Landing of illegal catch from India into Bangladeshi ports-although being a complicating factor for Bangladeshi waters-would not add to the estimated level of IUU fish as it will be already accounted for under the “under-reporting” categories for India.

Illegal harvest/possession of vulnerable species (shrimp fry) although being illegal in Bangladeshi waters would not add to the estimated level of IUU fish as it will be already accounted for under the “unlicensed fishing” categories.

Illegal fishing related to spatio-temporal closures (protected areas) is a complicating factor but would not add to the estimated level of IUU fish as it will be already accounted for under the “unlicensed fishing” categories.

Bribery/obstruction/mistreating of observers or fisheries officers as another complicating factor and illegal in Bangladeshi waters would not add to the estimated level of IUU fish as it will be already accounted.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Bangladeshi EEZ can be found in Table 14.

Table 14 Summary of estimated rates – Bangladesh.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZs by national boats	1,2,3 and 4	Finfish Shrimp	1990-2013	5	15	0	0
Unlicensed fishing in EEZs by boats from regional States (India, Thailand, Sri Lanka, Myanmar)	5 and 6	Finfish Shrimp	1990-2013	5	20	0	0
Under-or non-reporting target species (artisanal and industrial domestic fleets)	1,2,3,4	Finfish Shrimp	1990-2013	0	0	20	40
Misreporting of bycatch species	4	Finfish (in shrimp)	1990-2013	0	0	50	200
Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons)	1	Hilsa shad	1990-2013	10	50	0	0
Violation of rules on discards (30% of Catch must be finfish)	3, 4	---	1990-2013	0	0	0	0
Use of prohibited gear	1,4,5,6	---	1990-2013	0	0	0	0
Landing of illegal catch from India into Bangladeshi ports	---	---	1990-2013	0	0	0	0
Illegal harvest/possession of vulnerable species (shrimp fry)	2	---	1990-2013	0	0	0	0
Illegal fishing related to spatio-temporal closures (protected areas)	All	---	1990-2013	0	0	0	0
Bribery/obstruction/mistreating of observers or fisheries officers	All	---	1990-2013	0	0	0	0

5.2.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 160,187 and 461,978 t per annum (i.e. 40.51 and 116.83%). Illegal catches contribute an estimated 13.97-54.85% and unreported catches 26.54 61.98% in addition to the reported catch. Losses from Illegal, Unreported and Unregulated fishing in the Bangladesh EEZ are estimated to average between USD 262.41 and 762.20m. These figures represent significant illegal fishing along with a high estimated level of under-reporting in domestic fisheries.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 15 and as first landed value in Table 16. Profiles of the estimated level of illegal and unreported fishing combined in Bangladesh can be found in Figure 3 (catch in t) and Figure 4 (catch value in USD).

Table 15 Summary of estimated IUU by year in Bangladesh (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	253453	36237	143167	63461	143961	0	0
1991	258884	37127	146803	64887	147274	0	0
1992	280127	40319	159576	69316	156270	0	0
1993	312715	44040	173295	77953	176425	0	0
1994	253044	37178	147934	66469	154457	0	0
1995	264650	39118	155894	68039	156441	0	0
1996	279170	41182	164035	73709	171706	0	0
1997	295141	42372	167589	79547	187121	0	0
1998	300452	42207	165970	82701	196428	0	0
1999	309797	44769	177377	85100	201943	0	0
2000	333799	47136	185609	89757	210910	0	0
2001	378997	53056	208429	98731	228499	0	0
2002	414420	56372	219695	106605	245186	0	0
2003	430408	56377	217326	109836	251602	0	0
2004	455207	63635	249893	118031	272550	0	0
2005	474597	66899	263307	127353	298968	0	0
2006	479810	67468	265370	131072	310264	0	0
2007	487438	68025	267008	135218	322304	0	0
2008	497573	69367	272200	138211	329628	0	0
2009	602642	80154	310374	158963	370142	0	0
2010	607492	80209	309923	160207	373007	0	0
2011	546333	76715	301626	150764	358517	0	0
2012	578620	80602	316215	157812	373283	0	0
2013	588988	83651	329908	152271	351110	0	0

Table 16 Summary of the estimated value of IUU (USD) by year in Bangladesh (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	398.51	64.51	262.76	95.44	206.21	0	0
1991	408.70	66.31	270.25	97.90	211.55	0	0
1992	442.81	72.14	294.27	104.97	225.82	0	0
1993	481.77	77.08	313.14	115.31	249.09	0	0
1994	416.72	68.55	280.25	102.87	225.11	0	0
1995	436.74	72.32	296.08	106.00	230.32	0	0
1996	462.62	76.29	312.06	114.53	250.93	0	0
1997	475.46	76.65	311.95	120.26	265.74	0	0
1998	473.88	74.92	303.52	122.42	272.77	0	0
1999	505.72	81.79	333.08	129.51	287.59	0	0
2000	526.47	83.79	339.96	133.46	295.17	0	0
2001	586.14	92.92	376.70	145.33	318.60	0	0
2002	615.91	95.39	384.55	152.18	333.15	0	0
2003	546.23	81.72	323.58	138.18	305.10	0	0
2004	620.98	98.90	397.17	157.28	347.40	0	0
2005	658.02	105.30	423.29	171.32	382.48	0	0
2006	670.12	106.62	428.05	176.98	397.26	0	0
2007	729.88	114.74	462.33	192.07	430.83	0	0
2008	671.93	108.55	435.93	181.70	411.29	0	0
2009	940.10	143.74	579.65	234.95	516.89	0	0
2010	860.68	130.88	523.31	219.37	486.07	0	0
2011	1,024.07	156.76	636.99	255.64	562.57	0	0
2012	1,284.28	178.81	719.25	308.39	668.68	0	0
2013	1,325.63	185.47	747.03	307.56	657.04	0	0

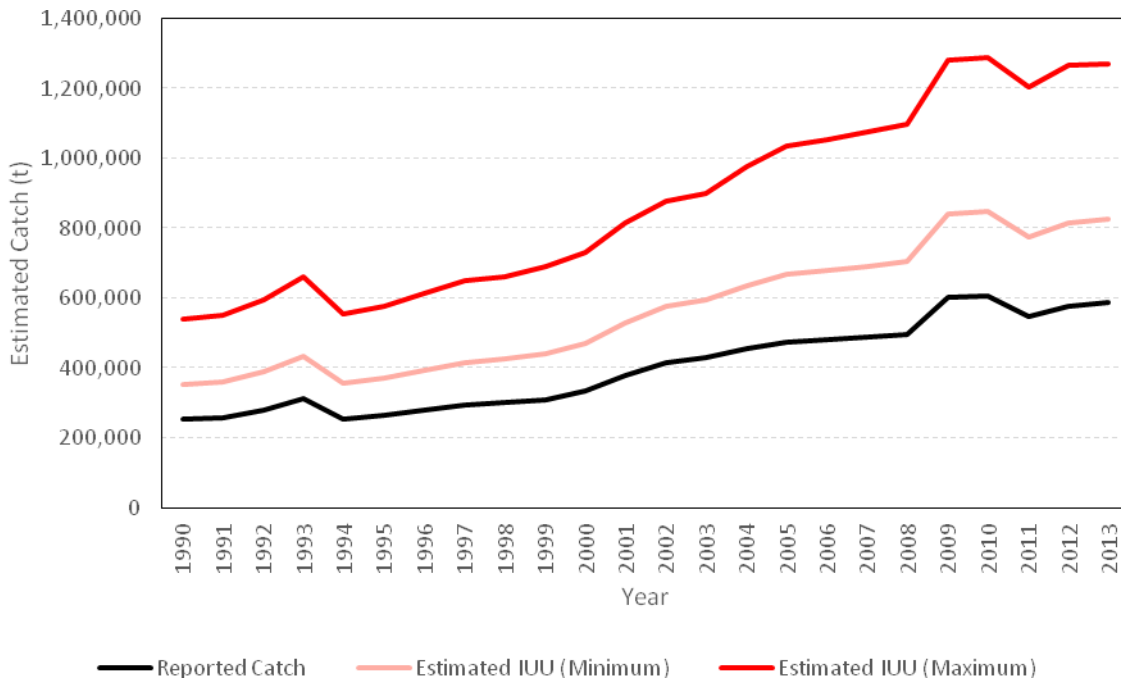


Figure 3 IUU Catch Profile (Bangladesh) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

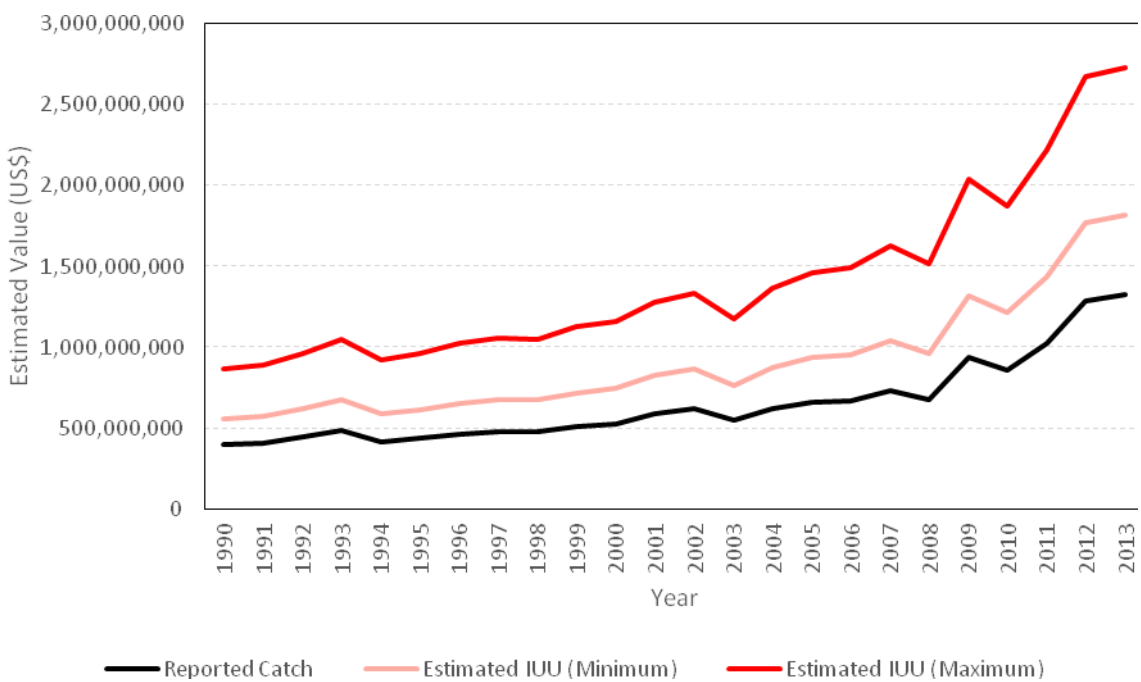


Figure 4 IUU Catch Value Profile (Bangladesh) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.3 British Indian Ocean Territory

5.3.1 Introduction

The British Indian Ocean Territory is a group of seven atolls comprising more than 100 individual tropical islands in the central Indian Ocean to the south of the Maldives. A 200 nautical mile Fisheries Conservation and Management Zone (FCMZ) was declared around the British Indian Ocean Territory (Chagos Archipelago) on the 1st October 1991 and a fisheries regime covering all BIOT fishing waters was established on the same day. The BIOT FCMZ/MPA consists of an area of over 620,000 km² with a limited territorial sea of less than 1,000 km². The British Indian Ocean Territory has only one shared border with the Maldives to the north.

On the 1st April 2010 the BIOT Commissioner proclaimed a Marine Protected Area (MPA) in the Territory. No further fishing licences have been issued since that date and the last fishing licences expired on 31 October 2010. From 1 November 2010 onwards the whole of the BIOT environmental preservation and protection zone (EPPZ, to 200nm) became a no-take MPA to commercial fishing including coastal and pelagic areas.

Four licensed fisheries existed during the period from 1991 to 2010:

- Offshore distant water tuna purse seine;
- Offshore distant water tuna longline;
- Inshore Mauritian mothership-dory fishery; and
- Recreational fishery (service personnel and visiting yachts).

The recreational fishery is the only fishery by visiting yachts allowed within the MPA, with service personnel fishing around Diego Garcia in an area excluded from the MPA. This is very small and has not been included in this analysis.

In addition, an illegal fishery consisting of small Sri Lankan drift-netter longliners has operated in the area since 2000. These vessels have been fishing illegally in the BIOT FCMZ and MPA due to displacement from their own national waters, India and the Maldives. This fleet has additionally been known to fish illegally in Seychelles and Mauritian waters.

Diego Garcia and its territorial waters are excluded from the MPA (the MPA exclusion zone). Pelagic and demersal recreational fisheries are permitted by personnel stationed on Diego Garcia within the MPA exclusion zone. Permitted recreational fisheries also include visiting yachts that fish outside the exclusion zone within the waters of the MPA, but not within Strict Nature Reserves. Such fishing must be for consumption within three days

5.3.2 Fleet breakdown

The fleets in Table 17 have been identified as having fished in the British Indian Ocean Territory or being a potential IUU risk.

Table 17 Fleet breakdown for the British Indian Ocean Territory Fishery.

#	Description	Gear	Flag(s)	Target species	Comment
1	Distant water longline	Longline	Japanese, Taiwanese, China, Seychelles, Others	Yellowfin tuna, bigeye tuna, swordfish other tuna like species.	Relatively risk averse fleet, highly compliant in the most part though some individual vessels may risk IUU fishing.
2	Distant water purse seine	Purse seine	France, Spain, Seychelles, Thailand,	Yellowfin and skipjack tuna	Risk averse fleet, highly compliant.
3	Sri Lankan IMUL	Longline and driftnet	Sri Lanka	Tuna and tuna-like species. Snappers, groupers, emperors and other demersal species. Bêche de mer.	Illegal fleet (operating since 2000). Small, hard to identify.
4	Indian multi-gear	Longline, trawl and driftnet	India	Tuna and tuna-like species. Snappers, groupers, emperors and other demersal species.	Illegal fleet. (2014/2015 only)
5	Mauritian mothership dory	Hook and line (via dory)	Mauritius and Madagascar	Snappers, groupers and emperors	Highly compliant fleet.

5.3.3 Catch breakdown by fleet

The catch breakdown extracted from the FAO and SeaAroundUs databases for the BIOT zone are both quite different to the reported catches to the BIOT authorities. The FAO dataset only includes domestic catches a tiny proportion of the overall catch and the SeaAroundUs dataset include many species that have not been recorded as being caught by any legal or illegal fleets (i.e. “Anchovies” (Engraulidae) and “Threadfin and dwarf brems nei” (Nemipteridae)). These species may indeed be caught in similar fisheries but with the restrictive licensing policies of the BIOT Administration (i.e.

no trawlers) many of these species have never been caught. As such an amended dataset has been provided based on a combination of reported catches by legal licensed vessels and inspections of illegal vessels. These data are provided in the project database.

5.3.4 IUU Influencing factors

The British Indian Ocean Territory does not maintain its own flag. The only vessels that operate domestically are visiting yachts flagged in other States or UK or US military vessels.

In terms of coastal State protection, the BIOT FCMZ/MPA has been widely acknowledged as the best managed and enforced fishery zone in the Indian Ocean (Dunne *et al.* 2014). There has been a patrol vessel dedicated to the BIOT FCMZ/MPA since the mid-1990s, before which only ad hoc patrolling could be conducted from passing military vessels. Although not dedicated 100% to fisheries the patrol vessel maintains a high degree of focus on fisheries patrols that are focussed on the main areas of potential illegal fishing (identified through a risk assessment process). Additional support is provided through passing vessels and aircraft that are requested to relay information on sightings to the BIOT Administration or to the patrol vessel direct.

The British Indian Ocean Territory has a strong and regularly updated legislative framework including the Waters (Regulation of Activities) Ordinance (1997), Visitors and Visiting Vessels Ordinance (2006), Trade in endangered Species Ordinance (2007) and the Fisheries (Conservation and Management) Ordinance 2007 (amended 2013). These ordinances clearly define the regulatory framework along with other implementing regulations such as Terms and Conditions of licensing for each fishery. Illegal fishing (i.e. without a licence) is clearly defined and the master, owner and charterer of a boat found guilty are each liable to a fine of up to £500,000 (USD 754,000) per offence with the additional possibility of the confiscation of catch, gear and the fishing vessel itself. Other common offences such as fishing with prohibited fishing gear or obstruction or interference with a fisheries officer are set up to a maximum value of £50,000 (USD 75,400) and £250,000 (USD 377,000) respectively. This level of sanction creates a clear deterrent.

The BIOT Administration (represented as UK Overseas Territories) are active members of IOTC particularly on IUU issues and through the various Working Parties, having put forward the modifications to IOTC Resolution 09/03 (now superseded by Resolution 11/03) that developed a framework for reporting IUU vessels to IOTC and also allowed all vessels and not just those from non-Member flag States to be IUU listed. This was in response to the increased problem of Sri Lankan IUU. The BIOT Administration and the Sri Lankan Department for Aquatic Resources now in recent years adopted a bilateral arrangement to assist in the reporting and actions taken against IUU vessels, showing their joint approach and commitment to addressing IUU.

The British Indian Ocean Territory is not ranked amongst the other study countries according to the World Bank Governance Indicators. As there is no domestic population any risks relating to direct corruption or a weak regulatory framework would be massively reduced as all the administration is through the UK Foreign and Commonwealth Office and a clear management framework. As such any risks relating to corruption and a regulatory framework in place would be significantly reduced i.e. Obstruction of bribery of fisheries officers and Falsification of documents. (See Table 159).

In summary as a coastal State, BIOT fisheries have a high deterrent value, high profile MCS activities and are regionally very active.

The British Indian Ocean Territory does not have a commercial port. The only port facilities are military and are used for inspections of suspected illegal fishing vessels that are escorted into port by the BPV.

The British Indian Ocean Territory is not a commercial market State for fisheries products. The only fish landed and utilised within the Territory are used for subsistence by visiting yachts or local military personnel.

5.3.5 Summary of IUU incidences

5.3.5.1 Distant water longline

During the period 1990 – 2013 only three incidences of illegal longline activity have been identified. In 1991 just after declaration of the BIOT FCMZ, a Japanese longliner was apprehended fishing inside the zone. A large fine was imposed and confiscation of the catch and subsequent resale of the catch of greater than a hundred tonnes of sashimi grade yellowfin and bigeye tuna back to the company provided a strong deterrent to other illegal fishers and created a strong licensing regime under which those vessels with licences provided the BIOT Administration with additional surveillance resources by reporting on all other vessel traffic encountered.

The next illegal fishing event in the longline fishery occurred in 2007 when a second Japanese longline was convicted of illegal shark fishing that had been banned in the BIOT FCMZ along with the IOTC area.

The final longline incident was in 2013 when a Taiwanese (Province of China) longline was detected “fishing the line” 3mn inside the BIOT MPA. The vessel after being identified by BIOT fisheries officers, cut her lines and escaped across the boundary. The vessel was reported to the flag State authorities and a court case was heard *in absentia*. The vessel was found guilty of illegal fishing, fined £300,000 but was not able to pay. The flag State authorities impounded the vessel and later destroyed the vessel as part of their flag State actions.

5.3.5.2 Distant water purse seine

During the period covered by the scope of the study no illegal purse seine activity has been encountered. Due to the high capital and running costs of the vessels they are highly risk averse and always purchased fishing licences and maintained good reporting to the BIOT Authorities. Since the creation of the MPA, all passing purse seine vessels report in voluntarily to ensure the fisheries officers are aware of their passage through the zone and willingly submit to inspections if required.

5.3.5.3 Sri Lankan IMUL

The largest IUU fleet in terms of numbers of vessels and incidences operating in the BIOT zone during the period 1990 – 2010 has been the Sri Lankan IMUL fleet. The first encounters with the Sri Lankan vessels in BIOT started in the early 2000’s. Sri Lankan IUU is driven primarily by an overcapacity in the domestic Sri Lankan fleet and the overexploitation of their domestic fisheries combined with the problems associated with a long civil war. This has forced fishers, to search further afield to ensure catches and the well managed fisheries of the British Indian Ocean Territory have been a target for those willing to risk fishing illegally. The expansion of the Sri Lankan fleet has also resulted in IUU fishing by these vessels in India and the Maldives. Since then Sri Lankan fleet has

dominated both the illegal activity in the BIOT zone and also monitoring vessels that are transiting the BIOT zone to fish on the Saya de Mahla bank although a number of vessels have been caught in the Seychelles EEZ (Pers. Comm. Seychelles Fishing Authority) and in the Mauritian EEZ²¹.

The IMUIL fleet is a multi-gear fleet, using a combination of small gillnets and longlines to target a variety of pelagic and demersal species including tuna and tuna-like species, sharks, snappers and groupers. The vessels are typically small, under 12m in length, with a crew of between 4-6 fishers. They are ice boats and have no freezing capacity.

Table 18 shows the first illegal Sri Lankan illegal fishers were detected and prosecuted in 2001. Illegal activity by Sri Lankan vessels has been observed and successfully prosecuted every year since then peaking in 2010 where 11 vessels were successfully apprehended and prosecuted. During this period the Sri Lankan fishers have become more aware of the patrol vessel and its operations and have adapted their behaviour to attempt to evade prosecution. Boats will now set and retrieve gear on the banks overnight, heading offshore where it is harder to detect them during the day. The vessels have also attempted to disrupt the inspection process by destroying all paper records on board, or just not recording logbook data at all, clearing waypoint data from GPS plotters just before inspections and attempting to hide fresh fish under older frozen fish that show no signs of being captured in the previous few days.

A typical catch of a small Sri Lankan IMUL IUU vessel is small, with a mean catch of approximately 2.5t and a maximum carrying capacity of about 5t.

The potential number of vessels fishing illegally in BIOT has previously been estimated by Price *et al.* (2010) which resulted in a range from 30-60 up to 100-200. Although these ranges are unlikely to be accurate given such high uncertainty and anecdotal methods of estimation, they have been used for exploratory catch predictions of IUU fishing (Moir-Clark *et al.* 2015). A more likely figure for Sri Lankan IUU is the lower end of the scale suggested by Price *et al.* (2010) and many of these may be transient fishers *en route* to other locations i.e. Saya de Mahla, so the full time equivalent effort number of vessels would be lower still.

A number of reports point to an illegal sea cucumber fishery in Chagos that may have been operating out of Sri Lanka from 1999 onwards (Spalding, 2006). This is not however supported by direct observations of IUU fishing throughout this period until 2005. Then it was observed that one or more Sri Lankan vessels has deployed fishermen onto Eagle Island, with it was assumed SCUBA gear, as compressors were present, drying racks and related equipment to enable fishermen to dive and snorkel to collect sea cucumbers. An estimated 5000–7000 sea cucumbers were observed drying during this time of various species. Several other Sri Lankan vessels were caught fishing illegally around this period but they could not be connected directly to fishing for sea cucumbers but they did have diving equipment onboard. Despite estimates to the contrary since 2005 no evidence of

²¹ <http://www.atuna.com/NewsArchive/ViewArticle.asp?ID=12542>

permanent camps for the purpose of diving for sea cucumbers have been found, although some activity of fishermen on the islands has been observed. No evidence of sea cucumber harvesting has been observed for the last 10 years.

5.3.5.4 Indian multi-gear

Recently, Indian multi-gear vessels have started to be encountered in the BIOT MPA. This has only occurred in the last two years of the fishery but has been included as a risk fleet as there is a potential they may have been fishing in smaller numbers in previous years. The drivers for their fishing are similar to Sri Lanka, with fishers extending their range to avoid domestic fisheries with overcapacity and overexploited stocks.

The Indian vessels are larger than the Sri Lankans at about 20m and can use gillnets, longlines or trawls. This extends their possible range of target species to include all the species living on the banks such as snappers, groupers and emperors along with tuna and tuna-like species and sharks. These vessels are also equipped with larger holds and freezers and are therefore capable of catching and storing up to 50t of fish for the larger vessels per trip.

Catch estimates from the Indian IUU vessels are limited but catch rates of up to 3t per day would be expected.

5.3.5.5 Mauritian mothership dory

Mauritian mothership dory operations occurred throughout the period of interest up to the declaration of the MPA in 2010. These vessels were issued licences by the BIOT Administration without charge whilst flagged in Mauritius and operated legally throughout. An observer programme was implemented to verify catches and no misreporting or illegal fishing operations were observed during the entire duration of the fishery. As such no IUU risks have been applied to this fishery.

A summary of the number of IUU incidences by the fleets operating in BIOT by year can be found in Table 18.

Table 18 Summary of IUU incidences in the British Indian Ocean Territory by year.

Year	Distant water purse seine	Distant water longline	Sri Lankan IMUL	Indian Trawl	Mauritian mothership-dory
1990	0	0	0	0	0
1991	0	1	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	2	0	0
2002	0	0	5	0	0
2003	0	0	8	0	0
2004	0	0	5	0	0
2005	0	0	6	0	0
2006	0	0	2	0	0
2007	0	1	1	0	0
2008	0	0	2	0	0
2009	0	0	6	0	0
2010	0	0	11	0	0
2011	0	0	8	0	0
2012	0	0	3	0	0
2013	0	1	3	0	0

5.3.6 IUU risk identification

For each of the fleets in Table 17, the risks from the five categories have been assessed and are identified below. The risks are summarised in Table 19 summarises the IUU risks that have been identified as possible risks for the British Indian Ocean Territory.

5.3.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.

There is a risk for three of the fleets for unlicensed fishing in the BIOT MPA from other regional States (Sri Lanka and India) and by boats from outside the region (longliners from Taiwan and Japan).

The risk from the Sri Lankan fleets is well documented with vessels fishing with a variety of gears including longlines, driftnets and diving gear, for tuna and tuna-like species, sharks, demersals and sea cucumbers (only encountered in 2005). A total of 62 vessels have been arrested since 2001 when the Sri Lankan fleet started to expand its area of operations outside their own EEZ and nearby waters. The Sri Lankan vessels are small vessels typically under 12m in size with limited hold capacity and often no freezing capacity only ice for storage. In 2005, a number of illegal fishing camps were found on islands in the main atoll groups. These camps were identified as being used by Sri Lankan fishermen as bases for snorkelling and diving (air compressors were found in the camps) for sea cucumbers (*bêche de mer*). The camps were destroyed, equipment confiscated and fishermen repatriated. The BIOT patrol vessel subsequently amended patrolling patterns to ensure regular patrols of all islands capable of maintaining a camp.

The risk from Indian vessels is recent and unlikely to feature in the estimation of historical data from the period of the study. With reciprocal actions being taken between India and Sri Lanka on IUU fishing in each other's' EEZs and decreasing catch rates in their own EEZ, Indian fishing vessels are being forced further afield to catch fish.

During the period of the licensed fishery, 1991 – 2010 a longline fishery operated throughout the year. During this period, the fishery was well managed with the reporting and movements of longline vessels under good control. There was a potential for vessels from the various longline fleets to fish illegally in the BIOT FCMZ/MPA during this period. Whilst only three vessels have been caught fishing during the period 1990-2015 a risk remains. With longline vessels fishing throughout the Indian Ocean, there will be times when fishing an eddy or a gyre when these current patterns may bring gear close to or bordering the MPA. Where gear enters the MPA a longline vessel may cross the boundary either unawares or intentionally to recover the gear (and any fish on it). This "fishing the line" has occurred a number of times and gear has been recovered with no markings attached and it is most likely that this would be the primary example of IUU from longline vessels.

For the licensed purse seine fleet during the period of the licensed fishery (1991 – 2010) there were very few reports of IUU, limited to a number of administrative penalties issued for late or non-reporting of entry or exit into the zone. There are no records of illegal fishing by purse seine vessels in the BIOT FCMZ during this period. Since the declaration of the BIOT MPA in 2010 the purse seine fleet has remained highly compliant with the requirements of the BIOT Administration. The fleet is highly risk averse given their high level of capital investment in the vessels and gear and the possible penalties of seizure of catch and gear. The risk of confiscation or even just the possibility of being tied up for a few days whilst brought into port and inspected would represent a potential loss of revenue. The risk of a purse seine vessel fishing illegally is therefore assessed as minimal.

Mauritian mothership-dory operations occurred in the BIOT zone from the early 1990s and the declaration of the zone until the declaration of the MPA in 2010. These vessels are given free licences if flying the Mauritian flag, (a small nominal charge has been made for Mauritian owned vessels flying another flag), due to the territorial claim of Mauritius over the British Indian Ocean Territory. These vessels are therefore unlikely to fish in an unauthorised manner

There is no domestic national commercial fleet and all recreational fishers, either from land or by small vessels are covered by a single licensing agreement.

5.3.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Prior to the implementation of the BIOT MPA in 2010, purse seine, longline and Mauritian mothership-dory operations were licensed by the BIOT Administration. Apart from a few minor discrepancies on entry and exit reporting requirements, reporting obligations (radio reports and logbooks) by the licensed fleet was very good both in reporting and quality. This in part can be explained by the licence fee paid being independent of the catches actually made by the vessels, reducing any incentive to misreport as has been observed in other fisheries where the licence fee paid is relative to the amount caught during the licensed period. The BIOT Patrol Vessel also checked licensed fishing vessels' holds during inspections to ensure that catches made matched up with reported catches on entry and logbook records to ensure reporting obligations were maintained.

The BIOT Administration has also for a number of years put observers onboard longline, purse seine and mothership-dory vessels. As part of their role, observers would verify that the catches recorded matched their own observations and that there was no "observer effect" where catches increase whilst an observer is present for no other discernible reason. The results of the observer programmes whilst limited in coverage, confirmed that reporting by authorised vessels in the BIOT zone was accurate in terms of volumes and catch composition.

As there is not a port however, where full catch monitoring could take place and the level of the observer programme and rate of inspection at sea are both low there is a risk that vessels may misreport target or bycatch species. It is therefore assumed that, apart from unlicensed and unauthorised fishing there perceived risks relating to reporting obligations will be low but have been included for completeness.

It has been noted that some late reporting of official data to the Indian Ocean Tuna Commission by some fishing nations has occurred. Logbook data have been submitted on exit of the zone or within a month to the BIOT Administration, but these data took longer to be aggregated and submitted to the RFMO. These data however have been shown to eventually be submitted by the relevant flag States with a delay of one or two years.

5.3.6.3 Non-compliance with other licence conditions by licensed/authorised vessels

The only licence condition applied in the BIOT zone that creates non-compliance is the possession and use of illegal gear. The BIOT administration only allows certain gear types to be used by licensed vessels i.e. purse-seine, longline and hook and line. Within these allowable gear types the only additional licence condition brought in by the BIOT administration above and beyond any international regulations (i.e. United Nations 1992 ban on driftnets greater than 2.5km) was the banning of wire trace on longlines and handlines in 2007. This ban was introduced to reduce the level of shark catch by the licensed tuna and demersal fisheries as sharks can bite through the monofilament lines but not wire trace. As this has been introduced unilaterally and not through IOTC, simple possession, i.e. the presence of gear on the vessel would not constitute non-compliance as long as it has been stowed correctly. If the wire-trace is available for immediate deployment, i.e. on deck with baited hooks this would be considered evidence of non-compliance.

5.3.6.4 Post-harvest IUU

As BIOT does not have a commercial port for the landing of fish, the only likely risk post-harvest would be illegal transshipment. With the large number of longliners historically active and the potential for illegal Sri Lankan and Indian fisheries within BIOT the potential for illegal transshipment exists. Due to the estimated levels of illegal fishing taking place it is more likely that the most likely vessels to tranship illegally would be the smaller Sri Lankan and Indian vessels. There has been some anecdotal information relating to transfer of fish between Sri Lankan vessels, along with transfer of sea cucumbers from camps to vessels in 2005, but due to the nature of the ownership of these vessels it is likely that the likely occurrence and volume of any transshipment is low.

5.3.6.5 Other offences

The islands of the Chagos Archipelago are known breeding grounds for a number of turtle species as well as numerous ground nesting birds. IOTC recognise that the bigeye thresher shark (*Alopias superciliosus*) is particularly endangered and vulnerable. Both turtles and sharks are potential targets for illegal longline and driftnetters.

The BIOT Administration charter a patrol vessel to maintain a presence all year round although not all the time is spent on fisheries patrols. During the period 1991-2010 when licensed fishing occurred year round in the zone fishing vessels provided an additional MCS resource, reporting in all vessels encountered to the patrol vessel. Many of these would be other licensed vessels but on a number of occasions unlicensed vessels were reported either fishing illegally or in transit through the zone, not having reported in to the patrol vessel. Table 19 summarises the IUU risks that have been identified as possible risks for the British Indian Ocean Territory.

Table 19 Specific risks identified for the British Indian Ocean Territory.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India).	3 & 4
	Unlicensed fishing in EEZs by boats from outside the region (Taiwan and Japan).	1 & 2
Non-compliance with reporting obligations by licensed/authorised vessels	Under-reporting target species	1, 2, 3, 4 and 5
	Misidentifying target species	1, 2, 3, 4 and 5
	Misreporting of bycatch species	1, 2, 3, 4 and 5
	Failure to provide prompt reporting to coastal State.	1, 2, 3, 4 and 5
Non-compliance with other licence conditions by licensed/authorised vessels	Use of non-prescribed gear	1, 3, 4 and 5
	Fishing inside closed waters	1, 2, 3, 4 and 5
Post-harvest IUU	Illegal transshipping	1, 3, 4 and 5
Other offences	Illegal harvest/possession of sharks or other protected species (sea cucumbers)	1, 2, 3, 4 and 5
	Bribery/obstruction/mistreating of observers or fisheries officers.	1, 2, 3, 4 and 5

5.3.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 20), impact (Table 21) and level of inherent risk (Table 22) for the British Indian Ocean Territory based on the risks identified in Table 19.

Table 20 Assessment of risk likelihood – British Indian Ocean Territory.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India).	Very High	Strong	Likely
Unlicensed fishing in EEZs by boats from outside the region (longliners).	High	Strong	Moderate
Under-reporting target species	Very Low	Strong	Rare
Misidentifying target species	Very Low	Strong	Rare
Misreporting of bycatch species	Very Low	Strong	Rare
Failure to provide prompt reporting to coastal State.	Very Low	Strong	Rare
Use of non-prescribed gear	Very High	Strong	Likely
Fishing inside closed waters	Very High	Strong	Likely
Illegal transhipping	Very Low	Strong	Rare
Illegal harvest/possession of sharks or other protected species (sea cucumbers)	High	Strong	Moderate
Bribery/obstruction/mistreating of observers or fisheries officers.	Moderate	Strong	Unlikely

Table 21 Assessment of risk impact – British Indian Ocean Territory.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India).	Moderate	Highly vulnerable	Major
Unlicensed fishing in EEZs by boats from outside the region (longliners).	Low	Moderate	Minor
Under-reporting target species	Low	Resilient	Minor
Misidentifying target species	Very low	Resilient	Insignificant
Misreporting of bycatch species	Very low	Vulnerable	Minor
Failure to provide prompt reporting to coastal State.	Low	Resilient	Minor
Use of non-prescribed gear	High	Highly vulnerable	Serious
Fishing inside closed waters	High	Moderate	Major
Illegal transshipping	High	Vulnerable	Major
Illegal harvest/possession of sharks or other protected species (sea cucumbers)	High	Highly vulnerable	Serious
Bribery/obstruction/mistreating of observers or fisheries officers.	Very low	Moderate	Minor

Table 22 Assessment of inherent risk – British Indian Ocean Territory.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India).	Likely	Major	High
Unlicensed fishing in EEZs by boats from outside the region (longliners).	Moderate	Minor	Moderate
Under-reporting target species	Rare	Minor	Low
Misidentifying target species	Rare	Insignificant	Low
Misreporting of bycatch species	Rare	Minor	Low
Failure to provide prompt reporting to coastal State.	Rare	Minor	Low
Use of non-prescribed gear	Likely	Serious	Severe
Fishing inside closed waters	Likely	Major	High
Illegal transshipping	Rare	Major	Moderate
Illegal harvest/possession of sharks or other protected species (sea cucumbers)	Moderate	Serious	High
Bribery/obstruction/mistreating of observers or fisheries officers.	Unlikely	Minor	Minor

5.3.8 Impacts of IUU

The impact of unlicensed fishing in EEZs by boats from other regional States, i.e. Sri Lanka and India in the case of BIOT is high. The level of risk is estimated as being high and the vessels target top predators such as sharks and tuna and tuna like species. Sri Lankan illegal fishing for sea cucumbers is also a high impact as the methods employed to catch sea cucumbers illegally aim to remove all available individuals from a particular area, where a responsible fishery would only ever aim to remove the surplus. In each of these cases an imbalance would occur in the local ecosystems. The potential impact by Indian vessels is higher as they are bigger vessels and the possible damage from trawl gear used on the banks of the Territory that have never been trawled is extremely high. This could disrupt habitats in a very short period and could have a huge negative impact on the resident stocks.

The risk of unlicensed fishing in the BIOT MPA by boats from outside the region namely the oriental longline fleets is estimated at a moderate level. These vessels will target bigeye and yellowfin tuna and as such the amount of catch taken from the BIOT zone will be limited compared to the catch taken from the overall Indian Ocean stocks of these two species.

The low risk of under-reporting or misidentification of target and bycatch species in the BIOT zone will have minimal impact on the pelagic tuna stocks. The under-reporting of shark catches for longline fisheries globally has been identified as a major problem in their stock assessment, however for BIOT shark numbers (and composition from observer and inspection data) are available. There may be some negative effect on the stock assessment of the inshore species particular the more

vulnerable snapper and grouper species, though this has not been apparent in the most recent stock assessments conducted before the establishment of the BIOT MPA (Nugent *et al.* 2010).

The use of non-prescribed gear in particular of gillnets by the Sri Lankan fleet, in cases greater than the maximum 2.5km permitted length internationally and wire trace, which has been banned unilaterally by the BIOT Administration, and the possible use of benthic trawl gear by Indian vessels has been identified as a severe risk. Gillnets as used by both the Sri Lankan and Indian vessels are indiscriminate in their targeting taking sharks, rays, turtles and potentially marine mammals in addition to other target species. Wire trace on longline gear has been shown to increase the shark catch rates which are then retained, and as for the gillnet fisheries this would then remove these top trophic level species from the ecosystem. It has also been proposed that BIOT could be a potential source of external recruitment for reef and bank species at other locations around the Indian Ocean where populations have already been significantly depleted (Koldewey *et al.* 2010).

Since the declaration of the FCMZ only pelagic gears have been licensed and the benthic habitats and ecosystems are in relatively pristine condition with only the limited fishing conducted by the Mauritian mothership-dory fishery having an impact on the benthic communities. Perhaps the most severe impact would be the potential damage would come from the illegal gears used the Sri Lankan (i.e. SCUBA and hand collection of sea cucumbers) and Indian vessels (i.e. benthic trawling) in and around the banks and lagoons of the Chagos Archipelago. Both these methods can have a very significant negative impact on the targeted areas, stripping them of target species or destroying whole habitats in a very short period of time.

Illegal transshipping and bunkering, although at a moderate level of risk, would likely impact only the high value species such as yellowfin and bigeye tuna from longliners or sea cucumbers from the illegal Sri Lankan fishing camps transshipping catch onto vessels for transfer back to market. It would add no more catch to the amount taken illegally but would affect the manner in which MCS operations are undertaken to identify and apprehend vessels being used in this manner and can extend the capacity of fishing vessels to continue to fish for longer periods without the need to return to port.

The illegal harvest or possession of sharks or other protected species (i.e. sea cucumbers) as discussed earlier is high and would be covered by the risk of illegal fishing. It is unlikely in BIOT waters that illegal possession of species captured elsewhere would be able to be identified and prosecuted due to the lack of port facilities for unloading.

5.3.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

The highest estimated rate of illegal fishing in the BIOT FCMZ/MPA is estimated to come from the risk “Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India)”. Although the size of the vessels and hence the level of catch is relatively small compared to other vessel types the frequency since 2001 is relatively high with a number of arrests (62). Estimating that as an upper level only a quarter of the vessels fishing illegally have been caught and an average of 5t capacity for each the upper level, then an annual estimate of illegal catches would be between 62 and 248t per year since 2001. This compared to the level of catch from the legal licensed mothership dory fishery is approximately between 50 and 100% of the annual catch of that fishery. Catches from this source

though will be added as a flat rate of “mixed species” and not as a percentage due to the volatility of catches from the legal licensed fishery.

Although the risk level has been estimated it is not thought that the threat from Indian vessels started until 2014, i.e. outside the scope of this study. These have therefore been classified as having no effect on the level of illegal catch.

The risk of “Unlicensed fishing in EEZs by boats from outside the region (longliners)” has been estimated at a moderate level. Based on the evidence of a low-level of activity encountered we would suggest a level of 2-10% illegal catch based on the level of legal catch.

Three other risks “Under-reporting target species”, “Misidentifying target species” and “Misreporting of bycatch species” have all been estimated to be at a low level for each of the fisheries. We estimate that only a level of between 0 to 1% by allocated to each of these risks for each legal fishery in the BIOT FCMZ/MPA as the catch recording was shown to be very good and complete. The only exception would be for sharks caught by longliners that were under-reported and for these species we would recommend a 0 – 100% level based on recorded catches.

The level of reporting of catches from the licensed fisheries in BIOT was very high at around 98 to 100% for the industrial longline fishery and at 100% for both the purse seine and inshore fisheries. An estimate of between 0 and 2% has been made therefore for the longline fishery for “Failure to provide prompt reporting to coastal State” but has been estimated at 0% for the other fisheries. Illegal catches by the other fleets would be considered under other categories to avoid double counting.

Use of non-prescribed gear, fishing inside closed waters and unreported/unregulated transshipment, although being complicating factors and illegal within BIOT waters, would not add to the estimated level of IUU fishing and are therefore not assigned separate rate estimation values.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the BIOT zone can be found in Table 23.

Table 23 Summary of estimated rates – British Indian Ocean Territory.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZs by boats from other regional States (Sri Lanka and India).	Sri Lanka	All listed	1990-2000	0	0	0	0
	Sri Lanka	All listed	2001-2013	2	10	0	0
	India	All listed	1990-2012	0	0	0	0
	India	All listed	2013	0	0	0	0
Unlicensed fishing in EEZs by boats from outside the region (Taiwan and Japan).	Longline	YFT, BET	1990-2010 ²²	2	10	0	0
	Purse Seine	YFT, SKJ, BET, ALB	1990-2010 ²²	0	0	0	0
Under-reporting target species	All	All	1990-2010 ²²	0	0	0	1
Misidentifying target species	All	All	1990-2010 ²²	0	0	0	1
Misreporting of bycatch species	Longline	Sharks	1990-2010 ²²	0	0	0	100
	PS/MV-Dory/LL(except sharks)	All	1990-2010 ²²	0	0	0	1
Failure to provide prompt reporting to coastal State.	Longline	All	1990-2010 ²²	0	0	0	2
	All others	All	1990-2010 ²²	0	0	0	0
Use of non-prescribed gear	All	All	1990-2013	0	0	0	0
Fishing inside closed waters	All	All	1990-2013	0	0	0	0
Illegal transhipping	All	All	1990-2013	0	0	0	0
Illegal harvest/possession of sharks or other protected species (sea cucumbers)	All	All	1990-2013	0	0	0	0
Bribery/obstruction/mistreating of observers or fisheries officers.	All	All	1990-2013	0	0	0	0

²² No active licensed fishery has been active since 2010.

5.3.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data, with adjustments for the foreign licensed fisheries and estimates of IUU fishing that has occurred in BIOT waters during 1990 – 2013 the average illegal and unreported catches represent between 51t and 525t per annum (0.62 and 6.34%). This is relatively small due to the catches of the highly compliant major industrial fisheries greatly outweighing the catches of the illegal fisheries. Illegal fishing makes up between 0.62 and 2.79% and unreported fishing between 0.00% and 3.55%.

Losses from Illegal, Unreported and Unregulated fishing in the BIOT FCMZ/MPA are estimated to average between USD 0.09 and 1.00 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 24 and as first landed value in Table 25. Profiles of the estimated level of illegal and unreported fishing combined in the British Indian Ocean Territory can be found in Figure 5 (catch in t) and Figure 6 (catch value in USD).

Table 24 Summary of estimated IUU by year 1990 – 2013 (British Indian Ocean Territory).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	213.51	4.27	21.35	0.00	0.00	0.00	0.00
1992	299.30	5.99	29.93	0.00	0.00	0.00	0.00
1993	16300.78	4.00	27.53	0.00	501.93	0.00	0.00
1994	20140.75	6.16	34.83	0.00	607.85	0.00	0.00
1995	13413.95	4.28	23.04	0.00	402.51	0.00	0.00
1996	14924.89	68.64	305.01	0.00	448.96	0.00	0.00
1997	2851.08	68.45	322.92	0.00	123.48	0.00	0.00
1998	6737.27	63.89	338.38	0.00	326.45	0.00	0.00
1999	7592.26	65.26	361.91	0.00	301.11	0.00	0.00
2000	4871.10	68.65	376.69	0.00	209.93	0.00	0.00
2001	2342.32	66.61	319.00	0.00	119.34	0.00	0.00
2002	4432.19	66.80	337.82	0.00	198.32	0.00	0.00
2003	1743.73	72.88	378.28	0.00	65.58	0.00	0.00
2004	4207.96	70.06	325.89	0.00	127.61	0.00	0.00
2005	14760.32	67.18	289.86	0.00	497.51	0.00	0.00
2006	875.77	70.01	306.10	0.00	111.54	0.00	0.00
2007	26770.19	69.68	323.44	0.00	977.14	0.00	0.00
2008	15463.63	62.28	279.66	0.00	536.44	0.00	0.00
2009	5583.06	66.11	332.39	0.00	203.99	0.00	0.00
2010	2053.37	63.70	424.90	0.00	118.19	0.00	0.00
2011	0.00	62.00	248.00	0.00	0.00	0.00	0.00
2012	0.00	62.00	248.00	0.00	0.00	0.00	0.00
2013	0.00	62.00	248.00	0.00	0.00	0.00	0.00

Table 25 Summary of the estimated value of IUU (USD) by year in BIOT (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.82	0.02	0.08	0.00	0.00	0.00	0.00
1992	0.86	0.02	0.09	0.00	0.00	0.00	0.00
1993	20.18	0.02	0.13	0.00	0.68	0.00	0.00
1994	27.47	0.03	0.16	0.00	0.86	0.00	0.00
1995	20.38	0.02	0.10	0.00	0.62	0.00	0.00
1996	23.22	0.08	0.42	0.00	0.72	0.00	0.00
1997	10.57	0.09	0.54	0.00	0.57	0.00	0.00
1998	23.81	0.06	0.64	0.00	1.46	0.00	0.00
1999	21.82	0.07	0.61	0.00	1.19	0.00	0.00
2000	16.03	0.08	0.63	0.00	0.89	0.00	0.00
2001	7.74	0.07	0.45	0.00	0.45	0.00	0.00
2002	10.40	0.07	0.47	0.00	0.54	0.00	0.00
2003	4.66	0.23	0.74	0.00	0.21	0.00	0.00
2004	6.57	0.22	0.63	0.00	0.20	0.00	0.00
2005	22.85	0.21	0.72	0.00	0.88	0.00	0.00
2006	4.17	0.22	0.67	0.00	0.30	0.00	0.00
2007	64.13	0.22	0.80	0.00	2.45	0.00	0.00
2008	36.14	0.06	0.32	0.00	1.30	0.00	0.00
2009	8.98	0.07	0.38	0.00	0.33	0.00	0.00
2010	13.28	0.06	0.79	0.00	0.90	0.00	0.00
2011	0.00	0.06	0.22	0.00	0.00	0.00	0.00
2012	0.00	0.06	0.22	0.00	0.00	0.00	0.00
2013	0.00	0.06	0.22	0.00	0.00	0.00	0.00

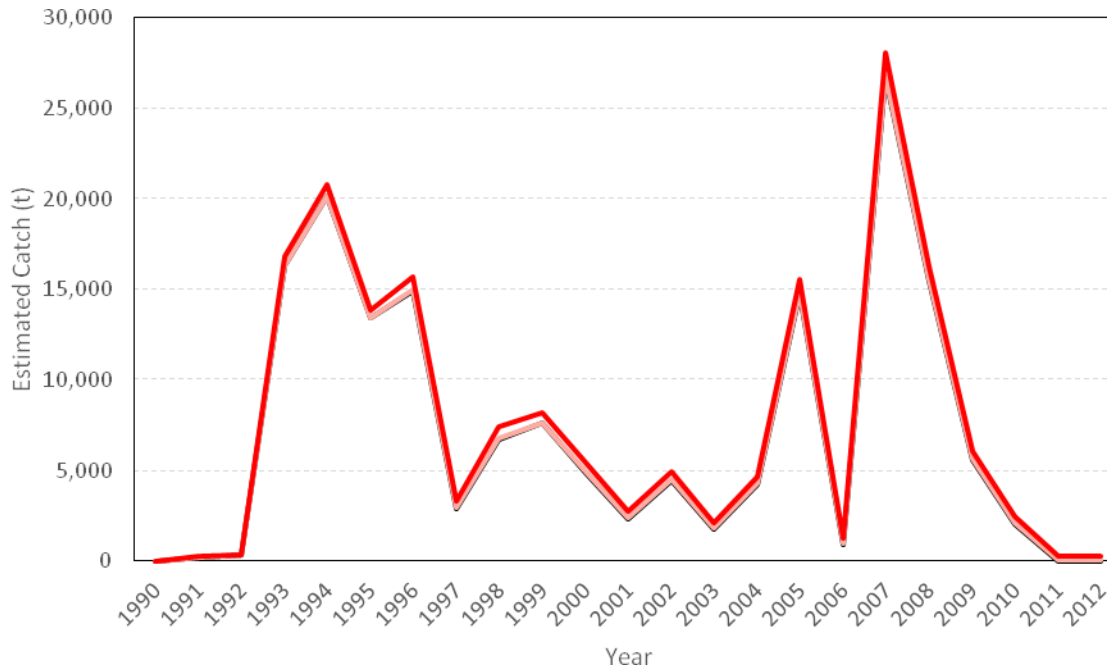


Figure 5 IUU Catch Profile (BIOT) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

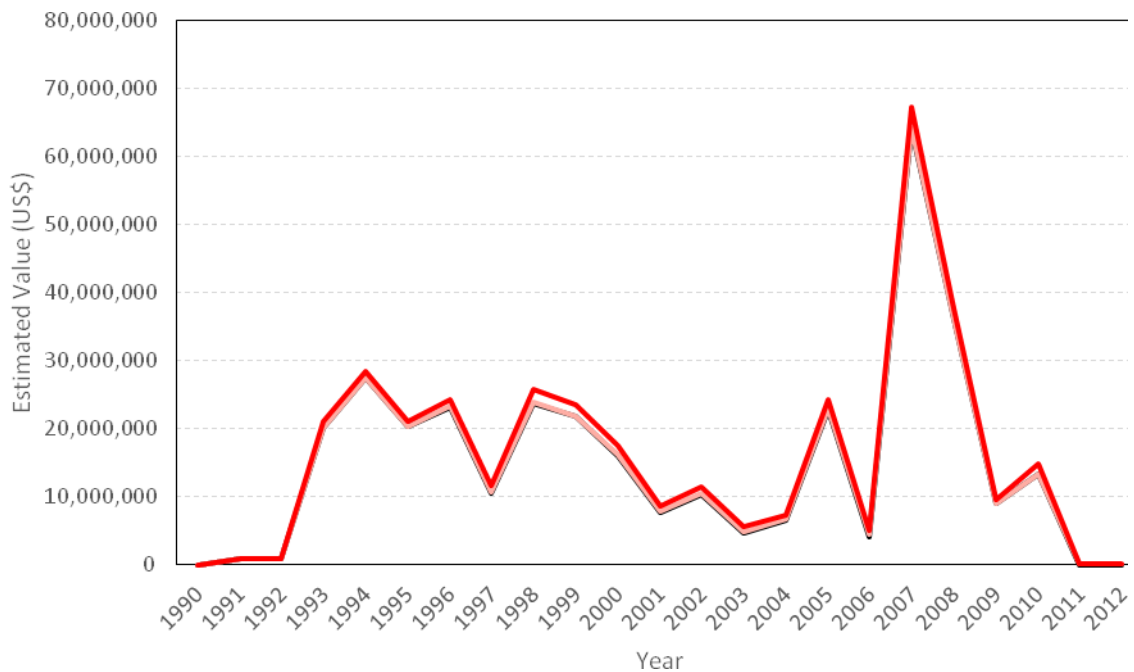


Figure 6 IUU Catch Value Profile (BIOT) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.4 Brunei

5.4.1 Introduction

Brunei Darussalam (hereafter referred to as Brunei) is a small nation on the island of Borneo, with its land border fully surrounded by Malaysia and a coastline facing into the South China Sea. Brunei has an EEZ of 7,070 km² and a territorial sea of 3,022 km², in addition to a further territorial claim of 16,450 km² which is disputed by China, Indonesia and Malaysia. The creation of three new NTZs within Brunei's coastal waters was announced in 2014, with the zones to be enforced in late 2015²³.

As of 2008 the value of fisheries in Brunei was estimated at c. \$142 million (converted from Brunei dollars), of which 56% was contributed by capture fisheries. Fisheries production in Brunei is dominated by small-scale fisheries, which account for c.70% of total production (Commonwealth Network, 2015). Brunei is notable for one of the highest fish consumption levels per capita in the Southeast Asian region, at 40-47kg annually²⁴.

5.4.2 Fleet breakdown

Brunei's national commercial fleet is insignificant in size compared to many other states in this study, with a total capacity of just 44 vessels in 2011 employing a range of gear types including trawls, purse seines and longlines (SEAFDEC, 2012).

Table 26 Fleet breakdown for Brunei.

Description	Gear	Flag(s)	Target Species	Comment
National small-scale/semi-commercial fleet	Mixed gears	Brunei	Small pelagics, mixed demersal and reef species, shrimps	
National commercial/industrial fleet	Trawl, purse seine, longline	Brunei	Small pelagics, tuna and tuna-like species	
Foreign industrial fleet	Longline, purse seine, trawl	Malaysia, Vietnam	Mixed demersal and pelagic species	
Foreign artisanal fleet	Mixed gears, incl. destructive gears	International	Mixed species	

²³ "Brunei to enforce protection of aquatic life in three areas - Borneo Bulletin Online," 2014.

²⁴ "Harvesting sea of potential - Focus - China Daily Asia," 2013.

5.4.3 Catch breakdown by fleet

The FAO reported catch data for Brunei totals at 58,691 tonnes between 1990 and 2013, and the data is highly aggregated, consisting predominantly of various invertebrate taxa *nei* and marine fishes *nei*, the latter of which accounts for the highest percentage of the reported catch at 86%. Indian Mackerel (*Rastrelliger kanagurta*) is the only species level classification available in the catch data, but catch is only recorded for one year, with 194 tonnes in 2006.

The SAU reconstruction for Brunei estimated catches from 1950-2010 at four times higher than the FAO reported catches, and the total reconstruction for 1990-2010 was 314,154 tonnes, over five times higher than the FAO reported catches. The SAU data is dominated by pelagic taxa such as herrings and sardines *nei* (Clupeidae) and mackerels *nei* (Scombridae) which together account for 35.2% of the estimated totals. Aggregated invertebrate species and penaeid shrimps *nei* (Penaeidae) account for a further 18% of the reconstructed catch.

It has not been possible to effectively breakdown the national catch level into disaggregated fleets for Brunei. A single fleet model for risks has been used for the calculation of level of risk and these risks have been applied to the national catch as reported.

5.4.4 IUU Influencing factors

5.4.4.1 Legislation and governance

Fisheries in Brunei are governed by the Department of Fisheries within the Ministry of Industry and Primary Resources (MIPR), under the Fisheries Order legislation of 2009.

Brunei is not a member of any regional RFMOs, but signed the UNCLOS Convention in 1996. Moreover Brunei is a member of the RPOA-IUU, and produced its own NPOA-IUU in 2011. The country is also one of the highest ranked countries in the study region according to the World Bank Governance Indicators (41st out of 212, 2nd in the region behind Singapore, 19% percentile). As such any risks relating to direct corruption or a weak regulatory framework would be significantly reduced compared to other States i.e. obstruction of bribery of fisheries officers and falsification of documents. (See Table 159).

5.4.4.2 Licensing and reporting requirements

Historically, Brunei's maritime laws have made no provision for the registration of national fishing vessels, thus creating a loophole in flag state measures. However, as part of activities resulting from the NPOA-IUU, the Merchant Shipping Order law (2002) was updated in 2011 to include the compulsory registration of all fishing vessels²⁵. This has increased flag state control of national

²⁵ Merchant Shipping (Registration of Fishing Vessels and Pleasure Craft) Regulations of Brunei Darussalam, 2011.

vessels, as the previous legislation did not subject 'administratively registered' fishing vessels to penalties for fishing offences²⁶.

Under the Brunei Darussalam Fisheries Limits, the national fleet operates within four spatial zones, within which the licensing to fish is determined by engine horsepower, gross tonnage and fishing gear. Zone 1, closest to the shore, is reserved for semi-commercial and small-scale vessels with artisanal gears, with industrial gear permitted progressively further from the shore in zones 2-4.

All ownership and use of fishing vessels or gear requires a license under national law, irrespective of artisanal or industrial methods. In addition industrial vessels are required by Ministerial provision to report catch in monthly logbooks (Cinco, 2015), but the Fisheries Order does not contain any requirements for the recording and reporting of catch (with the exception of marine mammal bycatch) by any other portion of the national fleet.

Specific conditions are also set out regarding fishing in marine reserves or parks, which is illegal without a licence and can only be carried out on the grounds of proper management activities (Article 27).

5.4.4.3 Restrictions, fines and penalties

Fishing for CITES listed species, and the use of destructive fishing gears, is specifically prohibited under the Fisheries Order (Article 31). Specific gears referred to in the text include explosives, pollutants and noxious substances, although not reference is made to other potentially destructive gears such as nets with small mesh sizes, trawls or dredges. The Department of Fisheries has also introduced additional management measures including a moratorium on the issuing of commercial trawling licenses in 2004 and a moratorium on the issuing of new zone 1 licences for small scale fishers in 2008 (SEAFDEC, 2012).

The default individual penalty for violation of the Fisheries Order by a national citizen is a maximum fine of \$10,000 and/or a maximum prison term of 1 year (Article 40). The Fisheries Order also stipulates that fishing by foreign vessels within the EEZ is prohibited unless authorised under an international fisheries agreement. If a foreign vessel is convicted of an offence under the Fisheries Order, the master and owner of a ship can face a maximum fine of \$100,000, imprisonment for a maximum of five years, or both. In addition, members of the crew can be fined a maximum of \$2,500, and/or imprisoned for a maximum of one year (Article 17). It is important to note that the Fisheries Order makes no provision for the regulation or prohibition of transshipments. A 2011 news report referred to the case of nine Vietnamese nationals arrested for illegal fishing, and stated potential penalties consistent with those listed above from the legislation²⁷. However, a separate report from 2015 on the trial of foreign fishermen arrested on an illegal Vietnamese fishing boat

²⁶ "Fishing, private ships must register by March next year | The Brunei Times," 2011.

²⁷ ("9 Vietnamese guilty of illegal fishing | The Brunei Times," 2011.)

stated that the owner and master were sentenced to six months imprisonment, whilst each crew member was sentenced to three months²⁸.

5.4.4.4 MCS protocols and enforcement capacity

Under national legislation enforcement officers are invested with the power to stop, board and search vessels suspected of fisheries offence, in addition to seizing catch and/or gear. Obstruction or resistance of enforcement officers is also a specific offence (Article 41-46). According to published statistics, 2,529 patrols were carried out in national waters by maritime enforcement agencies between 2010 and 2014. However, enforcement effort is uneven, and the fishing zones further from the coastline are not fully patrolled.

5.4.4.5 Port state

The only deep-water port in Brunei is situated in Muara, at the northeast tip of the country, but catch is also landed in the capital city of Bandar Seri Begawan and the second largest town, Kuala Belait. The Fisheries Order specifically mandates the Minister to 'regulate the landing of fish, to provide for the management and control of fishing ports and fish-landing areas' (Article 60), however Brunei has not signed the FAO Port State Measures Agreement. Indeed a 2010 review of Brunei's fisheries legislation identified key weaknesses in Brunei's capacity to implement port state control of fishing vessels (Edeson *et al.*, 2010).

5.4.4.6 Market state

Despite the country's high seafood consumption, national fisheries do not supply sufficient seafood for market demand, and consequently around half of Brunei's seafood is imported. Moreover Brunei's seafood exports are minimal, at only B\$1.63 million annually in comparison to B\$73.6 million of imports (Commonwealth Network, 2015). A 2014 news article referred to an imminent enforcement crackdown on the import of shark into Brunei, suggesting that the country's imports may potentially be a channel for illegally harvested ETP shark species²⁹.

5.4.5 Summary of IUU incidences

A comprehensive grey literature and online media review identified numerous IUU incidents within the Brunei EEZ, with economic losses to IUU fishing stated at \$19 million for 2012 by a national media source³⁰. Quoted statistics on IUU monitoring and enforcement between 2010 and 2014

²⁸ ("31 Vietnamese in Jail for Violating Fisheries Act," 2015.)

²⁹ ("Plan to cut losses due to illegal fishing | The Brunei Times," 2014.)

³⁰ ("\$19 million lost due to illegal fishing | The Brunei Times," 2013.)

recorded 235 sightings of illegal foreign vessels in national waters, with 98 cases brought for IUU offences³¹.

National media reports on IUU fishing indicate the arrest and imprisonment of fishermen from several other states in the BOBLME and Southeast Asia region, in addition to incidents involving Brunei nationals. A summary is presented below, with incidents divided between national and foreign fleets.

5.4.5.1 National fleets

Limited evidence of IUU activities by national fishers was uncovered in the literature review, with arrests of artisanal fishers recorded in 2011³² and 2012³³ for fishing within oilfield exclusion zones. In addition a fishing company was reportedly fined in 2015 for operating in a zone without the correct license, as well as not carrying a GPS system³⁴. Information on catch and gear types was absent from these reports, however the use of destructive fishing methods such as dynamite³⁵ and cyanide by artisanal fishermen has also been highlighted elsewhere (Funge-Smith *et al.*, 2015). It should be noted that no reported IUU events were found which indicated the involvement of national industrial fleets.

5.4.5.2 Foreign fleets

Brunei's online media contain extensive reports of IUU fishing by foreign vessels, with the literature review recording incidents from 2008 to 2015. In several cases the vessels involved were Malaysian-flagged, with Vietnamese nationals predominating amongst the arrested crews in a number of separately documented incidents (see news articles cited elsewhere in this country section for details on arrests of Vietnamese nationals). In addition crews comprising Thai³⁶, Cambodian³⁷, Filipino, Malaysian and stateless³⁸ individuals were also recorded in various illegal fishing incidents within the Brunei EEZ. Information on gear type was predominantly absent, but IUU fishers were

³¹ "Plan to cut losses due to illegal fishing | The Brunei Times," 2014.

³² ("\$11k fine for illegal fishing | The Brunei Times," 2012.)

³³ ("Two nabbed for illegal fishing | The Brunei Times," 2012.)

³⁴ ("Fishing Company Fined For Operating Outside Its Designated Zone," 2015.)

³⁵ It should be noted that the term 'dynamite' is used throughout this report as a general term for all explosives, most of which are made from agricultural fertilizers and other chemicals rather than dynamite itself.

³⁶ ("9 Thai Nationals Imprisoned for Illegal Fishing in Brunei Waters," 2014.)

³⁷ ("Cambodians, Thais face illegal fishing charge | The Brunei Times," 2014.)

³⁸ ("Fishermen fined, vessels seized | The Brunei Times," 2012.)

recorded using longlines, trawl gear and artisanal methods in various news reports. Species reported in seized catch included cuttlefish³⁹, yellowfin tuna⁴⁰, mackerel sp. and wolf herring⁴¹.

5.4.6 IUU risk identification

5.4.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone

A combination of factors create evident risks for unlicensed/unauthorised fishing by both foreign and national vessels. The inconsistency of patrol effort by national authorities, which is reduced in the outer fisheries zones, creates an opportunity for IUU activities to pass undetected. Given that the outer zones (particularly zone 4 which is used to target lucrative species such as tuna) are beyond the reach of many artisanal vessels, this risk is more likely to apply to industrial vessels. Moreover the disputed nature of Brunei's maritime boundaries increases the probability that foreign fishing vessels will transgress. Other postulated drivers for unlicensed/unauthorised fishing include overfishing/depletion of neighbouring waters in Malaysia and the insufficient deterrent provided by current fishing offence penalties (Funge-Smith *et al.*, 2015).

5.4.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

As the Fisheries Order does not contain any reporting obligations for national vessels, non-compliance with reporting obligations is not a legal issue in Brunei. However, for the purposes of the risk assessment, the failure to accurately report catch or not reporting catch entirely is included as a specific risk within this category due to the implications of such actions. All national fleets will be risk assessed collectively under this specific risk.

5.4.6.3 Non-compliance with other licence conditions and/or legislation

Brunei's use of a zonal fishing permit system creates a risk of non-compliance by licensed/authorised vessels, as boats may stray into zones in which they are not permitted to fish. In addition, the review of online media highlighted incidences of fishermen being arrested after straying into closed areas in oilfields, creating another risk of potential non-compliance. At the time of writing Brunei had enforced its newly announced NTZs, and thus these closed areas were not considered as part of the risk assessment for non-compliance.

³⁹ ("31 Vietnamese in Jail for Violating Fisheries Act," 2015.)

⁴⁰ ("Illegal fishing: 11 Vietnamese jailed | The Brunei Times," 2011.)

⁴¹ ("Five pump boats impounded for illegal fishing | The Brunei Times," 2010.)

5.4.6.4 Post-harvest IUU

Due to the lack of provisions regarding transshipping under Brunei's fisheries laws, all transshipment activities in the EEZ, whether by legal or illegal vessels, are likely to be unreported and unregulated. In addition Brunei's prominence

5.4.6.5 Other offences

References to the fishing of sharks in Brunei's waters were found during the literature review (although it is unclear whether ETP shark species were involved), and in addition a media article covering an IUU incident in 2011 reported the illegal fishing of yellowfin tuna (near threatened)⁴².

⁴² "Illegal fishing: 11 Vietnamese jailed | The Brunei Times," 2011.

Table 27 Specific risks identified for Brunei.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unauthorised fishing by foreign industrial vessels in EEZ	1
	Unauthorised fishing by foreign artisanal vessels in EEZ	1
	Unlicensed fishing by national industrial vessels in EEZ	1
	Unlicensed fishing by national artisanal vessels in EEZ	1
Non-compliance with reporting obligations by licensed/authorised vessels	Misreported/unreported catch by licensed national vessels	1
Non-compliance with other licence conditions and/or legislation	Use of prohibited and destructive gears	1
	Fishing inside spatio-temporal areas	1
	Fishing outside of zones permitted in license	1
Post-harvest IUU	Unreported and unregulated transshipping	1
Other offences	Harvest of sharks and other ETP species	1

5.4.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 28), impact (Table 29) and level of inherent risk (Table 30) for Brunei based on the risks identified in Table 27.

Table 28 Assessment of risk likelihood – Brunei.

Specific Risk	Incentives	Deterrents	Likelihood
Unauthorised fishing by foreign industrial vessels in EEZ	Moderate	Moderate	Moderate
Unauthorised fishing by foreign artisanal vessels in EEZ	Low	Moderate	Unlikely
Unlicensed fishing by national industrial vessels in EEZ	Moderate	Moderate	Moderate
Unlicensed fishing by national artisanal vessels in EEZ	Low	Strong	Unlikely

Misreported/unreported catch by licensed national vessels	Moderate	Very weak	Likely
Use of prohibited and destructive gears	Moderate	Strong	Unlikely
Fishing inside closed areas	High	Strong	Moderate
Fishing outside of zones permitted in license	High	Strong	Moderate
Unreported and unregulated transshipping	Low	Very Weak	Likely
Harvest of sharks and other ETP species	Moderate	Moderate	Moderate

Table 29 Assessment of risk impact – Brunei.

Specific risk	Catch	Vulnerability	Impact
Unauthorised fishing by foreign industrial vessels in EEZ	High	Moderate	Major
Unauthorised fishing by foreign artisanal vessels in EEZ	Moderate	Vulnerable	Major
Unlicensed fishing by national industrial vessels in EEZ	Moderate	Moderate	Moderate
Unlicensed fishing by national artisanal vessels in EEZ	High	Vulnerable	Major
Misreported/unreported catch by licensed national vessels	High	Vulnerable	Major
Use of prohibited and destructive gears	Low	Highly vulnerable	Major
Fishing inside closed areas	Moderate	Moderate	Major
Fishing outside of zones permitted in license	Moderate	Vulnerable	Major
Unreported and unregulated transshipping	Very low	Moderate	Minor
Harvest of sharks and other ETP species	Low	Vulnerable	Moderate

Table 30 Assessment of inherent risk – Brunei.

Specific risk	Likelihood	Impact	Risk
Unauthorised fishing by foreign industrial vessels in EEZ	Moderate	Major	High
Unauthorised fishing by foreign artisanal vessels in EEZ	Unlikely	Major	Moderate
Unlicensed fishing by national industrial vessels in EEZ	Moderate	Moderate	Moderate
Unlicensed fishing by national artisanal vessels in EEZ	Unlikely	Major	Moderate
Misreported/unreported catch by licensed national vessels	Likely	Major	High
Use of prohibited and destructive gears	Unlikely	Major	Moderate
Fishing inside closed areas	Moderate	Moderate	Moderate
Fishing outside of zones permitted in license	Moderate	Major	High
Unreported and unregulated transshipping	Unlikely	Minor	Minor
Harvest of sharks and other ETP species	Moderate	Moderate	Moderate

5.4.8 Impacts of IUU

Brunei's IUU risk assessment produced a generally lower level of risk than many other states covered by this study, with a relatively small EEZ, low national fleet capacity, reasonably high (albeit spatially uneven) patrol effort by enforcement bodies and a high World Bank governance score. Nonetheless, the evidence indicates that IUU activities are carried out within Bruneian waters, and several risk categories were assessed to be at a high level.

The impact of illegal fishing by foreign fleets in Brunei's EEZ has already been estimated to be significant by national sources in Brunei (see section 1.1.5), and the vessels involved are likely to target commercially valuable species, with the consequence that catches from Brunei will either be reported after landing in other countries or not reported at all. Therefore the quality of data available for stock assessment and management at both a national and regional level is undermined, in addition to the socio-economic losses incurred through the loss of taxation opportunities and reduction in availability of fish within national markets.

Moreover, the lack of robust reporting obligations in national legislation was adjudged to represent a high risk for the licensed national fleet. Even though this fleet segment appears to be small, at roughly 50 vessels (see section 1.1.2), poor catch reporting by this vessels will significantly

undermine the quality of national catch data, as demonstrated by the dominance of marine fishes *nei* in the available FAO data (see section 1.1.3) despite the fact that industrial vessels are required to submit monthly logbooks. Such absence of reported catch data prevents quantitative decision-making in Brunei's national fisheries, with the lack of species-specific information meaning that the impacts of the licensed fleet on fish stocks within the EEZ is almost impossible to discern beyond assessing the aggregated quantities of catch. Poor reporting mechanisms also increase the likelihood that ETP species, or species subject to management measures, will be landed without detection.

The risk of national vessels fishing out of the zones stated in their license was also assessed at a high risk, with Brunei employing a zonal management system based on four categories and therefore creating a situation whereby vessels may enter areas without the required permission. Such a scenario can exacerbate capacity issues within certain zones, and the licensing moratoriums imposed by Brunei in 2004 and 2008 suggest that overcapacity in the nearshore zones has become an issue during the period of this study. Moreover the encroachment of industrial vessels into nearshore areas can severely damage artisanal fishing grounds, although there was insufficient evidence of this specific zonal violation within Brunei to consider the encroachment of industrial vessels as a standalone risk, and hence this issue has been subsumed into the broader risk of zonal violations.

5.4.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

It should be noted that, as Brunei's reported catches have not disaggregated by fleet, the multiplying percentages applied correspond to the total national catch. The highest estimated risks (high) for Brunei were assigned to the risk of misreported/unreported catch by licensed national vessels, with a minimum limit of 10% and an upper limit of 25%. This is due to the lack of reporting requirements stated in Brunei's fisheries legislation, thereby creating minimal incentives for vessels to report their catch. The true value may be higher than this range, but given the species mix and small scale it was judged that the rates given would be appropriate. The poor quality of reporting in Brunei is emphasised by the highly aggregated FAO data and the dominance of marine fishes *nei* within the statistics, and moreover the scale of under-reporting is emphasised by the size of the discrepancies between the FAO data and the SAU catch reconstructions (see section 5.4.3). Overall, the evidence suggests that Brunei's unreported catches from national vessels should be considered as a significant modifier to the existing statistics.

A high upper limit was also assigned to unlicensed/unauthorised fishing by foreign industrial vessels, although this was qualified with a conservative lower limit to indicate the uncertainty surrounding the scale of foreign illegal fishing within Bruneian waters. The 5-20% modifier reflects the evidence indicating that illegal encroachment by foreign industrial vessels occurs on a significant scale within Brunei, and therefore represents a proportion of catch outside the official statistics which requires inclusion. National industrial fleets, have been allocated a low estimated rate of 0-5%, reflecting the small size of this fleet (see section 1.1.2) and the lack of evidence for IUU activities undertaken by national industrial vessels, Foreign and national artisanal fleets were assigned rate ranges of 2-8% and 0-5% respectively, reflecting the lower capacity of these fleets but also acknowledging the likelihood that some vessels within these fleet segments are at times fishing illegally.

The remaining identified risks such as use of prohibited and destructive gears, fishing inside spatio-temporal closures and the additional post-harvest/other risks would not add to the estimated level of IUU fishing, which is quantified through unlicensed fishing and misreporting/failing to report catches, and therefore estimated rate values are not assigned.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Brunei can be found in Table 31.

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Table 31 Summary of estimated rates – Brunei.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by foreign industrial vessels in EEZ	Single fleet	All	1990-2013	5	20	0	0
Unlicensed/ Unauthorised fishing by foreign artisanal vessels in EEZ	Single fleet	All	1990-2013	2	8	0	0
Unlicensed fishing by national industrial vessels in EEZ	Single fleet	All	1990-2013	0	5	0	0
Unlicensed fishing by national artisanal vessels in EEZ	Single fleet	All	1990-2013	0	5	0	0
Misreported/Unreported catch by licensed national vessels	Single fleet	All	1990-2013	0	0	10	25
Use of prohibited and destructive gears	Single fleet	All	1990-2013	0	0	0	0
Fishing inside spatio-temporal areas	Single fleet	All	1990-2013	0	0	0	0
Fishing outside of zones permitted in licence	Single fleet	All	1990-2013	0	0	0	0
Unreported and unregulated transshipping	Single fleet	All	1990-2013	0	0	0	0
Harvest of sharks and other ETP species	Single fleet	All	1990-2013	0	0	0	0

5.4.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the average illegal and unreported catches represent on average between 347 and 1243t per annum (i.e. 12 and 43%). Illegal catches contribute an estimated 2-18% and unreported catches 10-25%% in addition to the reported catch. Losses from Illegal, Unreported and Unregulated fishing in Brunei are estimated to average between USD 0.34 and 1.20 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 32 and as first landed value in Table 33. Profiles of the estimated level of illegal and unreported fishing combined in Brunei can be found in Figure 7 (catch in t) and Figure 8 (catch value in USD).

Table 32 Summary of estimated IUU by year in Brunei (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	2244	45	404	224	561	0	0
1991	1546	31	278	155	387	0	0
1992	1667	33	300	167	417	0	0
1993	1703	34	307	170	426	0	0
1994	4441	89	799	444	1110	0	0
1995	4712	94	848	471	1178	0	0
1996	5714	114	1029	571	1429	0	0
1997	4504	90	811	450	1126	0	0
1998	5014	100	903	501	1254	0	0
1999	3160	63	569	316	790	0	0
2000	2464	49	444	246	616	0	0
2001	1578	32	284	158	395	0	0
2002	2044	41	368	204	511	0	0
2003	1784	36	321	178	446	0	0
2004	1912	38	344	191	478	0	0
2005	2709	54	488	271	677	0	0
2006	2279	46	410	228	570	0	0
2007	2550	51	459	255	638	0	0
2008	2357	47	424	236	589	0	0
2009	1958	39	352	196	490	0	0
2010	2351	47	423	235	588	0	0
2011	2154	43	388	215	539	0	0
2012	4523	90	814	452	1131	0	0
2013	4000	80	720	400	1000	0	0

Table 33 Summary of the estimated value of IUU (USD) by year in Brunei (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	2.09	0.04	0.38	0.21	0.52	0.00	0.00
1991	1.45	0.03	0.26	0.15	0.36	0.00	0.00
1992	1.60	0.03	0.29	0.16	0.40	0.00	0.00
1993	1.61	0.03	0.29	0.16	0.40	0.00	0.00
1994	4.11	0.08	0.74	0.41	1.03	0.00	0.00
1995	4.30	0.09	0.77	0.43	1.07	0.00	0.00
1996	5.47	0.11	0.98	0.55	1.37	0.00	0.00
1997	4.16	0.08	0.75	0.42	1.04	0.00	0.00
1998	4.61	0.09	0.83	0.46	1.15	0.00	0.00
1999	2.93	0.06	0.53	0.29	0.73	0.00	0.00
2000	2.34	0.05	0.42	0.23	0.58	0.00	0.00
2001	1.85	0.04	0.33	0.19	0.46	0.00	0.00
2002	2.41	0.05	0.43	0.24	0.60	0.00	0.00
2003	2.00	0.04	0.36	0.20	0.50	0.00	0.00
2004	1.98	0.04	0.36	0.20	0.49	0.00	0.00
2005	2.65	0.05	0.48	0.27	0.66	0.00	0.00
2006	2.36	0.05	0.42	0.24	0.59	0.00	0.00
2007	2.59	0.05	0.47	0.26	0.65	0.00	0.00
2008	2.32	0.05	0.42	0.23	0.58	0.00	0.00
2009	1.93	0.04	0.35	0.19	0.48	0.00	0.00
2010	2.25	0.04	0.40	0.22	0.56	0.00	0.00
2011	2.06	0.04	0.37	0.21	0.52	0.00	0.00
2012	4.34	0.09	0.78	0.43	1.08	0.00	0.00
2013	3.84	0.08	0.69	0.38	0.96	0.00	0.00

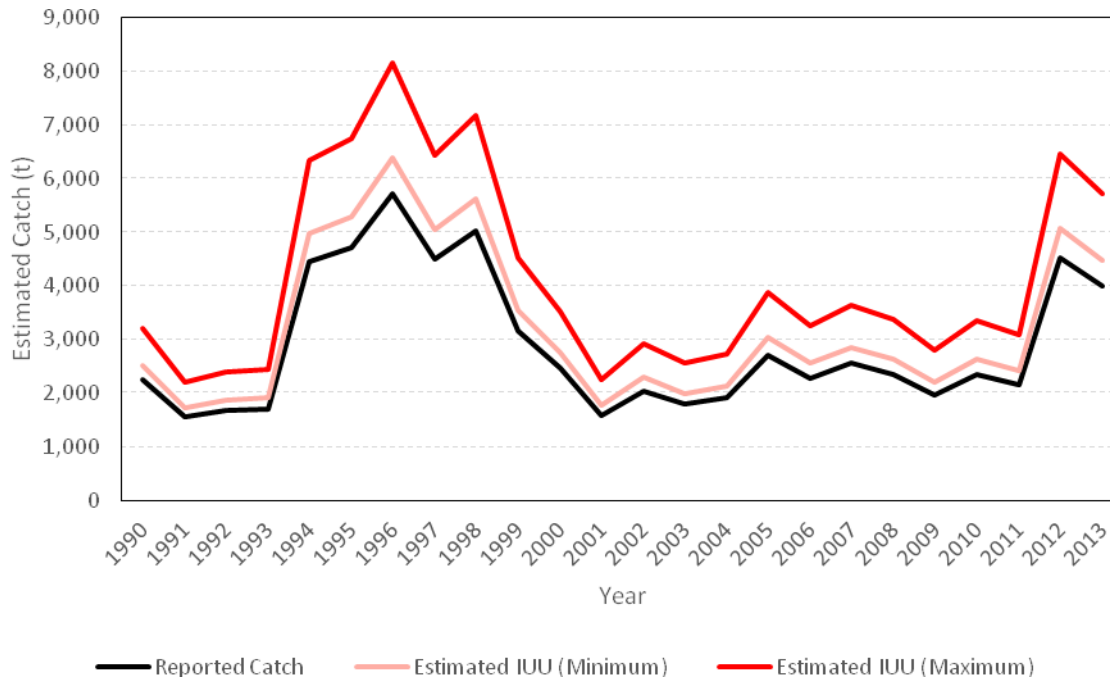


Figure 7 IUU Catch Profile (Brunei) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

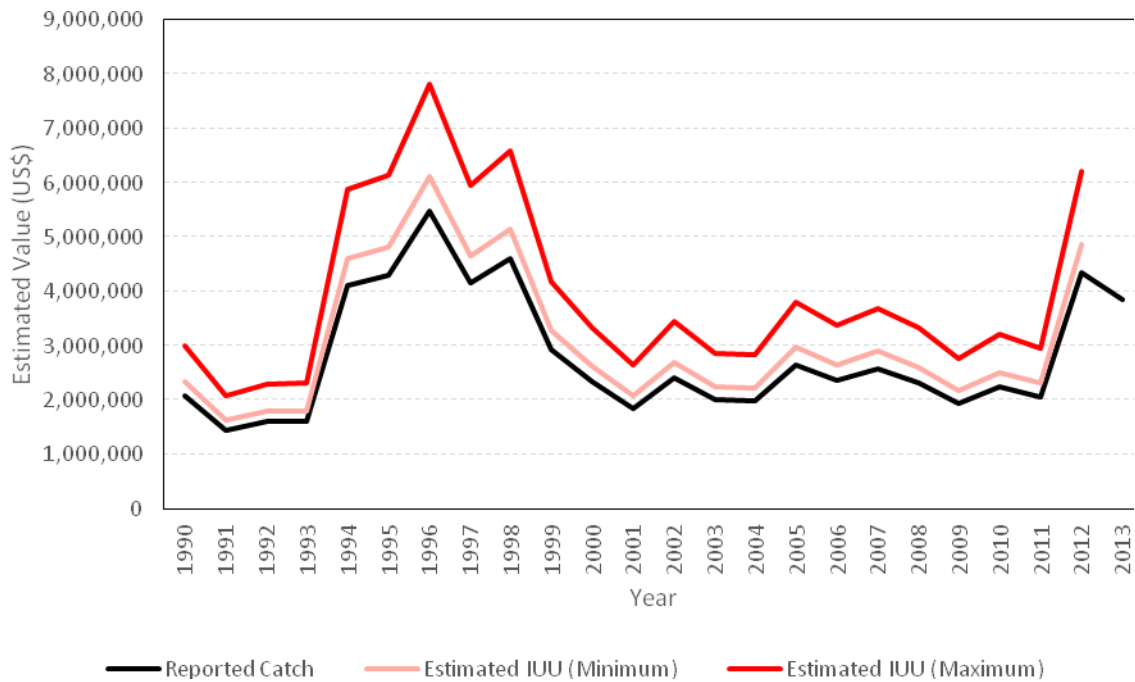


Figure 8 IUU Catch Value Profile (Brunei) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.5 Cambodia

5.5.1 Introduction

The Cambodian Exclusive Economic Zone (EEZ) covers an area of 106,900 km² with an additional area of 15,100 km² defined as territorial sea and 4,157 km² as contiguous zone. The Cambodian EEZ shares borders with Thailand to the west and Vietnam to the south east. In 2001, Cambodia and Thailand came to an agreement and signed a Memorandum of Understanding regarding the Area of their Overlapping Maritime claims to the Continental Shelf, subsequent negotiations indicated the possibility of establishing joint ventures in order to make possible the use of overlapping claimed economic areas (of approximately 20-30,000 km²) in the Gulf of Thailand (focussed on oil and gas exploration, not fisheries). A historical disputed area also exists on the southern boundary with Vietnam, over which the two neighbouring States signed an agreement in 1982 placing an area of over 8000 km² between the two countries in the Gulf of Thailand under the status of “historic internal waters”.

The marine environment of Cambodia supports a diverse range of fish and invertebrate species, of which the main species exploited commercially are mackerels (Scombridae), scads (Carangidae), anchovies (Engraulidae) and snappers (Lutjanidae), penaeid and metapenaeid shrimps, blue swimming crabs (*Portunus pelagicus*), cuttlefish, squid (Sepiolidae & Loliginidae), green mussels, oysters (Ostreidae); and blood cockles (*Anadara granosa*) (FAO, 2011). Information regarding the status of Cambodia’s marine resources is relatively limited, but it is generally regarded that they are fully exploited (FAO, 2011). It should be noted that marine fisheries production is low compared to inland fisheries production; for example, in 2013, marine fisheries capture production was reported as 111,468 tonnes (FAO, 2014), whereas inland fisheries production equalled approximately 528,000 tonnes (FAO, 2015).

Within Cambodia there are four established protected areas which have marine components. These protected areas total 2,500 km² and include Ream National Park, which contains significant coral reefs; Botum Sakor National Park (171,250 ha); Dong Peng Multiple Use Area (27,700 ha) and Peam Krasop Wildlife Sanctuary (25 897 ha) (FAO, 2011).

5.5.2 Fleet breakdown

A fleet breakdown of the 2009 Cambodian fishing fleet by vessel type is presented in Table 35. The fisheries department of Cambodia classifies non-motorised vessels into three categories based on their weight: <5 tonnes, >5 tonnes, and duk-boats (duk boats are transport vessels not used for fishing and are therefore excluded here as a fishing fleet). Motorised vessels are categorised according to engine size and are classified into four main groups: <10hp, 10-30hp; 31-50hp; >50hp. It is estimated that about 25% of all motorised marine fishing vessels in Cambodia are trawlers (Gillett 2008) The fleet breakdown therefore suggests that the majority of fishing vessels are small-scale in nature with approximately 91% of vessels being non-motorized or motorised and <10hp. From this breakdown, it can also be concluded that the majority of fishing pressure will be exerted on inshore fisheries resources as most vessels will not be capable of fishing offshore.

Table 34 Number of marine fishing vessels by vessel type, 2009 (Source: FAO, 2011)

Description	No. of vessels	% of Fleet
Non-Motorised Boats		
< 5 tonnes	57 910	53.55
>5 tonnes	3 808	3.52
Motorised Boats		
<10 hp	37 338	34.53
10-30 hp	7 696	7.12
31-50 hp	792	0.73
>50 hp	601	0.56
TOTAL	108 145	100.00

For the purpose of this study a breakdown of the fishing vessels operating in Cambodian waters into distinct legal and illegal fishing fleets is presented in Table 35. These fleet classifications have been derived from available information presented in the literature.

Table 35 Fleet breakdown for Cambodia

#	Description	Gear	Flag(s)	Target species	Comment
1	Foreign Industrial	Trawl Dredge Push Net Handline	Vietnam Thailand	Shrimp Blood Clam Squid	Majority of vessels considered to be illegal. Vessels fishing under unofficial agreements
2	Foreign Small and Medium Scale	Explosives Poisons	Vietnam Cambodia	Mixed	Illegal fleet
3	Domestic Subsistence (small-scale)	Multi-gear	Cambodia	Mixed	Unreported
4	Domestic Medium Scale	Multi-gear Trawls	Cambodia	Mixed Shrimp Finfish	Includes small trawlers which fish inshore areas, fish at night, and catch shrimp and fish
5	Domestic Industrial	Trawls Purse Seines	Cambodia	Shrimp Squid Mackerel Anchovy	Includes large-scale trawlers which fish offshore and often tranship their catch

5.5.3 Catch breakdown

Marine fisheries capture production for Cambodia reported by the FAO in 2010 equalled 85,094 tonnes. Examination of the ASFIS categories reported in the FAO statistics reveals that catches are given at a highly aggregated level. For example, catches of marine species are reported under 8 species classifications/groups: Cephalopods not elsewhere included (nei), Marine molluscs nei, sea cucumbers nei, Marine crabs nei, Natanian decapods nei, Marine fishes nei, Tuna-like fishes nei, and, Argentine shortfin squid (FAO, 2015).

Catch reconstructions presented by SeaAroundUs (SAU)⁴³ and the accompanying working paper by Teh *et al.* (2014) estimates marine fisheries catches for Cambodia from 1950-2010 by accounting for unreported catches from i) small-scale fisheries; ii) marine catches sold at sea; and, iii) discards. Results indicate that marine capture production equalled 4.1 million tonnes for the 1950-2010 period, approximately 3 times the official reported catch of 1.4 million tonnes. This reconstruction does not account for foreign fishing vessels in Cambodian waters which are thought to represent significant fisheries catches.

The fleet breakdown and catch breakdown presented above unfortunately do not allow the catch to be broken down to the species or species group level by the fleets identified. Only a few species groups, i.e. cephalopods, marine molluscs, sea cucumbers are disaggregated and it is not possible to match these to the fleets to the level required. Risks have therefore unfortunately been only able to be estimated at the national level only.

5.5.4 IUU influencing factors

5.5.4.1 Fisheries legislation and management bodies

The Fisheries Administration (FiA), a department under the Ministry of Agriculture, Forestry and Fisheries (MMAF), is the authority responsible for management fisheries and fisheries resources in line with national policy. The Structure of the FiA is presented in Figure 9.

⁴³ <http://www.seaaroundus.org/>

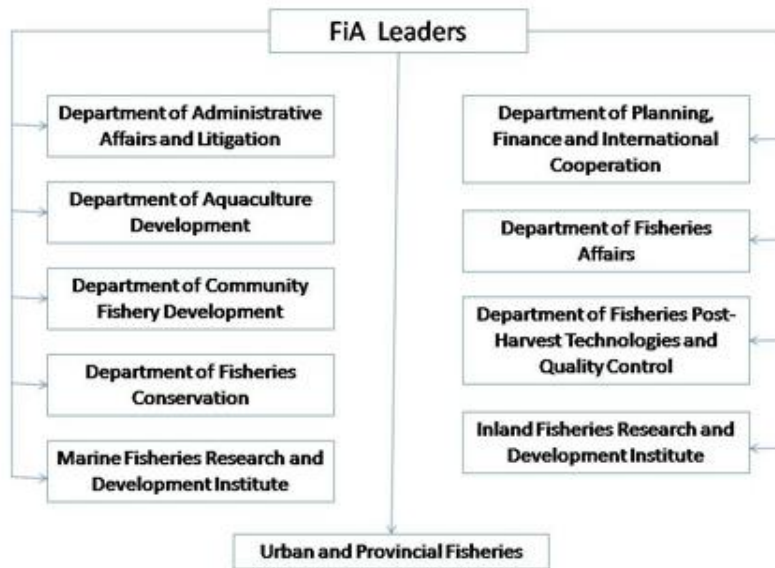


Figure 9: Organisational structure of the FiA.

Source: <http://www.fia.gov.kh/english/index.php?page=organization>.

The FiA governs Cambodia's marine fisheries in accordance with the Cambodian Fisheries Law (Preah Reach Kram NS/RKM/506/011⁴⁴) of 2006, which replaced the Fiat Law on Fisheries Management and Administration of 1987 (Fiat-Law No. 33 KRO. CHOR⁴⁵). The purpose of this Law is to ensure the management of fisheries and fishery resources, to boost development of aquaculture, and production and processing of aquaculture products. The Fishery Law charges the FiA with developing a National Fishery Management Plan which is to reflect the following principles: conservation of fishery resources; elimination of over-fishing; minimizing the degree of pollutants within the fishery domains; protection of the biodiversity and inland and marine environment; development of fish markets, processing industry and fishing ports. The fisheries management plan is therefore intended to define fisheries management priorities and activities. However, with regards to IUU, no specific national plan of action to address IUU fishing has so far been adopted by Cambodia.

To achieve the stated objective of Cambodia's Fisheries Law, the following input controls utilised by the FiA to manage and control Cambodian fisheries (FAO, 2011):

- Fishing permits for commercial fishing,
- Licences for offshore boats,
- Prohibition of illegal fishing gears, such as electro-fishing, explosives & poisons,

⁴⁴ <http://faolex.fao.org/docs/pdf/cam82001.pdf>

⁴⁵ http://faolex.fao.org/cgi-bin/faolex.exe?rec_id=000055&database=faolex&search_type=link&table=result&lang=eng&format_name=@ERALL

- Restrictions on some gear types and sizes,
- Prohibition to trawling in waters less than 20 m deep,
- Protection of mangrove areas and designated fish sanctuaries,
- Closed spawning season for mackerel from 15 January to 31st March,
- Prohibition of harvesting corals and endangered species listed in the CITES appendices.

Overall, fisheries management policies and legislation (for both inland and marine fisheries) are focused on gear restrictions through licences and prohibitions, combined with closed seasons which approximately correspond with breeding and spawning seasons.

Cambodia has also been engaged in encouraging fishing communities to manage their own waters through participatory management mechanisms. Involved communities undertake a range of activities to improve management of fisheries resources, such as patrolling and information dissemination regarding destructive fishing practices⁴⁶. Licensing and Reporting Requirements

A fisheries licensing system is one of the main tools used by the FiA to manage Cambodia's fisheries, and details of the licensing system are presented in Cambodia's Law on Fisheries (see Preah Reach Kram NS/RKM/506/011⁴⁷). The fishery law states that all fishing vessels require a licence with the exception of small-scale (subsistence) fishers; however, this is somewhat ambiguous as no precise definition of what constitutes a small-scale fisher is provided within the law itself. A review of technical reports clarifies how Cambodia's licensing system is practically applied: all vessels with an engine size of >30 hp are required to possess a licence (Teh *et al.*, 2014). This licensing framework is relatively straightforward; however this implies, as the vast majority of Cambodian vessels are non-motorised or motorised and <30 hp (see Table 34), that most vessels can be considered subsistence/small-scale fishers, are unlicensed, and their catches will be unreported. This point is somewhat corroborated by catch reconstructions calculated by Teh *et al.* (2014), who, as previously discussed, estimate that reported Cambodian catches are approximately three times lower than actual catches.

Provisions relating to reporting requirements of Cambodian fishing vessels are also provided in the Law on Fisheries. Article 34 states that all fishing activities that require a permit have to hold a logbook issued by the FiA. Fishers are further required to record their statistics at daily intervals and to have their logbooks certified on a monthly basis by the FiA. Article 95 states that fishing without a logbook or non-compliance with logbook requirements warrants a transactional fine (see 5.16.4.3).

⁴⁶ <http://www.fao.org/3/a-ar503e.pdf>

⁴⁷ <http://faolex.fao.org/docs/pdf/cam82001.pdf>

The Law on Fisheries however lacks any requirements relating to national reporting obligations to the FAO and other international and regional organisations.

5.5.4.2 Restrictions, fines and penalties

Restrictions

Cambodia's Law on Fisheries⁴⁸ provides an extensive list of fishing gears and fishing activities which are prohibited within Cambodian waters. The main articles relating to marine fisheries are 20, 21, 29, 49, 50, 52, and 69. In summary, article 20 provides list of the gears/activities prohibited, which includes, inter alia, poisons, explosives, fine-mesh nets, mechanised motor pushed nets, and blocking fish migration routes. Article 21 prohibits the production and sale of certain gears: electrocuting devices, all type of mosquito net fishing gear, mechanised motor pushed nets, and inland trawler gear intended for the use of fishing are all prohibited. Article 49 prohibits trawling in the inshore zone. Article 50 relates to the storage of gear by unlicensed vessels and prohibits unlicensed vessels from stowing trawl gear in a manner that is readily deployed. Article 52 relates to the protection of seagrass beds and corals, and prohibits activities which damage these habitats unless permission is given by the government. Furthermore, Article 69 prohibits the buying, selling and transportation of fishery products sourced from illegal fisheries.

Fines and penalties

Cambodia has different degrees of fines and penalties corresponding to different types of violations of the Law on Fisheries. Chapter 15 of the Cambodian fisheries law details the fines and penalties associated with different types of violations, and Article 89 states the general penalties to be issued for fisheries offences. The following three main categories of offences and penalties are presented in the Cambodian fisheries legislation:

1. "For fishery offense class 1: shall be imprisoned from 3 to 5 years and all evidences shall be seized for the state property.
2. For fishery offense class 2: shall be imprisoned from 1 to 3 years and shall be subject to a fine from 5,000,000 to 50,000,000 Riels (USD 1,250 to USD 12,500). All evidences shall be seized for the state property.
3. For fishery offense class 3: shall be imprisoned from 1 month to 1 year or must be subjected to a fine from 1,000,000 to 5,000,000 Riels (USD 250 to USD 1,250). All evidences can be seized for the state property."

The subsequent Articles of chapter 15 provide details regarding the penalties associated for specific offences: For example, Article 97 stipulates that offences such as not having a logbook or recording a statistics of fishery products warrants a fine ranging from 500,000 to 5,000,000 Riels (USD 125 to USD 1,250).: and, Article 101 states that buying, selling, processing, stocking and transporting fishery

⁴⁸ Preah Reach Kram NS/RKM/506/011

products from illegal fishing or from the use of illegal fishing gears is regarded as a class 3 fishery offense. For full details of the fines associated with fisheries violations in Cambodia see Preah Reach Kram NS/RKM/506/011⁴⁹.

The European Commission has, as part of its decision to ban fishery imports from Cambodia, evaluated whether fines and penalties enforced by Cambodia are of sufficient severity to deprive the offenders of the benefits accruing from IUU fishing. As described in the recital (84) of the Commission Decision of 15 November 2012⁵⁰, the commission concluded that Cambodia did not impose adequate sanctions for IUU fishing by foreign vessels and, to the greatest extent possible, nationals under their jurisdiction. The commission therefore decided that Cambodia's actions were not in line with the recommendation in point 21 of the International Plan of Action to Prevent, Deter and Eliminate IUU.

5.5.4.3 MCS protocols and capacity

There is a lack of publicly available information regarding Cambodia's MCS protocols and capacity; however, the available information suggests MCS capabilities are limited. For example, a brief review of MCS in Cambodia, published in 2009 as part of the Workshop on Monitoring Control and Surveillance in Marine Fisheries in Southeast Asia⁵¹, indicates that national MCS is constrained due to the following four factors:

1. Lack of qualified staff;
2. Budgetary limitations for equipment and materials;
3. Open access nature of fisheries and the difficulty in separating small from medium-scale fisheries in actual practice;
4. Lack of community participation and involvement in fisheries conservation, protection and management;

Cambodia's limited MCS capabilities have also been highlighted by the EC in the Commission Implementing Decision of 26 November 2013. Article 99 specifically identifies Cambodia as having a lack of an adequate administrative system for investigations and monitoring of its vessels. Furthermore, a review of Cambodia's Fishery Law highlights that the legislation lacks provisions to implement observer and vessel monitoring programmes for local and foreign vessels (Edeson *et al.*, 2010).

⁴⁹ <http://faolex.fao.org/docs/pdf/cam82001.pdf>

⁵⁰ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D1117%2802%29&from=EN>

⁵¹ <http://bobpigo.org/uploaded/pdf/MCS-Bangladesh-REP110.pdf>

5.5.4.4 Port state

Port and harbour facilities in Cambodia are considered to be limited and in most cases poorly developed, with most landing ports being small and rural. Sihanoukville, Koh Kong, Kampot and Kep City are considered to be the most important ports with regards to fisheries landings. However, fisheries capture production is not presented for individual ports within national statistics and are instead presented at the provincial level. Statistics for 2007 (presented in FAO, 2011) provide an indication of the proportion of Cambodia's fisheries catch landed in each of the provinces: Kandal (35,000 tonnes), Kompong Chhnang (17,000 tonnes), Siem Reap (12,000 tonnes) Pursat (14,000 tonnes), Kompong Thom (10,500 tonnes) and Battambang (10,000 tonnes) (FAO, 2011).

Cambodia's Law on Fisheries contains relatively few articles relating to port State measures. Articles 47 and 74 provide detail on required protocols for transshipments and the role of authorities in tackling fishery offences, respectively. Article 47 mandates that fishers shall tranship fishery products at a fishing port determined by the FiA, and requires that foreign fishing vessels must inform the FiA prior to port calls. This article therefore indirectly prohibits transshipping at sea and in ports other than those officially specified by the fishery administration. Article 74 identifies the role that various government bodies, including the port authorities, should play in relation to fishery related offences, which is to facilitate and provide forces to investigate, prevent and crackdown on such offences. Article 74 also stipulates that once a fishery offence has been detected by any of these authorities that it should be reported to the fishery administration immediately, and that suspects and evidence should be temporarily detained and sent to the FiA. Article 74 also prohibits any authorities which are acting in support of the FiA from fining offenders or seizing evidence.

Overall, the Cambodian Fisheries Law lacks measures to exercise effective port State control over fishing vessels, with the exception of the requirement for advanced notice of entry. Cambodia has not ratified or signed the FAO port State measures agreement.

Cambodia has a very poor ranking in the study region and globally according to the World Bank Governance Indicators (174th out of 212, 82nd percentile). As such, we would estimate that any risks that relate to corruption or weaknesses in the regulatory framework would be significantly increased as any weaknesses could be exploited i.e. "Obstruction or bribery of fisheries officers" and "Falsification of documents" (See Table 159).

5.5.5 Summary of IUU incidences

Illegal, Unreported and Unregulated (IUU) fishing is known to be practised both by national and foreign fleets within the Cambodian EEZ; and IUU has recently been acknowledged as a national issue in Cambodia's Strategic Planning Framework for Fisheries (2010-2019) (FiA, 2010). Evidence indicates that foreign vessels engaged in IUU fishing primarily originate from Thailand and Vietnam, and target a variety of species such as squid, shrimp and blood clams. In 2008, a total of 1,948 offences relating to illegal and destructive fishing were officially reported within Cambodia, and,

within the strategic planning framework, a target has been set to reduce the level of illegal and destructive fishing activity by 40% by 2020⁵²

Cambodian flagged vessels have also been discovered fishing illegally outside of the Cambodian Exclusive Economic Zone (EEZ), and, consequently, the European Commission has recently identified Cambodia as a non-cooperating third country pursuant to Council Regulation (EC) No 1005/2008, establishing a Community system to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing. Overall this indicates a lack of the necessary measures required to deter, prevent and eliminate IUU.

5.5.5.1 Foreign industrial

The presence of IUU fishing conducted by unlicensed/unauthorised foreign vessels in Cambodian waters is regarded as extensive and is thought to be primarily undertaken by Thai and Vietnamese vessels/fishers (Teh *et al.*, 2014; Leng, 2013; FAO, 2011). Specific incidents of IUU fishing by foreign fishers have recently been documented by various sources, such as news articles and technical reports.

The illegal incursion of Vietnamese fishers into Cambodian waters is well documented in Cambodian news articles. The nature of these articles means that details of these offences, such as the specific gears used or species targeted, is often omitted. However, evidence suggests that industrial-scale illegal fishing undertaken by Vietnamese fishers utilise a variety of different fishing techniques, including trawling⁵³ and longlines⁵⁴, and target a variety of species. Reported IUU offences involving Vietnamese nationals includes the following incidents: In 2004, 52 Vietnamese fishers were arrested for using illegal gear off the coast of Kampot⁵⁵. In 2010, Vietnamese fishing boats illegally entering Cambodian waters to catch fish along the Kampot coast was reported by local villagers⁵⁶; these illegal fishers operated at night to avoid detection and used prohibited fishing techniques. In March 2011, a crackdown on illegal Vietnamese fishing boats in Kep province was documented by the Phnom Pehn Post. During this incident FiA officials caught 40 Vietnamese fishing boats fishing illegally and using destructive gears⁵⁷. In May 2014, 13 Vietnamese fishermen were apprehended by Cambodian fishers for fishing illegally in off the coast of the Kampot province⁵⁸.

⁵² [of the baseline recorded in 2008 which is 1,948 offences](#)

⁵³ <https://www.cambodiadaily.com/news/police-arrest-dozens-of-vietnamese-fishermen-88885/>

⁵⁴ <https://www.cambodiadaily.com/squidinc/>

⁵⁵ <https://www.cambodiadaily.com/archives/52-illegal-vietnamese-fishermen-arrested-off-kampot-37601/>

⁵⁶ <http://khmerization.blogspot.co.uk/2010/08/vietnamese-fishing-boats-illegally.html>

⁵⁷ <http://www.phnompenhpost.com/national/kep-officials-crack-down-vietnamese-boats>

⁵⁸ <https://www.cambodiadaily.com/archives/illegal-vietnamese-fishermen-caught-in-nighttime-operation-58171/>

Recently, in May 2015, Vietnamese fishers have been implicated in operating a vast and illegal squid fishery in the waters surrounding Koh Tang and Koh Rong Sanloem⁵⁴. Here, dozens of unflagged fishing boats deploy hundreds of Vietnamese anglers into small fishing baskets on a daily basis. These fishers use longlines and catch up to 10 kg of squid per day. This illegal fishing operation is considered to operate with impunity as, according to the fishers, an unofficial agreement has been made between the fishers and the Cambodian Navy.

The illegal incursion of Thai fishing fleets into Cambodian waters is acknowledged to occur by several sources (such as, Teh *et al.*, 2014; Grafton *et al.*, 2009); however, accounts of specific incidents of IUU involving Thai vessels are less prevalent than those for Vietnamese vessels. Thai vessels are thought to fish heavily in the offshore area, where the majority of the Cambodian fleet cannot exploit the resources due to limited capacity (Teh *et al.*, 2014).

Despite many of the previously discussed IUU incidents being outside of the focal study period (1990-2013), it is believed that they provide clear examples of the sources of illegal fishing for the period of the study.

5.5.5.2 Small and medium-scale foreign fleets

Small-scale vessels operated by Vietnamese fishers and utilising a variety of prohibited and destructive gears has also been reported in Cambodia. Krell *et al.* (2011) provides an account of illegal fishing operations conducted by small-scale fleets around the islands of Koh Rong Samloem and Koh Kon: Destructive fishing practices and gears used by Vietnamese fishers include air supplied fishing for harvesting of abalone, corals, giant clams and Murex (Muricidae), dynamite fishing and cyanide fishing.

5.5.5.3 Domestic industrial and medium-scale fleets

Cambodia's domestic fishing fleet engage in a variety of IUU fishing activities, including transshipping at sea, using prohibited trawl gear in inshore areas, and fishing using destructive gears.

The illegal transshipment of catches to foreign vessels at sea is considered to be a regular occurrence in Cambodian waters, which contravenes Article 47 of the Cambodian Law on Fisheries, specifying that fishery products must be transhipped at a fishing port determined by the fisheries administration. The FAO country profile acknowledges that a significant amount of the nation's marine catch is transhipped (FAO, 2011), however reports of specific IUU incidents involving transshipments from domestic vessels to foreign vessels are rare.

The incursion of trawlers into the prohibited inshore zone is regarded as one of the main IUU activities occurring in Cambodia undertaken by the domestic fleet. Trawling is currently banned in the inshore zone in order to reduce conflict between trawlers and small-scale fishers. However, this activity persists and incidents have been well documented by a number of sources. For example, a case study by Chu *et al.* (1999), which describes the fishing practices of eight villages around Kompong Som Bay, documents that all trawling activity in the area takes place within the inshore zone, and is therefore illegal. Moreover, the catches of these trawlers is reported to consist of shrimp, squid, crabs and fish, much of which is trash fish (made into fertiliser), constituting up to 50 to 60 percent of the catch. The incursion of trawlers into the inshore zone is also documented by Weinberger and Chou (2003), which additionally and worryingly indicates that 22 fishers have been

killed by trawler crews between 1989 and 2002. Conflicts between these groups are also documented by Sour (2005), which indicates that trawlers have frequently destroyed the fishing nets of small-scale fishers in the inshore zone; and Doma (2011) which reports that violent confrontations occur between trawl fishers and traditional fishers.

The widespread use of illegal and destructive fishing gear in Cambodia is acknowledged in the literature, and the FAO country profile states there has been significant habitat degradation caused by destructive fishing (FAO, 2011). Accounts of specific incidents involving destructive gear use by domestic fishers are, however, relatively uncommon in the publicly available literature. Sources indicate the general use of several destructive gear types throughout Cambodia, including push nets (UNEP, 2008), dynamite and cyanide (FAO, 2011).

5.5.5.4 Cambodian flagged vessels fishing illegally outside of the Cambodian EEZ.

As part of the EC's identification of Cambodia as a non-cooperating third party pursuant to Council Regulation (EC) No 1005/2008, the EC gathered evidence and documented incidences of Cambodian flagged vessels fishing illegally outside of the Cambodian EEZ. This includes the fishing vessels Draco-1 and Xiong Nu Baru 33 which were both sighted fishing illegally in the CCAMLR area in January 2010 and in April 2010⁵⁹; and the vessels Trosky and Yangzi Hua 44 which were both sighted fishing illegally in the CCAMLR area in April 2010.

Cambodian flagged vessels have also been identified as culpable for recurrent infringements of ICCAT conservation and management measures. The infringements relate to a Cambodian flagged carrier vessel which received transshipments at sea from purse-seiners. As ICCAT: Recommendation 06-11 stipulates that purse seiners are not permitted to tranship tuna species at sea within the ICCAT area. Furthermore, the Cambodian vessel was not officially registered with the ICCAT Registry and therefore not entitled to operate within the ICCAT area. As no action was taken on this matter by the Cambodian authorities, the EU found that the performance of Cambodia was in contravention of the requirements of Article 94(1) and (2) UNCLOS, which specifies that each State shall exercise jurisdiction and control over ships flying its flag.

Furthermore, incidents of Cambodian flagged vessels fishing illegally within the EEZ of other countries, such as Thailand, Brunei and Angola, has been reported in a series of news articles: in August 2000, the Cambodian flagged vessel Benny 87 was caught transshipping bigeye tuna off the coast of Angola in violation ICCAT regulations⁶⁰. In July 2014, seven Cambodian nationals were trialled for illegal fishing in Brunei⁶¹. In July 2015, three Cambodian nationals were arrested for fishing illegally off the coast of Chonburi, Thailand; the fishers were, *inter alia*, charged with, (1) not

⁵⁹ as mentioned in the recital (75) of the Commission Decision of 15 November 2012

⁶⁰ <http://www.phnompenhpost.com/national/cambodian-flag-flies-boats-fishing-illegally>

⁶¹ <http://www.bruneitimes.com.bn/news-national/2014/07/13/cambodians-thais-face-illegal-fishing-charge>

being able to show the boat's registration papers when asked and (2) not having a logbook to report daily catches⁶².

5.5.6 IUU risk identification

5.5.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone

There is an overall significant risk of unlicensed and unauthorised fishing within the Cambodian EEZ from foreign fishing fleets. As previously discussed (5.5.5.1), it is stated in the literature that substantial amounts of illegal fishing by unauthorised vessels from Thailand and Vietnam is believed to occur (Teh *et al.*, 2014; Leng, 2013; FAO, 2011). These vessels target a variety of species, such as shrimp (Gillet, 2008) squid⁶³ and blood clams⁶⁴, and further evidence corroborates that illegal fishing by these nations is common place. For example, news articles have documented cases where illegal Thai or Vietnamese fishers have been caught fishing illegally in Cambodian waters (see section 5.5.6.1). The prevalence of these vessels in Cambodian waters has previously been attributed to poor enforcement (Teh *et al.*, 2014); however, it has been acknowledged that these unlicensed vessels enter into unofficial agreements with those responsible for fisheries MCS, allowing them fish illegally with impunity. For example, Butcher (1999) suggests that Thai trawlers had long fished in Cambodian waters under unofficial agreements; local news articles have stated the existence of unofficial agreements between Vietnamese fishers and the Cambodian Navy (charged with fisheries control)⁶⁵; and, furthermore, a recent speech (07/09/2015) given by the Interior Minister of Cambodia appeals to local authorities not to accept bribes from illegal fishers from Vietnam and Thailand⁶⁵, thus acknowledging the practice.

5.5.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

There is a significant risk of non-compliance with reporting obligations by licensed/authorised Cambodian flagged fishing vessels within Cambodian waters and outside of the nation's EEZ. The Cambodian Law on Fisheries (Article 34) stipulates that all fishing activities which require a permit (licence) are required to maintain a fisheries logbook and submit logbooks to the FiA. However, previous studies indicate that Cambodia lacks a structured, systematic data collection system (Gillet, 2004; FAO 2007). This is partially evidenced in the national statistics submitted to FAO which lack resolution to the species level (see section 5.5.3).

⁶² <http://www.bangkokpost.com/news/general/631072/illegal-fishing-boat-caught-by-navy-off-chon-buri>

⁶³ <https://www.cambodiadaily.com/squidinc/>

⁶⁴ <http://www.rfa.org/english/news/cambodia/ngos-provincial-officials-applaud-interior-ministers-warning-against-illegal-fishing-09092015153353.html>

⁶⁵ <http://www.rfa.org/english/news/cambodia/ngos-provincial-officials-applaud-interior-ministers-warning-against-illegal-fishing-09092015153353.html>

Furthermore, catch trends presented by the FAO for some years are apparently based on expert opinion or traditional knowledge rather than collected data (FAO, 2010). Overall, this situation may suggest that fishers do not comply with reporting obligations due to the absence of an adequate data reporting framework.

5.5.6.3 Non-compliance with other licence conditions by licensed/authorised vessels

Non-compliance with other licence conditions, such as violation of spatial restrictions, have been common within Cambodian waters and can thus be considered a significant risk. The main violation commonly discussed in the literature is trawling by domestic fleets within Cambodia's restricted inshore zone.

As previously discussed, trawling was originally banned in the inshore zone in order to reduce conflict between trawlers and small-scale fishers. However, this ban has been largely ineffectual and trawling has continued illegally within inshore areas. This situation is sustained by the following factors: The majority of trawlers in Cambodia are small and therefore unsuitable for fishing in offshore areas; the Department of Fisheries have been reluctant to enforce the trawling ban due to the perceived financial difficulties incurred on the operators of trawlers (Gillett, 2004); and, trawlers operating in the inshore region were under the protection of high-ranking officials (Gillett, 2008).

5.5.6.4 Other offences

5.5.6.5 Discards

Discarding of fish in Cambodia is considered low as there is a market demand for most fish species: low value fish are utilised as crab bait (Gillett 2008), or converted to fertilizer and fishmeal.

5.5.6.6 Post-harvest IUU

It is acknowledged that post-harvest IUU occurs in Cambodian waters as a significant amount of marine catch is illegally transhipped at sea (FAO, 2011). This is in contravention of Article 47 of the fishery law specifying that fishery products are required to be transhipped at a fishing port determined by the fisheries administration.

Table 36 shows the IUU risks that have been identified as possible risks for Cambodia

Table 36 Specific risks identified for Cambodia.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed/unauthorised fishing by Industrial boats from other regional States (Thailand, Vietnam).	1
	Unlicensed fishing in EEZs by small and medium-scale fleets from other regional States employing destructive gears (Vietnam).	2
Non-compliance with reporting obligations by licensed/authorised vessels	Failure to submit and keep logbooks due to lax monitoring framework (all licenced fleets)	4,5
	Unreported fishing of the small-scale fleet	3
Non-compliance with other licence conditions by licensed/authorised vessels	Violation of inshore spatial restrictions by industrial and medium-scale domestic trawlers	4,5
	Use of illegal/destructive fishing techniques/gears (dynamite, cyanide) by domestic fleet	3,4
Post-harvest IUU	Illegal transhipping	4,5
Other offences	Catching, buying or selling protected species	All
	Unofficial fishing agreements between illegal foreign fishers and Cambodian authorities (Bribery)	1,2

NB: Although risks have been identified for each fleet all risks have been identified at the national level for estimation of IUU in Cambodia.

5.5.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 37), impact (Table 38) and level of inherent risk (Table 39) for Cambodia based on the risks identified in Table 36.

Table 37 Assessment of risk likelihood – Cambodia.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZs by Industrial boats from other regional States (Thailand, Vietnam).	Very High	Very Weak	Almost Certain
Unlicensed fishing in EEZs by small and medium-scale fleets from other regional States employing destructive gears (Vietnam).	High	Weak	Likely
Failure to submit and keep logbooks due to lax monitoring framework (all fleets)	High	Weak	Likely
Violation of inshore spatial restrictions by industrial and medium-scale domestic trawlers	Very High	Very Weak	Almost Certain
Use of illegal/destructive fishing techniques/gears (dynamite, cyanide) by domestic fleet	High	Weak	Likely
Illegal transshipping	High	Weak	Likely
Catching, buying or selling protected species	High	Weak	Likely
Unofficial fishing agreements between illegal foreign fishers and Cambodian authorities (Bribery)	Very High	Very Weak	Almost Certain
Unreported fishing of the small-scale fleet	Very High	Very Weak	Almost Certain

Table 38 Assessment of risk impact – Cambodia.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZs by Industrial boats from other regional States (Thailand, Vietnam).	High	Vulnerable	Major
Unlicensed fishing in EEZs by small and medium-scale fleets from other regional States employing destructive gears (Vietnam).	Moderate	Highly Vulnerable	Major

Failure to submit and keep logbooks due to lax monitoring framework (all fleets)	Low	Moderate	Minor
Violation of inshore spatial restrictions by industrial and medium-scale domestic trawlers	Very High	Highly Vulnerable	Serious
Use of illegal/destructive fishing techniques/gears (dynamite, cyanide) by domestic fleet	Moderate	Highly Vulnerable	Major
Illegal transshipping	Low	Moderate	Minor
Catching, buying or selling protected species	Moderate	Highly Vulnerable	Major
Unofficial fishing agreements between illegal foreign fishers and Cambodian authorities (Bribery)	High	Vulnerable	Major
Unreported fishing of the small-scale fleet	High	Moderate	Major

Table 39 Assessment of inherent risk – Cambodia.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing in EEZs by Industrial boats from other regional States (Thailand, Vietnam).	Almost Certain	Major	Severe
Unlicensed fishing in EEZs by small and medium-scale fleets from other regional States employing destructive gears (Vietnam).	Likely	Major	High
Failure to submit and keep logbooks due to lax monitoring framework (all fleets)	Likely	Minor	Moderate
Violation of inshore spatial restrictions by industrial and medium-scale domestic trawlers	Almost Certain	Serious	Severe
Use of illegal/destructive fishing techniques/gears (dynamite, cyanide) by domestic fleet	Likely	Major	High
Illegal transshipping	Likely	Minor	High

Catching, buying or selling protected species	Likely	Major	High
Unofficial fishing agreements between illegal foreign fishers and Cambodian authorities (Bribery)	Almost Certain	Major	Severe
Unreported fishing of the small-scale fleet	Almost Certain	Major	Severe

5.5.8 Impacts of IUU

Unlicensed fishing in Cambodia’s EEZs by industrial boats from other regional States (Thailand, Vietnam), and unlicensed fishing in EEZs by small and medium-scale fleets from other regional States employing destructive gears (Vietnam) are identified as severe and high risks, respectively. There are clear impacts of these risks; for example, the management of stocks will likely be negatively affected due to the consequential unknowns relating to harvest rates and stock status. There will also be direct losses to the Cambodian economy through the loss of licensing revenues from national and foreign boats, and indirect losses associated with the depletion of commercially exploited stocks. Illegal fish caught by foreign vessels are unlikely to be landed in Cambodia and it is more likely they will be landed in ports in Vietnam and Thailand. This will result in a loss of national revenue in the form of potential taxation and other potential benefits to local industry. Furthermore, the utilisation of the destructive gears by foreign fleets and by domestic fleet may have significant negative impacts on the marine environment, such as damage to inshore resources, habitats, breeding grounds and nursery grounds. In turn this may result in reduced fisheries productivity and also increased conflict between fishers using destructive gear.

Failure to submit and keep logbooks due to lax monitoring framework is identified as a moderate risk and is a characteristic of all fleets examined here. This will have similar impacts as previously mentioned in terms of unknown harvests and stocks. Again there is the potential loss of national revenue from potential taxation on landings.

Violation of inshore spatial restrictions by industrial and medium-scale domestic trawlers has been reported and identified as a severe risk for Cambodia. The most serious impact of this IUU fishing activity has been documented by several sources and relates to increasing conflict between trawl vessels and artisanal fisheries. Conflict between these two groups has reportedly resulted in the death of fishers.

The use of prohibited gears such as dynamite and cyanide has been identified as high risk and this activity has distinct and severe negative impacts on the marine environment and fisheries production. The illegal gears utilised in Cambodia (dynamite and cyanide) are considered highly destructive. The degree of impact on the marine environment will depend on the extent of these activities.

Illegal transshipping is thought to occur extensively within Cambodian waters and is associated with a high level of risk. It is likely that illegal transshipping will mostly impact high value species. Although

this practice adds no more catch to the amount taken illegally, it will have negative impacts in terms of loss of revenue from processing and secondary industry to Cambodia.

5.5.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

Unlicensed fishing in Cambodia's EEZ by boats from other regional States, particularly Thailand and Vietnam, is widely acknowledged to occur in Cambodia's waters. Illegal fishing by these nations within Cambodia is frequently reported in the grey literature and, furthermore, it is commonly stated that these illegal fishers operate with impunity having entered into unofficial agreements with the Cambodian authorities. Given the high frequency of this offence coupled with the weak deterrents and the low volume of officially reported catch in Cambodia, it is estimated that an additional 10-50% over the total reported catch is potentially taken by these fleets.

The fleet breakdown for Cambodia suggests that the majority of fishing vessels are small-scale in nature with approximately 91% of vessels being non-motorized or motorised and <10hp. Thus, according to fisheries legislation the majority of fishing vessels have been exempt from reporting requirements. Moreover, sources imply that the artisanal catches are largely excluded from official catch statistics (Teh *et al.*, 2014). Considering these factors it is estimated that an additional 20-200% over the total reported catch is potentially taken by Cambodia's small-scale fishers.

The failure to submit and keep logbooks by the domestic industrial fleet will also contribute to the unreported catch in Cambodia. However, due to the small number of vessels in comparison to the artisanal sector it is considered that the impact this will have in terms of unreported catch will be, overall, relatively minor. Considering this, it is estimated that that an additional 1-5% over the total reported catch is potentially unreported by Cambodia's industrial fleet.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Cambodian EEZ can be found in Table 40.

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Table 40 Summary of estimated rates – Cambodia.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZs by Industrial boats from other regional States (Thailand, Vietnam).	National level (Foreign fleets)	All target	1990-2013	10	50	0	0
Unreported fishing of the small-scale fleet	National level (Small scale only)	All target	1990-2013	0	0	20	200
Failure to submit and keep logbooks due to lax monitoring framework (all fleets)	National level (industrial only)	All target	1990-2013	0	0	1	5
Violation of inshore spatial restrictions by industrial and medium-scale domestic trawlers	National level	All target	1990-2013	0	0	0	0
Use of illegal/destructive fishing techniques/gears (dynamite, cyanide) by domestic fleet	National level	All target	1990-2013	0	0	0	0
Unlicensed fishing in EEZs by small and medium-scale fleets from other regional States employing destructive gears (Vietnam).	National level	All target	1990-2013	0	0	0	0
Illegal transshipping	National level	All target	1990-2013	0	0	0	0
Catching, buying or selling protected species	National level	All target	1990-2013	0	0	0	0
Unofficial fishing agreements between illegal foreign fishers and Cambodian authorities (Bribery)	National level	All target	1990-2013	0	0	0	0

5.5.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 39,058 and 222,797t per annum (i.e. 71 and 405%). Illegal catches contribute an estimated 50-200% and unreported catches 21-205% in addition to the reported catch. Losses from Illegal, Unreported and Unregulated fishing in the Cambodia EEZ are estimated to average between USD 44.24 and 252.35 million each year. These estimates are the highest in the region in percentage terms, this is due to an inherent high level of risk of both illegal and unreported fishing but also a lack of firm quantitative data to restrict the upper limits of the estimates and therefore very high upper limits of greater than 200% of the reported catches have been put in place.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 41 and as first landed value in Table 42. Profiles of the estimated level of illegal and unreported fishing combined in Cambodia can be found in Figure 10 (catch in t) and Figure 10Figure 11(catch value in USD).

Table 41 Summary of estimated IUU by year in Cambodia (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	39927	19964	79854	8385	81850	0	0
1991	36454	18227	72908	7655	74731	0	0
1992	33778	16889	67556	7093	69245	0	0
1993	33169	16585	66338	6965	67996	0	0
1994	30054	15027	60108	6311	61611	0	0
1995	30500	15250	61000	6405	62525	0	0
1996	31200	15600	62400	6552	63960	0	0
1997	29800	14900	59600	6258	61090	0	0
1998	32200	16100	64400	6762	66010	0	0
1999	38100	19050	76200	8001	78105	0	0
2000	36000	18000	72000	7560	73800	0	0
2001	42000	21000	84000	8820	86100	0	0
2002	45850	22925	91700	9629	93993	0	0
2003	54750	27375	109500	11498	112238	0	0
2004	55800	27900	111600	11718	114390	0	0
2005	60000	30000	120000	12600	123000	0	0
2006	60500	30250	121000	12705	124025	0	0
2007	63500	31750	127000	13335	130175	0	0
2008	66000	33000	132000	13860	135300	0	0
2009	75000	37500	150000	15750	153750	0	0
2010	85000	42500	170000	17850	174250	0	0
2011	114695	57348	229390	24086	235125	0	0
2012	116000	58000	232000	24360	237800	0	0
2013	110000	55000	220000	23100	225500	0	0

Table 42 Summary of the estimated value of IUU (USD) by year in Cambodia (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	41.61	20.81	83.22	8.74	85.30	0.00	0.00
1991	38.92	19.46	77.84	8.17	79.78	0.00	0.00
1992	36.21	18.11	72.42	7.60	74.23	0.00	0.00
1993	33.99	17.00	67.99	7.14	69.69	0.00	0.00
1994	31.01	15.50	62.02	6.51	63.57	0.00	0.00
1995	31.63	15.82	63.26	6.64	64.84	0.00	0.00
1996	32.37	16.19	64.74	6.80	66.36	0.00	0.00
1997	30.91	15.46	61.82	6.49	63.37	0.00	0.00
1998	33.40	16.70	66.80	7.01	68.47	0.00	0.00
1999	39.52	19.76	79.03	8.30	81.01	0.00	0.00
2000	37.23	18.62	74.47	7.82	76.33	0.00	0.00
2001	50.01	25.01	100.02	10.50	102.52	0.00	0.00
2002	54.58	27.29	109.15	11.46	111.88	0.00	0.00
2003	65.01	32.50	130.01	13.65	133.26	0.00	0.00
2004	66.25	33.12	132.49	13.91	135.81	0.00	0.00
2005	71.05	35.53	142.10	14.92	145.65	0.00	0.00
2006	71.50	35.75	143.00	15.02	146.58	0.00	0.00
2007	74.31	37.16	148.62	15.61	152.34	0.00	0.00
2008	76.42	38.21	152.85	16.05	156.67	0.00	0.00
2009	88.08	44.04	176.16	18.50	180.57	0.00	0.00
2010	99.76	49.88	199.51	20.95	204.50	0.00	0.00
2011	131.80	65.90	263.60	27.68	270.19	0.00	0.00
2012	133.32	66.66	266.64	28.00	273.30	0.00	0.00
2013	126.50	63.25	253.00	26.57	259.33	0.00	0.00

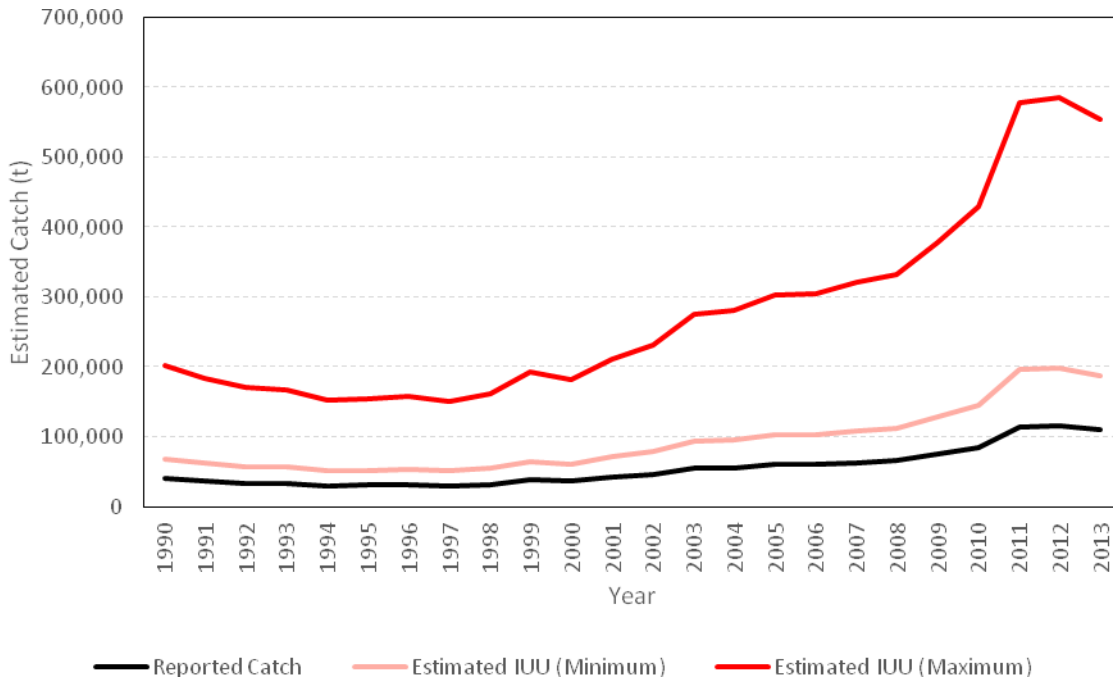


Figure 10 IUU Catch Profile (Cambodia) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

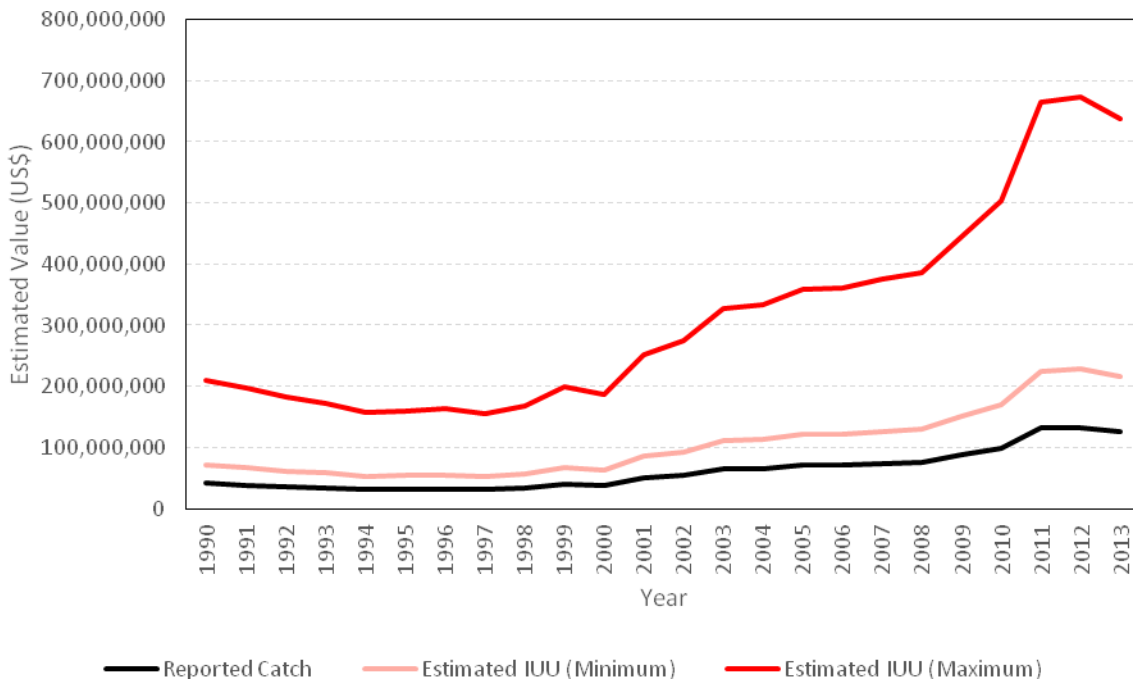


Figure 11 IUU Catch Value Profile (Cambodia) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.6 East Timor

5.6.1 Introduction

The nation of East Timor occupies half of the island of Timor, with the western portion part of Indonesia, from whom East Timor gained its independence in 2002. The East Timor EEZ covers an area of 52,060 km² with an additional area of 13,254 km² defined as territorial sea and 6,362 km² as contiguous zone. The East Timor EEZ is surrounded to the north, east and west by Indonesia and has a border to the south with Australia, with ongoing disputes surrounding the definition of maritime boundaries between East Timor and the bordering states (NPOA-IUU, 2013). The first No Take Zones (NTZs) within the country's EEZ were established in 2013, with seven zones covering 207km² created within larger multiple use marine areas⁶⁶. The National Directorate for Fisheries and Aquaculture (NDFA) holds responsibility for the fisheries sector in East Timor.

5.6.2 Fleet breakdown

East Timor's national fishery is highly decentralised, dominated by small-scale artisanal fleets which fish either for subsistence or localised supply chains. An FAO report in 2013 recorded 4723 registered fishers operating 3016 boats, 62.4% of which are small non-motorised wooden boats (Alonso *et al.*, 2013). In addition a group of boats are currently classed as 'semi-industrial', but as an interim administrative measure (as of 2013) these vessels were registered as artisanal. Currently the national industrial fleet is comprised of only two longline vessels, which are based in the east of the country and are licensed to operate within a specified area of 18,000km². An illegal fleet of international industrial vessels is also known to operate within the East Timor EEZ. Moreover illegal artisanal fishers may encroach into the EEZ from Indonesia, an issue which is exacerbated by poorly defined and disputed boundaries between the waters of the two countries.

Table 43 Fleet breakdown for the East Timor Fishery.

Number	Description	Gear	Flag(s)	Target species	Comment
1	Two licensed industrial longliners	Longline	East Timor	Various tuna and tuna-like species, billfish, sharks.	
2	Foreign industrial boats	Mixed	Indonesia and other flags	Various species	Illegally fish in East Timor EEZ

⁶⁶ Conservation International, (2015) 'Timor-Leste gives fisheries a boost with first No Take Zones'.

3	Subsistence/local sale artisanal fleets	Mixed gears including gillnets, traps and diver-based methods	East Timor	Various reef fish and shellfish species, in addition to some small pelagics and tuna.	3000 registered artisanal boats, but subsistence fishers do not require licenses
4	Subsistence/local sale artisanal fleets	Mixed gears	Indonesia	Various reef species	Illegally encroach from neighbouring Indonesian waters
5	Semi-industrial boats	Mixed gears	East Timor	Various species	Registered as artisanal but technically should be considered as semi-industrial

5.6.3 Catch breakdown by fleet

Application of the FAO data on East Timor's fisheries catch is severely hampered by data quality. No data is available from before 1999, with total reported catches from 1999-2010 totalling 41, 657 tonnes. The data available is extremely aggregated, with "Marine fishes *nei*" accounting for 97.5% of the recorded catch at 40,615 tonnes, with all other catch categories accounting for less than 1% of reported catch each. Yellowfin tuna (*Thunnus albacares*) is the only species identified in the catch data, with a recorded total volume of 34 tonnes. For the purpose of this study, only the years 2002 - 2013 i.e. post-independence will be included. Fisheries data prior to this will be included in the pre-independence statistics for Indonesia.

The SAU catch reconstructions total 188,942 tonnes between 1990 and 2010, however the reconstruction for 2002-2010 totals 48,752 tonnes, representing an increase of c.8,000 tonnes from the FAO data. East Timor's reconstructions for 2002-2010 show a dominance of sea catfishes *nei* (Ariidae) at 27% of the total, followed by mullets *nei* (Mugilidae) at 10.48% and mackerels *nei* (Scombridae) at 10.1%.

Although individual fleets have been able to be identified for East Timor, it has not been possible to effectively breakdown the national catch level into these disaggregated fleets due to the high level of catch aggregation. A single fleet model for risks has therefore been used for the calculation of level of risk and these risks have been applied to the national catch as reported.

5.6.4 IUU influencing factors

5.6.4.1 Legislation and governance

Fisheries in East Timor are governed primarily under the Fisheries Law of 2004, in addition to certain supplementary legislation, with institutional responsibility conferred on the Ministry of Agriculture and Fisheries (MAF).

East Timor is not a member of any regional RFMOs, although the country signed the UNCLOS convention in 2013. The country is a member of the RPOA IUU, and produced a NPOA for IUU fishing in 2013. It should be noted that although technically an Indian Ocean State for the management of its fisheries resources and tuna in particular it is more closely aligned with Pacific Ocean States and has been involved in EU funded exercises including training with like-minded States through the Forum Fisheries Agency.

East Timor has some of the lowest scores for Control of Corruption, Government Effectiveness, Regulatory Quality and Rule of Law according to the World Bank Governance Indicators (188th out of 212 – 89th percentile). As such any risks relating to these indicators i.e. direct corruption or a weak regulatory framework would be increased greatly, i.e. obstruction of bribery of fisheries officers and falsification of documents. (See Table 159).

5.6.4.2 Licensing and reporting requirements

The fisheries law makes clear provisions for the licensing of foreign vessels, which are not permitted to fish closer than 6 nm from the coastline. The FAO noted in 2009 that bilateral fishing agreements between East Timor and other nations had either been cancelled or expired. Moreover the NPOA-IUU notes that the ease of undertaking of IUU fishing in East Timor has reduced the incentives driving development of legal, licensed industrial fleets (NPOA-IUU Timor-Leste, 2013).

The Fisheries Decree Law, which provides the foundation for national fisheries management, contains detailed information on the provision of permits, with artisanal, semi-industrial and industrial fishing all subject to 'Commercial Fishing Permits'⁶⁷. National fishing vessels are subject to delineated fishing zones starting from 200 nm, 3 nm and 12 nm from the shore for small-scale, artisanal and industrial fleets respectively, with separate permits issues for East Timor-flagged vessels to fish on the high seas.

The Department of General Fisheries Inspection (DIGP) deploys fisheries inspectors to carry out coastal checks on artisanal licences. However, the small number of inspectors again limits the capacity of this initiative, given the large size of the artisanal fleet. The Fisheries Law stipulates that all fishing permit holders must record catch and fishing areas, in addition to keeping a logbook (Article 27), but the country lacks a standardised reporting mechanism, and low literacy levels

⁶⁷ Fisheries Decree Law of East Timor, 2004.

among artisanal/semi-industrial fishers hamper efforts to implement catch monitoring systems. Recent developments in governance of East Timor's coastal fisheries include a vessel licensing system and census which is maintained by the DIGP and a community based MCS reporting system for IUU (Alonso *et al.*, 2013).

It should be noted that subsistence fishers are exempted from permit requirements (Article 10) and therefore a substantial proportion of East Timor's fleet can be classified as unlicensed, though not illegal under national law. East Timor maintains two licensed longliners under its national flag, in addition to the large licensed artisanal fleet of c. 3000 boats.

5.6.4.3 Restrictions, fines and penalties

East Timor's legislation also specifically prohibits the possession or use of explosive or toxic fishing gear, in addition to electric fishing gear (Article 83). The law also includes mesh size restrictions alongside a ban on double purse seine trawling and driftnets (Article 87). Moreover all fishing on coral reefs is prohibited (Article 91) and the harvesting and sale of coral is also specifically banned (Article 85). The primary fisheries legislation does not specifically state any fines for the stipulated violations, however some supplementary provisions are made in the 'Crimes relating to fisheries' law which was also passed in 2004, including some potentially severe levels of fines⁶⁸.

Under this additional legislation use of explosives, poisons or firearms to target fish is punishable by 1-5 years imprisonment in addition to fines ranging from USD 300-100,000 (Article 1). Moreover the document also states a penalty of 1-5 years imprisonment and USD 500-500,000 for unauthorised fishing within protected areas or fishing for protected species (Article 2). For the broader offence of illegal fishing without the required license, high penalties are proscribed, with the offender liable to a fine of USD 25,000-1.5 million in addition to 2-8 years imprisonment, although it should be noted that subsistence fishers are excluded from these penalties (Article 3). Powers of inspection and seizure of gear and vessels are also laid out within the 'Crimes relating to fisheries' law, and the text specifically states the applicability of the legislation to foreign offenders (Article 5 & 6).

5.6.4.4 MCS protocols and enforcement capacity

National capacity to enforce maritime legislation in East Timor is limited. Maritime enforcement agencies operate primarily out of the capital city of Dili, on the north coast, with minimal patrol effort on the remote southern coastline. Indeed the NPOA states that approximately half of the EEZ is beyond the range of current enforcement capacity. In 2013, national enforcement capacity was stated as eight medium sized patrol vessels and approximately twenty inflatable vessels.

It should be noted that in 2014 East Timor gained international recognition for its new community based monitoring system, where fishermen were provided with a GPS device which enabled immediate IUU alerts to be sent to fisheries inspection and enforcement staff. However the actual

⁶⁸ Crimes relating to Fishing, Law. No.12/2004.

IUU reporting response infrastructure is poor, with processes between communities, fisheries officers and enforcement agencies often inefficient.

5.6.4.5 Port state

Due to the dominance of subsistence and local supply chain-based fisheries in East Timor, the majority of landed catch does not come through designated ports, thus severely limiting the power of any national port measures. DIGP inspectors do carry out in-port inspections of the landed catch of licensed industrial vessels, however these vessels represent a small fraction of the overall national fleet. Moreover East Timor has not signed the FAO Port State Measures Agreement, and weaknesses have been highlighted in the existing national port legislation (Edeson *et al.*, 2010). None of the ports in East Timor are likely routes for the landing or transfer of IUU fish, beyond those for local markets, as there is a lack of the infrastructure necessary to facilitate this.

5.6.4.6 Market state

The seafood market in East Timor is severely under-developed, with a lack of distribution networks, supply chain infrastructure and sale opportunities, and therefore the majority of catch from the large artisanal fleet is sold within highly localised, largely unmonitored markets. Moreover fish consumption in East Timor is low in comparison to Asian and global levels, placing a further demand constraint on the seafood market. East Timor is therefore also unlikely to be a market for IUU seafood from outside Timorese waters.

5.6.5 Summary of IUU incidences

Due to insufficient information on IUU fishing activities in East Timor, it is not feasible to accurately divide known IUU incidences according to the fishing fleet breakdown detailed above. A comprehensive review of national online media yielded no reports of specific IUU fishing incidents within the East Timor EEZ. However a summary of available information from other sources is presented below, using sub categories where possible.

The NDFA estimated in 2004 that 20% (c. 1000 metric tonnes) of the total marine fish catch in East Timor was taken by IUU vessels operating within the national EEZ, with particular IUU hotspots off the country's south coast in areas such as the Sahul Banks where enforcement capacity is minimal in comparison to the north coast (Amaral, 2010). Moreover in 2013 the NPOA estimated an annual loss of c. USD 40 million to IUU fishing, additionally stating a claim by national fishermen that c. USD 300,000 of licensed gear had been lost or damaged as a result of IUU activities in the previous year.

5.6.5.1 Foreign industrial fleet

Licensed Timorese fishers have reported the presence of illegal motherships supporting large numbers of unlicensed fishing vessels, indicating the potential for at sea transshipping (transshipping outside of ports and wharves is illegal under national law) and bunkering in addition to illegal fishing by a network of foreign vessels. In addition, the NPOA records at least 20 FADs known to have been placed illegally within the EEZ. Illegal FADs negatively affect fishing activities of East Timor's two licensed longliners, which are forced to drastically reduce the length of their lines to avoid entanglement.

5.6.5.2 National and foreign artisanal fleet

A 2012 article from an Indonesian media outlet reported the repatriation of six Indonesian fishermen who were arrested for illegal fishing and illegal entry into Timorese waters off the island's northeast coast. No information on convictions, fines, gear etc. was provided⁶⁹.

However, the country's National Biodiversity Strategy and Action Plan highlights the threat of destructive fishing practices to East Timor's coral reefs by national and foreign operators, specifically in the regions of Behau, Taitolu, Com, Baucau, Cristo Rei, Jaco Island and Metinaro⁷⁰. One incident in 2012, recorded the removal of an entire population of *Trochus* spp. from a no-take zone in the Timor EEZ, with an estimated value of USD 20,000 (Funge-Smith *et al.*, 2015). Furthermore the NPOA highlights the possibility that dynamite may be supplied to Timorese fishers from Indonesia. Poison fishing is believed to occur at a minor level, although details on this activity are lacking.

IUU fishing in East Timor has also been linked to outbreaks of violence, including missiles fired at a documentary film crew from an illegal vessel, a suspected murder and harassment/intimidation of licensed fishermen by illegal operators.

5.6.6 IUU risk identification

In light of the influencing factors and IUU incidents discussed above, a set of possible IUU risks have been identified for East Timor. These risks are briefly explained and then set out below in Table 44.

5.6.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone

There is strong evidence to suggest that unlicensed/unauthorised fishing is widespread within East Timor's waters, involving both national and foreign fleets using artisanal and industrial methods. The two national industrial longliners also require consideration separately despite the small size of this fleet segment. National and foreign artisanal fleets will be risk assessed together, whilst the foreign industrial fleet segment also requires evaluation in isolation.

5.6.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Due to the lack of a robust catch reporting mechanism in East Timor, there is an evident risk of catch being misreported or unreported entirely by the national artisanal fleet and the two licensed national industrial vessels, a risk which is increased by the limited capacity of the DIGP to carry out inspections.

⁶⁹ Six Indonesian fishermen repatriated from Timor Leste - ANTARA News, 2012.

⁷⁰ The National Biodiversity Strategy and Action Plan of Timor-Leste (2011-2020). 2011.

5.6.6.3 Non-compliance with other licence conditions and/or legislation

East Timor's enforcement capacity is limited and spatially uneven, and the large artisanal fleet is poorly monitored. This presents a risk of non-compliance with license conditions and legislation such as the prohibition of certain gear types and bans on fishing in certain areas, with insufficient means to enforce compliance.

5.6.6.4 Post-harvest IUU

The reported presence of mothership vessels in the East Timor EEZ indicates the likelihood of illegal transshipping and bunkering in support of smaller IUU vessels. In addition the dependence of the artisanal fleet on decentralised local market chains rather than designated landing ports creates a further post-harvest IUU risk, as the vast majority of catch is landed and processed without monitoring or inspection.

5.6.6.5 Other offences

The lack of general monitoring and enforcement, in addition to the recognised high marine biodiversity (hitherto relatively undisturbed) in East Timor creates an evident risk of the harvest of ETP species such as sharks, turtles corals etc. across all fleet groups.

Table 44 Specific risks identified East Timor.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed fishing in EEZ by national and foreign artisanal vessels	National fleet level
	Unlicensed fishing in EEZ by foreign industrial vessels	
	Unlicensed fishing in EEZ by national industrial vessels	
Non-compliance with reporting obligations by licensed/authorised vessels	Unreported/misreported catch by licensed national artisanal vessels	
	Unreported/misreported catch by licensed national industrial vessels	
Non-compliance with other licence conditions and/or legislation	Fishing inside closed waters	
	Use of prohibited fishing gear types	
Post-harvest IUU	Illegal transshipping and bunkering	
	Landing of illegal catch outside of monitored national ports	
	Harvest of ETP species such as corals	

5.6.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 45), impact (Table 46) and level of inherent risk (Table 47) for East Timor based on the risks identified in Table 44.

Table 45 Assessment of risk likelihood – East Timor.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZ by national artisanal vessels (subject to permits under law)	High	Weak	Likely
Unlicensed fishing in EEZ by foreign industrial vessels	Very High	Very Weak	Almost certain
Unlicensed fishing in EEZ by national industrial vessels	Very Low	Moderate	Unlikely
Unreported/misreported catch by national artisanal vessels	High	Weak	Likely
Unreported/misreported catch by national industrial vessels	Low	Moderate	Unlikely
Use of prohibited fishing gear types	High	Weak	Likely
Illegal transshipping	High	Moderate	Likely
Bunkering (refuelling at sea)	High	Moderate	Likely
Landing of IUU catch outside of monitored national ports	High	Weak	Likely
Harvest of ETP species	Very High	Weak	Almost certain

Table 46 Assessment of risk impact – East Timor.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZ by commercial artisanal vessels	High	Moderate	Major
Unlicensed fishing in EEZ by foreign industrial vessels	Very high	Vulnerable	Severe

Unlicensed fishing in EEZ by national industrial vessels	Very low	Resilient	Insignificant
Unreported/misreported catch by subsistence artisanal vessels	High	Moderate	Major
Unreported/misreported catch by licensed national industrial vessels	Very low	Resilient	Insignificant
Use of prohibited fishing gear types	Moderate	Vulnerable	Major
Illegal transshipping	Very low	Vulnerable	Minor
Bunkering (refuelling at sea)	Very low	Vulnerable	Minor
Landing of illegal catch outside of monitored national ports	Very low	Resilient	Insignificant
Harvest of ETP species	High	Highly vulnerable	Severe

Table 47 Assessment of inherent risk – East Timor.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing in EEZ by national artisanal vessels	Likely	Major	High
Unlicensed fishing in EEZ by foreign industrial vessels	Almost certain	Serious	Severe
Unlicensed fishing in EEZ by national industrial vessels	Unlikely	Insignificant	Low
Unreported/misreported catch by licensed national artisanal vessels	Likely	Major	High
Unreported/misreported catch by licensed national industrial vessels	Unlikely	Insignificant	Low
Use of prohibited fishing gear types	Likely	Major	High
Illegal transshipping	Likely	Minor	Moderate
Bunkering (refuelling at sea)	Likely	Minor	Moderate
Landing of illegal catch outside of monitored national ports	Likely	Insignificant	Moderate
Harvest of ETP species	Almost certain	Serious	Severe

5.6.8 Impacts of IUU

The two highest potential risks estimated are from the unlicensed fishing inside the Timorese EEZ and the harvest of ETP species. Both these risks will contribute to the unknown level of catch and effort for species impacted resulting in a stock assessment with a high degree of uncertainty. The economic loss of revenue to national economy through the potential revenue of licensing will be large. In the longer term there may also be future losses due to stock depletion and a lack of productivity from local stocks or sub-stocks in the future.

The presence of illegal fishing vessels when combined with the estimated high risk of illegal fishing gears being used in East Timor would suggest a high possibility of poor environmental aspects of the fishery. This may include increased and undocumented bycatch, high levels of incidental mortality of ETP species and discards and the potential of damage to environment.

Importantly for any developing country, the impact of illegal fishing by vessels offshore and particularly those operating in areas that overlap with domestic artisanal fisheries may impact adversely on domestic food supply.

In the present international community the presence of IUU in domestic fisheries (i.e. flag State) and coastal waters (i.e. foreign vessels showing a lack of coastal State control) can lead to possible export bans i.e. ban on exports to the EU

Losses of fish that would be landed outside of East Timor, i.e. illegal vessels landing in Indonesian ports would lead to a loss of processing and secondary industry revenue to East Timor. At the moment this sector is not well developed in East Timor, but fish being landed outside of the region could lead to such a sector not developing in country and therefore a potential long-term loss of revenue from these important secondary industries. The landing of fish outside of East Timor could also in the long-term benefit IUU operators. Profits to operators and processors dealing in IUU fish can lead to an increase in their capacity i.e. better equipped and larger IUU fleets, as profits will be able to be reinvested and not be used for fisheries control. Vessels operating remotely will also not be able to be inspected in local ports but continue to fish and then return to ports in Indonesia, Malaysia or Thailand resulting in lower compliance rates.

5.6.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

The highest estimated rate of IUU fishing for East Timor's specific risks was assigned to unlicensed fishing in the EEZ by foreign industrial vessels, with a broad range of 20-60% increases on the reported catches used in order to illustrate the uncertainty surround the scale of encroachment by foreign vessels in Timorese waters. Nonetheless, despite the uncertainty, evidence indicates that a substantial foreign fleet operates in the EEZ with little or no deterrent, with the capacity of this fleet apparently supported by the presence of motherships to facilitate transshipment and bunkering. Moreover the capacity of these large foreign vessels is likely to be considerably higher than East Timor's generally low capacity, artisanal national fleet, a fact which further influenced the decision to apply a high 60% upper rate estimate to the reported catches. Artisanal vessels were assigned a range value of 10-20%, given the evidence of illegal fishing activities involving artisanal vessels within the EEZ, however the lower values also reflect the smaller capacity of this fleet segment. The

national industrial segment is very small and therefore a nominal 0-1% rate has been applied to this sector.

Misreporting or failing to report catch is recognised as problem for East Timor's licensed national vessels, with inadequate national reporting mechanisms for the decentralised artisanal fleet segment, and this is demonstrated by the extremely aggregated FAO data. Consequently the artisanal fleet's risk has been assigned a value range of 10-40% to account for the likelihood of misreporting, whilst a lower value of 2-5% has been assigned to the national industrial fleet to account for the possibility that catches from this small fleet segment may still be subject to reporting issues.

The remaining risks were not assigned separate rate estimation values as, whilst they represent IUU risks within East Timor, they do not modify the catch data in addition to the multipliers assigned for the unlicensed fishing and catch reporting risks.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the East Timor EEZ can be found in Table 48Table 14.

Table 48 Summary of estimated rates – East Timor.

Specific Risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZ by national and foreign artisanal vessels	Combined	All	2002-2013	10	20	0	0
Unlicensed fishing in EEZ by foreign industrial vessels	Combined	All	2002-2013	20	60	0	0
Unlicensed fishing in EEZ by national industrial vessels	Combined	All	2002-2013	0	1	0	0
Unreported/misreported catch by licensed national artisanal vessels	Combined	All	2002-2013	0	0	10	40
Unreported/misreported catch by licensed national industrial vessels	Combined	All	2002-2013	0	0	2	5
Use of prohibited fishing gear types	Combined	All	2002-2013	0	0	0	0
Illegal transshipping	Combined	All	2002-2013	0	0	0	0
Bunkering (refuelling at sea)	Combined	All	2002-2013	0	0	0	0
Landing of illegal catch outside of monitored national ports	Combined	All	2002-2013	0	0	0	0
Harvest of ETP species	Combined	All	2002-2013	0	0	0	0

5.6.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 1,435 and 4,306 t per annum (i.e. 42.00 and 126.00%). Illegal catches contribute an estimated 30-81% and unreported catches 12-45% in addition to the reported catch. The highest contribution to losses in East Timor are those from foreign fishing vessels operating illegally inside the Timorese EEZ, although significant under-reporting still exists.

Losses from Illegal, Unreported and Unregulated fishing in the East Timor EEZ are estimated to average between USD 1.39 to 4.16 million a year.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 49 and as first landed value in Table 50. Profiles of the estimated level of illegal and unreported fishing combined in East Timor can be found in Figure 12 (catch in t) and Figure 13 (catch value in USD).

Table 49 Summary of estimated IUU by year in East Timor (1999 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990							
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998							
1999	3401	1020	2755	408	1530	0	0
2000	3621	1086	2933	435	1629	0	0
2001	3561	1068	2884	427	1602	0	0
2002	3720	1116	3013	446	1674	0	0
2003	3850	1155	3119	462	1733	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

2004	4000	1200	3240	480	1800	0	0
2005	3650	1095	2957	438	1643	0	0
2006	3300	990	2673	396	1485	0	0
2007	2911	873	2358	349	1310	0	0
2008	3243	973	2627	389	1459	0	0
2009	3200	960	2592	384	1440	0	0
2010	3200	960	2592	384	1440	0	0
2011	3200	960	2592	384	1440	0	0
2012	3200	960	2592	384	1440	0	0
2013	3200	960	2592	384	1440	0	0

NB: Data only available for East Timor post-independence. Prior data would be included in the submissions for Indonesia.

Table 50 Summary of the estimated value of IUU (USD) by year in East Timor (1999 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990							
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998							
1999	3.27	0.98	2.65	0.39	1.47	0.00	0.00
2000	3.49	1.05	2.83	0.42	1.57	0.00	0.00
2001	3.45	1.03	2.79	0.41	1.55	0.00	0.00
2002	3.59	1.08	2.91	0.43	1.61	0.00	0.00
2003	3.72	1.12	3.02	0.45	1.68	0.00	0.00
2004	3.87	1.16	3.13	0.46	1.74	0.00	0.00
2005	3.53	1.06	2.86	0.42	1.59	0.00	0.00
2006	3.20	0.96	2.60	0.38	1.44	0.00	0.00
2007	2.83	0.85	2.29	0.34	1.27	0.00	0.00
2008	3.14	0.94	2.54	0.38	1.41	0.00	0.00
2009	3.09	0.93	2.50	0.37	1.39	0.00	0.00
2010	3.09	0.93	2.50	0.37	1.39	0.00	0.00
2011	3.09	0.93	2.50	0.37	1.39	0.00	0.00
2012	3.09	0.93	2.50	0.37	1.39	0.00	0.00
2013	3.09	0.93	2.50	0.37	1.39	0.00	0.00

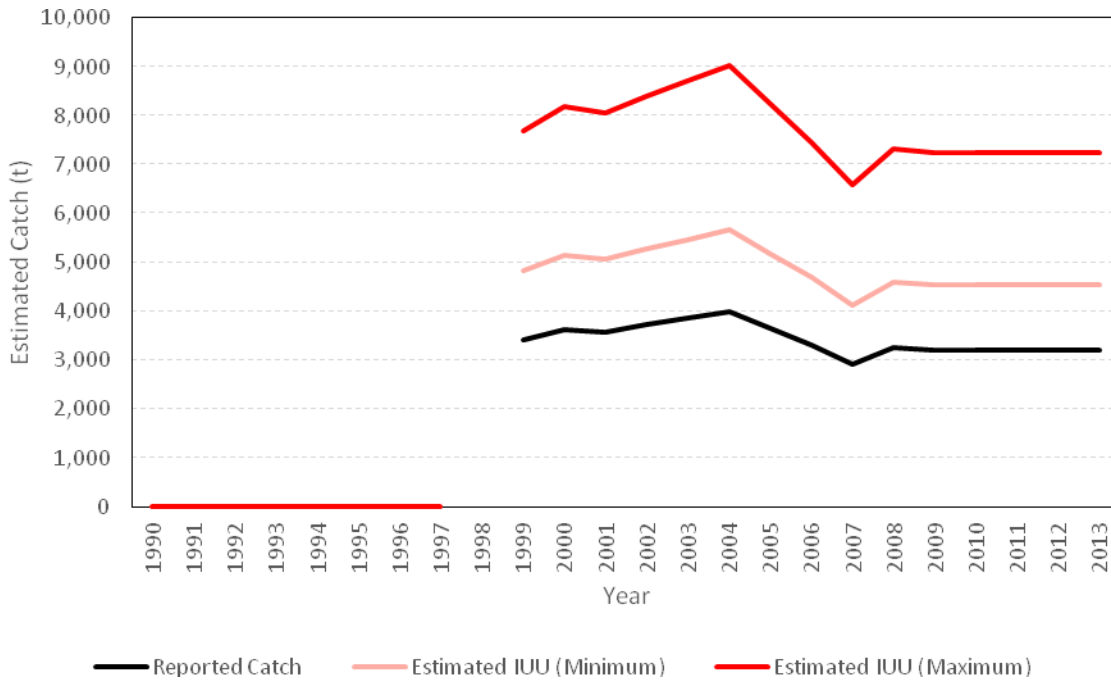


Figure 12 IUU Catch Profile (East Timor) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1999-2013.

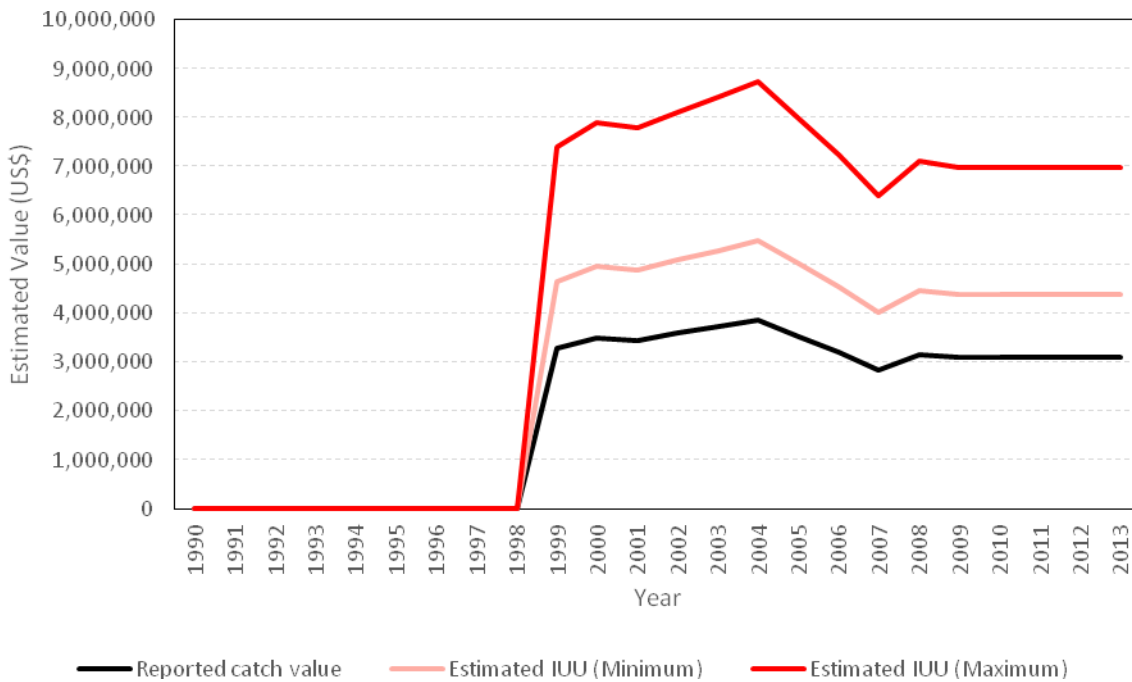


Figure 13 IUU Catch Value Profile (East Timor) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1999-2013.

5.7 India

5.7.1 Introduction

The Indian EEZ covers a total area of 2,200,000 km², comprising 860,000 km² (42.6 % of the total) on the west coast, 560,000 km² (27.7%) on the east coast, and 600,000 km² (29.7%) around the Andaman and Nicobar Islands located in the Andaman Sea. The Indian EEZ shares borders with Pakistan to the west, the Maldives and Sri Lanka to the south and Bangladesh, Myanmar, Thailand and Indonesia to the east. This expansive EEZ contains diverse marine ecosystems, such as mangroves, tidal flats and coral reefs, and harbours significant marine biodiversity and fisheries. India's EEZ contains ~1,700 species of fish, of which ~200 are of commercial importance. These marine resources represent important sources of food and employment to millions of people dependent on fish resources, with the population of marine fishers totalling approximately 3.57 million individuals spread across 3,305 fishing villages (Rajagopalan, 2011). . India's fishing fleet is diverse and utilises a vast array of gear types (Sathianandan, 2014).

Marine Protected Areas are increasingly being used as a fisheries management tool in India, and the country has established 33 coastal and Marine Protected Areas and three Marine Biosphere Reserves. These reserves encompass a total area of approximately 5,319 km², which equals less than 0.3 percent of the EEZ. MPAs in India are recognised as contributing to conservation of coastal and marine biodiversity, however, their establishment in the country has been criticised for resulting in the loss of livelihoods of traditional and small-scale fishers. For example, the establishment of Bitharkanika National Park in Orissa and the Gulf of Mannar Marine National Park are considered to have displaced traditional fishers resulting in a loss of livelihoods.

5.7.2 Fleet breakdown

National statistics presented on India's fishing fleet categorises vessels into three main groups: mechanized, motorised and non-motorised. In 2010 it is reported that India's fishing fleet consisted of 194,490 fishing crafts, of which 50,618 (26%) were traditional (non-motorised), 71,313 (37%) were motorised traditional vessels, and 72,559 vessels were mechanized fishing vessels (MFVs) (37%)⁷¹. Statistics for 2013 indicate that the mechanized sector is responsible for the majority of India's total fisheries catch (79.5%), with the motorised sector responsible for 18.6% and the non-motorised sector responsible for 1.9%⁷².

⁷¹ Source: National Marine Fisheries Census, 2010, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India. Available from: <http://eprints.cmfri.org.in/8998/>

⁷² <http://www.cmfri.org.in/uploads/files/Achivementsss.pdf>

For the purpose of this study a breakdown of the fishing vessels operating in Indian waters into distinct legal and illegal fishing fleets is presented in Table 51. These fleet classifications have been derived from available information presented in the literature.

Table 51 Fleet breakdown for India.

#	Description	Gear	Flag(s)	Target species	Comment
1	Domestic, Artisanal	Various	India	Mixed	
2	Domestic Industrial (Mechanised)	Various	India	Mixed	Unregulated fleet
3	Indian Deep Sea (EEZ) Fleet	Longlines Purse Seines Squid Jiggers Pelagic Purse Seine	India	Tuna Squid Indian oil sardine Clupeoids Indian mackerel Tunas	Currently being developed
4	Foreign Chartered Fleet (Letter of Permission (LoP) Fleet) (See Section 5.7.5.5 for description)	Various Trawl Longline	India Thailand Taiwan	Mixed Tuna	Misuse of scheme has led to IUU fishing
5	Bangladesh Trawl	Trawl	Bangladesh	Shrimp	Illegal fleet. Thought to be primarily active in West Bengal and Orissa
6	Sri Lankan, Longline	Longline	Sri Lanka	Tuna	Illegal fleet
7	Myanmar, Andaman Island	Longline	Myanmar	Shark, tuna	Illegal fleet
8	Pakistan	Various	Pakistan	Mixed	Illegal fleet

5.7.3 Catch breakdown

Catch statistics presented by the FAO for India indicate that total capture production of marine species in 2010 was ~3,400,000 tonnes (FAO, 2015). Major species/species groups presented in the catch statistics include Indian oil sardine (~9.5% of total catch), croakers and drums (7%), Bombay duck (4.5%), giant tiger prawn (4.5%), hairtails and scabbard fishes nei (4.2%), Natantian decapods

nei (3.8%), and Cephalopods nei (3.2%), constituting ~ 36% of the total catch. The category ‘Marine fishes nei’ is reported as ~20% of the total.

Catch reconstructions presented by SeaAroundUs (SAU)⁷³ estimate the total catch for the same year as 3,986,535 tonnes. Major species groups presented include Indian oil sardine (9%), drums/croakers (6.3%), jacks/pompanos (4.8%), cutlassfishes (4.2%), perch-like (3.8%), anchovies (3.7%), and herrings/shads/sardines (3.3%). The category ‘Others’ is reported as 38.88% to the total catch.

No clear breakdown of catches between the fleets in Table 51 was possible and IUU risks have therefore been estimated based on the national catch as a whole.

5.7.4 IUU influencing factors

5.7.4.1 Legislation and governance

Fisheries management in India can be divided into two categories: 1) fisheries in the EEZ (12-200 nm from shore), which is the responsibility of the central government; and, 2) fisheries in territorial waters (0-12 nm from shore) which is the responsibility of State governments. Management of fisheries by the central government is undertaken by the Department of Animal Husbandry, Dairying and Fisheries (DAHD&F), with several ministries assuming various responsibilities: Table 52 provides a brief overview of the institutional framework of fisheries management in India.

Table 52 Fisheries management duties/actions and the corresponding responsible body

Duty or action	Responsible body
<ul style="list-style-type: none"> • Deep sea fishing (List I) • Survey & assessment of fisheries resources • Research • Training & extension • Fisheries development 	Ministry of Agriculture /DAHDF, Indian Council of Agricultural Research Fisheries Survey of India, National Fisheries Development Board Ministry of Earth Sciences (MoES)

⁷³ <http://www.seaaroundus.org/>

Duty or action	Responsible body
<ul style="list-style-type: none"> Monitoring of fishing by foreign vessels (List I) Prevention of marine pollution by ships 	Ministry of Defence/Coast Guard
<ul style="list-style-type: none"> Protection of endangered species (Wildlife Protection) Act, 1972) 	MoEF
<ul style="list-style-type: none"> Fish processing Processing units Exports 	Ministry of Food Processing Industries/ Ministry of Commerce & Industry (MoCI)- MPEDA and NFDB
<ul style="list-style-type: none"> Seafood exports (List I) Quality control 	MoCI-MPEDA Export Inspection Council
<ul style="list-style-type: none"> Law of the Sea negotiations (List I) 	Ministry of External Affairs
<ul style="list-style-type: none"> Potential fishing zones Monitoring ocean pollution 	Ministry of Earth Sciences (MoES)
<ul style="list-style-type: none"> Fishing vessel industry (List I) Major fishing ports (List I) Minor fishing ports (List II) 	Ministry of Shipping, Road Transport and Highways/, Ministry of Agriculture, State Governments
<ul style="list-style-type: none"> Fisheries in Territorial Waters (List II) 	State Governments
<ul style="list-style-type: none"> Protection of marine biodiversity (List III)¹¹ Protection of coastal habitats (List III) Focal point for Ramsar, CITES, CMS & CBD Conventions (List III) 	Ministry of Environment and Forests (MoEF) Ministry of Earth Sciences MoES
<ul style="list-style-type: none"> Infrastructure 	Ministry of Agriculture/MoCI, MPEDA

Source: India's 12th Five Year Plan on the Development and Management of Fisheries and Aquaculture

The legislative framework for fisheries management in India is set out in the following key pieces of legislation:

- Indian Fisheries Act, 1897
- The Wild Life (Protection) Act, 1972
- MFR (regulation) Bill, 1978 formulated after the EEZ declaration
- Maritime Fishing Regulation Act of maritime states enacted from 1980 in all maritime states
- Maritime Zones of India Act (Regulation of Fishing by Foreign Vessels), 1981
- Environment (Protection) Act, 1986

The Maritime Fishing Regulation Act (MFRA) forms the basis of fisheries management within India's territorial waters. This act permits Maritime States to govern their territorial waters and to develop their own regulations, and is based on a model piece of legislation produced by the Indian Ministry of Agriculture in 1979. It was developed primarily in response to demands from traditional fishers seeking to protect their fishing grounds from trawlers, and was developed at a time of significant conflict between the two subsectors. Each State's MFRA therefore contains regionally specific provisions designed to protect traditional fishers and reduce conflict.

The Maritime Zones of India Act is the main piece of legislation relating to the management of foreign flagged vessels operating within India's EEZ. It contains provisions relating to vessel licensing, and details penalties for associated violations.

The Wild Life (Protection) Act, 1972, is a key piece of legislation which provides the legal basis for the protection of plants and animal species in India, and is relevant to fisheries management as it provides restrictions on harvesting certain marine species. The act contains six schedules which provide varying degrees of protection to the animals listed on each schedule. For example, schedule I and II provide absolute protection and any harvest of these animals warrants the maximum possible penalty. Whereas species under schedule III and IV are protected but penalties associated with harvesting are lower⁷⁴.

Analysis of the legal framework reveals that there is no comprehensive legislation relating directly to fisheries management in the EEZ. There are only guidelines governing the activities of fishing vessels of foreign origin (Rajagopalan, 2011). This represents a significant oversight in current fisheries legislation as Indian vessels operating in the EEZ are unregulated.

In line with the above pieces of legislation a number of management tools are utilised by central and State governments to manage and control fisheries, including:

- Closed seasons
- Closed fishing areas
- Marine Protected Areas (MPAs)
- Protected Species
- Ban on certain destructive fishing gears and methods

⁷⁴ https://en.wikipedia.org/wiki/Wildlife_Protection_Act,_1972

- Minimum mesh size regulation (only for trawls)
- Minimum legal size at capture
- Use of Turtle Exclusion Device (TED) in trawls in Orissa

The degree to which these management measures are utilised to govern fisheries resources in India is detailed in the subsequent sections of this report.

5.7.4.2 Licensing and reporting requirements

Licensing of domestic fishing vessels

A fisheries licensing system is in place for domestic vessels operating in India's territorial waters. The licensing system for territorial waters is detailed within the provincial MFRA's and, therefore, specific provisions of the licensing system can vary for the territorial waters of each coastal State. In general, across Indian territorial waters, the licensing system requires that only registered and licensed vessels can participate in fishing. An open access fishery is therefore not legally permitted in the Indian territorial waters based on the legislation contained within the MFRA's. License fees are regarded as low, as are penalties applied for offences (Morgan, 2006).

A licensing system for vessels fishing within India's EEZ is however restricted to foreign fishing vessels acquired by Indian citizens (See 5.7.5.5), or foreign-owned and operated vessels that are licensed to fish in the EEZ. A licensing system for domestic vessels operating in the EEZ is therefore absent, and there are no allowable catch limits set. India's EEZ can therefore be considered an open access regime with regards to the domestic fleet (Yadava, 2004; Handbook on Fisheries Statistics, 2006).

Licensing of foreign flagged vessels

Provisions relating to the licensing of foreign vessels are stipulated within The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act⁷⁵. The Act necessitates that foreign vessels intending to fish in the maritime zones of India are required to have a licence, and also details provisions regarding fines and penalties (See Reg. 5 of The Maritime Zones of India Act).

However, a previous analysis of the regulation conducted by Sridhar (2007) highlights a number of short falls and states that the licensing system contains provisions which are not conducive to the effective regulation of fisheries, particularly in ecologically sensitive areas. Sridhar (2007) identifies, inter alia, that the Act does not provide mechanisms for monitoring and implementation, and subsequently concludes that the provisions laid down for cancellation or suspensions of licenses are rendered ineffective in the absence of effective monitoring. Furthermore, Sridhar (2007) also concludes that provisions which prohibit foreign vessels from catching species stipulated in the Wild

⁷⁵http://faolex.fao.org/cgi-bin/faolex.exe?rec_id=000279&database=faolex&search_type=link&table=result&lang=eng&format_name=@ERALL

Life Protection Act are, again, meaningless as monitoring procedures are not stipulated within the act.

Reporting requirements

The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act contains provisions relating to the monitoring of fishing activities. Foreign fishing vessels must, 1) Keep written records on a daily basis of fishing effort, catch, species size and weight, transshipments, and processing; 2) Record data on quantity of fish caught in excess of permitted quantity; 3) Keep written records of other information, as prescribed. However, the regulation contains no specific provisions regarding the submission of logbooks to the relevant authorities.

5.7.4.3 Restrictions, Fines and Penalties

Restrictions – Discarding

Regulation 5 of The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act contains a provision which prohibits significant discarding by foreign fishing vessels. The provision stipulates that surplus catch must be retained and surrendered as required to the authorities. However, since its implementation it is widely considered that this regulation has not been abided by or enforced: previous studies have suggested that mechanized vessels have not complied with this law (Pramod, 2010); and, monitoring of fishing vessel activity at sea is regarded as inadequate to detect violations of fisheries law (Pramod, 2010; Sridhar, 2007).

Restrictions – Inshore fishing zones and closed season (monsoon fishing ban)

Spatial restrictions implemented as part of India's fisheries management regime include permanent as well as temporary bans on fishing (Rajagopalan, 2011). Permanent spatial restrictions take the form of inshore fishing zones which are reserved for traditional fishers. Under the regulations of Maritime States, these inshore fishing zones are demarcated based on the distance from shore or depth. As these zones are reserved for traditional fisheries, trawling and other forms of mechanised fishing are prohibited. This can be viewed as one of the most important fisheries control measures that is currently in place (Rajagopalan, 2011).

Temporary bans on fishing take the form of a closed season for mechanised fishing vessels. This 'monsoon fishing ban' for mechanised vessels has been implemented throughout India on an annual basis since 1997-98 (DAHD&F, 2014), and is one of the main tools the Central Government currently uses to conserve and manage its fisheries. Previously, the ban period varied from state to state, but it has recently been made uniform: all states on the west coast implement the ban between June 15th and July 31st; and all states on the east coast implement the ban between April 15th and May 31st (DAHD&F, 2014). Prior to this system, the absence of a uniform ban period throughout India was exploited by fishing trawlers as they would fish in banned areas but land in an adjacent State with no implemented ban; thus taking advantage of a legislative loophole. A study by Pramod (2010) documented multiple complaints from fishers in Goa, Karnataka and Maharashtra (West coast), Orissa and West Bengal (East Coast) regarding this flawed system.

Restrictions-Mesh sizes

Mesh size restrictions are specified in several MFRAs (state specific fisheries legislation). For example, The Gujarat Fisheries Act (2003), Section 4(a), prohibits the use of fishing gear with less than 40 mm mesh in the cod end; in the territorial waters of Maharashtra, the Notification dated 12th December 1997 affirms that trawl gear should have a minimum mesh size of 35 mm in the waters of Thane, Mumbai, Raigad and Sindhudurg districts; The Karnataka Marine Fisheries Regulation act requires all mechanized trawlers operating along the coast to use a minimum cod end mesh size of 30 mm; The Kerala Marine Fishing Regulation Act (1980) prohibits the use of mid-water trawl and bottom trawl gear with less than 35 mm mesh. However, interviews conducted by Pramod (2010) indicate that mesh size restrictions are generally poorly enforced and, furthermore, Pramod concludes: “enforcement of mesh size regulations is dismal in all States, with Fisheries Departments in all maritime States being ill equipped to carry out surveillance or implementation of regulatory measures”. Furthermore, a study conducted by Chandralpal (2005) states that 94 per cent of the bottom trawlers operating in the Kerala region have a cod-end mesh size of 18 mm and below, instead of 35 mm imposed by the Government.

5.7.4.4 MCS protocols and capacity

India’s MCS protocols and capacity, although somewhat effective at detecting and apprehending IUU violations (see summary of IUU incidences), have previously been criticised for being limited relevant to the size of the nation’s coastline and EEZ; however, the intention to develop a comprehensive MCS programme is stated within the nation’s most recent Five Year Plan on the Development and Management off Fisheries, and evidence suggests that some progress has been made towards this.

Surveillance and control of fisheries in India’s EEZ is the responsibility of the coast guard, who are appointed under the Coast Guard Act and work under the general control and direction of the Central Government⁷⁶. Duties of the coast guard include the monitoring of foreign flagged vessels fishing within the EEZ under partnership agreements, and ensuring that unauthorized foreign fishing vessels do not operate in Indian waters. Capacity of the coast guard includes 10,440 personnel, 134 vessels and 60 aircraft⁷⁷. However, sources suggest that MCS capabilities of the Indian Coast Guard are limited. For example, Pramod (2010) concludes that it is impossible for the coast guard to monitor all trawlers operating within the EEZ as the nation does not have a VMS in place; and, a recent review of specific fisheries conservation measures in India (closed areas) states that, overall, there are weaknesses in India’s MCS regime (DAHD&F, 2014).

Within India’s territorial waters (0-12 nautical miles) the primary enforcement authority for fisheries management is the Fishery Departments of the relevant states. Capacity of fishery departments to

⁷⁶ http://planningcommission.gov.in/aboutus/committee/wrkgrp12/agri/wgrep_fish.pdf

⁷⁷ https://en.wikipedia.org/wiki/Indian_Coast_Guard

perform MCS duties is however limited: The majority of the States, with the exception of Orissa, do not have patrol vessels to enforce fishery control rules. The Coast Guard provides supplementary support in some States to enforce fisheries bans, but, given the budgetary restraints faced by the coast guard, it is impossible to monitor the vast numbers of trawlers operating along the Indian coastline (Pramod, 2010). Generally, patrolling is regarded as inadequate to effectively deter illegal fishing activity and capacity is lacking; for example, interviews conducted by Pramod (2010) with State Fisheries Departments in India indicate that, in some instances, illegal fishing vessels possess far better monitoring and radar equipment than the Fisheries Departments themselves.

The intention of the Central Government to implement effective MCS in India is clearly stated in India's most recent Five Year Plan on the Development and Management of Fisheries⁷⁶. Here, a number of activities are proposed to be undertaken in the 2012-2017 period which are designed to strengthen MCS capabilities. These include, *inter alia*, implementation of log book system, as appropriate for particular category of fishing vessels; provision of training and education to all persons involved in MCS operations; setting up of an MCS Division at the central level (Ministry of Agriculture-MoA) and in each coastal State and Union Territory for effective implementation of the scheme⁷⁸.

VMS

The absence of a Vessel Monitoring System in India has previously been indicated as a contributing factor to an ineffective MCS programme and poor fisheries control (see Pramod, 2010; Mohamed, 2015). The intention to resolve this issue by implementing a VMS is clearly communicated by the DAHD&F within India's 12th Five Year Plan on the Development and Management off Fisheries and Aquaculture⁷⁶. Evidence suggests that the institution of a national VMS is currently underway: There has been recent, necessary infrastructure development such as the installation of a coastal radar system⁷⁹.

Fines and penalties

Penalties associated with illegal foreign fishing include a fine of up to 1,000,000 Rs (*USD 15,000*) for offences in India's EEZ; whereas a larger financial penalty, up to 1,500,000 Rs (*USD 22,500*), is associated with similar offences committed within the territorial sea.⁸⁰

⁷⁸ For a full list of activities see pg. 109 of the India's 12th Five Year Plan on the Development and Management off Fisheries and Aquaculture

⁷⁹ http://articles.economicstimes.indiatimes.com/2015-01-19/news/58231552_1_fishing-vessel-indian-coast-guard-defence-minister-manohar-parrikar

⁸⁰ <http://www.fao.org/docrep/v9982e/v9982e08.htm>

Violation of licence or gear stowage rules carries financial penalties ranging from 50,000 Rs (*USD 750*) to Rs1 000 000 (*USD 15,000*)⁸⁰. The confiscation of vessel gear and catch is apparently mandatory on conviction for these offences. .

Contravention of the Wildlife Protection Act also carries associated fines and penalties, as detailed by Article 51. Offences relating to the hunting of endangered species include a minimum imprisonment of three years and a fine of up to 25,000 Rs (*USD 370*)⁸¹. Convictions related to the trade of endangered animal articles carries an associated penalty of up to a three year jail sentence and a fine of up to 25,000 Rs.

India has an average ranking globally compared to other States according to the World Bank Governance Indicators (109th out of 212 – 51st percentile). As such any risks relating to direct corruption or a weak regulatory framework would neither be reduced nor increased significantly. Risks are likely to exist relating to “Obstruction of bribery of fisheries officers” and “Falsification of documents” but not to the level observed in some regional States (See Table 159).

5.7.4.5 Port state

India contains a vast number of fish landing centres (~1,376) and fishing villages (~3,332) with varied development infrastructure. This includes five main fishing harbours—Mangalore (Karnataka), Kochi (Kerala), Chennai (Tamil Nadu), Vishakhapatnam (Andhra Pradesh), and Raichak in Kolkata (West Bengal)—twenty-three minor fishing harbours, and ninety-five designated fish-landing centres designed to provide landing facilities to fishing craft (DAHD&F, 2014).. India’s 12th Five Year Plan on the Development and Management of Fisheries and Aquaculture⁸², published in 2012, states that of the 1,376 fishing centres only 256 have been developed (18.6 percent of the existing landing centres). Thus, as current port facilities can only accommodate a limited proportion of India’s mechanised fishing fleet, resulting in associated issues such as overcrowding, port facilities in India can generally be regarded underdeveloped. The 12th five year plan therefore calls for further development of the landing facilities to meet the requirements of the existing fleet.

5.7.5 Summary of IUU incidences

Sources indicate that IUU fishing within Indian waters is undertaken by foreign and domestic vessels. Illegal/unauthorised fishing is primarily conducted by foreign vessels originating from Sri Lanka, Bangladesh, Pakistan and Myanmar; and by vessels originating from Thailand and Taiwan which violate the conditions of the Letter of Permit (LoP) scheme. Domestic vessels have been reported to participate in fishing activity in violation of a number of fisheries regulations, such as mesh size restrictions. Furthermore, Indian vessels and fishers have been apprehended fishing illegally in other countries’ EEZs.

⁸¹ [https://en.wikipedia.org/wiki/Wild_Life_\(Protection\)_Amendment_Act,_2002](https://en.wikipedia.org/wiki/Wild_Life_(Protection)_Amendment_Act,_2002)

⁸² http://planningcommission.gov.in/aboutus/committee/wrkgrp12/agri/wgrep_fish.pdf

5.7.5.1 Sri Lankan longline

Sri Lankan flagged vessels regularly fish illegally within India’s waters, primarily targeting tuna with longlines (Pramod, 2010). Information presented in Pramod (2010) highlights that the number of Sri Lankan vessels arrested for illegally operating in Indian waters increased significantly in 2007 (See Figure 14).

Instances of arrests of Sri Lankan vessels have been well documented in several news articles. For example, in February 2015, 19 Sri Lankan fishers were arrested off the Kanyakumari coast for illegally fishing in Indian waters; in April 2014, a Sri Lankan fishing vessel and its four crew were apprehended by the Indian coast guard for fishing illegally off the Paradip coast; and, in 2014, 16 Sri Lankan fishers were apprehended by the Indian coast guard for fishing illegally for sea cucumbers—collection of sea cucumbers is prohibited under Schedule I of India’s Wild Life Protection Act, 1972—on the West Coast of India .

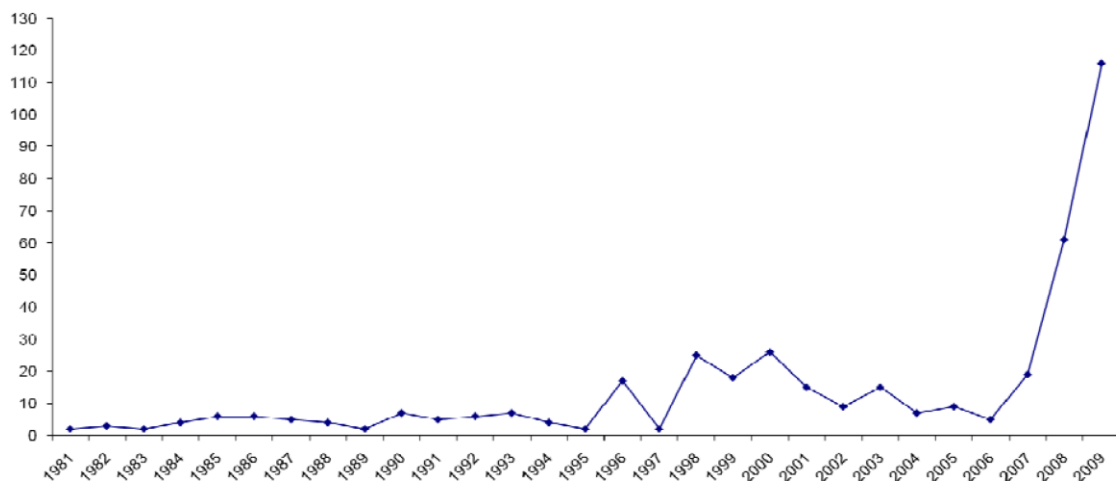


Figure 14 Number of fishing vessels from Sri Lanka arrested in the Indian EEZ (1981-2008). (Source: GIF Database © Ganapathiraju Pramod, as presented in Pramod, 2010)

5.7.5.2 Bangladesh trawl

Fishing vessels originating from Bangladesh and primarily targeting shrimp have also been implicated in IUU fishing within India’s waters. Interviews conducted by Pramod (2010) indicate that Bangladeshi trawlers frequently trawled the inshore region of West Bengal but, due to increased patrolling, the effort of Bangladeshi vessels has been recently displaced towards Orissa. Figure 15 provides the number of Bangladeshi fishing vessels arrested in the Indian EEZ for the period 1988–1999.

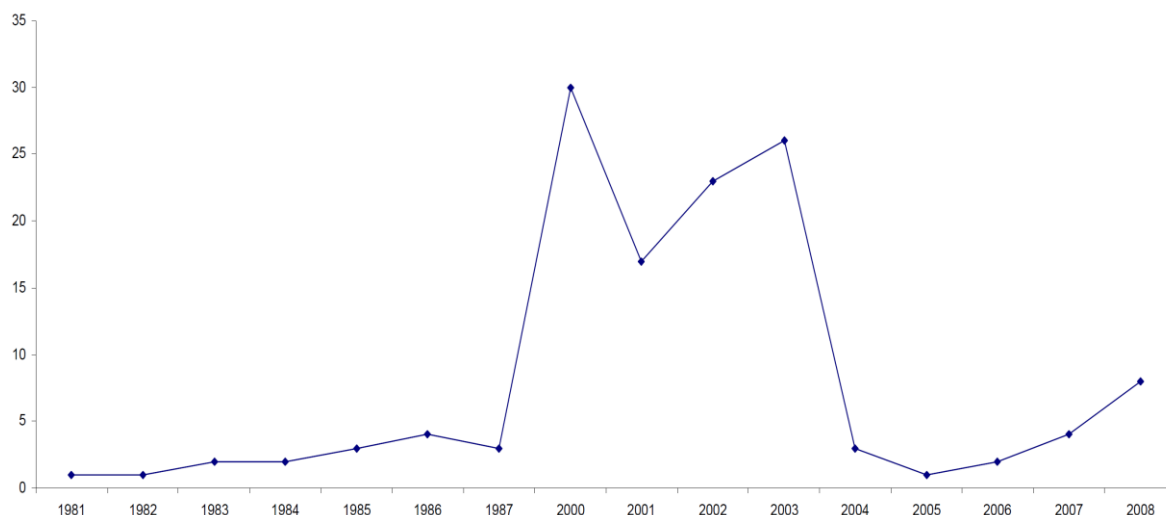


Figure 15 Number of Bangladeshi fishing vessels arrested in the Indian EEZ (1981-2008), No data are available for the years 1988 – 1999 (Source: GIFI Database © Ganapathiraju Pramod, as presented in Pramod, 2010)

5.7.5.3 Pakistan

Vessels from Pakistan are regularly intercepted and detained by Indian authorities for trespassing in Indian waters. For example, in June 2013, 12 Pakistani nationals were detained by Indian authorities for trespassing in Indian waters⁸³; in 2013, seven Pakistani nationals were detained by the Indian coast guard in September⁸⁴; and, nine Pakistani nationals were detained in August 2009, three of which did not have fishing documentation⁸⁵. This routine arrest of Pakistani nationals for entering India's waters is partially attributed to poorly defined maritime boundaries between the two countries, and a the lack of the technology possessed by fishers which is required to determine location.

5.7.5.4 Myanmar, Andaman Islands

Fishers originating from Myanmar are also widely acknowledged to fish illegally within Indian waters, particularly off the coast of the Andaman Islands. For example, by May 2007, more than 200 Myanmar fishers had been detained by the Indian authorities that year, and, in 2006, 357 Myanmar illegal fishers were detained in total⁸⁶. A news article published by Reuters in 2007 indicates that

⁸³ <http://www.ndtv.com/india-news/12-pakistani-national-arrested-for-entering-indian-waters-526758>

⁸⁴ <http://www.ndtv.com/india-news/indian-coast-guard-arrests-seven-pakistani-fishermen-535218>

⁸⁵ <http://nation.com.pk/politics/18-Aug-2009/India-arrests-9-Pakistani-fishermen>

illegal Myanmar fishers operating off the Andaman Islands are known to target sharks and are considered to damage sensitive species, such as corals⁸⁶. Furthermore, in February 2012, an expedition by the Greenpeace vessel *Esperanza* encountered four Myanmar vessels fishing illegally within India's EEZ off the coast of the Andaman Islands; catches of these vessels reportedly included sharks and yellowfin tuna (*Thunnus albacares*)⁸⁷.

5.7.5.5 Letter of Permit (LoP) fleet

The Letter of Permit scheme, introduced by the Indian Ministry of Agriculture (MoA) in 2002, was intended to support the Indian fishing sector but has been implicated as a mechanism which has legitimised IUU fishing. The basic premise of the scheme was to facilitate the purchase of used, deep-sea fishing vessels from other nations by Indian nationals, giving them access to the technology they require to exploit fishery resources in the EEZ (>12 nm). The scheme mandates that the vessels purchased need to be registered in India and under an Indian owner. However, loopholes and an absence of monitoring have allowed foreign-owned vessels to enter Indian waters, fake their registration papers, use shell companies, and fish in Indian waters without any restrictions on the amount of fish they catch, their revenues or their impact on the marine environment. Many vessels participating in the LoP scheme allegedly retain their original national registration, a direct violation of the LoP scheme and an internationally illegal practice known as 'flag hopping'. As these vessels also tranship their catches at sea little benefit is passed to India. Thus, instead of boosting India's fishing sector, the LoP scheme is recognised to have legitimised IUU fishing conducted by foreign fleets⁸⁸.

Furthermore, a representative of the Central Marine Fisheries Research Institute (Mohamed, 2015) has recently stated that the LoP scheme has not fulfilled its intended function as it has not improved Indian fishing capacity or increased fisheries production.

5.7.5.6 Domestic fleet (industrial and artisanal)

India's industrial fishing vessels are acknowledged to regularly violate India's fishery laws, particularly spatial restrictions implemented under Maritime State MFRAs, and a proportion of the domestic fleet is considered to be unregulated and unreported. For example, interviews conducted by Pramod (2010) indicate that illegal fishing by domestic trawlers in the inshore artisanal zone is present in all coastal States of mainland India. Furthermore, Pramod (2010) provides a summary of apprehensions and arrests for illegal fishing activities within the coastal state of Orissa (see Table 53). This summary details a number of additional violations attributed to the domestic fleet, such as fishing without turtle excluder devices, fishing within marine reserves (Garhirmatha and

⁸⁶ <http://www.reuters.com/article/2007/06/07/idUSDEL46065>

⁸⁷ <http://www.greenpeace.org/india/en/Press/Greenpeace-exposes-pirate-fishing-practices-off-Andaman-coast/>

⁸⁸ <http://www.greenpeace.org/india/en/Press/Busted-Greenpeace-Exposes-Letter-of-Permit-racket-in-Indian-EEZ/>

Bhitarkanika), and catching protected species (Olive Ridley turtles). Instances of industrial fishers being arrested for catching Olive Ridley (in contravention of provisions of Wildlife Protection Act and Orissa Marine Fishing Regulation Act) have also been reported in the media⁸⁹.

Table 53 Marine fishing violations in Orissa's territorial waters and marine sanctuaries (As presented in Pramod, 2010)

Date/Year	Target IUU Species	Type of IUU	Number of Illegal vessels	Action taken
1997-1998	Shrimps	Illegal	78	During the period 13.12.1997 to 26.1.1998, 55 trawlers and 23 gill netters were apprehended from Gahirmatha sanctuary (Anon 2003a).
January 30, 1998	Shrimps & Finfishes	Illegal	9	6 trawlers and 3 gill netters were apprehended from the core area of the Gahirmatha (Marine) Wildlife Sanctuary (Anon 2003a).
January 19, 2000	Shrimps & Finfishes	Illegal	5	Orissa Forest Department in collaboration with the Coast Guard arrested 15 people and seized 5 trawlers for illegal fishing inside the Gahirmatha Marine sanctuary (Anon 2003a).
2000	Shrimps & Finfishes	Illegal	64	64 trawlers and gill netters were seized for illegal fishing by the Forest Department (Shankar and Wright 2000).
2002	Shrimps & Finfishes	Illegal	44	Up to 44 fishing boats have been seized here by the Orissa Forest Dept officials; 12 fishing trawlers were found near mouth of Devi river within a prohibited zone of 5 km from the coast on December 31; none of the trawlers had turtle excluder devices, which are mandatory on all trawlers
February 8, 2003	Finfishes	Illegal	2	3 forest guards were abducted by the crewmembers of two gill- netters that were seized for illegal fishing inside the Gahirmatha Marine Sanctuary (Anon 2003b).
December 27, 2003	Finfishes	Illegal	11	Crews of 11 mechanised trawlers were fined Rs. 85,000 for illegal fishing within the Gahirmatha marine sanctuary. The catch was auctioned for Rs. 17,000. Boats were to be
2004	Shrimps & Finfishes	Illegal	10	Orissa Forest Department registered cases of illegal fishing in prohibited water bodies against 24 fishermen and confiscated 10 vessels for fishing in the Bhitarkanika wildlife sanctuary; fishing gear and other implements
February 2, 2006	Finfishes	Illegal	5	Bhitarkanika forest officials have arrested six persons and seized five trawlers from them near Chinchiri river mouth under Gahirmatha Marine Sanctuary on charge of illegal

⁸⁹ <http://odishasuntimes.com/2015/03/03/six-fishermen-held-fishing-near-turtle-nesting-site-odisha/>

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Date/Year	Target IUU Species	Type of IUU	Number of Illegal vessels	Action taken
December 23, 2005	Shrimps & Finfishes	Illegal	7	A Trawler with 4 crew members was arrested for fishing illegally along the Dhamra coast within Gahirmatha sanctuary. Fish catch worth more than Rs 1.5 lakh, fishing implements, fishing nets and VHF set were also impounded by the patrolling squad of the forest department. Earlier 6 trawlers with 16 crew were taken
2005	Shrimps & Finfishes	Illegal	7	Seven fishing trawlers and 24 crew were arrested for illegally fishing along the Dharma coast during the turtle breeding season; fish catch, fishing implements, fishing nets and VHF set were also impounded by patrolling personnel of the forest department (Anon 2005b)
January 2, 2006	Shrimps & Finfishes	Illegal	1	The Forest Department officials with the help of local police intercepted the trawler for illegally fishing inside the prohibited zone of Gahirmatha Marine Sanctuary. The fishermen allegedly attacked the patrolling party, leading to killing of one fisherman. Later 14 fishermen were arrested and trawler seized. They were in jail for 2 ½
2006	Shrimps & Finfishes	Illegal	>50	Trawlers fishing illegally caught 1800 endangered Olive Ridley Turtles in the Rushikulya estuary, in a marine sanctuary in Orissa state, fishing 200–300 m within the sanctuary; Fishing is prohibited in these waters during the breeding season of turtles. (Anon 2007c; Anon 2006b)
2007	Shrimps & Finfishes	Illegal	25	The Bhitarkanika forest department officials arrested 11 fishermen and seized five trawlers and their fish catch for illegal fishing. In this season the Forest dept officials seized 25 trawlers and arrested 70 fishermen with 10 sets
March 20, 2007	Shrimps & Finfishes	Illegal	9	Seven deep sea trawlers were intercepted by a joint forest-police patrol near Habelikhati off Gahirmatha marine sanctuary coast. In another mid-sea crackdown 12 marine fishermen along with their boats were apprehended by the turtle surveillance squad (Anon 2007c)
November 27, 2007	Shrimps & Finfishes	Illegal	4	17 fishermen were intercepted along with 4 deep sea trawlers for fishing illegally inside the Gahirmatha Marine Sanctuary. The turtle surveillance squad spotted the vessels near Satabhaya-Chinciri Island off Gahirmatha coast (Anon 2007c)
2008	Shrimps & Finfishes	Illegal	12	Between November 2007 and January 2008, 72 persons were arrested and 12 fishing boats including nine trawlers and one gill-netter were seized by enforcement wing of Orissa Forest Department (Anon 2008b)
January 13, 2008	Shrimps & Finfishes	Illegal	2	Two deep sea trawlers were spotted by the turtle surveillance squad near Babuballi Island off Gahirmatha coast. The Forest Department seized the two trawlers and took the crew into custody. Fish catch worth nearly two lakh rupees besides fishing nets and equipment were also
December 2, 2008	Shrimps & Finfishes	Illegal	2	The 2 mechanised trawlers were seized by the turtle surveillance squad spotted after spotting them near Satabhaya and Chinchiri off Gahirmatha coast. Catch worth Rs. 1 lakh besides fishing nets and implement were

Date/Year	Target IUU Species	Type of IUU	Number of Illegal vessels	Action taken
December 4, 2008	Shrimps & Finfishes	Illegal	3	Three fishing trawlers from Andhra Pradesh with 20 crew members were apprehended by the Coast Guard ship 'Sarojini Naidu' while they were fishing illegally off
December 13, 2008	Shrimps & Finfishes	Illegal	3	18 fishermen along with three trawlers were seized at Chinchiri mouth for fishing illegally inside the Gahirmatha sanctuary (Anon 2008f)
December 19, 2008	Shrimps & Finfishes	Illegal	4	Four deep sea trawlers with 21 crew were seized by turtle surveillance patrols while fishing near Satabhaya-Chinciri Island off Garhirmatha coast. This has increased the number of trawlers apprehended since November 1, to
January 17, 2009	Shrimps & Finfishes	Illegal	1	The Joint Forest-Police patrol apprehended one deep sea trawler with 6 crew members for illegally fishing near Satabhaya off Gahirmatha marine sanctuary (Anon
February 10, 2009	Shrimps & Finfishes	Illegal	20	In a joint operation, Bhitarkanika forest officials and Indian Coast Guard personnel seized 4 fishing trawlers along with 24 fishermen for fishing illegally within Gahirmatha Marine Sanctuary. State Forest Department had imposed ban on fishing around 20 Km off the shore from November 1 to May 31 every year to protect Olive
March 3, 2009	Shrimps & Finfishes	Illegal	60	60 fishing vessels and 180 marine fishermen were arrested by turtle surveillance patrols of the Coast Guard, Forest Dept, Police and Fisheries Department (Anon

Unreported catch from the domestic fishing fleet is considered to be a major form of IUU fishing occurring in Indian waters. Hornby *et al.* (2015) have recently reconstructed fisheries catches for India during the 1950–2010 period, taking account of unreported catch from various sectors (i.e. industrial, artisanal). The study concludes that, for the given period, the reconstructed catch for India was 155 million tonnes, over twice the 75 million tonnes officially reported to the FAO. Of the total volume, reported and unreported catch for industrial fisheries constituted about 34.8% (54 million t); the unreported subsistence sector constituted 32.9% (51 million t); and the artisanal sector constituted 32.3% (50 million t).

Pramod (2010) estimates unreported catches in India for a single year. The study concludes that around 1.5 million tonnes of fisheries catch went unreported in 2008, with a large proportion of unreported catch (about 1.2 million tonnes) attributed to discarded by-catch from industrial vessels. The high discards of the industrial fleet is attributed to low quality by-catch being discarded at sea in order to save space for storing shrimps and valuable finfish. This conclusion is somewhat substantiated by Chandrapal (2005), who estimates that 240,000 tonnes of low-value fish are thrown back into the sea by trawlers operating along the Kerala coast due to lack of on-board storage, markets, and the unpopular nature of the species. However, this conclusion is in contravention of previous studies (such as Kelleher, 2005; and, Bathal, 2005) which have estimated discarding to be low in Indian fisheries due to high demand for trash fish from, *inter alia*, poultry and aquaculture feed sectors.

5.7.5.7 Indian flagged vessels fishing illegally outside of the Indian EEZ.

Instances of Indian vessels fishing illegally within the Sri Lankan EEZ have been well documented by several sources. Vivekanandan (2010) provides an account of the nature of this activity: Illegal trawling, primarily targeting shrimp, by Indian nationals in Sri Lankan waters, and is frequently practiced by fishers originating from the State of Tamil Nadu, fishing in Sri Lanka's Palk Bay and Palk Straits. This situation has resulted in significant conflict between the two nations. Over 100 Indian fishers are thought to have lost their lives in skirmishes with the Sri Lankan Navy or Tamil Tigers, and thousands are thought to have been arrested by the Sri Lankan authorities. This incursion of Indian fishers is apparently driven by compounding factors, such as depleted fishery resources within the Indian EEZ, a restricted fishing season, and fleet overcapacity (Vivekanandan, 2010). These issues are corroborated by interviews with fishers from Tamil Nadu conducted by Pramod (2010): fishers indicate that fishing in the Sri Lankan EEZ was previously undertaken for profit but more recently has been undertaken for subsistence due to the declining catches in Indian waters and over capacity of the Indian fleet. Conflict relating to Indian vessels fishing in the Sri Lankan EEZ is well documented in several news articles⁹⁰.

Indian fishers have frequently been arrested for illegally entering and fishing in Pakistani waters: In April 2015, the Maritime Security Agency of Pakistan detained 17 Indian fishers and 3 vessels, and charged them with illegal fishing⁹¹; In March 2015, 18 Indian fishers and 3 vessels were arrested off the Karachi coast⁹². Similarly, the media provides accounts of incidents where arrested Indian fishers have been released by the Pakistani authorities: In 2007 Pakistan released 115 Indian fishers that had been apprehended over a period of two years for illegally entering Pakistan's territorial waters. Similarly, in 2009, Pakistan released 100 Indian prisoners arrested for illegally entering Pakistan's territorial waters⁹³. And, in 2015, Pakistan released an additional 113 fishers⁹⁴.

⁹⁰<http://www.dailymirror.lk/42562/thirty-more-indian-fishermen-arrested>

²³ <http://indianexpress.com/article/india/india-others/sri-lankan-navy-arrests-26-indian-fishermen-off-kodiakari-in-tamil-nadu/>

²³ <http://www.firstpost.com/india/sri-lankan-navy-arrests-16-fishermen-from-tamil-nadu-2416074.html>

⁹¹ <http://www.ibtimes.com/pakistan-arrests-17-indian-fishermen-seizes-3-boats-over-illegal-fishing-1876902>

⁹² <http://indiatoday.intoday.in/story/pakistan-indian-fishermen-arrested-karachi-coast/1/426463.html>

⁹³ <http://bdnews24.com/world/2009/12/23/pakistan-to-release-100-indian-fishermen>

⁹⁴ <http://indianexpress.com/article/india/india-others/pakistan-releases-113-indian-fishermen-from-prison/>

5.7.6 IUU risk identification

5.7.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.

Unlicensed/unauthorised fishing within Indian waters is considered common practice and therefore can be considered a risk.

Illegal foreign fleets operating from Sri Lanka, Myanmar, Bangladesh and Pakistan are well documented in the press and in technical reports. The illegal Sri Lankan fleets are generally regarded to use longlines and target tuna; the Bangladesh fleet is acknowledged to primarily trawl for shrimp; whereas vessels originating from Myanmar are thought to longline for tuna and sharks, and fish for sea cucumbers. Illegal fishers from each of these nations have been arrested by the Indian authorities in recent history; however, India's current MCS capacity is widely regarded as disproportionate to the level of IUU.

With regards to the domestic fleet, currently there is no legislation governing their activity within India's EEZ, and, therefore, their fishing operations in this area are largely unregulated.

5.7.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

There are no reporting obligations for domestic vessels operating in the EEZ. Catches from these vessels can be regarded as unregulated.

Foreign vessels operating within India's waters are required to keep records under the foreign vessels act. However, there seems to be no requirement for regular reporting to the Indian authorities.

5.7.6.3 Non-compliance with other licence conditions by licensed/authorised vessels

There is an evident risk of non-compliance with other licence conditions by licensed/authorised vessels in India. The main license conditions which have led to non-compliance issues include permanent spatial restrictions; temporary spatial restrictions; mesh size restrictions; measures to protect ETP species; rules associated with the LoP scheme; and, restrictions on discarding by foreign trawlers.

Permanent spatial restrictions, which prohibit industrial vessels from entering inshore fishing zones, are regularly violated and can therefore be regarded as high risk. Previous studies have indicated that there is incursion of trawlers in the inshore zones of all mainland coastal states.

Temporary spatial restrictions (monsoon fishing ban) are one of India's major tools to manage and conserve fishery resources. Historically this ban was implemented at different time periods across coastal states. Absence of a uniform ban period is however thought to have rendered the fishing ban easy to undermine: fishing trawlers would continue fishing in banned areas and then land in adjacent states where the ban was not in place (Prمود, 2010). The ban has however been recently revised to be a uniform time period.

Violation of mesh size restrictions, implemented under the MFRAs, can be regarded as high risk throughout India. Evidence suggests that the mesh size restriction is not respected or adequately enforced.

Significant discarding is considered to occur by foreign trawlers licensed to fish within India's EEZ. Regulation 5 of The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act relates prohibits significant discarding by foreign fishing vessels. However, previous studies indicate that vessels do not abide by this provision, and, furthermore, efforts to monitor and deter this issue are minimal.

Rules associated with the LoP scheme are considered to be poorly adhered to. For example, the scheme requires vessels to be registered in India only, but it has been revealed that vessels maintain two registrations and participate in flag hopping, an internationally illegal practice.

5.7.6.4 Post-harvest IUU

Fishing vessels originating from India are acknowledged to frequently illegally fish within waters of other countries, particularly Sri Lanka and Pakistan. It is therefore prudent to suggest that illegal catches originating from both Sri Lankan and Pakistani waters may be commonly landed within Indian ports.

5.7.6.5 Other offences

Illegal harvest of protected species has been recorded in India and can be considered high risk. For example, Pramod (2010) presents a list fishing violations occurring in Orissa's territorial waters, of which a number of violations relate to the capture of turtles. As previously discussed, cases involving the capture of protected species by India's domestic fleet have also been presented in the media⁹⁵. Furthermore, illegal fishers from Myanmar are acknowledged to target protected species when fishing off the coast of the Andaman Islands⁹⁶

Table 54 shows the IUU risks that have been identified as possible risks for India

⁹⁵ <http://odishasuntimes.com/2015/03/03/six-fishermen-held-fishing-near-turtle-nesting-site-odisha/>

⁹⁶ <http://www.mmtimes.com/index.php/business/610-india-repeats-warning-on-illegal-fishing.html>

Table 54 Specific risks identified for India and the fleets to which risks apply.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed fishing by domestic fleets	1,2,3,4
	Unlicensed fishing in EEZ by boats from other regional states-Sri Lanka, Tuna Longlining	6
	Unlicensed fishing in EEZ by boats from other regional states – Pakistan	8
	Unlicensed fishing in EEZ by boats from other regional states – Bangladesh, Trawling, West Bengal and Orissa	5
	Unlicensed fishing in EEZ by boats from other regional states – Myanmar, Andaman Islands	7
	Incursion of industrial fisheries into restricted, artisanal zones	1,2,3
Non-compliance with reporting obligations by licensed/authorised vessels	No reporting obligations for the domestic EEZ fleet	4
	Under-reporting target species (Violations of LoP scheme)	5
	Misreporting of bycatch species (Significant discarding by foreign licensed trawlers)	4
Non-compliance with other licence conditions by licensed/authorised vessels	Landing of catch in unauthorised foreign ports (Violations of LoP scheme)	4
	Use of prohibited gear	2
	Illegal fishing related to spatio-temporal closures	2
Post-harvest IUU	Illegal transshipping	4
Other offences	Illegal harvest/possession of sharks or other protected species (i.e. under the Wild Life Protection Act (1972) (i.e. turtles, sea cucumbers))	All

5.7.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 55), impact (Table 56) and level of inherent risk (Table 57) for India based on the risks identified in Table 54.

Table 55 Assessment of risk likelihood – India.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing by domestic fleets	Moderate	High	Unlikely
Unlicensed fishing in EEZ by boats from other regional states-Sri Lanka, Tuna Longlining	High	Moderate	Likely
Unlicensed fishing in EEZ by boats from other regional states – Pakistan	Moderate	Moderate	Moderate
Unlicensed fishing in EEZ by boats from other regional states – Bangladesh, Trawling, West Bengal and Orissa	High	Moderate	Likely
Unlicensed fishing in EEZ by boats from other regional states – Myanmar, Andaman Islands	High	Moderate	Likely
Incursion of industrial fisheries into restricted, artisanal zones	High	Weak	Likely
Non reporting of catch by the domestic EEZ fleet	Moderate	Very weak	Likely
Under-reporting target species (Violations of LoP scheme)	Very High	Weak	Almost Certain
Misreporting of bycatch species (Significant discarding by foreign licensed trawlers)	Very High	Weak	Almost Certain
Landing of catch in unauthorised foreign ports (Violations of LoP scheme)	Very High	Weak	Almost Certain
Use of prohibited gear	High	Very Weak	Almost Certain
Illegal fishing related to spatio-temporal closures	High	Weak	Likely
Illegal transshipping	High	Weak	Likely
Illegal harvest/possession of sharks or other protected species (i.e. under the Wild Life Protection Act (1972) (i.e. turtles, sea cucumbers))	High	Moderate	Likely

Table 56 Assessment of risk impact – India.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing by domestic fleets	Moderate	Moderate	Moderate
Unlicensed fishing in EEZ by boats from other regional states-Sri Lanka, Tuna Longlining	Moderate	Moderate	Moderate
Unlicensed fishing in EEZ by boats from other regional states – Pakistan	Moderate	Vulnerable	Major
Unlicensed fishing in EEZ by boats from other regional states – Bangladesh, Trawling, West Bengal and Orissa	Moderate	Vulnerable	Major
Unlicensed fishing in EEZ by boats from other regional states – Myanmar, Andaman Islands	Moderate	Vulnerable	Major
Incursion of industrial fisheries into restricted, artisanal zones	High	Vulnerable	Major
No reporting of catch by the domestic EEZ fleet	High	Moderate	Major
Under-reporting target species (Violations of LoP scheme)	Low	Moderate	Minor
Misreporting of bycatch species (Significant discarding by foreign licensed trawlers)	High	Highly Vulnerable	Major
Landing of catch in unauthorised foreign ports (Violations of LoP scheme)	Low	Moderate	Minor
Use of prohibited gear	High	Highly Vulnerable	Serious
Illegal fishing related to spatio-temporal closures	Low	Moderate	Minor
Illegal transshipping	Moderate	Moderate	Moderate
Illegal harvest/possession of sharks or other protected species (i.e. under the Wild Life Protection Act (1972) (i.e. turtles, sea cucumbers))	High	Highly Vulnerable	Serious

Table 57 Assessment of inherent risk – India.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing by domestic fleets	Unlikely	Moderate	Moderate
Unlicensed fishing in EEZ by boats from other regional states-Sri Lanka, Tuna Longlining	Likely	Moderate	High
Unlicensed fishing in EEZ by boats from other regional states – Pakistan	Moderate	Major	High
Unlicensed fishing in EEZ by boats from other regional states – Bangladesh, Trawling, West Bengal and Orissa	Likely	Major	High
Unlicensed fishing in EEZ by boats from other regional states – Myanmar, Andaman Islands	Likely	Major	High
Incursion of industrial fisheries into restricted, artisanal zones	Likely	Major	High
No reporting of catch by the domestic EEZ fleet	Likely	Major	High
Under-reporting target species (Violations of LoP scheme)	Almost Certain	Minor	High
Misreporting of bycatch species (Significant discarding by foreign licensed trawlers)	Almost Certain	Major	Severe
Landing of catch in unauthorised foreign ports (Violations of LoP scheme)	Almost Certain	Minor	High
Use of prohibited gear	Almost Certain	Serious	Severe
Illegal fishing related to spatio-temporal closures	Likely	Minor	Moderate
Illegal transshipping	Likely	Moderate	High
Illegal harvest/possession of sharks or other protected species (i.e. under the Wild Life Protection Act (1972) (i.e. turtles, sea cucumbers))	Likely	Serious	Severe

5.7.8 Impacts of IUU

There are clear impacts of unlicensed fishing by national and foreign vessels in India's EEZ. For example, the management of stocks will be negatively affected due to the consequential unknowns relating to harvest rates and stock status. There will also be direct losses to the Indian economy through the loss of licensing revenues from national and foreign boats, and indirect losses associated with the depletion of commercially exploited stocks. Furthermore illegal fish caught by foreign vessels are unlikely to be landed in India, and it is more likely they will be landed in ports in Bangladesh, Pakistan, Myanmar and Sri Lanka. This will result in a loss of national revenue in the form of potential taxation and other potential benefits to local industry.

Incursion of industrial fisheries into restricted, artisanal zones may have substantial impacts on the environment and on the livelihoods of artisanal fishers. Industrial trawlers which violate the restrictions will harvest fisheries resources reserved for artisanal fishers, thus reducing the harvestable stock available for small-scale fishers. The impact this will have on livelihoods will be dependent on the overall level of exploitation on the focal stocks and their status (i.e. under exploited or over exploited). Additionally, industrial vessels which utilise destructive gear, such as trawls, may damage sensitive inshore habitats.

No reporting of catch by the domestic EEZ fleet, under-reporting target species (Violations of LoP scheme), misreporting of bycatch species (significant discarding by foreign licensed trawlers), and landing of catch in unauthorised foreign ports (Violations of LoP scheme) will all have similar impacts to unlicensed fishing in terms of negative implications on fisheries management due to unknown harvest rates and stock status. Again there is the potential loss of national revenue from potential taxation on landings.

The use of prohibited gear is regarded as common in India, particularly the use of restricted mesh sizes in India's trawl fisheries. The ubiquitous use of small mesh sizes may potentially have significant negative impacts on the fish stocks as large volumes of juvenile fish may be removed, thus contributing to overexploitation.

Under- or non-reporting target species by the artisanal and industrial domestic fleets, misreporting of bycatch species, and non- or delayed submission of logbooks will have similar impacts as previously mentioned, in terms of unknown harvests and stocks. Again there is the potential loss of national revenue from potential taxation on landings.

Illegal fishing related to spatio-temporal closures of depth zone restrictions is likely to have impacts on fish stocks. For example the violation of the temporal fishing ban will contribute to the exploitation of stocks instead of allowing them the opportunity to recover.

Illegal transhipping is highlighted with a high level of risk and would mostly impact high value species such as yellowfin and bigeye tuna from longliners. This practice adds no more catch to the amount taken illegally but would affect the methods of IUU fishing and the manner in which MCS operations should be undertaken to effectively police the Indian EEZ.

The illegal harvest or possession of sharks or other protected species (turtles and sea cucumbers) is likely to have substantial impacts on the target populations due to their inherent vulnerability and the nature of exploitation.

5.7.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

Unlicensed fishing by Sri Lankan vessels is acknowledged to regularly occur in India's waters. It is thought that these vessels are primarily longlining and targeting high value species such as sharks and tuna. Considering high frequency of incursions, fishing method and the substantial size of domestic catches, it is estimated that an additional 1-5% over the total reported catch is potentially taken by these fleets for the 1990-2008 period. Furthermore, due to increased activity of the Sri Lankan fishing fleet during 2008-2013 due to improved political stability, it is estimated that an additional 1-8% over the total reported catch is potentially taken by these fleets for this period.

Unlicensed fishing by Pakistani vessels is considered to regularly occur in India's waters. However, the nature of the fishing activity undertaken is relatively unknown. Considering the frequency and substantial size of domestic catches, it is estimated that an additional 1-8% over the total reported catch is potentially taken by these fleets for the 1990-2013 period.

Unlicensed fishing by Bangladeshi vessels is considered to regularly occur in India's waters, primarily in the states of West Bengal and Orissa. Bangladeshi vessels are considered to primarily target shrimp using trawl gear. Considering the regularity of the illegal fishing, the size of the Bangladeshi industrial fleet and substantial size of India's domestic catches, it is estimated that an additional 1-5% over the total reported catch is potentially taken by these fleets for the 1990-2013 period.

Unlicensed fishing by Myanmar vessels is considered to regularly occur in India's waters, particularly in the Andaman and Nicobar Islands. Accounts of this illegal fishing activity indicate that illegal fishers from Myanmar target a variety of species including high value species, such as tuna, and ETP species, such as sharks and sea cucumbers. Considering the nature of the target species, the location, and the substantial size of India's domestic catches, it is estimated that an additional 1-5% over the total reported catch is potentially taken by these fleets for the 1990-2013 period.

Misreporting or non-reporting of catch by the domestic fishing fleet is considered a significant form of IUU fishing in India. The subsistence fishing sector is considered to be unreported and has formed a substantial component of recent catch reconstructions for India (Hornby *et al.*, 2015). Considering recent catch reconstructions and the size of the reported catches for India it is estimated that an additional 10-45% over the total reported catch is potentially taken by these fleets for the 1990-2013 period.

Violations of the LoP scheme is another risk which is acknowledged to contribute to the total IUU catch for India. Considering the relatively low numbers of vessels involved, the target species of these vessels (high value species such as Tuna), and that these vessels are acknowledged to have regularly transhipped their catches, it is suggested that an additional 1-15% over the total reported catch of Tuna is potentially unreported by these fleets for the 1990-2013 period.

Significant discarding is acknowledged to occur in industrial fisheries in India. Taking account of recent estimations of the discards of trawl fisheries given by Pramod (2010), it is estimated that 10-30% over the total reported catch is potentially unreported by these fleets for the 1990-2013 period.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Indian EEZ can be found in Table 58.

Table 58 Summary of estimated rates – India.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing by domestic fleets	1,2,3,4	All	1990-2013	1	5	0	0
Unlicensed fishing in EEZ by boats from other regional states-Sri Lanka, Tuna Longlining	6	Tuna, shark	1990-2007 2008-2013	1 1	5 8	0	0
Unlicensed fishing in EEZ by boats from other regional states – Pakistan	8	Mixed	1990-2013	1	8	0	0
Unlicensed fishing in EEZ by boats from other regional states – Bangladesh, Trawling, West Bengal and Orissa	5	Shrimp	1990-2013	1	5	0	0
Unlicensed fishing in EEZ by boats from other regional states – Myanmar, Andaman Islands	7	Mixed	1990-2013	1	5	0	0
Misreporting or non-reporting of catch by domestic fleets	1,2,3	---	1990-2013	0	0	10	30
Under-reporting target species (Violations of LoP scheme)	4	Tuna only	1990-2013	0	0	1	15
Misreporting of bycatch species (Significant	5	Mixed finfish	1990-2013	0	0	1	10

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
discarding by foreign licensed trawlers)							
Incursion of industrial fisheries into restricted, artisanal zones	2	Mixed	1990-2013	0	0	0	0
Landing of catch in unauthorised foreign ports (Violations of LoP scheme)	4	Mixed	1990-2013	0	0	0	0
Use of prohibited gear	2	Mixed	1990-2013	0	0	0	0
Illegal fishing related to spatio-temporal closures	2	Mixed	1990-2013	0	0	0	0
Illegal transshipping	4	Tuna, shark	1990-2013	0	0	0	0
Illegal harvest/possession of sharks or other protected species (i.e. under the Wild Life Protection Act (1972) (i.e. turtles, sea cucumbers))	All	Shark and other ETP species	1990-2013	0	0	0	0

NB: Estimated rates are based on the national catch and not individual fleets.

5.7.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 340,273 and 1,302,817 t per annum (i.e. 11.79 and 45.13%). Illegal catches contribute an estimated 2.8%-16.99% and unreported catches 8.99 – 28.14% in addition to the reported catch. These are relatively high losses but due to the high level of reported catch the losses are diluted in terms of the percentage losses.

Losses from Illegal, Unreported and Unregulated fishing in the Indian EEZ are estimated to average between USD 696.79 and 2,537.81 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 59 and as first landed value in Table 60. Profiles of the estimated level of illegal and unreported fishing combined in India can be found in Figure 16 (catch in t) and Figure 17 (catch value in USD).

Table 59 Summary of estimated IUU by year in India (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	2270208	62626	379709	201965	629368	0	0
1991	2435667	66210	402101	212685	665483	0	0
1992	2555815	68517	415573	220497	689004	0	0
1993	2574307	70479	428165	225586	709317	0	0
1994	2794733	78061	474470	249586	785596	0	0
1995	2749362	76023	461061	244315	765019	0	0
1996	2909516	81994	496584	262728	827350	0	0
1997	2979173	83554	505956	269984	839999	0	0
1998	2781053	77767	472376	249146	782453	0	0
1999	2856066	81112	492801	259813	815982	0	0
2000	2820727	80564	488804	258733	810629	0	0
2001	2841689	81091	491767	261202	815213	0	0
2002	2969754	85622	519022	276059	860753	0	0
2003	2963546	85735	519969	276281	861657	0	0
2004	2863720	81987	497601	263120	824940	0	0

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2005	2847618	81162	492823	260935	815600	0	0
2006	2952199	83384	505955	268152	838420	0	0
2007	3035884	85374	518179	273085	860271	0	0
2008	3151870	86852	530784	278221	873963	0	0
2009	3142802	87266	532325	280698	877720	0	0
2010	3245165	87933	534456	285104	883214	0	0
2011	3250099	90700	553519	291457	911574	0	0
2012	3408960	93286	569425	299630	937853	0	0
2013	3418821	92721	566222	297525	931983	0	0

Table 60 Summary of the estimated value of IUU (USD) by year in India (1990 – 2012).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	4706.87	93.23	600.58	448.22	1366.75	0.00	0.00
1991	5265.06	103.60	667.36	498.80	1522.12	0.00	0.00
1992	5526.92	108.32	697.69	521.25	1590.11	0.00	0.00
1993	5270.82	105.44	676.81	498.52	1526.05	0.00	0.00
1994	6140.66	123.56	793.70	587.28	1796.39	0.00	0.00
1995	5616.23	113.56	727.68	534.21	1633.21	0.00	0.00
1996	6105.75	122.80	789.07	585.27	1792.20	0.00	0.00
1997	6317.97	126.68	815.23	606.79	1848.99	0.00	0.00
1998	6326.28	126.54	814.61	606.73	1853.68	0.00	0.00
1999	6539.54	131.42	846.19	630.90	1927.52	0.00	0.00
2000	5757.45	116.60	748.51	554.93	1698.07	0.00	0.00
2001	5369.72	110.12	704.71	516.44	1579.47	0.00	0.00
2002	5833.86	120.94	773.23	564.76	1725.93	0.00	0.00
2003	5150.67	107.72	686.82	497.13	1522.48	0.00	0.00
2004	4987.85	102.47	654.77	477.97	1467.34	0.00	0.00
2005	5086.41	103.87	664.67	487.30	1492.65	0.00	0.00
2006	5169.91	105.21	673.02	492.71	1509.68	0.00	0.00
2007	5702.54	114.27	734.20	542.96	1667.73	0.00	0.00
2008	5695.74	112.76	726.08	536.22	1643.00	0.00	0.00
2009	6015.69	120.22	773.75	571.71	1751.57	0.00	0.00
2010	5996.69	119.88	770.11	564.48	1721.90	0.00	0.00
2011	7410.77	148.41	957.97	711.23	2171.37	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	9363.90	186.13	1203.28	899.45	2735.77	0.00	0.00
2013	9212.05	182.39	1179.96	881.55	2683.38	0.00	0.00

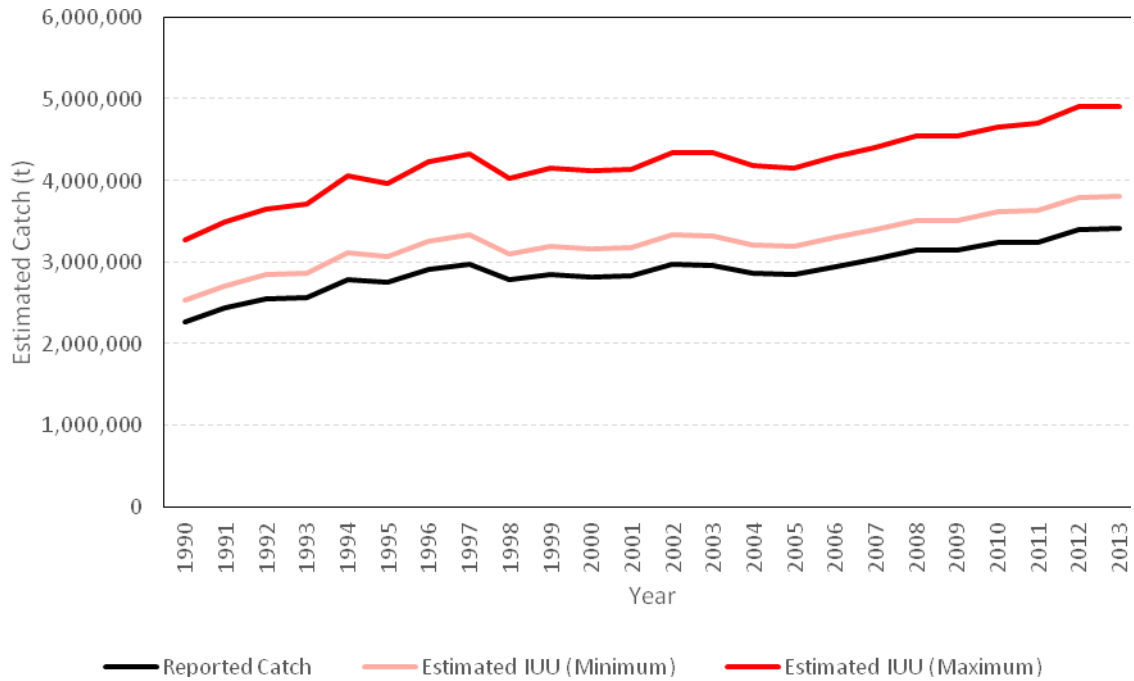


Figure 16 IUU Catch Profile (India) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

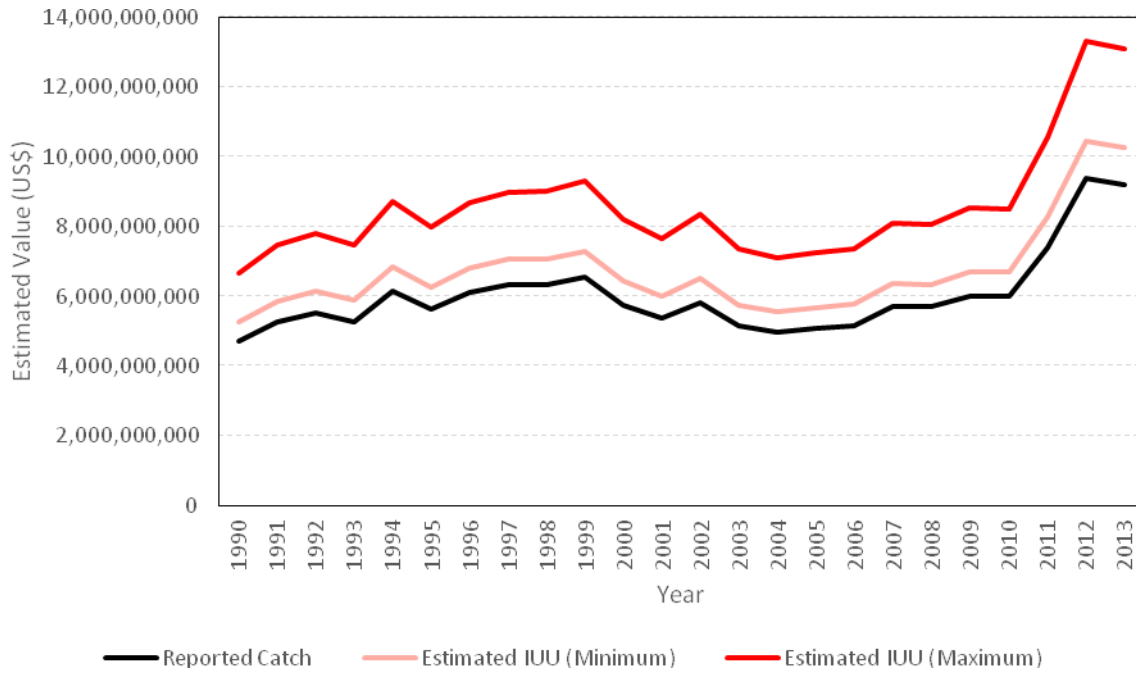


Figure 17: Catch Value Profile (India) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.8 Indonesia

5.8.1 Introduction

Indonesia is the world's largest archipelagic state and it contains highly diverse marine ecosystems and productive fishing grounds. The Indonesian EEZ covers an area of 2,436,060 km² with an additional area of 3,306,000 km² defined as territorial sea and 271,476 km² as contiguous zone. Additional areas of disputed territory in the South China Sea of an additional 200,000 km² and above are also claimed by Indonesia and neighbouring States. The Indonesian EEZ shares borders with India and Thailand to the north, Malaysia and the Philippines across a wide range of its northern boundary, Palau and Papua New Guinea to the east, East Timor and Australia in the south. In 2012, Indonesia's reported fisheries production equalled 5,420,247 tonnes, the second highest national fisheries production for the year (FAO, 2014).

The geography and rich fishing grounds of Indonesia unfortunately make it particularly vulnerable to Illegal, Unreported and Unregulated fishing. Illegal fishing practices, such as dynamite and cyanide fishing, alongside unreported fishing by domestic and foreign fishing vessels have been readily acknowledged as threats to the sustainability of Indonesia's marine ecosystems (Pet-Soede & Erdmann, 1998; Pet-Soede et al., 1999; Varkey et al., 2010; JALA, n.d.). The exact scale of IUU is difficult to determine, and its impact on the marine environment and national resources difficult to define. Previous reports by representatives of the Indonesian government have estimated the cost of IUU to Indonesian economy are ~ US \$ 2-5 billion per year⁹⁷, but it should be noted that the methods used to derive these figures are unknown.

Indonesia has recently demonstrated its commitment to deterring IUU fishing by publishing a National Plan of Action to prevent and combat IUU fishing (2012–2016). The plan of action states national Monitoring Control Surveillance (MCS) protocols, highlights the legal basis for IUU regulations, and describes the future steps to be taken to further prevent and combat IUU. The primary objective of this plan of action is to function as a reference manual for each organisational unit of the Ministry of Marine Affairs and Fisheries (MMAF) in their efforts to prevent and combat IUU fishing.

Furthermore, under the current administration Indonesia has launched a 'crackdown' on IUU in order to deter neighbouring countries, such as Malaysia and China, fishing illegally in Indonesian waters. Since taking office in October 2014, the administration has detained hundreds of fishers and sunk dozens of vessels caught fishing illegally in Indonesian waters.

⁹⁷ http://www.oecd.org/tad/events/Session_4_Point_3_Ida_Kusuma_Indonesia.pdf

5.8.2 Fleet breakdown

Indonesia is a vast archipelagic country with a diverse national fishing fleet. At the highest level of aggregation Indonesia's marine fisheries can be grouped into three main segments: small scale, medium scale and large scale. The large-scale fisheries are characterised by a strong export orientation, high value target species, particularly shrimp and tuna, deploying shrimp nets and tuna longlines and operate in isolation from small scale fishing fisheries (Priyono & Sumiono, 1997). Medium-scale fisheries are characterised by vessels less than 30 GT using inboard engines. These vessels use gear such as pole and line, purse seines, and gillnets (Priyono & Sumiono, 1997). The small scale fisheries are estimated to account for 95% of Indonesia's fisheries production and are characterised by small vessels with 1 to 3 crew, using gill nets, drifting gillnets, seine nets, cast nets and traps (Priyono & Sumiono, 1997).

#	Description	Gear	Flag(s)	Target species	Comment
1	Foreign Industrial	Trawl Mixed	Malaysia Thailand Philippines Vietnam	Mixed	Illegal fleet
2	Small-scale domestic	Gill nets, Seine nets, Cast nets Traps	Indonesia	Mixed	95% of Indonesia's catch
3	Medium-Scale domestic	Pole and line, Purse seines, Gillnets	Indonesia	Mixed	
4	Large-Scale domestic	Trawl Longline	Indonesia	Shrimp Tuna	Export orientation

Table 61 Fleet breakdown for the Republic of Indonesia

5.8.3 Catch breakdown by fleet

Fleet-level catch data for Indonesia are not readily available. In general, catches by Indonesia's fleets are multispecies in nature and consist of both demersal and pelagic species, such as snappers, groupers, sweetlips, mackerels, scads, anchovies, tunas (mostly skipjack, yellowfin and bigeye tunas), penaeid shrimp, squids, and others.

National catch statistics presented by the FAO for Indonesia (FAO, 2015) indicate that the top five landed species for the period include the false Venus comb (*Murex scolopax*), scads (*Decapterus spp.*), skipjack tuna (*Katsuwonus pelamis*), short mackerel (*Rastrelliger brachysoma*) and goldstripe sardinella (*Sardinella gibbosa*). All of which are caught in the Pacific Ocean and comprise ~28% of total national catches (by weight).

Catch reconstructions presented by Sea Around Us (Pauly and Budimartono, 2015) for Central and Eastern Indonesia for the 1950 – 2010 period, estimates a total catch of 117 million tonnes, 39% larger than the 84.2 million tonnes reported to the FAO. Of the total estimated catch, reported and unreported catch for industrial fisheries constituted 58.6%; discards from industrial fisheries, mainly

by shrimp trawlers, constituted 18%; artisanal catches constituted 31%; artisanal discards <1%; subsistence fishing 3%; and recreational fisheries 1%.

5.8.4 IUU influencing factors

5.8.4.1 Legislation and governance

The Ministry of Marine Affairs and Fisheries (MMAF) alongside provincial and district fisheries services (*Dinas Kelautan dan Perikanan (DKP)*) are responsible for the management of Indonesia's fisheries resources. MMAF consists of the Secretariat-General, the Inspectorate-General, five Directorates-General (Capture Fisheries; Aquaculture; Marine, Coastal, and Small Islands; Fisheries Products, Processing and Marketing; Marine and Fisheries Resources Surveillance) and three Agencies (Research and Development, Human Resources Development, and Fish Quarantine and Inspection). MMAF manage the nation's fisheries in accordance with Law 31 of 2004, as amended by Law 45 of 2009⁹⁸, which provides the legal basis for a wide range of fisheries management measures; a number of which have been recently revised in an attempt to improve the effectiveness of fisheries management and conservation (see annex 1 for a list of relevant legislation). To facilitate fisheries management, Indonesia is divided into 11 fisheries management regions (or WPP-NRI) (see Figure 18) under the Minister of Marine Affairs and Fisheries Regulation number PER. 01/ MEN/2009 on Fisheries Management Area of the Republic of Indonesia⁹⁹. Complementary to the management regions, Indonesia has implemented a zoning system in order to divide management responsibilities across administrative levels¹⁰⁰: The MMAF (national level) are responsible for the management of marine waters >12 nm; Provincial fisheries service (*Dinas Kelautan dan Perikanan (DKP)*) are responsible for the management of marine waters 4-12nm from the shoreline; and, district-level fisheries services (DKP) are responsible for marine waters up to 4nm from the shoreline. MMAF has implemented a number of initiatives and regulations designed to regulate and control national and foreign vessels.

⁹⁸ <http://faolex.fao.org/docs/pdf/ins97600.pdf>

⁹⁹ <https://bangim76.files.wordpress.com/2009/10/permen-01-2009-wilayah-pengelolaan-perikanan.pdf>

¹⁰⁰ Law 32/2004 and government regulation 38/2007

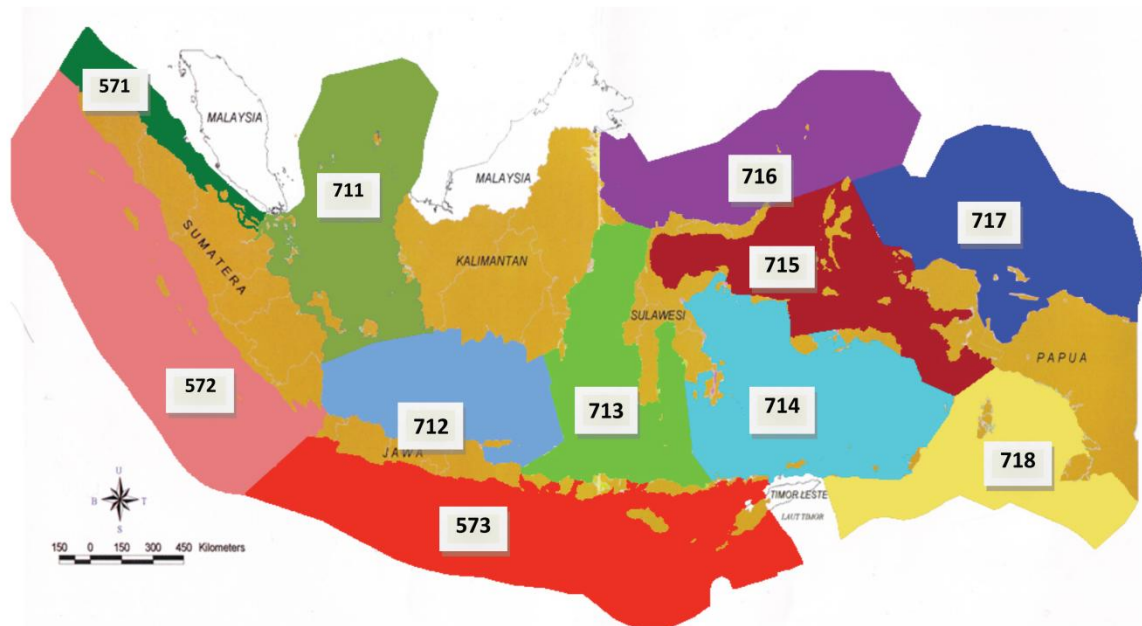


Figure 18 Fisheries management regions of Indonesia. (Source: Indonesia NPOA for IUU fishing)

5.8.4.2 Licensing and reporting

A vessel licensing system is the main instrument by which Indonesia manages its fisheries. All fishing vessels and fish carrier vessels >5 GT¹⁰¹ and operating within Indonesian waters must have a Fisheries Business Licence (SIUP), a Catch License (SIPI) and/or a Fish Carrier Vessel Licence (SIKI). Whether licences are granted to individual vessels is based on consideration of, *inter alia*, business planning, potential fisheries resources and allowable catch. The protocols for issuance, renewal and modification of licences are clearly stated within the Indonesian Plan of Action to Prevent and Combat IUU Fishing, alongside roles and responsibilities (see Figure 19 & Figure 20).

Responsibilities of the licensing system (as presented in Indonesia’s NPOA):

- a) “the Director General is authorised to issue the SIUP, SIPI and SIKPI for the fishing vessel and fish carrier vessel with the size over 30 (thirty) GT, using/employing foreign capital and/or labour (MMAF);
- b) the Governor is authorized to issue the SIUP, SIPI and SIKPI for the fishing vessel and fish carrier vessel with the size between 10 (ten) GT to 30 (thirty) GT, in his administration area and operated within the area of fishery management under his authority, and not employing foreign capital and/or employees) (Provincial DKP);
- c) the Regent/Mayor is authorized to issue the SIUP, SIPI and SIKPI for the fishing vessel and fish carrier vessel with the size between 5 (five) GT to 10 (ten) GT, in his administration area

¹⁰¹ Fishing vessels <5 GT are only required to register at the local *Dinas Kelautan dan Perikanan* (OECD, 2013)

and operated within the area of fishery management under his authority, and not employing foreign capital and/or employees (District DKP)”.

The legal basis of the fisheries licensing scheme is based on the following acts:

1. “Minister of Marine Affairs and Fisheries Regulation Number PER.14/MEN/2011 on Fishing Business as amended by Minister of Marine Affairs and Fisheries Regulation No. PER.49/MEN/2011;
2. Minister of Marine Affairs and Fisheries Regulation Number PER.12/MEN/2012 on High Seas Fishing Business.”

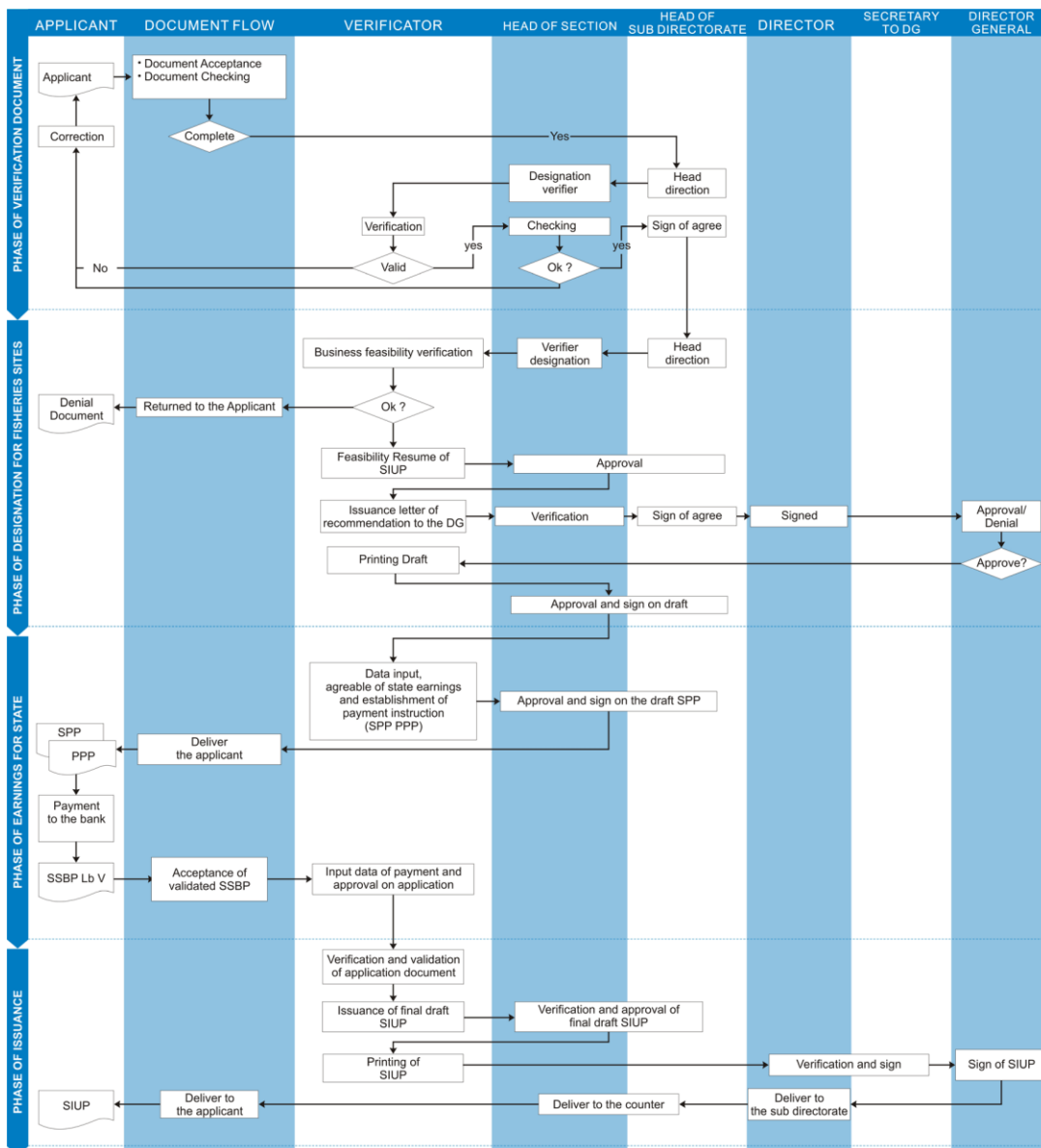


Figure 19 Procedure for Issuance, renewal and modification of Fisheries Business Licence (SIUP) (Source: Indonesian NPOA for IUU fishing)

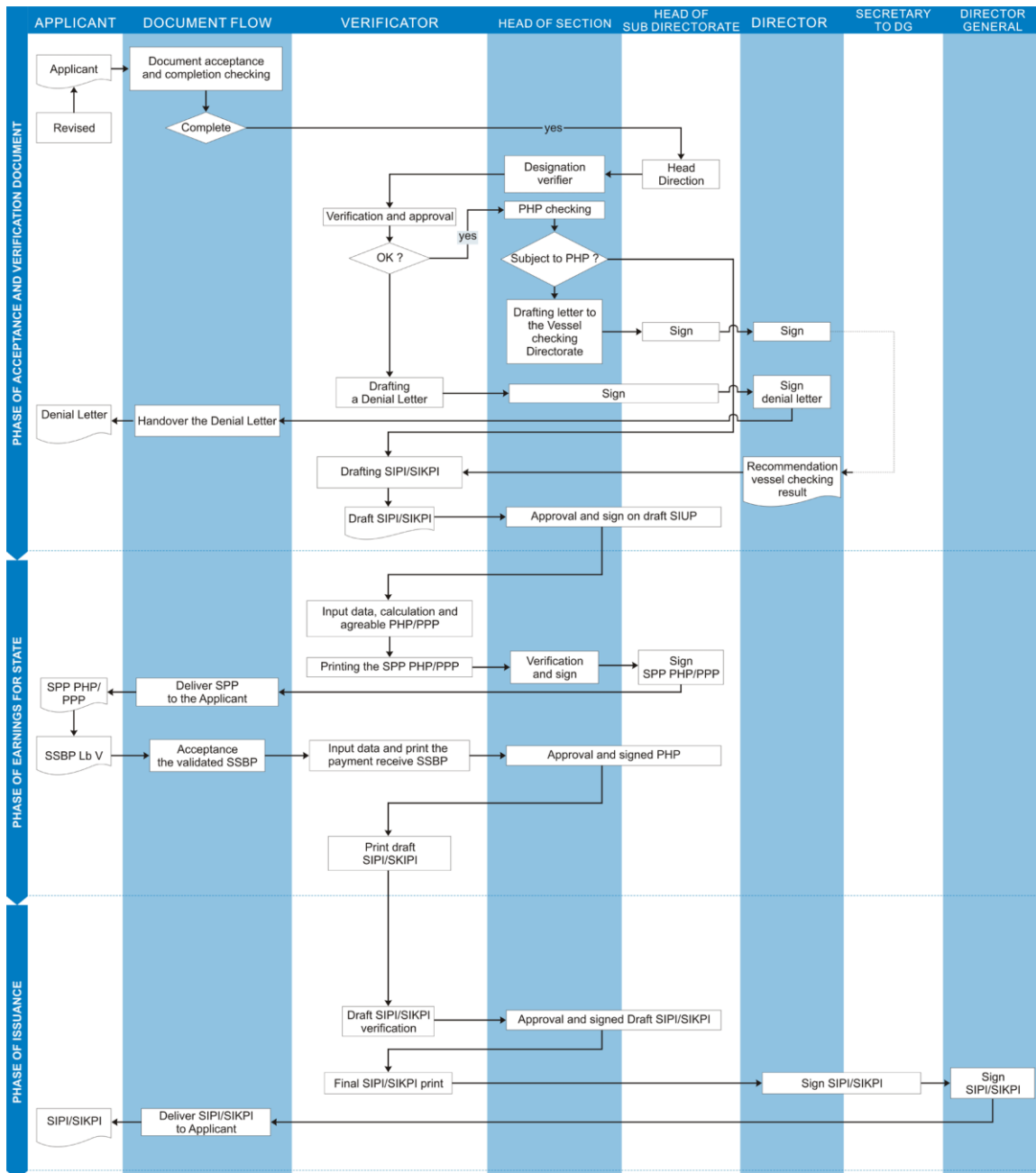


Figure 20 Procedure for Issuance, renewal and modification of Catch License (SIPI) and Fish Carrier Licence (SIKI)

(Source: Indonesia NPOA for IUU fishing)

Reporting

Vessel logbooks are mandatory for all Indonesian fishing vessels with a licence (i.e. all vessels >5 GT). Logbooks are required to contain data on location, fishing practices, and catch for each fishing trip. Requirements for vessel logbooks are detailed within Minister of Marine Affairs and Fisheries Regulation Number PER.18/MEN/2010 on Fishing Logbook.

A catch certification scheme was implemented in Indonesia from the 1st January 2010 in order to ensure the traceability of fisheries products originating from Indonesia, and to support trade

activities with the EU. The catch certification scheme was implemented under the Minister of Marine Affairs and Fisheries Regulation No. 28/2009 concerning Catch Certification, and subsequently modified by Minister of Marine Affairs and Fisheries Regulation Number PER.13/MEN/2012 on Catch Certificate.

Vessel Monitoring Systems (VMS)

To monitor fishing vessel activity a VMS has been operational within Indonesia since 2003. All Indonesian flagged vessels over 60 GT, including those operating outside of the Indonesian EEZ, are required to install a VMS transmitter by law¹⁰². Furthermore, an offline VMS for vessels 30–60 GT is also in place, which, instead of providing real-time positioning of the vessels, uploads tracking data upon a vessels return to the harbour (OECD, 2013). At the end of 2011, MMAF recorded that there were 4201 online VMS units installed with the average activation of 2122 units, and 1500 offline VMS units installed with an average activation of 970 units (Indonesia NPOA, 2012).

5.8.4.3 Restrictions, fines and penalties

Gear restrictions

Fisheries management within Indonesia's EEZ includes various gear restrictions: Pair trawling is prohibited; Trawl nets must meet design criteria given in Ministerial Regulation 11 of 2009, and trawl net use is restricted to five of the twelve management areas. Furthermore, the use of poisons, explosives and electrical techniques are prohibited under Fisheries Law No. 9, (19 June 1985).

Penalties

Penalties associated with fisheries violations in Indonesia include financial penalties, suspension or cancellation of licenses, refusal for new licenses and full removal from the fishery (Flewwelling and Hosch, 2006). Conviction of destructive gear use (explosives, poisons and electrical techniques) carries a penalty of up to 10 years in jail and/or a Rp 100 million fine (USD 7,300).

Indonesia has a slightly below average ranking globally compared to other States according to the World Bank Governance Indicators (131st out of 212 – 62nd percentile). As such we would suggest that any risks relating to direct corruption or a weak regulatory framework could be slightly increased. Risks are likely to exist relating to “Obstruction or bribery of fisheries officers” and “Falsification of documents” but not to the level observed in some regional States (See Table 159).

MCS protocols and capacity

The established legal framework supports a Monitoring, Control and Surveillance (MCS) programme developed to combat IUU fishing. Indonesia's MCS programme involves the coordination of several

¹⁰² Ministry of Marine Affairs and Fisheries Regulation No.5/2007 Concerning the Implementation of Fishing Vessel Monitoring System

agencies, including the Ministry of Marine Affairs and Fisheries (MMAF), Indonesian Navy (TNI-AL), Marine Police (Polair), Marine Security Coordinating Board (Bakorkamla), and Directorate General of Sea Transportation (HUBLA) Ministry of Transportation. Surveillance operations are executed independently by MMAF patrol vessels, and also, in addition to these independent operations, joint surveillance operations are conducted with the Navy and Marine Police. Furthermore, in accordance with Act No. 31 of 2004 on Fisheries as amended with the Act No. 45 of 2009, and the Minister of Marine Affairs and Fisheries Decree no. KEP.58/MEN/2001, community-based surveillance operations have been implemented by community-based surveillance groups called POKMASWAS; the function of POKMASWAS is to report any violations of fisheries regulations to law enforcement agencies. A graphical representation of Indonesia's MCS procedures is presented below.

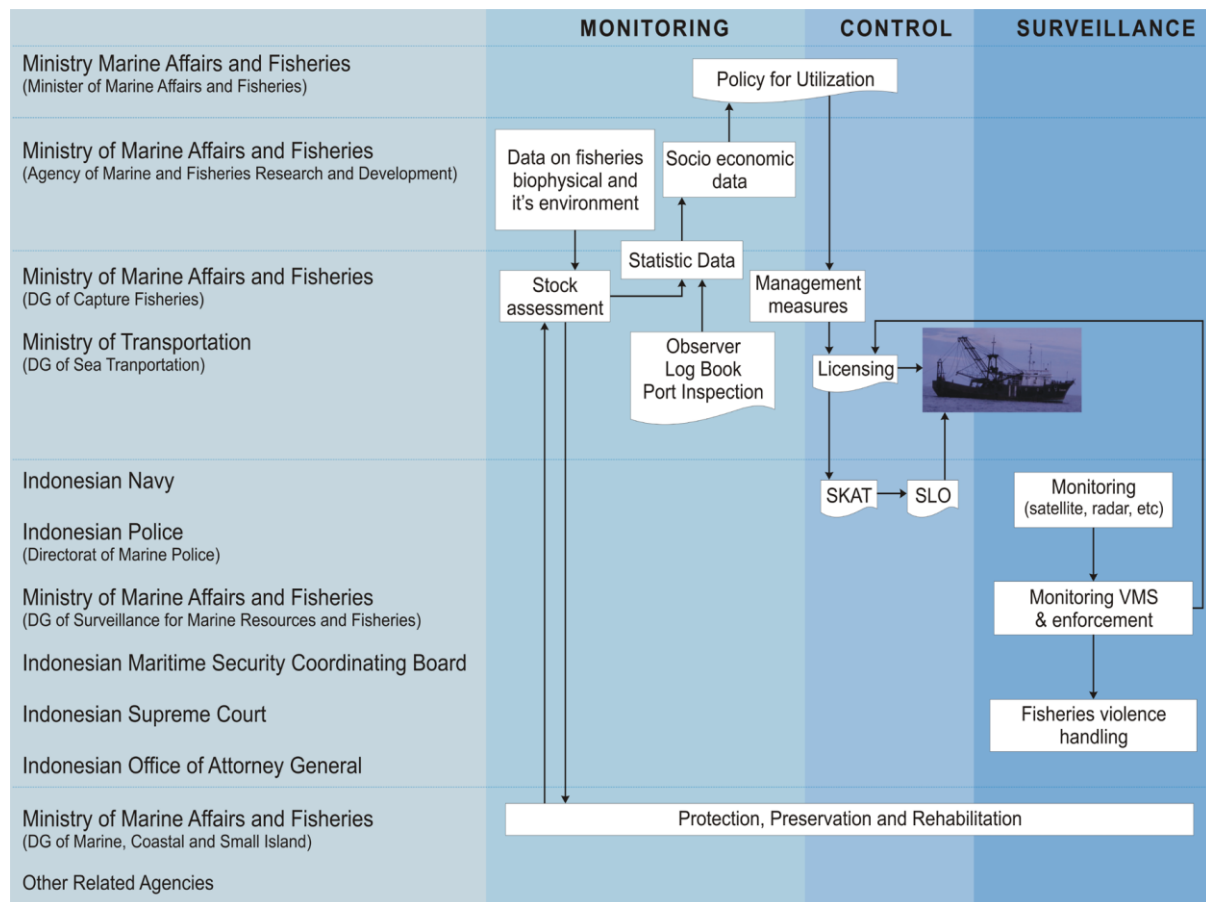


Figure 21 Indonesian MCS procedures for marine capture fisheries.

(Source: Indonesia NPOA for IUU fishing)

Indonesia's resources and capacity to implement MCS and combat IUU in 2011 included 25 MMAF decked patrol vessels and 64 speedboats (OECD, 2013). Furthermore, to process IUU offences judicial infrastructure has been established within Indonesia, including seven specialised Fishing Courts located in Jakarta, Belawan, Tanjung Pinang, Ranai, Pontianak, Bitung, and Tual. To improve the coordination of processing IUU offences a fisheries law enforcement coordination forum was created.

Memberships and arrangements

Indonesia is a member of several regional fisheries management organisations and has a number of bilateral and multilateral agreements with other nations to effectively manage fish stocks. Memberships as presented in the Indonesia NPOA are presented below:

1. IOTC (Indian Ocean Tuna Commission) member, Contracting Party status since 2007, stipulated by the Presidential Regulation Number 9 of 2007;
2. CCSBT (Commission for the Conservation of the Southern Bluefin Tuna) member, Contracting Party status, regulated with the Presidential Regulation Number 109 of 2007;
3. Cooperating Non-Member of the WCPFC. Efforts have been made to improve the membership status in the WCPFC and Indonesia intends to continue its membership application progress (Indonesia NPOA, 2012)
4. Participant, South East Asia Fisheries Development Centre (SEAFDEC);
5. Participant, the Arafura and Timor Seas Forum ();
6. Participant, Association of South East Asian Nations (ASEAN) Working Group on Fisheries;
7. Participant, The Regional Plan of Action to Promote Responsible Fishing, including Combating IUU Fishing in the Region;
8. Indonesia has established a Task Force RFMO through the Decree of the Minister of Marine Affairs and Fisheries Number KEP.06/MEN/2012 as RFMOs implementation and formed an Inter-Ministry coordination for WCPFC Ratification.

5.8.4.4 Port state

Indonesia has adopted port State measures (see Table 62) as a tool to combat IUU, and evidence suggests that the nation is committed to preventing foreign vessels suspected of IUU fishing from entering its ports. This intention is clearly communicated within Indonesia's NPOA and is further supported by the country's commitment to the FAO Port State Measures Agreement (PSMA)¹⁰³, which was signed in 2010. However, to implement effective port state measures it is recognised that a number of improvements to infrastructure and enforcement capacity are required (NPOA, 2012). Thus, to work towards PSMA ratification and effective PSM, a number of initiatives have recently been undertaken, including the designation of 5 fishing ports¹⁰⁴ as port state measure implementation stations; and, a new training programme for MMAF staff¹⁰⁵, developed by IMACs and NOAA, designed to provide knowledge and skills required to competently implement and

¹⁰³Signed in 2010 and currently in the process of ratification.

¹⁰⁴ The five designated fishing ports are namely Nizam Zachman, Belawan, Bitung, Pelabuhan Ratu, and Ambon

¹⁰⁵ <http://www.imacsindonesia.com/v5/index.php/en/news/274-port-state-measures-can-reduce-iuu-fishing>

enforce regulations, verify the completeness of documentation, examine and report on the physical condition of vessels and, when warranted, provide guidance regarding codes of conduct.

Table 62 Indonesian Port State Measures, August 2015.

#	Port State Measure	Measure text	Reference
1	PSM1-Designated Ports-All Vessels	<p>Article 41</p> <p>(3) Every fish catching ship and fish transporting ship are obliged to land its catches at stipulated ports or other designated ports.</p> <p>(4) Every person possessing and/or operating a fish catching ship and/or fish transporting ship not loading/unloading its catches at the stipulated fishing ports or the other designated ports More text as meant in paragraph (3) will be imposed to administrative sanction in the form of warning, freezing of permit, or revocation of permit.</p>	<p>Fisheries Law No. 31/2004, as amended by Law No. 45/2009 amending Law No. 31/2004 concerning Fishery, article 41(3),(4)</p>
2	PSM2-Sanctions-All Vessels	<p>Article 41</p> <p>(3) Every fish catching ship and fish transporting ship are obliged to land its catches at stipulated ports or other designated ports.</p> <p>(4) Every person possessing and/or operating a fish catching ship and/or fish transporting ship not loading/unloading its catches at the stipulated fishing ports or the other designated ports as meant in paragraph (3) will be imposed to administrative sanction in the form of warning, freezing of permit, or revocation of permit.</p>	<p>Fisheries Law No. 31/2004, as amended by Law No. 45/2009 amending Law No. 31/2004 concerning Fishery, article 41(3),(4)</p>

#	Port State Measure	Measure text	Reference
3	PSM3-Port Inspections-All Vessels	(2) Harbour masters at fishing ports have the duties and authority to: (c) re-check the completeness of fishing ship documents; (d) investigate technical and nautical aspects of fishing ships, and to investigate fish catching equipment gears, and fish catching auxiliary tools; (f) check log book of fish	Fisheries Law No. 31/2004, as amended by Law No. 45/2009 amending Law No. 31/2004 concerning Fishery, article 42(2)
4	PSM4-Port Departure Requirements-All Vessels	Any fishing ship going to embark for fish catching and/or fish transportation from a fishing port must possess a Sailing Approval Letter issued by the harbour master of the fishing port.	Fisheries Law No. 31/2004, as amended by Law No. 45/2009 amending Law No. 31/2004 concerning Fishery, article 42(3)
5	PSM5-Port Inspections-All Vessels	Control on fishery is executed by a Fishery Controller. Article 66B (1) The Fishery Controller referred to in Article 66 perform the following duties: (c) fishing ports and/or other appointed ports; Article 66C(1) In the performance of its duties referred to in Article 66, the Fishery	Fisheries Law No. 31/2004, as amended by Law No. 45/2009 amending Law No. 31/2004 concerning Fishery, articles 66(1), 66B(1) and 66C(1)
6	PSM6-Port Inspections-All Vessels	Article 73 (1) Investigation of criminal acts in the field of fishery in the fishery management zone of the State of the Republic of Indonesia shall be performed by Government Civil Employee Fishery Investigators, Indonesian Naval Officer Investigators, and/or Indonesian Police Investigators.	Fisheries Law No. 31/2004, as amended by Law No. 45/2009 amending Law No. 31/2004 concerning Fishery, articles 73(1), 73A

#	Port State Measure	Measure text	Reference
7	PSM7-Documentation Requirements-All Vessels	<p>Article 8</p> <p>Every fishing vessel or fish-transporting vessel, either KII or KIA [national- and foreign flag carrying vessels], entering a general port or a fishing port shall be obligated to surrender the licenses and certificates as meant in Article 7 to the port administrator or the head of a fishing port or an appointed official along with the SIB sailing</p>	<p>Joint Decision of the Director General of Fisheries and the Director General of Sea Communications No. JK.120/DJ.7172.96 and No. PY.68/I/12-96 dated 12 July 1996 re the granting of sailing licences to fishing vessels and fish-transporting vessels, article 8</p>
8	PSM8-Trade-related Measures-Foreign Vessels	<p>Article 23</p> <p>(1) A foreign-flag vessel carrying live fish shall be permitted only to carry living fish from 2 (two) seaports, 2 (two) fish-collection locations/sites or 2 (two) fish-breeding sites, accommodate and/or carry fish which has been collected, as specified in the SIKPIA or SPKPIA to an export destination country.</p> <p>(2) A fish carrying vessel carrying</p>	<p>Decree of the Minister of Agriculture No. 805/Kpts/IK.120/12/95 on the stipulation on the use of fish-carrying vessels, article 23</p>
9	PSM9-Documentation Requirements-Foreign Vessels	<p>Article 25</p> <p>After entering a seaport or a site as referred to in Article 22, a fish-carrying vessel shall be obligated to report its arrival to the MCS Officer.</p>	<p>Decree of the Minister of Agriculture No. 805/Kpts/IK.120/12/95 on the stipulation on the use of fish-carrying vessels, article 25</p>

#	Port State Measure	Measure text	Reference
10	PSM10-Documentation Requirements-Foreign Vessels	<p>Article 1</p> <p>The port appointed as a base for a chartered foreign flag fishing vessel for fishing in the EEZ before and after carrying out fishing is called a fishing base:</p> <p>A. For the fishing area in the South China Sea and the Pacific Ocean are:</p> <ol style="list-style-type: none"> 1. Tanjung Pinang harbour, Riau Province 2. Tarempa coastal fishing port, Riau Province 3. Batam 	Indonesia: Decree of the Minister of Agriculture on appointing a port as a fishing base for chartered foreign flag fishing vessels for fishing in the EEZ (No. 144 of 1993), articles 1 and 2(2)
11	PSM11-Trade-related Measures-Foreign Vessels	<p>Article 1</p> <p>(1) Indonesian fishing companies possessing IUP intending to use foreign flag fishing vessel through charter arrangements for fishing in the EEZ must possess PPKA which is valid for a period of three years</p> <p>(2) The foreign flag fishing vessel mentioned above must possess SIPI.</p> <p>Article 4</p> <p>(1) The Indonesian fishing company as</p>	Decree of the Minister of Agriculture on the use of charter of foreign flag fishing vessels for fishing in the Indonesian Exclusive Economic Zone (No. 816 of 1990), articles 1(1),(2) and 4

#	Port State Measure	Measure text	Reference
12	PSM12-Prior Notification of Port entry/landing/transshipment-Foreign Vessels	<p>Article 2</p> <p>The foreign fishing vessels are subject to report at the beginning, during and after their fishing operations to the port officer in one of the ports listed in Article 1 herein, as stated in their permit, in accordance with the following procedure:</p> <p>(a) Not later than 24 hours before entering the Indonesian Exclusive Economic Zone, the master is obliged to inform the officer of the port by electronic communication instruments (radio, telex, telegraph or SSB);</p> <p>(b) A foreign fishing vessel which, because of the position of its fishing ground, as stated in its permit, will cross the Indonesian waters or shall take aboard an inspector, is obliged to enter the designated port.</p>	Decree of the Minister of Agriculture No. 476/KPTS/IK.121/7/1985 on the Reporting Stations for Licensed Fishing Vessels in the Indonesian Exclusive Economic Zone, Article 2

(Source: <http://www.fao.org/fi/website/FISearchAction.do>)

5.8.5 Summary of IUU incidences

Both national and foreign fleets have been shown to participate in IUU fishing in Indonesian waters. Foreign vessels originating from Malaysia, the Philippines, Thailand and Vietnam are commonly recorded committing IUU violations within Indonesia's EEZ (Indonesia Marine and Fisheries Book, 2014). Official reports from MMAF and available news articles suggest that IUU within Indonesian waters can be considered diverse and extensive, including a range of fleets, gears and target species. For example, a presentation recently given by the Executive Secretary of the Directorate General of

Surveillance for Marine and Fisheries Resources indicates that the following IUU issues have been acknowledged as occurring within Indonesia¹⁰⁶:

- Fishing without legal permits, illegal entry into Indonesian waters;
- Unauthorised fishing gears;
- Fake documentation;
- Unauthorised documentation;
- Double flagging under Indonesian flags within Indonesian waters and on the high seas; and
- Destructive fishing practices.

5.8.5.1 Reported statistics on IUU fishing offences

Examination of official statistics released by the MMAF provides the number of inspections and arrests for IUU fishing offences made by Indonesian authorities between 2005 and 2014 (Table 63) (NB: Detailed data not available prior to this date but levels assumed to have been consistent before the reported period). The number of fishery inspections made by Indonesian authorities has increased over the period (344 inspections in 2005, 3871 in 2013) which indicates a large increase in capacity or political will to conduct inspections. During this period a total of 544 Indonesian vessels were arrested compared to 689 foreign fishing vessels, indicating that IUU by foreign vessels is potentially more commonplace; alternatively, protocols in place at MMAF for combating IUU could be prone to arresting foreign vessels. For the latest year of available data (2012) 3,871 fishing vessels (3,824 Indonesian and 47 foreign vessels) were inspected by MMAF, of which 24 Indonesian vessels and 44 foreign vessels were arrested for breaching fishing laws and regulations. Documented offences for 2013 included using prohibited fishing gears; no documentation/incomplete documentation; fishing outside of specified fishing areas; and illegal fishing, particularly by foreign vessels from Malaysia and the Philippines (Indonesia Marine and Fisheries Book, 2014).

¹⁰⁶ http://www.oecd.org/tad/events/Session_4_Point_3_Ida_Kusuma_Indonesia.pdf

Table 63 Inspections and Arrests Related to IUU fishing of Indonesian Fishing Vessels (IFV) and Foreign Fishing Vessels.

(Source: Indonesia Marine and Fisheries Book, 2014; Indonesia NPOA, 2012-2016)

Year	Inspected	Arrested		
		IFV	FFV	IFV + FFV
2005	344	91	24	115
2006	1447	83	49	132
2007	2207	95	88	183
2008	2178	119	124	243
2009	3961	78	125	203
2010	2253	24	159	183
2011	3348	30	76	106
2012	---	---	---	---
2013	3871	24	44	68
Total	19609	544	689	1233

During 2013 a total of 84 cases were processed relating to fisheries violations, 18 of which were dismissed as administrative penalties (warnings). These cases related to nine types of violation, of which fishing without documentation and use of fishing gear not suitable for the license issued comprised 50% (42/84) of the cases (see Table 64 for full breakdown of violations).

Table 64 Type and number of fisheries violation in Indonesia, 2013.

Fisheries violation	No. of violations
Fishing without documentation	23
Fishing using illegal gear or without appropriate licenses	1
Use of fishing gear not suitable for licenses issued	29
Incomplete documents	16

Fishing using dangerous materials or environmentally harmful methods	3
Violation of fishing areas	7
Fishing without a document in disputed maritime boundary area	3
Undocumented transport of fish	2
Unloading which does not match the port base	0
Total	84

(Source: Indonesia Marine and Fisheries Book, 2014)

5.8.5.2 Foreign industrial

Incidents of IUU fishing in the Indonesian EEZ committed by foreign industrial vessels have been regularly reported in news articles in recent years. For example, two Vietnamese vessels were seized for illegal fishing by West Kalimantan water police in June 2015¹⁰⁷; three Filipino fishers were trialled for fishing without the necessary documentation in April 2015¹⁰⁸; twelve Vietnamese fishers were detained and their boat sunk in February 2015 for illegally fishing for protected species in Indonesian waters¹⁰⁹; two boats operated by Thai sailors were arrested for fishing without permits in December 2014; two Vietnamese vessels were intercepted and detained for fishing without permits and using illegal trawl fishing gear in April 2013¹¹⁰; South Sulawesi Police arrested fishermen and seized four Indonesian boats for using explosives and fishing for protected species in April 2012¹¹¹; three Malaysian fishing boats were arrested for having no documentation and for using illegal trawl gear, April 2011¹¹². These provide clear examples of the sources of illegal fishing, types of fishing vessels and gear and the species being targeted for the period of the study even though the majority of reports are more recent.

¹⁰⁷ <http://www.thejakartapost.com/news/2015/06/30/two-vietnamese-vessels-seized-illegal-fishing.html>

¹⁰⁸ <http://www.thejakartapost.com/news/2015/04/22/three-filipinos-stand-trial-palu-illegal-fishing.html>

¹⁰⁹ <http://www.thejakartapost.com/news/2015/02/12/vietnamese-boat-sunk-raja-ampat-illegal-fishing.html>

¹¹⁰ <http://www.thejakartapost.com/news/2013/04/01/two-vietnamese-ships-impounded-illegal-fishing-natuna.html>

¹¹¹ <http://www.thejakartapost.com/news/2012/04/18/s-sulawesi-police-net-illegal-fishing-boats.html>

¹¹² <http://www.antaranews.com/en/news/70625/three-malaysian-fishing-boats-nabbed-in-riau-province-waters>

5.8.5.3 Domestic fleet

Indonesia's domestic fleets are acknowledged to undertake a range of IUU fishing activities. For example, it has been previously reported by the Jakarta Post (2009) that a significant number of domestic fishing vessels (38,000) were operating without the appropriate licences and permits in East Java¹¹³. The article attributes this to the time-consuming permit application procedure, and a limited number of port administration offices where fishers can get their permits processed: there are only six offices in East Java.

Illegal and destructive fishing practices, such as blast and cyanide fishing, is a form of IUU fishing activity considered to be widely practised by Indonesia's domestic fishing fleet¹¹⁴. The impacts of these fishing methods on the marine environment are well documented (i.e. Alcala and Gomez, 1987; Pet-Soede *et al.*, 1999; Mous *et al.*, 2000), and both are prohibited by Indonesian law: Fisheries Law No. 9, (19 June 1985), includes prohibition of the use of destructive fishing techniques such as explosives, poison and electrical techniques. Nevertheless, destructive fishing is estimated to have significant negative impacts on the Indonesian economy: at its peak, estimated net quantifiable losses to the Indonesian economy due to cyanide fishing was USD46 million over four years (Cesar 1996); and, the economic loss due to blast fishing over 20 years has been estimated as USD306,800 per square kilometre (Pet-Soede *et al.*, 1999). Despite these impacts and penalties, evidence suggests that the deterrent and prosecution of destructive fishing practices is minimal, and blast and cyanide fishers largely operate with impunity. For example, in 2001, CCIF (Conservation and Community Investment Forum) reported that authorities mostly failed to enforce fisheries laws, and when fishers were arrested for destructive fishing offenses they faced very light fines¹¹⁵. CCIF (2001) also states: 'The only systematic enforcement takes place when an existing dynamite/cyanide cartel pays for protection from potential competitors'. More recent evidence suggests that this situation has not changed. For example, the numbers of documented prosecutions relating to destructive fishing in 2013 are minimal: three violations relating to the use of dangerous materials or environmentally harmful methods were processed (Table 64) during 2013. A number of recently published news articles indicate that destructive fishing is commonplace: the Jakarta Post reports that blast fishing has decimated coral reefs off Komodo in April 2012¹¹⁶, and that blast fishing for tuna is rampant in East Flores in 2013¹¹⁷.

¹¹³ <http://www.thejakartapost.com/news/2009/03/12/38000-fishing-boats-unlicensed-east-java.html>

¹¹⁴ http://www.oecd.org/tad/events/Session_4_Point_3_Ida_Kusuma_Indonesia.pdf

¹¹⁵ http://www.cciforum.org/pdfs/Destructive_Practices.pdf

¹¹⁶ <http://www.thejakartapost.com/news/2012/04/25/issue-fishermen-blast-premier-dive-sites.html>

¹¹⁷ <http://www.thebalidaily.com/2013-03-16/blast-fishing-rampant-east-flores.html>

In addition to cyanide and blast fishing, illegal trawling is a destructive fishing method practiced widely by Indonesia's domestic fleet. Trawling was banned by Presidential Decree 39/1980 in 1980. However, it is reported that the ban was undermined due to negligible enforcement and by the renaming of trawl gear (Gillett, 2008), and trawling in Sumatra is considered to have increased significantly since its implementation¹¹⁸. Furthermore, the trawl vessels have been reported to regularly violate the 3-mile inshore zone of Sumatra reserved for traditional fishers. Thus, trawl fishers not only use prohibited gear but also violate spatio-temporal restrictions¹¹⁸. Other examples of fishing in prohibited areas include the violation of spatial restriction of government-controlled protected areas; for example, a study conducted by Campbell *et al.* (2012) concludes that compliance with spatial restrictions of the Karimunjawa National Park was weak.

Misreporting of fisheries catch is acknowledged to be a major form of IUU fishing activity undertaken by licenced vessels in Indonesia; however, the nature of the offence and a limited MCS capacity means that reports of prosecutions or arrests for such offences are rare in the available literature. Indonesia's NPOA reports this as an issue and indicates that the main incentive fishers have to under-report/misreport catches is to avoid paying taxes or levies on their catches.

Domestic fishing vessels have also been documented fishing for ETP species. For example, in 2012 four Indonesian boats were apprehended by South Sulawesi police with 25 kg of dried turtle meat¹¹⁹.

5.8.6 IUU risk identification

For each of the fleets in identified fleets the risks from the five categories have been assessed and are identified below. The risks are summarised in Table 65.

5.8.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.

Within Indonesia's EEZ there is a significant risk of foreign and domestic vessels fishing without the required license and documentation. Foreign vessels from Vietnam, the Philippines and Malaysia have regularly been inspected and subsequently arrested within Indonesia's EEZ for having no or incomplete documentation^{120 121 122}, it has been acknowledged by the MMAF that fishing by foreign vessels without legal permits (poaching) is a significant issue¹²³. In addition to foreign fishing vessels,

¹¹⁸ http://www.imcsnet.org/imcs/docs/when_fishing_turns_deadly_north_sumatra.pdf

¹¹⁹ <http://www.thejakartapost.com/news/2012/04/18/s-sulawesi-police-net-illegal-fishing-boats.html>

¹²⁰ <http://www.thejakartapost.com/news/2015/06/30/two-vietnamese-vessels-seized-illegal-fishing.html>

¹²¹ <http://www.thejakartapost.com/news/2015/04/22/three-filipinos-stand-trial-palu-illegal-fishing.html>

¹²² <http://www.antaranews.com/en/news/70625/three-malaysian-fishing-boats-nabbed-in-riau-province-waters>

¹²³ http://www.oecd.org/tad/events/Session_4_Point_3_Ida_Kusuma_Indonesia.pdf

substantial numbers of domestic fishing vessels are also considered to be operating unlicensed: the Indonesian NPOA states that Indonesian fishing vessels are guilty of illegal fishing activities, including fishing without the appropriate license and documentation.

Indonesia has however recently made efforts to improve its fishing licensing system and deter unlicensed/unauthorised fishing activities, as set out in the NPOA. Furthermore, the recent campaign to eradicate IUU fishing undertaken by Indonesian authorities (implemented since Joko Widodo entered into power in Oct 2014) may provide a strong incentive for foreign vessels to not fish illegally within the Indonesia's EEZ. However, it is difficult to draw conclusions regarding the effectiveness of the measures implemented under the NPOA and the campaign against IUU has been up to this point.

5.8.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Unreported fishing/non-compliance with reporting obligations by licensed vessels is considered to be an issue within Indonesian waters and is stated as a problem in the country's NPOA. This issue is thus an evident risk across Indonesia's fishing fleets. The primary reason given in the NPOA for fishing vessels improperly reporting catches is to avoid paying tax levies. In order to avoid accurate reporting it is acknowledged that vessels are transferring catches at sea without reporting it to authorities; fishing vessels and carriers do not report in accordance to the license requirements; and, that fishing vessels transport catch directly to foreign countries without reporting to the specified port.

5.8.6.3 Non-compliance with other licence conditions by licensed/authorised vessels

The main forms of non-compliance with other licence conditions within Indonesia are the use of destructive illegal gear and fishing in prohibited areas¹²⁴. Both practices are acknowledged as problems in the Indonesian NPOA to prevent and deter illegal fishing, and evidence suggests these issues are widespread and therefore represent a significant risk across Indonesian fisheries.

The use of illegal destructive fishing gear throughout Indonesia includes trawls, dynamite and cyanide. Trawlers were banned within Indonesian waters by Presidential Decree 39/1980 (in 1980) in an attempt to increase fisher catch and decrease social tensions. However, it is suggested that the implementation of this legislation has been a failure and the number of trawlers operating in Indonesian waters, particularly in Sumatra, has increased¹²⁵. Furthermore, recent evidence of foreign fishing vessels being detained for use of trawl gear is also present in the media¹²⁶. Dynamite and cyanide fishing are widely used throughout Indonesia despite being prohibited by law, and both methods have been recognised as serious threats to the sustainable use of the marine environment

¹²⁴ http://www.oecd.org/tad/events/Session_4_Point_3_Ida_Kusuma_Indonesia.pdf

¹²⁵ http://www.imcsnet.org/imcs/docs/when_fishing_turns_deadly_north_sumatra.pdf

¹²⁶ <http://www.thejakartapost.com/news/2013/04/01/two-vietnamese-ships-impounded-illegal-fishing-natuna.html>

(Pet-Soede & Erdmann, 1998; Halim & Mous, 2006). Blast fishing involves the use of homemade fertiliser bombs which are thrown into the middle of schooling fish. Typical target species include schooling reef fishes, such as surgeonfish, rabbitfish, snappers, as well as small pelagics such as scad and sardines (Pet-Soede & Erdmann, 1998). The use of cyanide occurs in three main fisheries in Indonesia: ornamental fisheries; live reef food fish; and, rock lobsters (Pet-Soede & Erdmann, 1998). Cyanide fishing involves divers spraying jets of cyanide from squirt bottles onto their target. This practice not only decimates target populations but also causes extensive environmental degradation to the adjacent environment (Pet-Soede & Erdmann, 1998).

Fishing in prohibited areas is also considered to widely occur throughout Indonesia. One of the most prominent issues relating to fishing in prohibited areas is the incursion of fishing trawlers into the three mile inshore zone, an area exclusively reserved for traditional fishing activities¹²⁷. This issue has led to significant conflict between traditional fishers and trawlers in northern Sumatra, a region with a high numbers of trawlers, due to decreases in catch and income for the traditional fishers. In some instances conflict between the groups has resulted in damage to equipment, injuries and death¹²⁷.

5.8.6.4 Post-harvest IUU

It is readily acknowledged that post-harvest IUU occurs within Indonesia. As previously discussed, the country's NPOA states that vessels are transferring catches at sea without reporting it to authorities, and that fishing vessels transport catch directly to foreign countries without reporting to the specified port.

5.8.6.5 Other offences

Endangered, Threatened or Protected (ETP) species are often caught by fishing fleets operating within Indonesian waters. For example, Indonesia has the world's largest diversity of sharks, 118 species, and also the world's largest shark fishery which targets species classified as endangered or threatened¹²⁸. Sea turtles, which are protected by Indonesian law, are also believed to be extensively caught in Indonesian waters as direct targets and as incidental catch¹²⁹. Fishers arrested for fishing with illegal fishing gears have also been caught with dried turtle meat¹³⁰.

A summary of the specific risks identified for Indonesian fisheries can be found in Table 65.

¹²⁷ http://www.imcsnet.org/imcs/docs/when_fishing_turns_deadly_north_sumatra.pdf

¹²⁸ <http://news.mongabay.com/2015/08/shrinking-indonesian-shark-fisheries-spur-a-national-action-plan/>

¹²⁹ http://www.ioseaturtles.org/pom_detail.php?id=76

¹³⁰ <http://www.thejakartapost.com/news/2012/04/18/s-sulawesi-police-net-illegal-fishing-boats.html>

Table 65 Specific risks identified for Indonesia.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed fishing in EEZ by boats from other regional states (Malaysia, China, Thailand, Philippines, Vietnam)	1
	Unlicensed fishing in EEZs by national boat	2,3,4
Non-compliance with reporting obligations by licensed/authorised vessels	Under-reporting target species	2,3,4
	Non- or delayed logbook submission	3,4
	Transport of catch directly to foreign countries without reporting to specified port authorities	4
Non-compliance with other licence conditions by licensed/authorised vessels	Use of prohibited gear (trawls, dynamite, cyanide)	All
	Illegal fishing related to spatio-temporal closures (3 mile zone and protected areas)	1,3,4
	Falsification/misuse of licence documents	3,4
Post-harvest IUU	Illegal transshipping	1,4
Other offences	Illegal harvest/possession of sharks or other protected species	All

5.8.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 66), impact (Table 67) and level of inherent risk (Table 68) for Indonesia based on the risks identified in Table 65.

Table 66 Assessment of risk likelihood – Indonesia.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZs by national vessels	High	Very Weak	Almost Certain
Unlicensed fishing in EEZ by boats from other regional states (Malaysia, China, Thailand, Philippines, Vietnam)	Very High	Weak	Almost Certain
Under-reporting target species	Very High	Very Weak	Almost Certain

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZs by national vessels	High	Very Weak	Almost Certain
Non-or delayed logbook submission	High	Very Weak	Almost Certain
Transport of catch directly to foreign countries without reporting to specified port authorities	Very High	Weak	Almost Certain
Use of prohibited gear (trawls, dynamite, cyanide)	High	Weak	Likely
Illegal fishing related to spatio-temporal closures (3 mile zone and protected areas)	High	Weak	Likely
Falsification/misuse of licence documents	High	Weak	Likely
Illegal transshipping	Very High	Weak	Almost Certain
Illegal harvest/possession of sharks or other protected species	High	Weak	Likely

Table 67 Assessment of risk impact – Indonesia.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZ by boats from other regional states (Malaysia, China, Thailand, Philippines, Vietnam)	High	Vulnerable	Major
Unlicensed fishing in EEZs by national boat	Very High	Vulnerable	Major
Under-reporting target species	Very High	Moderate	Major
Non-or delayed logbook submission	Low	Resilient	Minor
Transport of catch directly to foreign countries without reporting to specified port authorities	High	Vulnerable	Major
Use of prohibited gear (trawls, dynamite, cyanide)	High	Highly Vulnerable	Serious

Specific risk	Catch	Vulnerability	Impact
Illegal fishing related to spatio-temporal closures (3 mile zone and protected areas)	High	Highly Vulnerable	Serious
Falsification/misuse of licence documents	Low	Low	Minor
Illegal transshipping	Low	Low	Minor
Illegal harvest/possession of sharks or other protected species	High	Highly Vulnerable	Serious

Table 68 Assessment of inherent risk – Indonesia.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing in EEZ by boats from other regional states (Malaysia, China, Thailand, Philippines, Vietnam)	Almost Certain	Major	Severe
Unlicensed fishing in EEZs by national boat	Almost Certain	Major	Severe
Under-reporting target species	Almost Certain	Major	Severe
Non-or delayed logbook submission	Almost Certain	Minor	High
Transport of catch directly to foreign countries without reporting to specified port authorities	Almost Certain	Major	Severe
Use of prohibited gear (trawls, dynamite, cyanide)	Likely	Serious	Severe
Illegal fishing related to spatio-temporal closures (3 mile zone and protected areas)	Likely	Serious	Severe
Falsification/misuse of licence documents	Likely	Minor	Moderate
Illegal transshipping	Almost Certain	Minor	High
Illegal harvest/possession of sharks or other protected species	Likely	Serious	Severe

5.8.8 Impacts of IUU

There are clear impacts of unlicensed fishing by national and foreign vessels in Indonesia's EEZ. For example, the management of stocks will be negatively affected due to the consequential unknowns relating to harvest rates and stock status. There will also be direct losses to the Indonesian economy through the loss of licensing revenues from national and foreign boats, and indirect losses associated with the depletion of commercially exploited stocks. Furthermore illegal fish caught by foreign vessels are unlikely to be landed in Indonesia, and it is more likely they will be landed in ports in Malaysia, China, Thailand, Philippines, and Vietnam. This will result in a loss of national revenue in the form of potential taxation and other potential benefits to local industry.

Under- or non-reporting target species, non- or delayed submission of logbooks, transport of catch directly to foreign countries without reporting to specified port authorities will all have similar impacts as previously mentioned in terms of unknown harvests and stocks. These risks and the falsification/misuse of licence documents will also result in the loss of national revenue from licencing and potential taxation on landings.

Use of prohibited gear (trawls, dynamite and cyanide) is considered to be widely practised in Indonesia. These practices have been associated with significant negative impacts on the marine environment, such as reductions in coral reef coverage and overexploitation.

Illegal fishing related to spatio-temporal closures (3 mile zone and protected areas) may have substantial impacts on the marine environment and on the livelihoods of artisanal fishers. For example, industrial fisheries which violate these restrictions will harvest and consequently reduce the available stock in the inshore area. Thus, artisanal fishers may suffer reduced fishing opportunities. The impact this situation will have on livelihoods will be dependent on the overall level of exploitation on the focal stocks and their status (i.e. under exploited or over exploited). Additionally, industrial vessels which violate the spatio-temporal closures are thought to utilise destructive gear, such as trawls, which may damage sensitive inshore habitats.

Illegal transshipping is highlighted with a high level of risk and would mostly impact high value species such as Tuna. This practice adds no more catch to the amount taken illegally but would affect the methods of IUU fishing and the manner in which MCS operations should be undertaken to effectively police the Indonesian EEZ.

The illegal harvest or possession of sharks or other protected is likely to have substantial impacts on the target populations due to their inherent vulnerability and the nature of exploitation.

5.8.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

Unlicensed fishing in Indonesia's EEZ by boats from other regional states (Malaysia, China, Thailand, Philippines, and Vietnam) is acknowledged to have extensively occurred in Indonesian waters in recent history and is frequently reported in the grey literature. The Indonesian MMAF has acknowledged that fishing by foreign vessels without legal permits (poaching) is a significant issue, and, furthermore, the nation has recently launched a crackdown on illegal fishing by foreign vessels. Taking into account the substantial size and catches of the domestic fishing fleets, it is estimated that illegal, foreign vessels contribute an additional 15-40% over the total reported catch.

A significant level of unlicensed fishing undertaken by the domestic fleet is acknowledged to occur in Indonesia's EEZ. Considering the high numbers of vessels involved and the weak deterrents in place (until the recent improvement in MCS), it is estimated that an additional 10-20% over the total reported catch is potentially taken by these fleets.

Significant under-reporting of catches is thought to occur in Indonesia as this allows fishers to avoid tax levies placed on their catches. Furthermore, it is acknowledged that vessels transfer catches at sea without reporting it to authorities. Given this high incentive and the weak deterrents in place for the focal period of the study, it is estimated that an additional 10-30% over the total reported catch is potentially under-reported.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Indonesian EEZ can be found in Table 69.

Table 69 Summary of estimated rates – Indonesia.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZ by boats from other regional states (Malaysia, China, Thailand, Philippines, Vietnam)	1	Mixed	1990-2013	15	40	0	0
Unlicensed fishing in EEZ by domestic fleets	2,3,4	Mixed	1990-2013	10	20	0	0
Under-reporting target species	2,3,4	Mixed	1990-2013	0	0	10	30
Non-or delayed logbook submission	3,4	Mixed	1990-2013	0	0	0	0
Transport of catch directly to foreign countries without reporting to specified port authorities	4	Mixed	1990-2013	0	0	0	0
Use of prohibited gear (trawls, dynamite, cyanide)	All	Mixed	1990-2013	0	0	0	0
Illegal fishing related to spatio-temporal closures (3 mile zone and protected areas)	1,3,4	Mixed	1990-2013	0	0	0	0
Falsification/misuse of licence documents	3,4	Mixed	1990-2013	0	0	0	0
Illegal transshipping	1,4	Mixed	1990-2013	0	0	0	0
Illegal harvest/possession of sharks or other protected species	All	Mixed	1990-2013	0	0	0	0

5.8.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches in Indonesia represent on average between 1,406,684 and 3,617,188t per annum (i.e. 35 to 90%). Illegal catches contribute an estimated 25-60% and unreported catches 10-30% in addition to the reported levels of catch. Losses from Illegal, Unreported and Unregulated fishing in the Indonesian EEZ are estimated to average between USD 1,571.21 and 4,025.47 million. These are the highest physical totals in the region for a single country and represent the high levels of illegal fishing conducted in Indonesian waters by fishing boats from Malaysia, China, Thailand, Philippines and Vietnam amongst others.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 70 and as first landed value in Table 71. Profiles of the estimated level of illegal and unreported fishing combined in Indonesia can be found in Figure 22 (catch in t) and Figure 23 (catch value in USD).

Table 70 Summary of estimated IUU by year in Indonesia (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	2350984	587746	1410590	235098	705295	0	0
1991	2519240	629810	1511544	251924	755772	0	0
1992	2680987	670247	1608592	268099	804296	0	0
1993	2900933	725233	1740560	290093	870280	0	0
1994	3104771	776193	1862863	310477	931431	0	0
1995	3315718	828930	1989431	331572	994715	0	0
1996	3431732	857933	2059039	343173	1029520	0	0
1997	3613964	903491	2168378	361396	1084189	0	0
1998	3724645	931161	2234787	372465	1117394	0	0
1999	3683245	920811	2209947	368324	1104973	0	0
2000	3805994	951498	2283596	380599	1141798	0	0
2001	3984218	996055	2390531	398422	1195265	0	0
2002	4074066	1018517	2444440	407407	1222220	0	0
2003	4339780	1084945	2603868	433978	1301934	0	0
2004	4283297	1070824	2569978	428330	1284989	0	0

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2005	4394448	1098612	2636669	439445	1318334	0	0
2006	4505988	1126497	2703593	450599	1351796	0	0
2007	4729016	1182254	2837410	472902	1418705	0	0
2008	4697622	1174406	2818573	469762	1409287	0	0
2009	4808335	1202084	2885001	480834	1442501	0	0
2010	5033871	1258468	3020323	503387	1510161	0	0
2011	5339485	1334871	3203691	533949	1601846	0	0
2012	5429048	1357262	3257429	542905	1628714	0	0
2013	5706950	1426738	3424170	570695	1712085	0	0

Table 71 Summary of the estimated value of IUU (USD) by year in Indonesia (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	2939.35	665.89	1579.74	293.93	881.80	0	0
1991	2977.79	666.38	1578.51	297.78	893.34	0	0
1992	3366.87	758.68	1798.68	336.69	1010.06	0	0
1993	3670.20	822.42	1948.44	367.02	1101.06	0	0
1994	4010.62	905.71	2147.86	401.06	1203.19	0	0
1995	4202.24	925.05	2186.64	420.22	1260.67	0	0
1996	4492.85	1009.43	2392.29	449.28	1347.85	0	0
1997	4649.83	1036.88	2455.02	464.98	1394.95	0	0
1998	4582.97	1014.76	2400.49	458.30	1374.89	0	0
1999	4659.10	1028.70	2432.59	465.91	1397.73	0	0
2000	4804.79	1060.46	2507.58	480.48	1441.44	0	0
2001	4918.60	1083.85	2562.35	491.86	1475.58	0	0
2002	5067.01	1112.66	2629.28	506.70	1520.10	0	0
2003	4998.85	1081.74	2551.39	499.89	1499.66	0	0
2004	4986.98	1084.22	2558.80	498.70	1496.10	0	0
2005	5171.23	1116.27	2631.96	517.12	1551.37	0	0
2006	5288.35	1132.33	2666.99	528.84	1586.51	0	0
2007	5725.01	1218.58	2867.87	572.50	1717.50	0	0
2008	5532.25	1166.23	2741.14	553.23	1659.68	0	0
2009	5992.77	1272.89	2994.86	599.28	1797.83	0	0
2010	6525.24	1401.51	3302.34	652.52	1957.57	0	0
2011	7292.16	1577.94	3721.69	729.22	2187.65	0	0
2012	7600.38	1649.73	3892.60	760.04	2280.11	0	0
2013	7975.63	1709.94	4028.12	797.56	2392.69	0	0

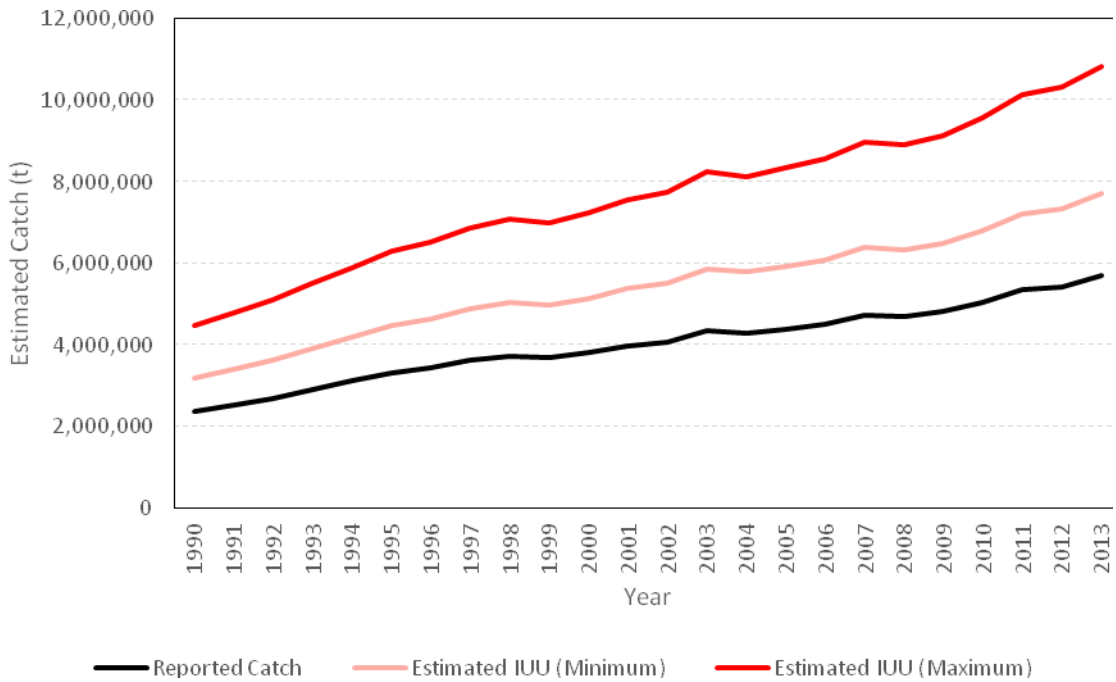


Figure 22 Catch Profile (Indonesia) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

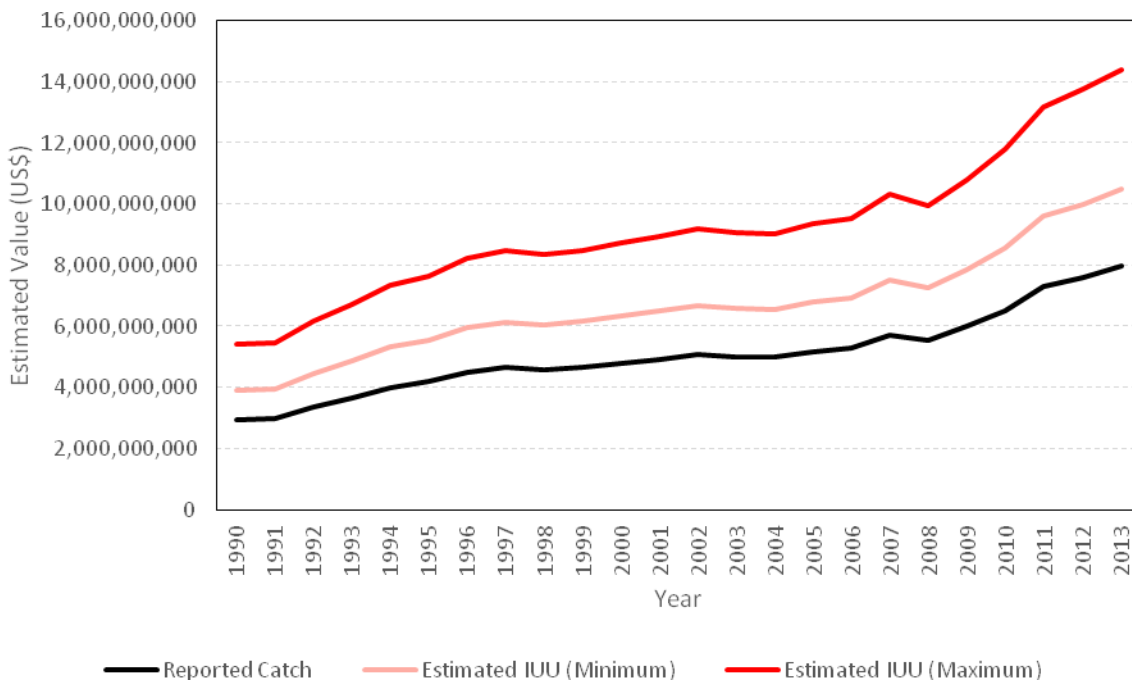


Figure 23 IUU Catch Value Profile (Indonesia) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.8.11 Relevant legislation

Government Regulation Number 24 of 2006 on Appointment and Dismissal Procedures of Ad Hoc Judge in Fisheries Court;

Presidential Decree Number 15 of 2010 on Establishment of Fisheries Court in Tanjung Pinang and Ranai;

Minister of Marine Affairs and Fisheries Decree Number KEP.58/Men/2001 on the Procedures in Implementing Community Based Surveillance System for Management and Utilization of Marine Resources and Fisheries;

Minister of Marine Affairs and Fisheries Regulation Number PER.13/MEN/2005 on Fisheries Law Enforcement Coordination Forum (Forum Koordinasi Tindak Pidana Perikanan) as amended by PER.18/MEN/2011; IPOA-IUU Fishing Recommendation:

Minister of Marine Affairs and Fisheries Regulation Number PER.04/MEN/2006 on Establishment of TIU-SMFR;

Minister of Marine Affairs and Fisheries Regulation Number PER.19/MEN/2006 on Appointment of Port Officer of the Fishing Ports;

Minister of Marine Affairs and Fisheries Regulation Number PER.05/MEN/2007 on Fishing Vessel Monitoring System;

Minister of Marine Affairs and Fisheries Regulation Number PER.27/MEN/2009 on Registration and Marking of Fishing Vessel;

Minister of Marine Affairs and Fisheries Regulation Number PER.18/MEN/2010 on Fishing Log Book;

Minister of Marine Affairs and Fisheries Regulation Number PER.14/MEN/2011 on Capture Fisheries Business as amended by PER.49/MEN/2011;

Minister of Marine Affairs and Fisheries Regulation Number PER.08/MEN/2012 on Fishing Port;

Minister of Marine Affairs and Fisheries Regulation Number PER.12/MEN/2012 on Capture Fisheries Business in High Seas;

Minister of Marine Affairs and Fisheries Regulation Number PER.13/MEN/2012 on Catch Certification;

DG SMFR Decree Number KEP.143/DJ-PSDKP/2012 on Technical Operational Guidance of the Patrol

5.9 Malaysia

5.9.1 Introduction

The country of Malaysia is made up of mainland peninsular Malaysia in addition to the territories of Sabah and Sarawak. Malaysia has a coastline of 4,492 km and the Malaysian EEZ covers an area of 338,630 km² (of which approximately 142,000 km² is disputed territory between Malaysia and neighbouring States) with an additional area of 123,120 km² defined as territorial sea.¹³¹ The Malaysian EEZ shares borders with Thailand to the north, Singapore and Indonesia to the south (peninsula), Brunei and Vietnam to the north and the Philippines to the east. It should be noted that a number of Malaysia's maritime boundaries are disputed, particularly in the Malacca Strait with Indonesia and Thailand, and the Spratly Islands with China and several other nations.

Malaysia's NPOA-IUU, published in 2013, states that national fisheries landings amounted to 1,655,857 tonnes in 2011 with a value of RM 9.38 billion¹³², of which 82.43% was accounted for by capture fisheries.

5.9.2 Fleet breakdown

Malaysia's fishing fleet is divided between traditional and commercial sectors, of which the former consists of vessels of less than 40 GRT operating 'traditional' gears, and the latter of vessels of greater than 40 GRT which use industrial gears such as trawls, purse seines, longlines and traps (NPOA-IUU, 2013). According to SEAFDEC the national fishing fleet numbered at 49,576 vessels in 2010, of which 3,073 are over 40 GRT. The total number of vessels in 2011 was reported in the NPOA as 53,002, with a total workforce of 134,100 fishers.

¹³¹ NB: These figures are approximate due to the large number of disputed boundaries and islands present in the South China Sea.

¹³² 1 Malaysian ringgit (RM) = USD 0.24 as of October 2015. www.oanda.com

Table 72 Fleet breakdown for Malaysia.

Number	Description	Gear	Flag(s)	Target Species	Comment
1	National traditional fleets	Mixed artisanal gears	Malaysia	Mixed reef and demersal species, small pelagics	Some estimates indicate that c.50% of this fleet may be unlicensed
2	National commercial fleets	Trawls, purse seines, longlines, traps	Malaysia	Tuna and tuna-like species, mixed demersal and small pelagic species	Acknowledged to encroach on traditional fishing zones
3	Foreign fleets	Trawls, mixed artisanal gears	Indonesia, Vietnam, Singapore, Thailand (trawls)	Squid, shrimp, other mixed species	May have dual-flag with Malaysian and foreign flags.

5.9.3 Catch breakdown by fleet

The available reported catch data from the FAO are reasonably detailed in comparison to several of the other states included in this study, however marine fishes *nei* still account for the largest proportion of the total at 30.7%, with Indian mackerels *nei* (*Rastrelliger* spp.) the largest represented genus at 9.9%. Indian scad (*Decapterus russelli*) accounts for the largest proportion for a single species at 6.1 %. Total reported catches between 1990 and 2010 amount to 25,370,112 tonnes.

The catch total estimated by the SAU reconstructions for Malaysia is more than double the FAO total at 65,800,612 tonnes for 1990-2010. Moreover the total catch reconstruction for 1950-2010 is 85% higher than the reported catches for the same period. Indian mackerels *nei* also feature prominently in the SAU data (Teh & Teh, 2014), accounting for the largest proportion for a single genus at 7.1%, followed by threadfin and dwarf breams *nei* at 6.4%. A species of *Rastrelliger* (*R. kanagurta*) also accounts for the largest proportion for an individual species at 2.4%. These small proportions illustrate the heterogeneity of the Malaysian catch reconstructions.

It has not been possible to break down the catch profile of Malaysia into the recognised fleets. All risks have therefore been estimated based on the total national catch.

5.9.4 IUU influencing factors

5.9.4.1 Legislation and governance

Fisheries within national waters are governed primarily by the Fisheries Act of 1985¹³³, with the Department of Fisheries Malaysia (DOFM) responsible for overall fisheries management, in addition to maintaining a record of all licensed fishing vessels. The separate Department of Fisheries Sabah (DOFS) holds responsibility in Sabah State only.

Malaysia signed the UNCLOS Convention in 1996, and has been a member of IOTC since 1998, in addition to holding membership of APFIC, SEAFDEC and ASEAN. The country also has a slightly above average ranking globally compared to other States in the region according to the Worldwide Governance Indicators (68th out of 212 – 32nd percentile). This would suggest that any risks relating to direct corruption or the Malaysian regulatory framework would be slightly decreased. Although risks may still exist relating to obstruction or bribery of fisheries officers and the falsification of documents, they would not be to the level observed in most of the regional States in this study (See Table 17).

The operational areas of Malaysian fishing vessels are divided into management zones A, B, C, C2 and C3 (C3 refers to the high seas fleet only), each with its own restrictions on the vessels permitted to undertake fishing activities (NPOA, 2013; SEAFDEC 2011). Zone A (0-5nm from the shore) allows vessels of up to 40 GRT not utilising trawls or fish purse seine, whilst zone B (5-12nm) permits vessels of up to 40 GRT operating commercial gears. Zone C (12-30nm) permits vessels of up to 70 GRT using commercial gears, whilst Zone C2 (30nm+) is not restricted and allows vessels of greater than 70 GRT.

5.9.4.2 Licensing and reporting requirements

All fishing vessels and gears used in Malaysian waters must be licensed under an annual system according to the Fisheries Act (Article 8), and the description of licence conditions makes specific reference to vessel markings, the nationality of the crew and any other applicable laws (Article 10). However, it should be noted that a potential loophole exists within the licensing legislation, due to the DOFM's 'informal policy' of not requiring low-income traditional fishers to obtain licences, creating a pool of unlicensed fishers (Teh & Teh, 2014).

Moreover there is no requirement in the legislation for national vessels to report catch, keep logbooks or carry VMS; however, the NPOA-IUU states that Malaysian vessels of greater than 70 GRT have used VMS since 1999. This document also states that the use of Mobile Transceiver Units (MTUs) is required as a licence condition; however, such a device is not mentioned in the Fisheries Act. A national media article also states that all fishing boats have been required to carry an

¹³³ The Fisheries Act 1985, Laws of Malaysia, Act 317 (incorporating all amendments up to 1 January 2006).

unspecified 'tracking device' since September 2014¹³⁴. Despite the absence of specific requirements to keep a logbook, landing data is recorded on a monthly basis at landing centres, and consequently Malaysia's fisheries data collection mechanisms have been described as 'sound' (Teh & Teh, 2014).

All fishing within the Malaysia EEZ by foreign fishing vessels is prohibited unless undertaken as part of an international fisheries agreement (Article 15) and all foreign vessels must be supported in their application for a permit by a Malaysian agent (Article 19). Moreover provisions are made for foreign fishing licences to cover a broad suite of conditions relating to key activities such as transshipment, landing catch, entry into Malaysian ports and the placement of observers. It should be noted that such detailed provisions are not made for nationally flagged vessels (Article 19).

5.9.4.3 Restrictions, fines and penalties

The possession of any catch from foreign vessels (therefore, by implication, engaging in any transshipment with foreign vessels) by any person within the EEZ is also a specific offence (Article 20). Any breach of licence conditions by a foreign vessel is subject to a maximum penalty of RM 100,000 (USD 22,872)¹³⁵ for the vessel's owner and master, in addition to a further penalty not greater than RM 5,000 (USD 1,143) for each crew member. For any offences by a foreign vessel where a specific penalty is not stated, the maximum fine is RM 1 million (USD 228,720) for owners and/or masters and RM 100,000 (USD 22,872) for each crewmember (Article 25). It should be noted that no imprisonment terms are proscribed in the Fisheries Act for foreign offenders.

The Fisheries Act also sets out separate provisions which ban all fishing activities within marine parks and marine reserves in national waters (Article 43).

For fisheries offences by Malaysian nationals which do not carry a specific penalty, the maximum fine is stated at RM 20,000 (USD 4,574) and/or a maximum imprisonment of two years (Article 25). The possession and use of destructive gears including poison, explosives and electric methods is also prohibited (Article 26) although a legislative review noted that other destructive/unselective gears are not regulated in the Fisheries Act (Edeson *et al.*, 2010). An additional piece of legislation does state further gear restrictions, with an outright ban of drift nets and a minimum mesh size of 10 inches for gill nets¹³⁶.

Fishing for turtles and aquatic mammals in Malaysian waters is also specifically banned, with provisions additionally made for the unintentional bycatch of such species, and a penalty of RM 5,000 (USD 1,143) is stated for violations (Article 27).

¹³⁴ "'Fishing boats must have tracking device,'" 2014.

¹³⁵ At a nominal 2015 exchange rate of 1 MYR: 0.22872 USD. www.oanda.com

¹³⁶ Fisheries (Prohibition of Method of Fishing) Regulations 1980.

In addition to the stipulations of the Fisheries Act, Malaysian authorities have also enacted various other management measures to control fishing effort, including a moratorium on all coastal fishing licences which has been in place since 1982 and a buy-back scheme for zone B licence holders to reduce fishing effort (SEAFDEC, 2011). The use of all traditional fishing gears has also been prohibited within 0.5nm of any artificial reef and 2nm of any marine park island.

5.9.4.4 MCS protocols and capacity

Fisheries enforcement in Malaysia is currently carried out by the Malaysia Maritime Enforcement Agency (MMEA which was created in 2005, in addition to the marine division of the police with support from national armed forces. However, Malaysian MCS capacity during the period of this study is acknowledged to have been weak, with efforts undermined by poor vessel condition, lack of training and other factors. This is illustrated by the fact that, out of 2,619 foreign fishing vessels sighted operating illegally in Malaysian waters between 2000 and 2004, only 120 were arrested, with an additional average of less than 30 arrests per year between 2005 and 2007. In addition the MMEA's enforcement capacity was stated in 2008 at just 70 vessels of varying size, with few suitable for offshore patrols and many severely outdated (APEC, 2008). A lack of effective cooperation between the MMEA and other enforcement agencies has also been cited as a hindrance to MCS in Malaysia.

Authorised fisheries officers are vested with the power to stop, board, and search any fishing vessel within Malaysian waters, with seizure and arrests permitted if a violation is suspected (Article 47). The obstruction of fisheries officers is also a specific offence within the Fisheries Act, carrying a maximum penalty of RM 20,000 (USD 4,574).

5.9.4.5 Port state

Malaysia has not ratified the FAO Port State Measures Agreement, however the Fisheries Act makes provisions for the regulation of fisheries at the port level and as Members of IOTC they should implement a similar system to the FAO PSMA through IOTC Resolution 10/11. Specifically, the loading or unloading of fish without approval from the DOFM is prohibited, and standard operating procedures have been implemented in order to respond to Malaysian and foreign IUU vessels which enter national ports (NPOA, 2013). This forms part of a suite of port state measures which are stated in the NPOA, including requirements for prior notification of arrival, monitored landings of catch and submission to inspections.

5.9.4.6 Market state

In 2008 the EU temporarily banned all imports of Malaysian seafood due to the poor quality of the country's fish processing industry and the resulting implications for consumer safety. Moreover, the

Malaysian Government instigated a further export ban in 2014 in an attempt to restrict rises in the price of fish following disruptions to fishing by monsoons¹³⁷.

Malaysia has been implicated in the export of various species which may be sourced through IUU supply chains, such as unreported and unregulated lobster exported to Singapore (which is a key export market for Malaysian fisheries) and the smuggling of cockles to Thailand. Malaysia also supports a major domestic market for turtle eggs, which are illegal to collect without a permit under the Fisheries Act, and the country has also been implicated in the export of shark fins to China and Hong Kong (APEC, 2008).

5.9.5 Summary of IUU incidences

The review of online media and grey literature yielded evidence of substantial IUU activity within the Malaysian EEZ, including particular hotspots in the Malacca Strait, the northeast coast of peninsular Malaysia and waters off Sarawak. The recorded incidences are divided between national and foreign fleets below.

5.9.5.1 National fleets

According to statistics on fisheries offences by national fishers between 1997 and 2005, license violations accounted for the most majority of cases, peaking at over 700 reported incidents in 1999 (APEC, 2008). Of the various types of licence violation, encroachment by commercial vessels into reserved zones was the most prevalent. Indeed the encroachment of larger vessels on inshore waters reserved for traditional fishing has been acknowledged as an IUU issue in Malaysia, causing damage to vulnerable coastal habitats and undermining valuable small-scale fishery stocks (MRAG, 2005). Use of illegal gears is also a widespread violation, with otter trawl use dominating the offence statistics between 1990 and 1999. Blast fishing is acknowledged to occur in localised areas of Malaysia such as Sabah, but is not considered widespread (APEC, 2008). Moreover national fishers are known to engage in the illegal harvest of a number of commercially valuable and threatened species including humphead wrasse (*Cheilinus undulatus*) lobsters, cockles, sharks and marine turtles (Poh & Fanning, 2012). Despite the ban on fishing within 2nm of marine parks, IUU fishing is acknowledged to occur in parks such as Pulau Perhentian and Pulau Redang in Terengganu, particularly at night, with involvement of both national and foreign vessels (APEC, 2008).

Supplementary evidence of IUU activities by nationally-flagged vessels was uncovered in online media, including a figure of 30 fishing boats arrested in the first six months of 2014 by the MMEA¹³⁸.

¹³⁷ ("Malaysia bans fish exports to control prices | The Brunei Times," 2014)

¹³⁸ Agency steps up sea patrols, NST Online, 2014.

A 2015 report also mentions the seizure of national boats accused of fishing in the incorrect zone¹³⁹. It has also been reported that some Malaysian vessels land their catch outside of national ports, instead crossing into Thai waters in order to offload at ports such as Pattani, Phuket and Songhla. It is also alleged that Malaysian vessels tranship illegally to Thai carrier vessels in the offshore waters of Peninsular Malaysia (Funge-Smith *et al.*, 2015).

5.9.5.2 Foreign fleets

The available information indicates that vessels flagged to several other regional states are involved in IUU fishing within Malaysian waters. Thai vessels are particularly prominent, with 300 Thai vessels reported in 2010 as chartered to a Malaysian company in Sarawak but likely to be violating national law on catch reporting and landing, with some Thai vessels additionally dual-flagging between Thailand and Malaysia (Funge-Smith *et al.*, 2015).

Several of the collated media articles referred to the arrest of Vietnamese nationals for illegal fishing. For example, two boats containing 18 Vietnamese crew were reportedly arrested in 2012, with the article in question stating that 188 Vietnamese nationals had been arrested for illegal fishing in the first four months of 2012¹⁴⁰. In another incident 26 Vietnamese fishers were fined for trespassing in Malaysian waters in May 2013¹⁴¹, and an illegal Vietnamese trawler was seized with nine crew in 2014, carrying a cargo of squid, prawns and other fish¹⁴². Reports also indicate that Indonesian and Singaporean vessels have been arrested for illegal fishing, with 23 vessels of flags and crew nationalities arrested during a single MCS operation near Kota Tinggi in June 2015¹⁴³.

Certain high profile vessels included on the CCAMLR IUU blacklist have also been reported as operating within Malaysian waters. In 2015 the captain and crew of the Spanish-owned FV Perlon were charged with illegal transshipment in national waters by a Malaysian court¹⁴⁴, and the FV Ming 5 (FV Thunder) and FV Tai San (FV Chang Bai) were detained by the MMEA in 2014 on suspicion of illegal fishing¹⁴⁵. Furthermore Malaysian ports have been highlighted as landing points for blacklisted vessels illegally fishing toothfish in the Southern Ocean, providing a route to markets in China and Hong Kong (Gianni *et al.*, 2005; WWF, 2010).

¹³⁹ ("Three fishing boats seized and 11 nabbed in op - Nation | The Star Online," 2015.)

¹⁴⁰ ("Illegal fishing: MMEA Seizes two boats, detains 18 Vietnamese- Borneo Post Online," 2012)

¹⁴¹ ("26 Vietnamese fishermen fined - Nation | The Star Online," 2013)

¹⁴² ("Nine Viets nabbed for illegal fishing - Nation | The Star Online," 2014)

¹⁴³ (Nabbed for Illegal fishing - Nation | The Star Online, 2015)

¹⁴⁴ ("47 fishing crew charged for illegal transfer of fish | theSundaily," 2015)

¹⁴⁵ ("Malaysia: MMEA detains two foreign ships for illegal fishing," 2014)

5.9.6 IUU risk identification

5.9.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone

Both the commercial and traditional national fleets present evident risks of unlicensed/unauthorised fishing, given the reportedly large number of unlicensed vessels and generally insufficient levels of MCS.

The clear presence of foreign IUU vessels is also apparent, creating an additional risk within this category for non-Malaysian fleets.

5.9.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Requirements for VMS, logbooks and other reporting mechanisms have been poorly defined in national legislation during the period of this study, although the presence of a monthly landings monitoring framework should be noted. However the risk of misreporting and/or failing to report catch by licensed vessels must still be considered, and traditional and commercial national fleets will again be considered separately. Given reports of authorised foreign vessels violating the conditions of international fishing agreements, this category of risks must also be evaluated individually for foreign vessels.

5.9.6.3 Non-compliance with other licence conditions and/or legislation

In light of the evidence of illegal fishing activities being undertaken in Malaysia's marine parks, the general risk of fishing within spatio-temporal closures will be assessed under this category. The use of prohibited and destructive gears in the Malaysian EEZ also requires evaluation, with the literature indicating that a variety of these gear types have been in use during the period of this study.

5.9.6.4 Post-harvest IUU

A number of post-harvest risks require consideration for Malaysia, such as the recognised occurrence of illegal transshipments between national vessels and foreign carriers. Issues within Malaysia's ports such as the harbouring of known IUU vessels and the landing of illegal catch from both within and beyond the EEZ must also be evaluated. Finally Malaysia's role as a regional market conduit for IUU products will be assessed under this section.

5.9.6.5 Other offences

The impact of IUU fishing practices on ETP species such as marine turtles and sought after reef fish in Malaysia is evident in the literature, and must therefore be considered as part of this risk assessment. The acknowledged encroachment of commercial vessels into areas reserved for traditional fishing practices will be considered as a risk within this category, given the zonal basis upon which licenses for Malaysian vessels are granted and the evidence for violations.

Table 73 shows the IUU risks that have been identified as possible risks for Malaysia.

Table 73 Specific risks identified for Malaysia.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed/unauthorised fishing by national traditional fleet	1
	Unlicensed/unauthorised fishing by national commercial fleet	2
	Unlicensed/unauthorised fishing by foreign fleets	3
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of/unreported catch by national traditional fleet	1
	Misreporting of/unreported catch by national commercial fleet	2
	Misreporting of/unreported catch by foreign fleets	3
Non-compliance with other licence conditions and/or legislation	Use of prohibited and destructive gears	All
	Fishing within spatio-temporal closures	All
Post-harvest IUU	Illegal transshipment	2,3
	Illegal landing of IUU catch in national ports	All
	Entry of IUU vessels into national ports	All
	Export or import of IUU catch	All
Other offences	Harvest of ETP species	All
	Incursion of industrial vessels into restricted artisanal zones	2,3

5.9.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 74), impact (Table 75) and level of inherent risk (Table 76) for Malaysia based on the risks identified in Table 73.

Table 74 Assessment of risk likelihood – Malaysia.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed/unauthorised fishing by national traditional fleet	High	Very Weak	Almost certain
Unlicensed/unauthorised fishing by national commercial fleet	High	Weak	Likely
Unlicensed/unauthorised fishing by foreign fleets	Moderate	Weak	Likely
Misreporting of/unreported catch by national traditional fleet	Moderate	Very Weak	Likely
Misreporting of/unreported catch by national commercial fleet	High	Weak	Likely
Misreporting of/unreported catch by foreign fleets	Moderate	Moderate	Moderate
Use of prohibited and destructive gears	High	Weak	Likely
Fishing within closed areas	High	Weak	Likely
Illegal transshipment	Moderate	Weak	Likely
Illegal landing of IUU catch in national ports	High	Moderate	Likely
Export or import of IUU catch	High	Weak	Likely
Harvest of ETP species	Very High	Very weak	Almost certain
Incursion of industrial vessels into restricted artisanal zones	Moderate	Weak	Likely
Dual flagging of foreign boats under Malaysian flag	High	Weak	Likely

Table 75 Assessment of risk impact – Malaysia.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by national traditional fleet	High	Vulnerable	Major
Unlicensed/unauthorised fishing by national commercial fleet	High	Moderate	Major
Unlicensed/unauthorised fishing by foreign fleets	Moderate	Vulnerable	Major
Misreporting of/unreported catch by national traditional fleet	Moderate	Vulnerable	Major
Misreporting of/unreported catch by national commercial fleet	High	Moderate	Major
Misreporting of/unreported catch by foreign fleets	Moderate	Moderate	Moderate
Use of prohibited and destructive gears	High	Highly Vulnerable	Serious
Fishing within closed areas	Moderate	Highly Vulnerable	Major
Illegal transshipment	Low	Moderate	Moderate
Illegal landing of IUU catch in national ports	Moderate	Vulnerable	Major
Export or import of IUU catch	Low	Vulnerable	Moderate
Harvest of ETP species	High	Highly Vulnerable	Serious
Incursion of industrial vessels into restricted artisanal zones	Moderate	Highly Vulnerable	Major
Dual flagging of foreign boats under Malaysian flag	Low	Vulnerable	Moderate

Table 76 Assessment of inherent risk – Malaysia.

Specific risk	Likelihood	Impact	RISK
Unlicensed/unauthorised fishing by national traditional fleet	Almost Certain	Major	Severe
Unlicensed/unauthorised fishing by national commercial fleet	Likely	Major	High
Unlicensed/unauthorised fishing by foreign fleets	Likely	Major	High
Misreporting of/unreported catch by national traditional fleet	Likely	Major	High
Misreporting of/unreported catch by national commercial fleet	Likely	Major	High
Misreporting of/unreported catch by foreign fleets	Moderate	Moderate	Moderate
Use of prohibited and destructive gears	Likely	Serious	Severe
Fishing within closed areas	Likely	Major	High
Illegal transshipment	Likely	Moderate	High
Illegal landing of IUU catch in national ports	Likely	Major	High
Export or import of IUU catch	Likely	Moderate	High
Harvest of ETP species	Almost certain	Serious	Severe
Dual flagging of foreign boats under Malaysian flag.	Likely	Major	Moderate
Incursion of industrial vessels into restricted artisanal zones	Likely	Major	High

5.9.8 Impacts of IUU

All of the specific IUU risks for Malaysia were assigned a minimum level of high and four risks were classed at a severe level, with large fleet capacities, high incentives, vulnerable marine ecosystems and weak levels of enforcement combining to increase the risk levels. The severe risk identified for unlicensed/unauthorised fishing by the national traditional fleet illustrates the significant proportion of this fleet fishing illegally without licenses, a situation exacerbated by the 'informal' exemption of traditional operators from licensing by authorities even though it is required under national law. Unlicensed fishing on such a large scale prevents effective fisheries management and quantitative

analysis, with catch and effort data likely to be unobtainable from this fleet segment. Moreover the smaller vessel types within the traditional fleet will be concentrated in coastal areas, and consequently unlicensed fishing by this fleet is likely to exert unsustainable pressure on coastal marine resources and threaten vulnerable shallow habitats such as coral reefs and seagrass. High risks of unlicensed fishing were also scored for the national commercial fleet and foreign fleets, creating similar issues regarding unknown catch and effort. Moreover unlicensed commercial vessels compete with legitimate fleets for resources, and unlicensed fishing by foreign fleets is additionally damaging as it deprives Malaysia of revenues which could be obtained from legal foreign fishing operations under international fishing agreements.

The licensed portion of the national traditional fleet also scored a severe level for the risk of misreporting of or failing to report catch, with a high risk also identified for the licensed national commercial fleet. Failure to report catch and inaccurate reporting of catch undermine fisheries data quality, leading to underestimation of quantities and preventing accurate stock assessments of target species. In addition these offences often cause the available data to become aggregated, with insufficient species or genus specific catch data to inform appropriate management actions.

A severe risk was also identified for the use of prohibited and destructive gears, with the evidence indicating the illegal use of gears such as otter trawls and dynamite. The use of these indiscriminate gear types causes significant ecological damage, resulting in the long-term degradation of vulnerable habitats and high levels of bycatch. Furthermore fishing inside spatio-temporal closures was also scored as a high risk, with Malaysia's network of MPAs known to be illegally exploited. Given that MPAs and other forms of closure are employed to protect sensitive areas of high biodiversity and/or sites important for the life cycles of important fish stocks, the impact of illegal fishing inside these areas is likely to cause adverse economic and ecological effects. Encroachment of industrial vessels into reserved artisanal areas was assessed as a separate risk, given the evidence for this practice in Malaysia, and the operation of industrial vessels in coastal areas can threaten the livelihoods of communities involved in small-scale fishing by undermining coastal fish stocks unable to sustain industrial levels of offtake.

Several post-harvest risks were also scored at a high level for Malaysia, with evidence indicating the transshipment, landing and trade of IUU products both domestically and abroad. Illegal transshipment increases the likelihood that catch from the Malaysian EEZ will not be reported, and also the presence of unmonitored carrier vessels allows illegal fishing vessels to continue fishing for longer periods without returning to shore, thus increasing fishing intensity. Moreover national vessels are able to exploit potential loopholes in the fisheries governance of other states, thereby illegally accessing alternative market opportunities and depriving Malaysia of revenue, as in the example of Malaysian vessels transshipping to Thai carriers rather than bringing catch ashore. Furthermore the identified role of Malaysia's ports as a hub for IUU vessels increases the regional range of illegal fishing activities, providing a base for vessels to operate from in addition to an avenue for the landing of illegal catches. Moreover the illegal vessels passing through Malaysia's ports are known to target highly vulnerable and commercially valuable toothfish stocks under CCAMLR management, and thus Malaysia's port state weaknesses are assisting IUU vessels in their efforts to target stocks inside RFMO areas.

Harvest of ETP and CITES-listed species was also assessed at a severe level in light of the diverse range of protected, vulnerable marine species known to be targeted by IUU activities. Species such as sharks, marine turtles and napoleon wrasse are recognised to be ecologically susceptible to fishing pressure and in global decline, and illegal extraction of these animals is likely to negatively impact their populations within Malaysian and regional waters.

5.9.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

A number of Malaysian specific risks were assigned relatively high estimated rates for IUU fishing, and due to the fact that the catch data were not disaggregated by fleet for the purposes of calculation, it should be noted that the modifying percentages are applied to the catch data as a whole.

Unlicensed fishing is acknowledged as a major issue in Malaysia, and overall estimated rates of 5-20% have been applied across the specific risks for the various unlicensed fleet segments, with the high upper limit values taking account of the reportedly large scale of unlicensed fishing within Malaysia's EEZ. The highest value of 20% was allocated to national traditional fleets, reflecting the size of this fleet segment and the recognised informal policy of not licensing traditional fishers, thereby increasing the quantity of illegal catch likely to be attributable to this fleet. Ranges of 5-20 and 5-10% were used to estimate the illegal catch of unlicensed national commercial fleets and foreign fleets respectively.

Misreported/unreported catch for the national traditional fleet was assigned a relatively low range of 5-20% given that this fleet segment is likely to be largely unlicensed and thereby covered by the percentages assigned to the risks in the previous paragraph. A higher range of 10-25% was assigned to the national commercial fleet, given the lack of legislative requirements for reporting mechanisms to be adopted and therefore the probability that a significant proportion of catch from this fleet segment is not reported correctly or unreported entirely. Given the lack of evidence for licensed foreign fisheries in Malaysia, in addition to the fact that foreign vessels are only permitted in Malaysia under international agreements, the risk of misreporting by this fleet segment was assigned a low estimated rate of 0-2%.

The remaining risks identified for Malaysia would not add to the estimated level of IUU fishing and are therefore not assigned separate estimated rate values.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Malaysian EEZ can be found in Table 77.

Table 77 Summary of estimated rates – Malaysia.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by national traditional fleet	1	Mixed	1990-2013	5	20	0	0
Unlicensed/unauthorised fishing by national commercial fleet	2	Tuna, tuna-like species, small pelagics, mixed demersal fish and invertebrates	1990 – 2013	5	20	0	0
Unlicensed/unauthorised fishing by foreign fleets	3	Mixed	1990 – 2013	5	10	0	0
Misreporting of/unreported catch by national traditional fleet	1	Mixed	1990 – 2013	0	0	5	20
Misreporting of/unreported catch by national commercial fleet	2	Tuna, tuna-like species, small pelagics, mixed demersal fish and invertebrates	1990 – 2013	0	0	10	25
Misreporting of/unreported catch by foreign fleets	3	Mixed	1990 – 2013	0	0	0	2

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Use of prohibited and destructive gears	All	Mixed	1990 – 2013	0	0	0	0
Fishing within closed areas	All	Mixed	1990-2013	0	0	0	0
Illegal transshipment	All	Mixed	1990 – 2013	0	0	0	0
Illegal landing of IUU catch in national ports	All	Mixed	1990 – 2013	0	0	0	0
Export or import of IUU catch	All	Mixed	1990 – 2013	0	0	0	0
Harvest of ETP species	All	Sharks, turtles, corals, sea cucumbers, rare reef fish.	1990 – 2013	0	0	0	0
Dual flagging of foreign boats under Malaysian flag	3	----	1990 – 2013	0	0	0	0
Incursion of industrial vessels into restricted artisanal zones	2,3	Mixed	1990-2013	0	0	0	0

5.9.10 Quantification of Illegal, Unreported and Unregulated fishing

The total illegal and unreported catches, based on reported FAO catch data, represent between 314,153 and 1,019,067t per annum on average (i.e. 25 and 82%). Illegal catches contribute an estimated 12.82 – 43.08% and unreported catches 12.55-39.24% in addition to the reported catch. Losses from Illegal, Unreported and Unregulated fishing in the Malaysian EEZ are estimated to average between USD 537.57 and 1,752.82 million per annum.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 78 and as first landed value in Table 79. Profiles of the estimated level of illegal and unreported fishing combined in Malaysia can be found in Figure 24 (catch in t) and Figure 25 (catch value in USD).

Table 78 Summary of estimated IUU by year In Malaysia (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	955422	127393	424527	127218	398838	0	0
1991	914260	123655	417735	119250	372015	0	0
1992	1024766	135453	451381	135259	424057	0	0
1993	1047641	139055	463394	138870	435361	0	0
1994	1066476	142628	478295	140223	438609	0	0
1995	1113276	150740	510549	144396	450011	0	0
1996	1131279	151922	515479	144863	451136	0	0
1997	1173063	155502	523294	151501	473292	0	0
1998	1153173	151116	513127	143636	447299	0	0
1999	1252482	163276	553200	156127	486598	0	0
2000	1289776	170529	572742	166913	521859	0	0
2001	1235367	161492	538158	161270	505594	0	0
2002	1276185	169763	565742	169563	531550	0	0
2003	1287336	167348	565840	161023	502156	0	0
2004	1335725	168883	568353	164502	513906	0	0
2005	1213681	155418	517930	155224	486613	0	0

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	1286393	163502	544847	163263	511859	0	0
2007	1385503	178143	593622	177862	557656	0	0
2008	1398102	171824	580543	165545	516475	0	0
2009	1397294	171680	579607	165685	517102	0	0
2010	1432912	174659	588944	169177	528190	0	0
2011	1377185	166682	562925	160795	501725	0	0
2012	1476319	176018	589145	173810	544094	0	0
2013	1486979	173671	578681	173340	543551	0	0

Table 79 Summary of the estimated value of IUU (USD) by year in Malaysia (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	1310.37	180.70	601.21	180.35	564.39	0.00	0.00
1991	1420.63	207.49	715.36	188.98	584.26	0.00	0.00
1992	1542.94	212.61	706.97	212.22	663.55	0.00	0.00
1993	1787.75	246.78	819.07	246.41	768.29	0.00	0.00
1994	1765.24	246.59	822.84	244.24	762.78	0.00	0.00
1995	1863.62	274.46	956.17	240.85	737.20	0.00	0.00
1996	1958.43	288.68	1009.31	250.53	764.94	0.00	0.00
1997	1993.60	287.45	994.24	256.58	785.60	0.00	0.00
1998	1844.43	271.51	956.05	231.58	707.88	0.00	0.00
1999	2053.69	301.29	1054.90	262.21	805.25	0.00	0.00
2000	2059.92	298.41	1029.16	271.01	836.78	0.00	0.00
2001	2005.19	278.10	926.03	277.65	869.67	0.00	0.00
2002	2044.75	286.77	955.50	286.37	897.62	0.00	0.00
2003	1874.62	270.31	945.42	235.39	721.44	0.00	0.00
2004	1957.13	277.53	967.74	243.77	747.97	0.00	0.00
2005	1724.26	233.78	778.54	233.39	731.19	0.00	0.00
2006	1843.43	249.15	829.79	248.67	779.26	0.00	0.00
2007	2236.76	307.08	1022.29	306.52	959.92	0.00	0.00
2008	2018.85	280.79	979.66	246.20	755.75	0.00	0.00
2009	2241.80	308.33	1064.01	277.04	850.22	0.00	0.00
2010	2313.16	321.57	1108.94	292.61	904.65	0.00	0.00
2011	2350.10	328.83	1137.20	296.88	916.71	0.00	0.00
2012	2624.46	351.57	1173.25	349.29	1093.54	0.00	0.00
2013	2684.39	356.95	1188.78	356.29	1116.42	0.00	0.00

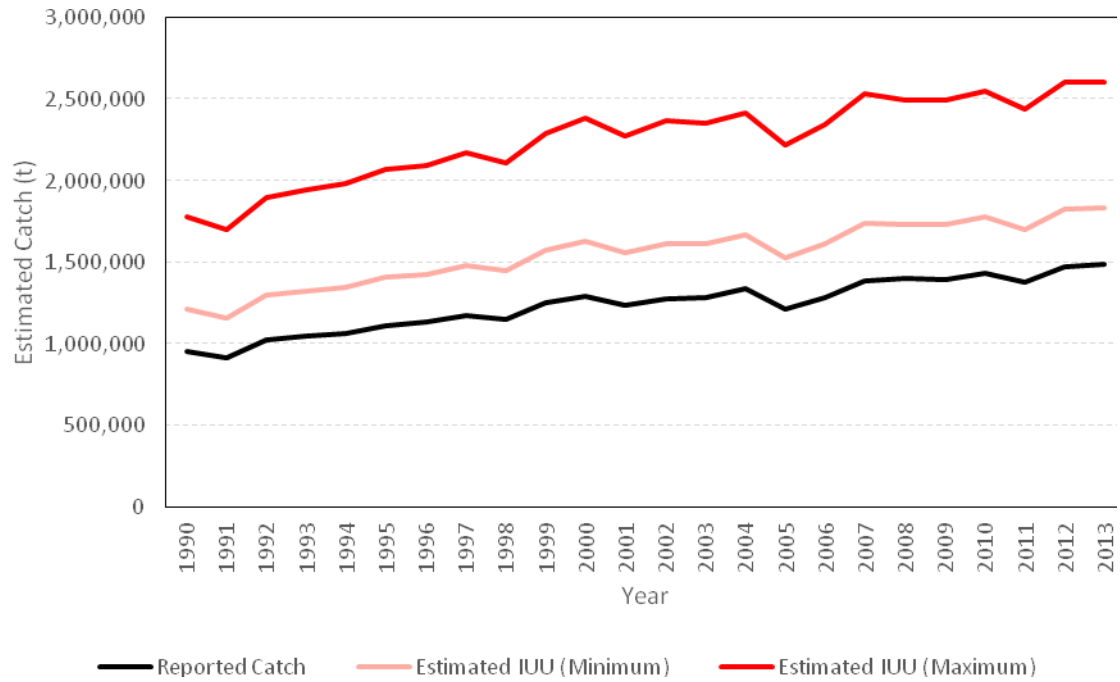


Figure 24 IUU Catch Profile (Malaysia) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

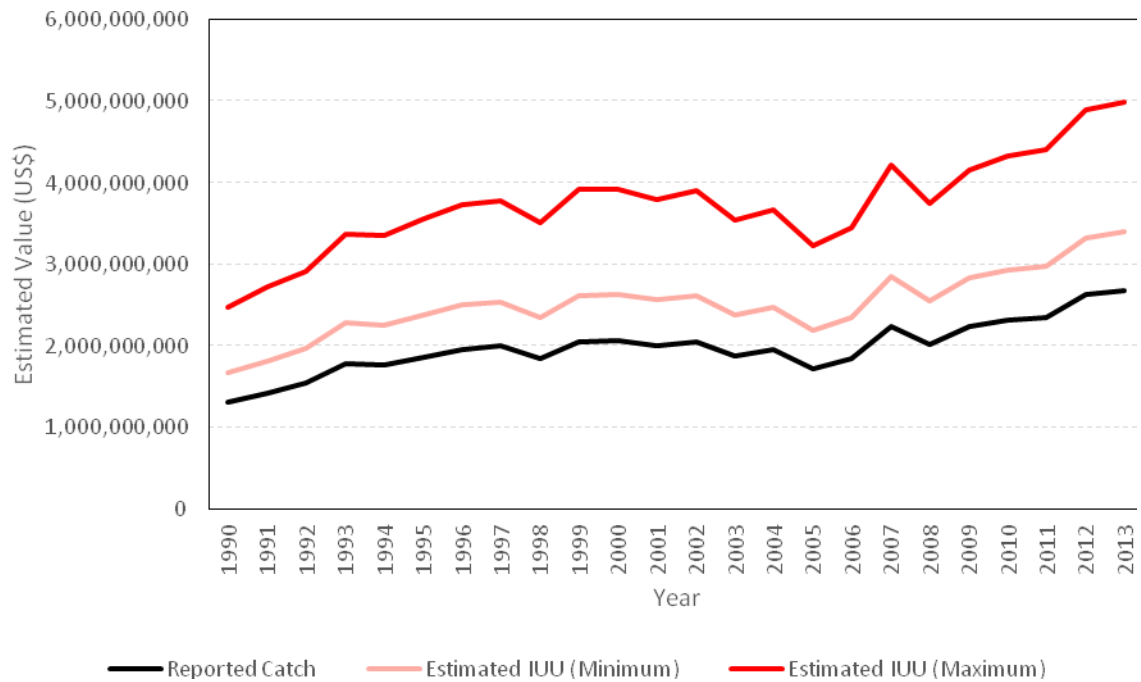


Figure 25 IUU Catch Value Profile (Malaysia) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.10 Maldives

5.10.1 Introduction

The Maldives Archipelago consists of 1,192 coral islands grouped in two chains of 26 atolls stretching in a north – south direction from the borders with India and Sri Lanka in the north to the British Indian Ocean Territory in the south. The Maldives EEZ covers an area of 766,600 km² with an additional 159,790 km² of territorial sea and internal waters. Fisheries is the second most important industry sector, after tourism, for the Maldives economy, both sectors contributing greatly to foreign exchange.

5.10.2 Fleet breakdown

The current legal fleets operating inside the Maldives are entirely domestic. The largest fleet in terms of catch is the pole and line fleet. This fleet targets skipjack and yellowfin tunas for canning and export primarily to the European Union and the entire national fleet achieved MSC certification in 2012. The handline fishery for high value yellowfin tuna is also in the process of undergoing MSC certification. Previously foreign longline vessels were allowed to operate in a zone offshore, but the foreign fishing vessel licensing scheme was scrapped by the Government of Maldives in March 2009. The handline fishery for reef and other species mainly supplies the domestic market and targets species in and around the archipelago.

Table 80 Fleet breakdown for Maldives.

Fleet	Description	Gear	Flag(s)	Target species	Comment
1	Pole and line	Pole and line	Maldives	Skipjack tuna	
2	Handline	Handline	Maldives	Yellowfin tuna	
3	Longline	Longline	Maldives (+ possible illegal)	Bigeye and yellowfin tuna	Some foreign vessels prior to 2009, now all domestic.
4	Trolling	Trolling	Maldives	Bigeye, yellowfin and skipjack tunas	
5	Handline (Reef)	Handline	Maldives	Snappers, groupers and small tunas	Often underestimated and under-reported in national catch figures.

5.10.3 Catch breakdown by fleet

In terms of catch breakdown the pole and line tuna fleet dominates with just over 70% of the total catch and is highly specific with 74% skipjack and 20% yellowfin tuna. The yellowfin tuna handline fleet is even more specific with over 90% yellowfin tuna. Longline catches are dominated by bigeye tuna (>90%) and trolling has a mix of bigeye, yellowfin, skipjack and small tunas. The handline (reef) catches mainly snappers, emperors and groupers with only a small bycatch of tuna species. A full breakdown of the catch by fleet and species based on those species reported in the national catch can be found in Table 81.

Table 81 Breakdown of total catch by fleet and species in the Maldives.

Species/species group	Pole and line	Handline	Longline	Trolling	Handline (Reef)
Bigeye tuna	0.2363%	0.4079%	1.1672%	0.2363%	0%
Marlins, sailfishes, etc. nei	0%	0%	0%	0%	0%
Sea cucumbers nei	0%	0%	0%	0%	0%
Dogtooth tuna	0.0290%	0.0021%	0%	0.0065%	0.0017%
Frigate and bullet tunas	0.4492%	0.0392%	0%	0.0172%	0.0001%
Kawakawa	0.5760%	0.0797%	0%	0.0345%	0.0001%
Marine molluscs nei	0%	0%	0%	0%	0%
Marine fishes nei	0%	0%	0%	0%	0%
Skipjack tuna	52.2998%	0.7889%	0.0003%	0.1406%	
Sharks, rays, skates, etc. nei	0%	0%	0%	0%	0%
Tropical spiny lobsters nei	0%	0%	0%	0%	0%
Tuna-like fishes nei	0%	0%	0%	0%	0%
Yellowfin tuna	14.3614%	23.5044%	0.1495%	0.1407%	0%
Other species nei	2.7658%	0.4695%	0.3330%	0.1152%	1.58%

5.10.4 Analysis of IUU related factors

The fisheries around the Maldives are dominated by domestic vessels during the period of the study. Only foreign licensed longline vessels have been allowed to fish inside the Maldives EEZ (restricted to areas >75nm from the islands) during the period and this was stopped in March 2009¹⁴⁶. This increased the level of control the Maldives can exercise both over the fisheries and the fishing vessels that operate under its flag.

In terms of the fishing fleets identified in Table 80 it is clear that most of the classes of fishing vessels that operate around the Maldives are local vessels with limited endurance (mostly fresh fish/ice boats which must return to port within a set period of time) except for the longline vessels. All local vessels are identified and registered locally and no Maldives vessels are known to have ever been included on any RFMO list of IUU vessels. The exclusion of foreign flagged vessels in preference to a wholly domestic fleet, and the physical requirement for boats to come into port on a regular basis, leads to more opportunity for inspection and less potential for non-compliance or illegal fishing. The fisheries can be divided simply into the four tuna targeting methods: pole and line (skipjack), handline (yellowfin), longline (bigeye and yellowfin) and trolling (mixed), and the handline fishery for reef species. These are all relatively high value species and as such the risk assessment must take this into account.

The Maldives is a responsible flag State with clear planning and management of fisheries in place, as is appropriate for a State that is highly dependent on fisheries financially. There is a Research Plan (MRC, 2012) that highlights national objectives both long term and short term objectives to ensure clear transparent management of the resources. This is primarily in place to ensure the continued MSC certification of both the skipjack pole and line and yellowfin tuna handline fisheries.

The flag State responsibilities indicated by the Maldives include a number that would place them at the forefront of fisheries management and flag State control among regional flag States:

- Ensuring that a VMS system is in place and implemented initially for the longline fleet, and subsequently make it mandatory for all licensed fishing vessels;
- Undertake work towards implementation of the observer programme where it is expected the minimum 5% (IOTC Resolution 11/04¹⁴⁷) coverage of fishing trips;
- Introduced full logbook system supplemented by the fish purchase and custom export data to replace current data collection system; and
- Improvement of the reporting and dissemination of the fishery statistics.

The Maldives is a signatory to the UN Fish Stocks Agreement (signed 1998) and UNCLOS (signed 2000), although it has not signed the FAO Port State Measures Agreement or the FAO Agreement to

¹⁴⁶ <http://iotc.org/sites/default/files/documents/proceedings/2011/s/IOTC-2011-S15-CoC61%5BE%5D.pdf>

¹⁴⁷ <http://www.iotc.org/cmm/resolution-1104-regional-observer-scheme>

Promote Compliance with International CMMs by fishing vessels on the High Seas at the time of reporting, although being an IOTC Member it has signed up to the IOTC Resolution 10/11 on port State measures¹⁴⁸.

National fisheries law is defined by the Fishery Law (Law No. 5/87) and associated regulations that are currently in force. This law dates from 1985 and together with the regulation for “Issuing License to fish in the Exclusive Economic Zone of the Republic of the Maldives”. It should be noted the Fisheries Law was revised and submitted to the Maldives Parliament in 2008, but the proposed bill was later withdrawn by the Government to make amendments with reflecting community consultations. The Bill has been further revised after extensive consultation and has been re-submitted to Parliament (Government of Maldives, 2009).

The Maldives has not been identified as a flag of non-compliance and are not currently red or yellow flagged by the EU or any other State that would restrict exports. They have not been identified as being a flag State that has a poor record in completed EU catch certificates all of which show a good management structure in place with adequate resources. Maldives are in the middle of the group of regional States on the World Bank Governance indicators (See Table 159), which would lead to a slight increase in certain IUU risks as indicated by Agnew *et al.* (2009).

The Maldives are Members of IOTC but as their fleets do not operate over a wider geographic range there is no requirement for them to be Members of any other RFMOs. The Maldives did not join IOTC until 2011 but prior to this they were recognised as a cooperating non-contracting party and supplied data to IOTC as would any contracting party to enable these data to be included in the regional stock assessments. There are currently no quota restrictions in place within IOTC but at the moment the tuna species exploited in the Maldives under management by IOTC are all in a condition where they are not overfished and overfishing is not taking place (IOTC Scientific Committee, 2014). The Maldives are known to cooperate with other coastal States on monitoring, control and surveillance from ad hoc information exchanges through to discussions about exchanges of fisheries officers and joint patrols during patrols of shared border regions (MRAG Pers. Comm. 2015).

The Maldives’ responsibilities as a coastal State are limited by the opportunities of foreign flagged vessels to operate inside Maldives waters as defined above.

Refer to table of IUU Incidences in section 5.10.5.

The Maldives appear to have current MCS levels that should be considered to be moderate to high with the Maldives being comparatively rich compared to other regional States in terms of vessel assets (operated by the Coastguard), which include a 45m vessel, two 40m vessels, a 35m vessel and a number of other smaller vessels below 25m. These vessels as operated by the Coastguard are multipurpose, with the larger vessels spending about two thirds of their time at sea and about half

¹⁴⁸ <http://www.iotc.org/cmm/resolution-1011-port-state-measures-prevent-deter-and-eliminate-illegal-unreported-and>

of that time on fisheries activities and safety issues. The Coastguard has three operational bases, one in the north, one in Male (the capital), and one in the south of the archipelago. A VMS centre is operated from the Coastguard's offices and most of the tuna vessels are VMS monitored to comply with the requirements of the EU IUU regulation. Although historically there has been no aerial surveillance or extensive radar coverage of the EEZ this is planned with assistance from India. There has also not been a systematic observer programme implemented for the period concerned although funds have been allocated to implement one for 2015.

Licensing arrangements are public and on the Ministry of Fisheries and Agriculture website with all required application forms¹⁴⁹.

Sanctions for breaking the Maldivian fisheries law are defined clearly in section 15.1 of the law and are set "between 100,000 and 1,000,000 Rufiyaa or a sum of money not exceeding the cost of the vessel employed in the contravention of this Law" with additional confiscation of any gains (i.e. catch) from such contravention. This at current exchange rates sets fines in the region of USD 6,400 – USD 64,000, which are not the highest fines regionally but to many fishers this would create a medium level of deterrent.

The Maldives is not a port State used by many other fishing fleets. This is primarily for two reasons. The first is that only a limited number of licensed vessels have been allowed to operate in the Maldives EEZ and then at a distance from the main island chains. The second is that the Maldives onshore facilities are limited and geared up for the operations of domestic fleets only and the capacity for large scale operations by foreign vessels are not available. These two reasons make it more economical to supply themselves through bunkering and resupply at sea or through other ports in the region. The Maldives Customs Service/Ports Authority provide inspection capacity, restrict any illegal trade and implement port State measures. As a member of IOTC, the Maldives are signed up to IOTC Resolution 10/11 which effectively enforces the FAO PSMA for the Indian Ocean tuna fisheries. This provides a mechanism for combatting IUU fishing through port inspections of visiting vessels. Transshipment is only allowed in ports.

The Maldives is effectively only a market State for domestic products with little in the way of fisheries imports from other States and has not been identified as being used as a conduit for any IUU products.

5.10.5 Summary of IUU incidences

There are very few incentives or drivers of illegal fishing in the domestic fishery and no records of illegal fishing locally. There is in addition very little clear information about the extent to which foreign vessels might or might not be fishing illegally in Maldivian waters. There is no real way to determine the extent to which illegal activity is being detected, although it is perceived that foreign

¹⁴⁹ <http://www.fishagri.gov.mv/index.php/en/major-services-rendered/fisheries-services>

vessels may be engaged in a low but significant level of illegal fishing since the licensing of these vessels was stopped in 2009.

A number of small Sri Lankan vessels have been apprehended at regular intervals^{150 151}. These are the same fleet that is found illegally fishing in the British Indian Ocean Territory and can be found as far west as the Seychelles and as far south as Mauritius.

In October 2009, two Iranian fishing vessels (assumed gillnetters) were apprehended by the Maldives National Defense Force (MNDF) coastguard¹⁵². These two vessels were when inspected found to be carrying almost 60 tonnes of fish.

5.10.6 IUU risk identification

5.10.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or Exclusive Economic Zone.

The Maldives sit in a difficult position geographically that leaves them susceptible to foreign flagged vessels coming in and attempting to fish illegally. To the north lie India and Sri Lanka, who both have a history of illegal fishing in their own waters (and particularly in the southern Indian states) and have been recorded fishing in the Maldives^{153,154}. These threats have been in place for the entire period of the study although it is known that they have increased over the past fifteen years. In recent years, there has been an increasing threat from the growing and expanding gillnet fleets from Pakistan and Iran who have extensive fleets that have been known to fish in the Western Indian Ocean with illegal operations identified in both the Maldives¹⁵⁵ and other coastal States¹⁵⁶.

There is little incentive for unlicensed fishing by national boats inside the Maldives EEZ. With the exclusion of foreign flagged vessels there are opportunities and licensing. The Maldives authorities also have a clear handle on flag State control and it would appear that questions would be raised about any unlicensed vessel operating from a Maldives port by other vessels and the authorities.

During the period of the study a well-developed longline fishery has operated across the Indian Ocean and up to the edge of the Maldives EEZ. There exists throughout this period a possibility for

¹⁵⁰ <http://minivannews.com/society/the-proceeds-of-illegal-fishing-in-the-maldives-1828#sthash.KbuJnG1U.dpbs>

¹⁵¹ <http://www.emirates247.com/news/sri-lanka/lankan-fined-for-illegal-fishing-by-maldives-2013-03-10-1.497982>

¹⁵² <http://minivannews.com/society/the-proceeds-of-illegal-fishing-in-the-maldives-1828#sthash.KbuJnG1U.dpbs>

¹⁵³ <http://www.emirates247.com/news/sri-lanka/lankan-fined-for-illegal-fishing-by-maldives-2013-03-10-1.497982>

¹⁵⁴ http://www.stopillegalfishing.com/news_article.php?ID=99

¹⁵⁵ <http://www.atuna.com/NewsArchive/ViewArticle.asp?ID=7571>

¹⁵⁶ http://www.stopillegalfishing.com/sifnews_article.php?ID=38

vessels from the various longline fleets (i.e. Japan, Korea, China, Taiwan R.o.C, etc.) and also the gillnetter fleets from Iran, Pakistan and Oman to fish illegally in the Maldives EEZ during this period. There may be times when a longline or gillnet vessel is fishing on an eddy or a gyre and the movements of the current patterns may bring gear close to or bordering the Maldives EEZ, in which case a vessel may cross the boundary either willingly or unintentionally to continue to fish and recover the gear.

Similarly, a legal purse seine fleet operates in the Indian Ocean. Although there have been very few incidences of IUU from the purse seine fleet reported across the Indian Ocean as these vessels tend to be highly risk averse there does exist a minimal level of risk of some purse seine vessels in early years of the study before the mandatory requirements for VMS and AIS were introduced having exploited weaknesses in the Maldives offshore enforcement capability and fished on the edges of the EEZ. In more recent years the likelihood of IUU from the purse seine fleet would be minimal.

5.10.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Logbook data are collected for licensed/authorised fisheries and provide catch and effort series that are available from various industrial and artisanal fisheries and are considered to be of good quality relative to other regional data sources for common fisheries (Kolody and Adam, 2011).

The benefits of non-reporting or misreporting to fishers can include minimising the appearance of earnings and therefore reduction in tax by not recording higher value species and appearing to report and sell them as lower price with additional fraudulent payments that tax authorities are unaware of. In addition, from a fisheries management point of view quotas can be “massaged” by reporting quota managed target of bycatch species as non-quota managed species to enable the vessel to fish longer for high value target species. Similarly, misreporting or late reporting of catch can allow quotas in particular areas or periods to be exceeded.

5.10.6.3 Non-compliance with other licence conditions by licensed/authorised vessels

A number of possible other offences have been identified as possible risks for the fisheries inside the Maldives EEZ. Falsification of documentation and failure to carry an observer although possible are unlikely. The size and complexity of the fisheries administration make the falsification unlikely, although with a relatively average set of World Bank Governance Indexes (58th percentile) there would exist a risk of corruption although likely to be very low for back-dating of licences etc. Failure to carry an observer may be more likely if requested as longline vessels would need to leave the fishing waters and come into port to deploy and return an observer which would reduce fishing time.

5.10.6.4 Post-harvest IUU

There is a risk of illegal transshipping of catch taken from the Maldives EEZ onto reefers. This would only apply to the longline fleets operating and would coincide with the risks for under-reporting target and misreporting of bycatch species, where logbook records would not be completed correctly to accommodate the catch transhipped. The risk of this occurring would be low generally, but would be possible due to the low level of patrolling in the areas of the EEZ >75nm from shore, i.e. where the longline fleet would be operating. This risk would only have occurred up to and including 2009 when foreign longline activity stopped in the Maldives EEZ. After this date, any illegal

transhipments would be considered as illegal catch and reported under the appropriate risk category.

As for illegal transhipping, due to the lack of extensive patrolling in the areas >75nm from shore there exists a possibility for bunkering to occur at sea. This would only happen between 1990 and 2009 when vessels are likely to have been operating in this area.

Table 82 shows the IUU risks that have been identified as possible risks for Maldives

Table 82 Specific risks identified for Maldives.

Risk category	Specific risk	Fleets
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed fishing in EEZs by national boats	1, 2 ,3 ,4 and 5
	Unlicensed fishing in EEZs by boats from regional States	3
	Unlicensed fishing in EEZs by boats from outside the region	3
Non-compliance with reporting obligations by licensed/authorised vessels	Under-reporting target species	1, 2 ,3 ,4 and 5
	Misidentifying target species	1, 2 ,3 ,4 and 5
	Misreporting of bycatch species	1, 2 ,3 ,4 and 5
	Misreporting catch position	1, 2 ,3 ,4 and 5
	Non- or delayed logbook submission	1, 2 ,3 ,4 and 5
	Failure to operate VMS inside an EEZ where required	3
	Failure to provide prompt reporting to coastal State.	3
Non-compliance with other licence conditions by licensed/authorised vessels	Falsification/misuse of licence documents	3
	Failure to carry an observer when required.	3
	Illegal transhipping	3
	Bunkering (refuelling) at sea	3
Post-harvest IUU	Landing of catch in unauthorised foreign ports	3
	Illegal harvest/possession of sharks or other protected species.	3,4,5
	Damage to essential habitats in contravention of national laws.	3,4,5
Other offences	Bribery/obstruction/mistreating of observers or fisheries officers.	3

5.10.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 83), impact (Table 84) and level of inherent risk (Table 85) for the Maldives based on the risks identified in Table 82.

Table 83 Assessment of risk likelihood – Maldives.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZs by national boats	Low	Strong	Unlikely
Unlicensed fishing in EEZs by boats from regional States	High	Strong	Moderate
Unlicensed fishing in EEZs by boats from outside the region	High	Strong	Moderate
Under-reporting target species	Moderate	Strong	Unlikely
Misidentifying target species	Low	Strong	Unlikely
Misreporting of bycatch species	Low	Strong	Unlikely
Misreporting catch position	Moderate	Strong	Moderate
Non-or delayed logbook submission	Low	Strong	Unlikely
Failure to operate VMS inside an EEZ where required	Low	Strong	Unlikely
Failure to provide prompt reporting to coastal State	Moderate	Strong	Moderate
Falsification/misuse of licence documents	Low	Strong	Unlikely
Failure to carry an observer when required.	Low	Strong	Unlikely
Illegal transshipping	Moderate	Strong	Moderate
Bunkering (refuelling) at sea	Moderate	Strong	Moderate
Landing of catch in unauthorised foreign ports	Low	Strong	Unlikely
Illegal harvest/possession of sharks or other protected species	Low	Strong	Unlikely

Table 84 Assessment of risk impact – Maldives.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZs by national boats	Moderate	Moderate	Moderate
Unlicensed fishing in EEZs by boats from regional States	Moderate	Vulnerable	Major
Unlicensed fishing in EEZs by boats from outside the region	High	Moderate	Major
Under-reporting target species	Moderate	Moderate	Moderate
Misidentifying target species	Moderate	Moderate	Moderate
Misreporting of bycatch species	Moderate	Moderate	Moderate
Misreporting catch position	Low	Moderate	Minor
Non-or delayed logbook submission	Low	Resilient	Minor
Failure to operate VMS inside an EEZ where required	Low	Resilient	Minor
Failure to provide prompt reporting to coastal State	Low	Resilient	Minor
Falsification/misuse of licence documents	High	Resilient	Moderate
Failure to carry an observer when required.	Low	Resilient	Minor
Illegal transshipping	High	Moderate	Major
Bunkering (refuelling) at sea	Moderate	Resilient	Minor
Landing of catch in unauthorised foreign ports	Moderate	Resilient	Minor
Illegal harvest/possession of sharks or other protected species	Moderate	Vulnerable	Major

Table 85 Assessment of inherent risk – Maldives.

Specific risk	Likelihood	Impact	RISK
Unlicensed fishing in EEZs by national boats	Unlikely	Moderate	Moderate
Unlicensed fishing in EEZs by boats from regional States	Moderate	Major	High
Unlicensed fishing in EEZs by boats from outside the region	Moderate	Major	High
Under-reporting target species	Unlikely	Moderate	Moderate
Misidentifying target species	Unlikely	Moderate	Moderate
Misreporting of bycatch species	Unlikely	Moderate	Moderate
Misreporting catch position	Moderate	Minor	Moderate
Non-or delayed logbook submission	Unlikely	Minor	Minor
Failure to operate VMS inside an EEZ where required	Unlikely	Minor	Minor
Failure to provide prompt reporting to coastal State	Moderate	Minor	Moderate
Falsification/misuse of licence documents	Unlikely	Moderate	Moderate
Failure to carry an observer when required.	Unlikely	Minor	Minor
Illegal transshipping	Moderate	Major	High
Bunkering (refuelling) at sea	Moderate	Minor	Moderate
Landing of catch in unauthorised foreign ports	Unlikely	Minor	Minor
Illegal harvest/possession of sharks or other protected species	Unlikely	Major	Moderate

5.10.8 Impacts of IUU

The impact of unlicensed fishing in EEZs by boats from other regional States, (i.e. likely to be Sri Lanka and India as for the BIOT study and the Maldives shares borders with both these States) and boats from outside the region are both estimated to have a high level of risk. Both these vessels will target top predators such as sharks, large (high value reef fish) and tuna and tuna like species. There will be impacts on the management of the stocks of these species due to the unknown level of catch and effort from foreign vessels fishing illegally. Stocks will not be able to be managed to their maximum potential where large unknowns relating to illegal fishing exist. There are also direct losses of revenue to the Maldivian economy through decreased taxes of national operators (due to decreased availability of fish) and longer term indirect losses due to any depletion of the commercially exploited stocks.

Illegal fish caught by foreign vessels will not be landed in Maldives as locally caught legal fish would be. It is likely they will be removed to ports in India and Sri Lanka which will result in a loss in potential taxation and other benefits to local industry that could have accrued if fished legally by local vessels. Fishing for these species at a high rate could imbalance local ecosystems through the removal of top level predators. Inshore species, i.e. reef fish and reef sharks would be impacted higher as the effects would be seen locally. The larger longline vessels would operate more offshore, where surveillance is weaker, and will target the bigeye and yellowfin tuna stocks which are wider spread across the Indian Ocean and therefore any effect will be diluted and would not be easily observed locally.

There is also a risk of potential environmental damage from illegal vessels using trawl or net gear used in inshore areas, though this would be limited by the presence of local populations on the islands of the Maldives Archipelago.

There is a moderate risk highlighted of under-reporting or misidentification of both target and bycatch species in the Maldives EEZ. These may have an impact on the pelagic tuna stocks as catches (and other indicators such as CPUE) used as inputs to the stock assessment will be undervalued. Estimates of the level of under-reported can and should be made to allow adjustments to catch histories and CPUE series for the stock assessments. The under-reporting of shark catches for longline fisheries globally has been identified as a major problem in their stock assessment and gaps in shark data are particularly pronounced for many illegal fisheries.

Illegal transshipping is highlighted with a high level of risk, would likely impact only the high value species such as yellowfin and bigeye tuna from longliners or high value reef fish and possibly sea cucumbers from the illegal vessel operating close to the Maldives Archipelago and transshipping catch onto vessels for transfer back to market. It would add no more catch to the amount taken illegally but would affect the methods of IUU fishing and the manner in which MCS operations should be undertaken to effectively police the Maldives EEZ. Transshipment and bunkering may increase the capacity of illegal vessels to fish as they will not be required to come into port on a regular basis. This may also result in an increase in compliance problems and fisheries labour related issues such as indentured labour as fishing vessels do not return to port for regular inspections.

The illegal harvest or possession of sharks or other protected species (i.e. sea cucumbers) as discussed earlier is high and would be covered by the risk of illegal fishing. A ban on shark fishing, including a ban on export of shark products was introduced in the Maldives in 2010¹⁵⁷, making it the second State worldwide to introduce such a ban following Palau (see Maldives General Fisheries Regulations-<http://www.mvlaw.gov.mv/pdf/gavaid/minFisheries/10.pdf> where the shark ban is detailed for an initial ten year period). For some ETP species in the Maldives where tourism is a high value industry there may be a significant loss or limitation of any expansion for tourism related to these high profile species (i.e. diving with turtles and sharks). The economic value of these species alive is often calculated at a level much higher than their simple market value.

5.10.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

The highest risks indicated by the risk assessment that would contribute to a higher level of IUU fishing are “Unlicensed fishing in EEZs by boats from other regional States” and “Unlicensed fishing in EEZs by boats from outside the region”.

The risk of “Unlicensed fishing in EEZs by boats from outside the region (longliners)” has been estimated at a high level. Based on the evidence of a low-level of activity actually encountered (see section 5.10.5) we would suggest a level of 5-20% illegal catch based on the level of legal longline, handline and trolling catch, and 0 – 2% for pole and line across the period of the study. The risk of illegal fishing from other regional States (most likely Sri Lanka and India; see section 5.10.5) has a moderate level of risk: we would estimate based on the evidence of a low-level of activity encountered a level of between 2-10% illegal catch based on the level of legal catch for longline, handline and trolling catch and 0-2% for pole and line.

Three other risks “Under-reporting target species”, “Misidentifying target species” and “Misreporting of bycatch species” have all been estimated to be at a low level for each of the fisheries. We estimate that only a level of between 0 to 1% be allocated to each of these risks for each legal fishery in the Maldives EEZ. The only exception would be for sharks caught by longliners that were under-reported and for these species we would recommend a 0 – 100% level based on recorded catches as a default value for Indian Ocean longliners.

Four risks “Misreporting catch position”, “Non- or delayed logbook submission”, “Failure to operate VMS inside an EEZ where required” and “Failure to provide prompt reporting to coastal State” would create problems related to quota management and or stock assessment potentially but from an IUU quantification perspective they would not contribute to illegal or unreported catches.

¹⁵⁷ http://www.nytimes.com/2010/03/10/world/asia/10iht-shark.html?_r=0

Several risks highlighted although important from a control and enforcement perspective would not add to the estimated level of IUU fish but would add to the level of vulnerability of the fish to IUU. These would include “Falsification/misuse of licence documents”, “Failure to carry an observer when required”, “Illegal transshipping”, “Bunkering (refuelling) at sea” and “Landing of catch in unauthorised foreign ports”.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Maldives EEZ can be found in Table 86.

Table 86 Summary of Estimated Rates-Maldives.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZs by national boats	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	Covered below.	
Unlicensed fishing in EEZs by boats from BOBLME States	Pole and Line	All listed	1990 – 2013	0	2	0	0
	Handline and Longline			2	10	0	0
Unlicensed fishing in EEZs by boats from outside the BOBLME region	Pole and Line	All listed	1990 – 2013	0	2	0	0
	Handline and Longline			5	20	0	0
Under-reporting target species	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	1
Misidentifying target species	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	1
Misreporting of bycatch species	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	1
	Longline	Sharks	1990-2009	0	0	0	100
Misreporting catch position	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	0

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Non-or delayed logbook submission	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	0
Failure to operate VMS inside an EEZ where required	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	0
Failure to provide prompt reporting to coastal State.	Pole and Line, Handline, Longline & Trolling	All listed	1990 – 2013	0	0	0	0
Falsification/misuse of licence documents	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	0	0
Failure to carry an observer when required.	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	0	0
Illegal transshipping	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	0	0
Bunkering (refuelling) at sea	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	0	0
Landing of catch in unauthorised foreign ports	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	0	0
Illegal harvest/possession of sharks or other protected species	Pole and Line, Handline and Longline	All listed	1990 – 2013	0	0	0	0

5.10.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches in the Maldives represent on average between 971 and 11,647 t per annum (i.e. 0.90 and 10.81%). Illegal catches contribute an estimated 0.90 – 9.81% and unreported catches 0.00 – 1.00 % in addition to the reported catch. This represents the highly compliant and well monitored local fleets but that a risk of illegal fishing still remains in the offshore areas of the Maldives EEZ.

Losses from Illegal, Unreported and Unregulated fishing in the Maldives EEZ are estimated to average between USD 5.16 and 37.19 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 87 and as first landed value in Table 88. Profiles of the estimated level of illegal and unreported fishing combined in the Maldives can be found in Figure 26 (catch in t) and Figure 27 (catch value in USD).

Table 87 Summary of estimated IUU by year in the Maldives (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	72517.39	338.28	5774.49	0.00	725.17	0.00	0.00
1991	71091.10	429.23	6143.27	0.00	710.91	0.00	0.00
1992	73433.38	481.70	6425.70	0.00	734.33	0.00	0.00
1993	78471.09	565.66	7103.18	0.00	784.71	0.00	0.00
1994	89580.97	691.68	8253.94	0.00	895.81	0.00	0.00
1995	89925.76	665.36	8155.81	0.00	899.26	0.00	0.00
1996	89812.02	683.61	8297.32	0.00	898.12	0.00	0.00
1997	87088.77	674.89	8063.16	0.00	870.89	0.00	0.00
1998	100872.19	756.63	9228.51	0.00	1008.72	0.00	0.00
1999	112655.49	759.80	10174.40	0.00	1126.55	0.00	0.00
2000	98185.28	655.95	8664.09	0.00	981.85	0.00	0.00
2001	109370.57	775.08	9985.81	0.00	1093.71	0.00	0.00
2002	144428.25	1128.78	13648.68	0.00	1444.28	0.00	0.00
2003	135913.11	1044.36	12796.18	0.00	1359.13	0.00	0.00
2004	138848.02	1146.92	13312.12	0.00	1388.48	0.00	0.00

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2005	161896.01	1134.85	14562.31	0.00	1618.96	0.00	0.00
2006	167035.67	1182.92	15093.45	0.00	1670.36	0.00	0.00
2007	125521.07	1092.33	12163.46	0.00	1255.21	0.00	0.00
2008	117459.94	1171.73	12078.72	0.00	1174.60	0.00	0.00
2009	95650.92	1028.94	10171.98	0.00	956.51	0.00	0.00
2010	102645.18	1077.93	10647.61	0.00	1026.45	0.00	0.00
2011	98156.78	1642.15	12455.68	0.00	981.57	0.00	0.00
2012	100896.44	2031.99	14156.12	0.00	1008.96	0.00	0.00
2013	123223.77	2149.30	16322.76	0.00	1232.24	0.00	0.00

Table 88 Summary of the estimated value of IUU (USD) by year in the Maldives (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	93.79	0.77	9.21	0.00	0.94	0.00	0.00
1991	94.13	1.00	10.27	0.00	0.94	0.00	0.00
1992	99.73	1.14	11.26	0.00	1.00	0.00	0.00
1993	117.10	1.39	14.00	0.00	1.17	0.00	0.00
1994	130.18	1.75	16.97	0.00	1.30	0.00	0.00
1995	129.54	1.68	16.70	0.00	1.30	0.00	0.00
1996	137.39	1.79	18.62	0.00	1.37	0.00	0.00
1997	123.58	1.73	16.84	0.00	1.24	0.00	0.00
1998	140.35	1.86	17.79	0.00	1.40	0.00	0.00
1999	154.61	2.05	22.19	0.00	1.55	0.00	0.00
2000	133.90	1.62	16.29	0.00	1.34	0.00	0.00
2001	150.14	1.92	18.96	0.00	1.50	0.00	0.00
2002	200.35	2.82	26.54	0.00	2.00	0.00	0.00
2003	205.29	3.77	30.55	0.00	2.05	0.00	0.00
2004	220.42	4.72	34.87	0.00	2.20	0.00	0.00
2005	237.63	4.03	32.72	0.00	2.38	0.00	0.00
2006	259.64	5.35	39.47	0.00	2.60	0.00	0.00
2007	221.13	5.76	38.88	0.00	2.21	0.00	0.00
2008	250.96	8.44	52.56	0.00	2.51	0.00	0.00
2009	214.61	7.40	46.03	0.00	2.15	0.00	0.00
2010	298.46	8.95	56.50	0.00	2.98	0.00	0.00
2011	403.86	17.49	94.97	0.00	4.04	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	467.57	21.98	117.28	0.00	4.68	0.00	0.00
2013	398.97	14.35	84.29	0.00	3.99	0.00	0.00

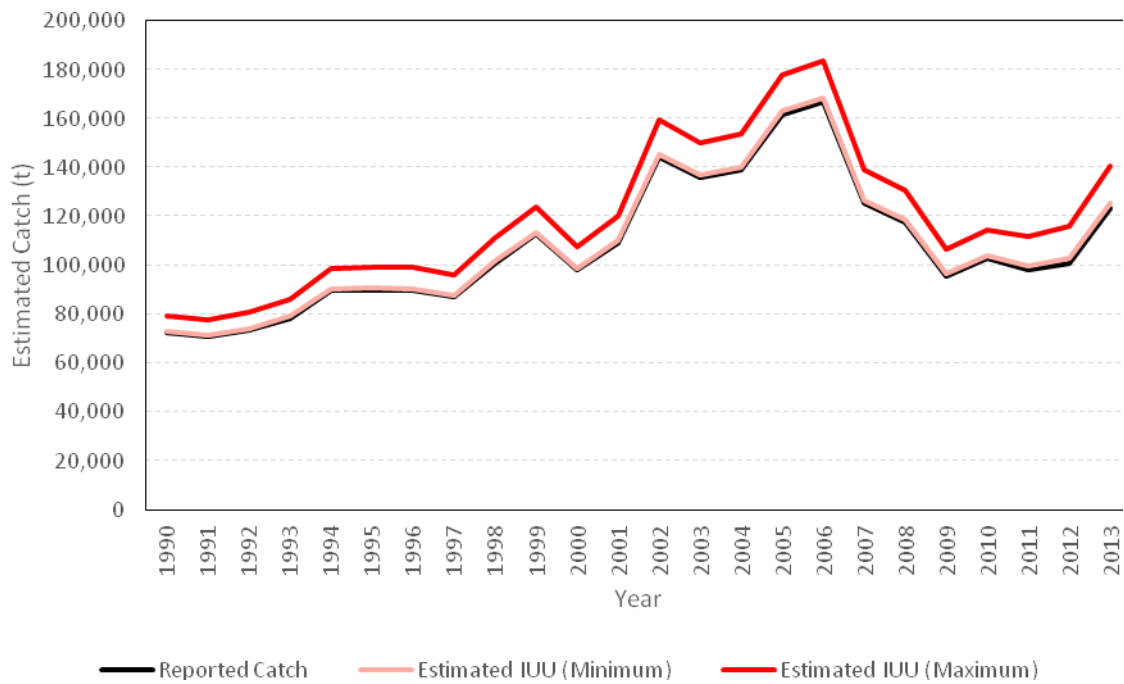


Figure 26 IUU Catch Profile (Maldives) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

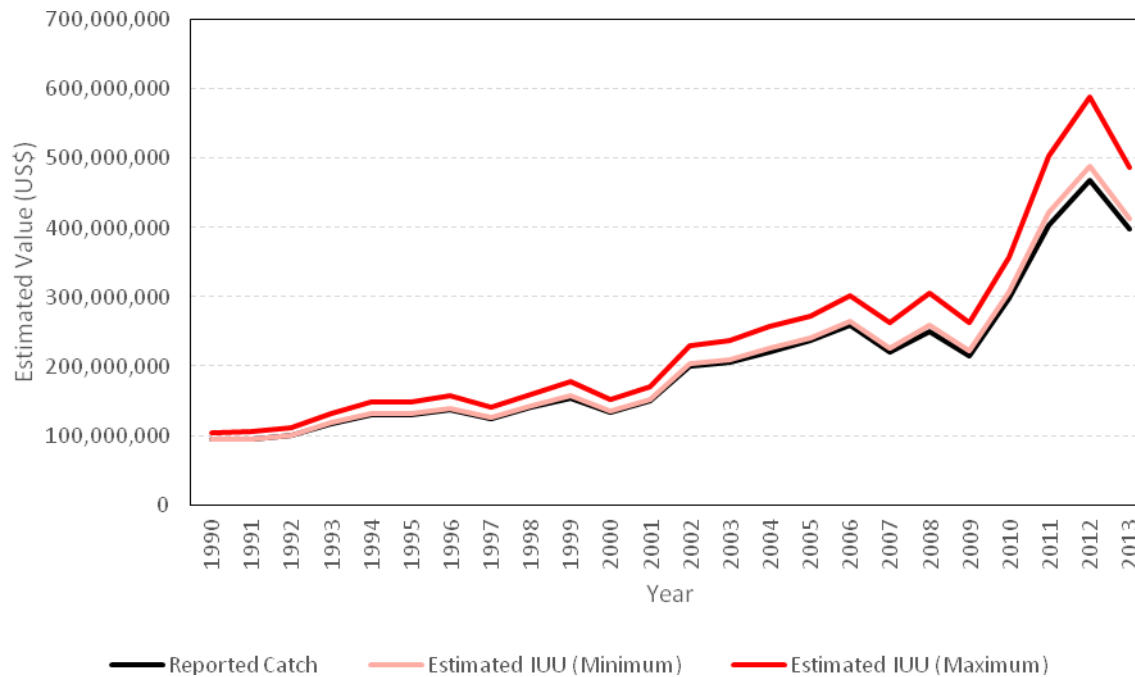


Figure 27 IUU Catch Value Profile (Maldives) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.11 Myanmar

5.11.1 Introduction

The Southeast Asian nation of Myanmar (previously known as Burma) sits to the north of Thailand and has additional land borders with India, Bangladesh, China and Laos. The Myanmar EEZ covers an area of 321,800 km² with an additional area of 152,939 km² defined as territorial sea and 43,418 km² as contiguous zone. The Myanmar EEZ shares borders with the EEZs of India, Bangladesh and Thailand.

Between 2009 and 2010 the total size of Myanmar’s marine capture fishery was stated at 1.37 million metric tonnes. Moreover the FAO estimated that almost 800,000 people were employed in the primary fisheries sector as of 2004 (FAO, 2006).

5.11.2 Fleet breakdown

Myanmar’s national fishing fleet is large and heterogeneous, with SEAFDEC stating that the inshore fleet (both mechanised and non-mechanised, operating up to a depth of c. 15m) numbered at over 30,000 vessels in 2009-2010. In addition a further 1,814 national offshore boats and 351 foreign offshore boats are also recorded for 2009-2010, utilising a variety of industrial and artisanal gears (SEAFDEC, 2012).

The fisheries in Myanmar have for the purposes of this study been broken down into four “fleets”. The national inshore fleet operates up to five nm from the coast (Rakhine) or up to ten nm from the coast and consists of small vessels of <12 hp and 30 feet in length. This fleet uses passive gears targeting reef and demersal species. The national offshore fisheries operate from the five or ten nm

limits of the inshore fleet area of operation to the edge of the EEZ. Vessels in this fleet have engines of >12hp and are greater than 30 feet in length and use a variety of trawl, purse seine, driftnet and longline gears and target small pelagics, shrimp and other species.

Two additional fleets of Thai fishing vessels, the most prominent illegal fishing fleet, and other foreign fishing vessels have been added. Some foreign vessels (approx. 250) of Thai and other nationalities have been legally licensed to fish in Myanmar during the period of this study, however it should be noted that these licenses were cancelled in 2014. The vessels within these licensed fleets operated a variety of gears, and targeted tuna-like species, demersals and reef fish.

A summary of the fleets used in the model for Myanmar can be found in Table 89.

Table 89 Fleet breakdown for Myanmar.

Number	Description	Gear	Flag(s)	Target species	Comment
1	Inshore national fleet	Various passive gears, dynamite	Myanmar	Mixed reef and demersal species	Catch data heavily misreported and/or unreported
2	Offshore national fleet	Trawl, purse seine, driftnet, longline, other active gears	Myanmar	Various anchovy species, hilsa shad, pomfret, threadfin, shrimp, mackerel, sardine	Known to engage in illegal transshipping with Thai vessels in southern national waters
3	Thai fleet	Trawl nets, tuna longlines, dynamite,	Thailand	Tuna and tuna-like species, small pelagics, demersal and reef fish	Contains 'unofficially licensed' and unlicensed vessels
4	Other foreign fleets	Trawl nets, tuna longlines,	Sri Lanka, Indonesia, Taiwan	Tuna and tuna-like species, small pelagics, demersal and reef fish	

5.11.3 Catch breakdown by fleet

The FAO data on Myanmar's fisheries catch is limited in value as it is patchy and highly aggregated. The recorded tonnage is divided across only five categories, of which only kawakawa (*Euthynnus affinis*) is identified to species level. However, kawakawa catch is only recorded for 2008, at a total of 9 tonnes, and the remaining catch is divided between decapods *nei*, jellyfishes *nei*, seerfishes *nei* and marine fishes *nei*, with the latter accounting for 97.5% of the recorded catch.

There are reports and analyses that show that the reported catch in Myanmar is in fact vastly greater than the actual catch (BOBLME, 2014). The 2014 State of Fisheries and Aquaculture (SOFIA) (FAO, 2014) report notes that for the period 2003-2012 there has been an “astonishing” 121.1% rise in the catch by Myanmar, which is only to be overshadowed by the 329.6% increase over the similar period in its inland fisheries production.

The SAU catch reconstructions for Myanmar estimate that catch totals were approximately 9% larger than the FAO reported catch statistics between 1950 and 2008 (Booth & Pauly, 2011). The most dominant taxon in the reconstructions between 1990 and 2008 is threadfin and dwarf bream *nei* (Nemipteridae) which account for 8% of the catch estimate. Various other pelagic species, including Indian mackerel (*Rastrelliger kanagurta*) and Carangids *nei* account for 28.69% of the reconstruction.

It has not been possible to break down the catch profile of Myanmar into the recognised fleets. All risks have therefore been estimated based on the total national catch.

5.11.4 IUU influencing factors

5.11.4.1 Legislation and governance

The fisheries of Myanmar are overseen by the Department of Fisheries, within the Ministry of Livestock, Fisheries and Rural Development (MOLFRD). The Myanmar Fisheries Law of 1990 forms the cornerstone of national fisheries legislation, in addition to a supplementary document on foreign fishing rights (see section 1.1.4.2) and various amendments which have been enacted since the passing of the original legislation. It should be noted that the original Fisheries Law of 1990 was amended in 1993, and this section will consider both the original and revised legislation.

Myanmar has the lowest average governance ranking compared to other States in the study region according to the World Bank Governance Indicators. It sits 210th out of 212 (99th percentile) with only North Korea and Somalia having poorer averages. As such we would suggest that any risks relating to direct corruption or a weak regulatory framework would be significantly increased to the level where they may have a direct impact of the level of illegal and unreported catches. Severe risks are likely to exist relating to risks such as “Obstruction or bribery of fisheries officers” and “Falsification of documents” (See Table 17).

Myanmar is not a member of any relevant regional RFMOs. However, the country signed the UNCLOS convention in 1996 and entered the FAO Agreement to Promote Compliance with International CMMs into force in 2004. As of 2005 Myanmar was listed in the top 32 flag of convenience States (ITF, 2005).

5.11.4.2 Licensing and reporting requirements

Under the 1990 Fisheries Law, licensing for national vessels is divided into inshore and offshore vessels, in addition to a separate provision for the licensing of foreign vessels (Sections 3-5), and no fishing is permitted without a licence (Sections 33-4). The law also gives priority to national citizens for inshore fishing between the coast and predetermined baselines (Section 13).

The law also states that the master of a fishing vessel is responsible for the maintenance of a logbook; however, the law is unclear as to which portions of the fleet this requirement applies to, as

no differentiation is made between artisanal and industrial vessels or inshore and offshore vessels (Section 31). Moreover the Fisheries Law states no requirements for nationally-flagged vessels to carry VMS equipment. Myanmar's fisheries reporting structure for national vessels is limited, with catch data collected sporadically, and information on the large inshore fleet of predominantly small vessels is especially sparse. This problem is illustrated by the poor quality of the available FAO data, as shown in section 1.1.3.

The Fisheries Law makes provisions for the separate licensing of foreign fishing vessels and joint fishing ventures between national and foreign companies. Moreover, additional regulations regarding foreign vessels are set out in the separate 'Law relating to the Fishing Rights of Foreign Fishing Vessels' which was originally enacted in 1989 and amended in 1993. Under this supplementary legislation, foreign vessels may apply for licences in the EEZ beyond the territorial sea, with licences only issued for fishing in other national waters under 'exceptional circumstances' (Chapter III). As with the legislation regarding national vessels, provision is made for inspections to be carried out on foreign vessels, in addition to the pursuit of foreign vessels which commit violations (Chapter V).

In addition to the requirement to keep a logbook, other reporting obligations are also set out for foreign vessels including routes, arrival times, cargo, gear and crew (Chapter VI). Foreign vessels are also required to undergo inspections in a 'port or place as specified' before and after fishing in Myanmar's waters. The legislation also prohibits all unlicensed fishing by foreign vessels in addition to all 'loading, unloading, processing and transferring' of fish or gear and the possession of banned gear types (Chapter IX).

5.11.4.3 Restrictions, fines and penalties

Conditions are set out for the penalties due upon violation of the Fisheries Law, including confiscation of vessels, gear and catch, in addition to a 'reasonable' fine. The initial penalties of the original Fisheries Law (5,000-50,000 kyats¹⁵⁸ depending on the offence) were increased under the amended legislation. According to the amendment, the penalty for undertaking any fishing activities without a license is up to 300,000 kyats and/or up to ten years imprisonment (Section 44). In addition, a penalty of 200,000 kyats and/or three years imprisonment is prescribed for any violations or illegal transferring of licenses (Section 45). Possession of destructive fishing gears such as dynamite and poison carries the highest penalty, specifically 500,000 kyats and/or ten years imprisonment (Section 47). Additional laws regarding public servants involved in enforcing the fisheries law are also inserted in the amended version, specifically regarding the concealment or replacement of offenders and tampering with offence-related evidence (Section 42a).

¹⁵⁸ 10 Myanmar kyats = USD 0.01, as of 07/09/2015.

Since the enactment of the law regarding foreign fishing vessels, Myanmar has leased offshore fishing rights at various stages to Thailand, Malaysia, Singapore and the Republic of Korea (Booth & Pauly, 2011). The agreement with Thailand, begun in 2004, expired in March 2014 following a decision by stakeholders in Myanmar not to renew the licence¹⁵⁹. The authorised Thai vessels were alleged to fish in unauthorised areas and, despite the cessation of the fishing agreement, Thai vessels continue to operate in Myanmar's waters. Some vessels are unofficially licensed by local authorities, or operate illegally without any licence (Funge-Smith *et al.*, 2015).

Under the 1989 legislation, penalties for violations by foreign vessels ranged from 3,000 to 100,000 kyats and one month to two years in prison, depending on the offence. The 1993 amendment increased the penalties, with a maximum fine of 300,000-500,000 kyats and/or one to three years in prison for various offences such as unauthorised transshipping or possession of destructive gears (Section 39 a-b). These penalties are only applicable to the Master of the vessel. It should be noted that there is no stated requirement for foreign vessels to operate VMS whilst fishing in Myanmar's waters.

The Fisheries Law also states the powers of 'inspectors' to stop, board and search any vessels operating within national waters, in addition to carrying out seizures in case of violations (Section 30). Moreover the harassment or assault of fisheries inspectors is specifically prohibited, with a penalty of 100,000 kyats and/or three years imprisonment. The amended legislation added an additional clause prohibiting the concealment or disposal of catch and gear (Section 42b).

5.11.4.4 MCS protocols and enforcement capacity

Maritime patrolling and enforcement is carried out by the national navy and coastguard with support from other law enforcement institutions in coastal waters, however the capacity of these institutions is insufficient to monitor the entire EEZ, and consequently compliance with legislation is often low or non-existent. Moreover it is alleged that national authorities collude with foreign IUU vessels, to the extent that perpetrators are advised of patrol areas in advance and thus able to avoid enforcement vessels (Funge-Smith *et al.*, 2015).

5.11.4.5 Port state

Myanmar ratified the FAO Port State Measures Agreement in 2010. All national vessels and foreign vessels operating as part of a joint venture are required by law to land their catch in national ports; however, this is often circumvented by both nationally-flagged and Thai-flagged vessels which illegally tranship catch from within the EEZ for landing in the port of Ranong in Thailand (see section 1.1.5.1).

¹⁵⁹ (Myanmar Times, 'Severing Thais: fisheries agreement expires', 2013)

Due to its relatively poor infrastructure, Myanmar's ports are not a major regional focal point for the offloading of catch by legal or illegal foreign fleets. However, locally caught fish by the national fleet will still be unloaded in national ports.

5.11.4.6 Market state

The markets of Myanmar are largely poorly monitored and regulated, with trade on the black market or illegally across borders estimated to be worth potentially double the national economy¹⁶⁰. The capital city of Yangon (formerly Rangoon) is the centre of the national wholesale fish market, and the demand of Chinese markets has been acknowledged as a driver for fish exports from Myanmar. In addition Burmese fishermen have been reported as illegally targeting sea cucumbers, turtles and other lucrative species in the Andaman Islands (Indian EEZ) in response to demand from Chinese and Japanese markets¹⁶¹.

5.11.5 Summary of IUU incidences

The literature and online media review revealed extensive evidence of IUU fishing by both national and foreign vessels within Myanmar's EEZ. Thai vessels dominate the foreign IUU fleets operating in the EEZ, as indicated by a statistic from the recent EJF report which stated that 878 Thai vessels and 4960 Thai nationals had been seized by Myanmar for illegal fishing between 1980 and 2010 (EJF, 2015).

5.11.5.1 Southern waters and the Myeik Archipelago

The southern portion of the Myanmar EEZ, especially the area around the highly biodiverse Myeik (also known as Mergui) Archipelago which contains the Lampi Island National Marine Park, has been recognised as a hotspot for IUU activity by both national and foreign vessels (Funge-Smith *et al.*, 2015). A substantial portion of the national fleet (estimated 400-500 trawlers) operating in the southern waters around the Myeik Archipelago are known to illegally tranship their catch to Thai carriers. This catch is then landed in the port of Ranong in northern Thailand, thus rendering any port state measures in Myanmar irrelevant. The value of the illegally transhipped catch from national vessels, not including additional illegal catch from Thai vessels operating in the same area, was estimated at USD 360 million (Funge-Smith *et al.*, 2015). It is not clear whether or not the Myanmar-flagged vessels are licensed.

As well as illegally transhipping catch, both national and Thai vessels are known to use destructive gears in and around the Myeik Archipelago, including bottom or 'baby' trawls and dynamite, with the dynamite allegedly supplied from Thailand¹⁶². Moreover the use of explosives in the archipelago,

¹⁶⁰ CIA World Fact Book (2015). <https://www.cia.gov/library/publications/the-world-factbook/geos/bm.html>

¹⁶¹ ("Myanmar poachers looting Andaman ecology -India | Reuters," 2011)

¹⁶² ("Illegal fishing threatens rich marine diversity of Myeik Archipelago," 2014)

in addition to facilitating illegal fish catch and negatively impacting coral reef habitats, is also cited as threatening lucrative pearl farms and undermining nascent ecotourism operations in the area¹⁶³. Aside from national and Thai-flagged vessels, Indonesian vessels were also reported to be operating illegally in the Myeik area in 2014¹⁶⁴.

5.11.5.2 Other incidences

Whilst the reported IUU incidences for Myanmar are concentrated around the Myeik Archipelago and the wider southern waters, limited evidence was also obtained for other areas of the EEZ. A 2014 article reported the widespread use of illegally small mesh sizes by fishermen off the coast of Mon state, which was suggested as a driver of depletion of fish stocks¹⁶⁵. The use of illegal 'baby trawl' gear by small national vessels to target shrimp has also been reported on the coast of the Ayeyarwady region, despite a ban on trawling within 10 nautical miles of the coast, and in 2004 shrimp resources were already reported to be under severe pressure from national fleets operating over capacity (Pe, 2004). The national small trawl fleet has also been cited as a major source of juvenile fish discards (Kelleher, 2004). There is also evidence of the harvest of shark fins in Myanmar, thereby likely affecting ETP species (Tun *et al.*, 2009).

The review of online media also uncovered reports from 2009 of Taiwanese-flagged vessels which had sailed into the Myanmar EEZ from Thailand and been detained for illegal fishing. The crews arrested in this incident were reported to be of Indonesian, Taiwanese and Filipino nationality¹⁶⁶. Moreover Sri Lankan media reported the arrest of five vessels and fifteen fishermen on charges of illegal fishing in Myanmar in 2014¹⁶⁷.

Although this section is concerned with IUU activities within the Myanmar EEZ, it should also be noted that Myanmar nationals are reported as involved in IUU fishing within the EEZ's of other nations included in this study, including India, Bangladesh and Thailand.

¹⁶³ ("Dynamite Fishing in Burma's Mergui Archipelago Proves Hard to Stop," 2014)

¹⁶⁴ ("Navy arrests Indonesian and Thai fishing boats," 2014)

¹⁶⁵ (" Myanmar Food Security Information Network-Illegally sized nets harming fish stocks ," 2014)

¹⁶⁶ ("Myanmar detains over 120 Indonesian, Taiwanese fishermen," 2009)

¹⁶⁷ ("15 SL fishermen in Myanmar custody": Dailymirror.lk: Breaking News," 2014)

5.11.6 IUU risk identification

5.11.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or Exclusive Economic Zone

The presence of unlicensed foreign vessels in Myanmar's waters is well documented in the reviewed literature, creating an evident risk of unlicensed and unauthorised fishing, particularly in light of the lack of enforcement capacity in Myanmar's waters. Thai vessels will be assessed as an individual risk, given their dominance within the foreign IUU fleets, with vessels of other nationalities assessed separately. The national fleet will also be split between the inshore and offshore portions, with each assessed separately.

5.11.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Given that logbook and reporting requirements for the different portions of the fleet are not clearly defined within the national fisheries legislation, the reporting obligations for Myanmar are unclear. However, the poor quality of national catch data and the lack of robust reporting mechanisms indicates a risk of misreporting of catch, or failing to report catch altogether. This risk will be considered separately for both the inshore and offshore national vessels. In addition, although the fishing agreement with Thailand has now expired, licensed Thai vessels have been operating in Myanmar during the time period covered by this study. Consequently the risk of misreported/unreported catch by Thai vessels operating under the agreement will also be considered.

5.11.6.3 Non-compliance with other licence conditions and/or legislation

In light of the lack of provisions for VMS and the limited capacity of national maritime enforcement, a prominent risk of fishing inside closed areas by both national and foreign vessels exists. Moreover a specific threat posed by IUU fishing in the Lampi Island National Marine Park is evident, and violations of zonal restrictions by national offshore vessels which encroach on inshore areas are known to occur. A separate risk of the use of prohibited and destructive gears is also apparent, with the literature containing references to various illegal gears including dynamite and trawls.

5.11.6.4 Post-harvest IUU

Extensive evidence has been highlighted which indicates substantial risks of post-harvest IUU, with illegal transshipping to Thai carriers widespread in the Myeik Archipelago. This in turn leads to an additional risk of the illegal landing of catch from the Myanmar EEZ in foreign ports, as the transhipped catch is landed in Ranong in Thailand. Moreover, given the role of Myanmar as an export market for China, the risk of IUU catch entering the export supply chain should also be considered, particularly given that Burmese fishermen have been reported as illegally fishing for valuable species in the Andaman Islands.

5.11.6.5 Other offences/issues

Given the acknowledged presence of IUU vessels and the use of destructive gear in the Myeik Archipelago, which is recognised as containing highly biodiverse coral reefs (including species potentially new to science) in predominantly good condition, the risk of damage to sensitive habitats and species is evident, in addition to the risk of harvesting ETP species such as sharks and reef fish. Foreign IUU vessels are also known to target tuna species with longlines, creating the potential that ETP tunas might also be affected.

Table 90 Specific risks identified for Myanmar.

Risk category	Specific risk	Fleets at risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed fishing within EEZ by national inshore vessels	1
	Unlicensed fishing within EEZ by national offshore vessels	2
	Unlicensed fishing within EEZ by Thai-flagged vessels	3
	Unlicensed fishing within EEZ by foreign vessels under other flags	4
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of/unreported catch by national offshore vessels	2
	Misreporting of/unreported catch by national inshore vessels	1
Non-compliance with other licence conditions and/or legislation	Fishing within spatio-temporal closed areas	All
	Use of prohibited and/or destructive gears	All
Post-harvest IUU	Illegal transshipment and bunkering	All
	Export of IUU products caught by national fishers to foreign markets	All
	Harvest of ETP species	All

5.11.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 91), impact (Table 92) and level of inherent risk (Table 93) for Myanmar based on the risks identified in Table 90.

Table 91 Assessment of risk likelihood – Myanmar.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing within EEZ by national inshore vessels	High	Weak	Likely
Unlicensed fishing within EEZ by national offshore vessels	Very High	Very Weak	Almost certain
Unlicensed fishing within EEZ by Thai-flagged vessels	Very high	Very weak	Almost certain
Unlicensed fishing within EEZ by foreign vessels under other flags	High	Very weak	Almost certain
Misreporting of/unreported catch by national offshore vessels	High	Weak	Likely
Misreporting of/unreported catch by national inshore vessels	High	Weak	Likely
Fishing within closed areas	High	Weak	Likely
Use of prohibited and/or destructive gears	High	Very weak	Almost certain
Illegal transshipment and bunkering	Moderate	Very weak	Likely
Export of IUU products caught by national fishers to foreign markets	Very High	Moderate	Likely
Harvest of ETP species	Very High	Very weak	Almost certain

Table 92 Assessment of risk impact – Myanmar.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing within EEZ by national inshore vessels	High	Vulnerable	Major
Unlicensed fishing within EEZ by national offshore vessels	High	Highly Vulnerable	Serious
Unlicensed fishing within EEZ by Thai-flagged vessels	Very high	Highly vulnerable	Serious
Unlicensed fishing within EEZ by foreign vessels under other flags	Moderate	Moderate	Moderate
Misreporting of/unreported catch by national offshore vessels	High	Moderate	Major
Misreporting of/unreported catch by national inshore vessels	High	Moderate	Major
Fishing within closed areas	Moderate	Highly vulnerable	Major
Use of prohibited and/or destructive gears	Moderate	Highly vulnerable	Major
Illegal transshipment and bunkering	Moderate	Moderate	Moderate
Export of IUU products caught by national fishers to foreign markets	Very low	Highly vulnerable	Moderate
Harvest of ETP species	High	Highly vulnerable	Serious

Table 93 Assessment of inherent risk – Myanmar.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing within EEZ by national inshore vessels	Likely	Major	High
Unlicensed fishing within EEZ by national offshore vessels	Almost certain	Serious	Severe
Unlicensed fishing within EEZ by Thai-flagged vessels	Almost certain	Serious	Severe
Unlicensed fishing within EEZ by foreign vessels under other flags	Almost certain	Moderate	High
Misreporting of/unreported catch by national offshore vessels	Likely	Major	High
Misreporting of/unreported catch by national inshore vessels	Likely	Major	High
Fishing within closed areas	Likely	Major	High
Use of prohibited and/or destructive gears	Almost certain	Major	Severe
Illegal transshipment and bunkering	Likely	Moderate	High
Export of IUU products caught by national fishers to foreign markets	Likely	Moderate	High
Harvest of ETP species	Almost certain	Serious	Severe

5.11.8 Impacts of IUU

The outputs of the risk assessment indicate that the general risk of IUU activities within the Myanmar EEZ is high, with the situation exacerbated by low national governance, minimal deterrents and the recent exploitation of vulnerable, previously intact habitats and ETP species.

National offshore vessels and vessels operating under a Thai flag recorded the highest risk for unlicensed fishing by specific fleets, due to the large scale illegal operations undertaken by both these fleet segments, especially in the previously near-pristine Myeik Archipelago, which is an acknowledged hotspot for IUU. The activities of these fleet segments is likely to result in both large quantities of catch and significant damage to ecologically sensitive shallow water habitats such as coral reefs, particularly given the predominance of destructive trawl or baby trawl gear and the acknowledged use of dynamite. The implications for the biodiversity within the archipelago and the Lampi marine park are therefore severe, with intense localised pressure on ecosystems. The use of such indiscriminate gears is likely to affect a broad suite of reef species, including ETP genera such as sharks and turtles, and the widespread use of these gear types in the archipelago and the wider Myanmar EEZ is reflected in the severe risk attributed to the use of prohibited and destructive gears.

Moreover the economic loss to Myanmar from fish caught in this area is exacerbated by the widespread illegal transshipment of catch from national vessels to Thai carriers, thus preventing catch being recorded nationally or entering national markets. The presence of Thai carriers is likely to significantly increase the catch capabilities of the illegal trawlers, allowing them to remain at sea for longer and intensify their fishing efforts. Further economic losses to Myanmar are likely as these illegal activities in the Myeik Archipelago undermine attempts to develop tourism infrastructure (such as eco-lodges and SCUBA operations) and maintain pearl farms. Therefore, the severe risks posed by the national offshore and Thai fleets are linked to negative biological and economic impacts. It should also be noted that the presence of an illegal transshipment system also increases a risk of labour-related issues, with crews potentially forced to work on boats for long periods with no return to shore.

Harvest of ETP species was the final risk to be assessed at a 'severe' level, and this is again closely linked to the intense fishing activity in the Myeik Archipelago, which is known to harbour large populations of vulnerable high trophic level species (Tun *et al.*, 2009). However this risk also reflects wider reports of the illegal targeting of sharks, tunas and tuna-like species by both national and foreign vessels, in addition to those species affected incidentally as bycatch from indiscriminate illegal gears. The illegal fishing of ETP species, many of which are both commercially valuable and ecologically vulnerable, can lead to severe data inadequacies in stock assessments as well as high uncertainty regarding the population level of such species.

Aside from the severe risks categories, high risk levels were returned for all other unlicensed fishing activities involving national inshore vessels and non-Thai foreign vessels, in addition to high risks of misreporting or failing to report catch. This reflects Myanmar's generally inadequate governance, reporting mechanisms and capacity to deter IUU through enforcement, and the lack of sufficient catch reporting acts as a major hindrance to quantitative decision-making for fisheries management in Myanmar.

5.11.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

All of Myanmar's risk estimates have been applied to the national catch as a whole, as it has not been possible to disaggregate to the required level by fleets, and a number of high upper limits have been assigned to the specific risks.

A range of 5-20% was assigned to the risk of unlicensed fishing by Thai vessels, thus taking into account the pervasive nature of encroachment into the EEZ by Thai operators and the large capacity of the industrial trawl vessels and transshipment reefers which are reportedly involved in the illegal fishing activities. It should be noted that, as of 2014, Myanmar no longer licenses Thai vessels to fish within the EEZ. This is likely to have some effect on the rates of unlicensed fishing by Thai vessels; however, this is beyond the temporal scope of this study's IUU rate estimations and therefore does not affect the rates presented here. The precautionary lower limit of 5% allows for the quantitative uncertainty surrounding the true scale of Thai IUU fishing in Myanmar. Unlicensed fishing by other foreign vessels was assigned a similar lower limit as for Thailand and as other nationalities are reported to fish illegally in Myanmar, but as the fleets of these other countries appear to be less prevalent when combined in comparison to Thailand, a lower upper limit of 15% was applied. High estimated upper limits of 15% and 20% were also assigned to unlicensed fishing by national offshore

and inshore fleets respectively, reflecting the evidence for illegal fishing practices undertaken by national operators.

Given that poor catch reporting is acknowledged as a key issue in Myanmar, as evidenced by the extremely high levels of aggregation in the national reported catch data, estimated risk rates were also assigned to the specific risks related to reporting. National inshore vessels were assigned the highest upper limit for reporting issues at 40%, with 30% assigned to the remaining fleet segments to account for the likelihood of catch under-reporting during the period of this study.

Use of non-prescribed gear, fishing inside closed waters and unreported/unregulated transshipment, although being complicating IUU issues in Myanmar's EEZ, would not add to the estimated level of IUU fishing and are therefore not assigned separate rate estimation values for this case study.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Myanmar EEZ can be found in Table 14.

Table 94 Summary of estimated rates – Myanmar.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing within EEZ by national inshore vessels	1	Mixed	1990-2013	5	15	0	0
Unlicensed fishing within EEZ by national offshore vessels	2	Mixed	1990-2013	5	20	0	0
Unlicensed fishing within EEZ by Thai-flagged vessels	3	Mixed	1990-2013	5	20	0	0
Unlicensed fishing within EEZ by foreign vessels under other flags	4	Mixed	1990-2013	5	10	0	0
Misreporting of/unreported catch by national offshore vessels	2	Mixed	1990-2013	0	0	5	30
Misreporting of/unreported catch by national inshore vessels	1	Mixed	1990-2013	0	0	5	40
Fishing within closed areas	All	Mixed	1990-2013	0	0	0	0
Use of prohibited and/or destructive gears	All	Mixed	1990-2013	0	0	0	0
Illegal transshipment and bunkering	All	Mixed	1990-2013	0	0	0	0
Export of IUU products caught by national fishers to foreign markets	All	Mixed	1990-2013	0	0	0	0
Harvest of ETP species	All	Sharks, turtles, corals, sea cucumbers, rare reef fish	1990-2013	0	0	0	0

5.11.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data, which as has been noted appear to have a number of issues, the total illegal and unreported catches represent on average between 348,568 and 1,568,557t per annum (i.e. 30 and 135%). Illegal catches contribute an estimated 20-65% and unreported catches 10-70% in addition to the reported catch, although these figures may not be correct due to concerns over data quality. If the reported catch and estimates are valid, the losses from Illegal, Unreported and Unregulated fishing in the Myanmar EEZ are estimated to average between USD 778.08 and 2,902.40 million each year.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 95 and as first landed value in Table 96. Profiles of the estimated level of illegal and unreported fishing combined in Myanmar can be found in Figure 28 (catch in t) and Figure 29 (catch value in USD).

Table 95 Summary of estimated IUU by year in Myanmar (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	599231	119846	389500	59923	419462	0	0
1991	587985	117597	382190	58799	411590	0	0
1992	590263	118053	383671	59026	413184	0	0
1993	597637	119527	388464	59764	418346	0	0
1994	599876	119975	389919	59988	419913	0	0
1995	603270	120654	392126	60327	422289	0	0
1996	455690	91138	296199	45569	318983	0	0
1997	631640	126328	410566	63164	442148	0	0
1998	681280	136256	442832	68128	476896	0	0
1999	760160	152032	494104	76016	532112	0	0
2000	897140	179428	583141	89714	627998	0	0
2001	949670	189934	617286	94967	664769	0	0
2002	1029460	205892	669149	102946	720622	0	0
2003	1053720	210744	684918	105372	737604	0	0
2004	1132340	226468	736021	113234	792638	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2005	1228710	245742	798662	122871	860097	0	0
2006	1375670	275134	894186	137567	962969	0	0
2007	1517940	303588	986661	151794	1062558	0	0
2008	1679010	335802	1091357	167901	1175307	0	0
2009	1867510	373502	1213882	186751	1307257	0	0
2010	2060780	412156	1339507	206078	1442546	0	0
2011	2169820	433964	1410383	216982	1518874	0	0
2012	2332790	466558	1516314	233279	1632953	0	0
2013	2483870	496774	1614516	248387	1738709	0	0

Table 96 Summary of the estimated value of IUU (USD) by year in Myanmar (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	539.31	188.76	862.89	215.72	647.17	0.00	0.00
1991	529.19	185.22	846.70	211.67	635.02	0.00	0.00
1992	531.24	185.93	849.98	212.49	637.48	0.00	0.00
1993	537.87	188.26	860.60	215.15	645.45	0.00	0.00
1994	539.89	188.96	863.82	215.96	647.87	0.00	0.00
1995	542.22	189.78	867.55	216.89	650.66	0.00	0.00
1996	408.75	143.06	654.00	163.50	490.50	0.00	0.00
1997	567.91	198.77	908.66	227.16	681.49	0.00	0.00
1998	612.98	214.54	980.77	245.19	735.58	0.00	0.00
1999	683.86	239.35	1094.18	273.55	820.64	0.00	0.00
2000	807.07	282.47	1291.31	322.83	968.48	0.00	0.00
2001	854.26	298.99	1366.82	341.71	1025.12	0.00	0.00
2002	925.99	324.10	1481.59	370.40	1111.19	0.00	0.00
2003	947.75	331.71	1516.40	379.10	1137.30	0.00	0.00
2004	1018.43	356.45	1629.48	407.37	1222.11	0.00	0.00
2005	1105.05	386.77	1768.08	442.02	1326.06	0.00	0.00
2006	1237.30	433.06	1979.68	494.92	1484.76	0.00	0.00
2007	1365.27	477.84	2184.43	546.11	1638.32	0.00	0.00
2008	1521.80	532.63	2434.88	608.72	1826.16	0.00	0.00
2009	1700.28	595.10	2720.45	680.11	2040.33	0.00	0.00
2010	1873.27	655.64	2997.23	749.31	2247.92	0.00	0.00
2011	1970.67	689.73	3153.07	788.27	2364.80	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	2116.60	740.81	3386.55	846.64	2539.91	0.00	0.00
2013	2251.79	788.13	3602.86	682.97	1831.18	0.00	0.00

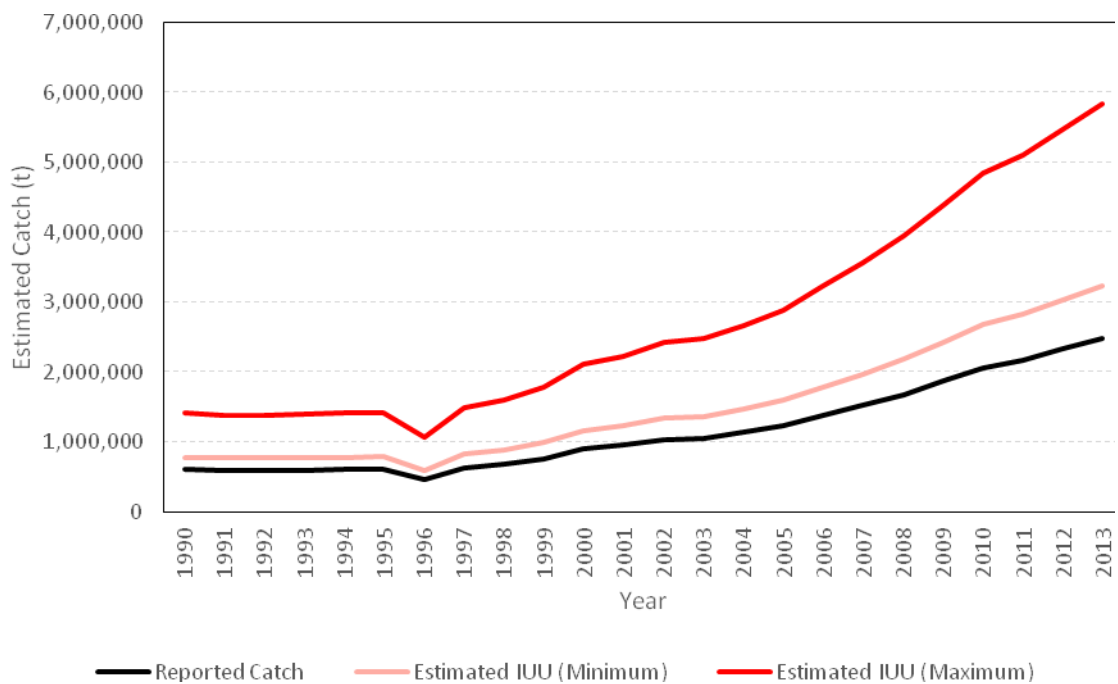


Figure 28 IUU Catch Profile (Myanmar) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

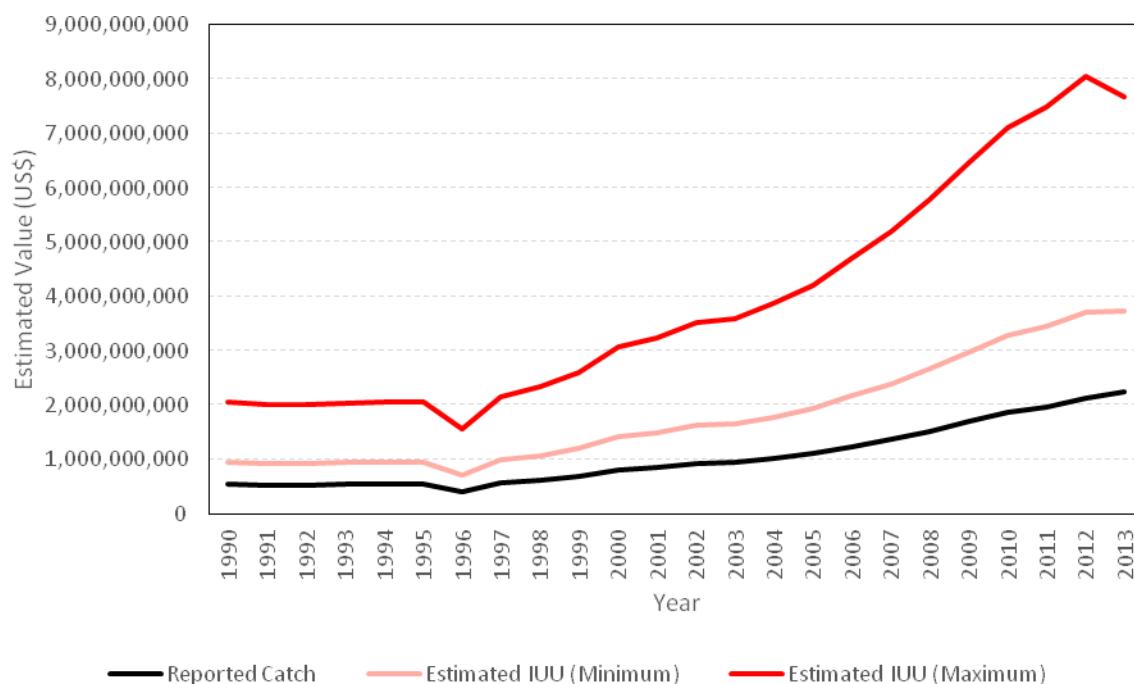


Figure 29 IUU Catch Value Profile (Myanmar) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.12 Pakistan

5.12.1 Introduction

The Pakistan Exclusive Economic Zone (EEZ) covers an area of 240,000 km² (plus 50,000 km² in 2015). The Pakistan EEZ shares borders with India (east), Iran (west), and Oman across the Gulf of Oman & Arabian Sea to the west. The Pakistan coastline is 1,050 km in length. The coastline is split between the Balochistan (800 km) and Sindh (250 km) provinces of Pakistan stretching from Iran to India. The coastal fisheries are an important economic activity in the villages and towns along the coast in both of the provinces. In most of the coastal villages and settlements fishing is the sole source of employment and income generation (FAO, 2009).

The Pakistan EEZ contains a range of coastal marine habitats including sandy and rocky shores, coral reefs, lagoons, deltas, tidal/mud-flats and mangroves as well as offshore pelagic and deep-sea areas. These habitats are home to approximately 760-790 species of fish (Hoda, 1985; Majid et al., 1992; Sheik et al., 2000; Nazira et al., 2015). Approximately 360 species of these fish (small, medium, large pelagic; and, demersal fish) and shellfish (shrimp, lobsters, crabs and cephalopods) are commercially relevant to Pakistan, however numerous key stocks including shrimps spp., lobsters and some finfish are now considered to be overexploited (FAO, 2009).

Marine capture fisheries production in Pakistan is currently stated at around 522,000 tonnes a year, with 300,000 fishers working in the sector as of 2005 (Hornby et al., 2014).

5.12.2 Fleet breakdown

There are several fleet activities involved in the marine capture fisheries in Pakistan waters. There are coastal/inshore small-scale fisheries of the Sindh and Balochistan provinces, as well as artisanal/industrial offshore and deep-sea fisheries largely exploited by foreign vessels under various licensing arrangements. The majority of domestic fishing takes place in the coastal/inshore area between the shore and 12nm.

There are four basic types of fishing vessels: (i) mechanised; (ii) mechanised-sail boats; (iii) non-mechanised sail boats/*doonda* boats. There were an estimated 4,335 mechanised vessels and 2,000 mechanised cum-sail vessels (FAO, 2009) operating under the Pakistan flag, however, other estimates of the number of vessels by fishery and gear in 2002 are higher (Khan, in De Young, 2006) with vessels divided into industrial shrimp trawl (2,580 vessels), industrial tuna (1,862 vessels), artisanal demersal gillnets (10,147 vessels). No recent data on vessel numbers in 2013 could be found in the literature beyond those reported to the IOTC Record of Authorised Vessels (RAV).

It has not been possible to break down the catch profile of Pakistan into the recognised fleets included in the fleet breakdown table below. All risks have therefore been estimated based on the total national catch as a whole quantity.

Table 97 provides a breakdown of fleets and fishing activities operating in the Pakistan EEZ.

Table 97 Fleet breakdown for Pakistan.

Number	Description	Gear	Flag(s)	Target species	Comment
1	Shrimp trawl fleet	Trawls, bag nets	Pakistan	Shrimp (Penaeus spp., Metapenaeus spp., Parapaenopsis spp.)	Incorporates both industrial and small-scale shrimp boats
2	Small-scale and artisanal fleets	Gillnets, cast nets, drag nets, traps	Pakistan	Mixed demersal fish (i.e. pomfrets, croakers, snappers), small pelagics (eg. sardine and anchovy), tuna and tuna-like species	.
3	National industrial fleet	Large gillnets, longlines, trawls	Pakistan (dual-flagging may occur)	Tuna, tuna-like species, sharks/rays, small pelagic species	.
4	Indian fleet	Primarily trawls, also other mixed gears	India	Mixed demersal fish species and various small cephalopods	
5	Other foreign fleets	Trawls Longlines	South Korea, China, Taiwan, Iran,	Tuna, tuna-like species, sharks/rays, whales, small pelagic species	

It should be noted that there are also sizable recreational fisheries that exists in Pakistan, for example, recreational fisheries for tuna/billfishes, hand-line fishing for demersal species and pelagic

sport fishing. A significant subsistence fishery also exists for a variety of coastal and freshwater species. Recreational and subsistence activities are not within scope of the study and are not considered further in this country report.

5.12.3 Catch breakdown by fleet

Catch statistics presented by the FAO for Pakistan indicates that total capture production of marine species in 2010 was 337,916 tonnes (FAO, 2015). Major species/species groups presented in the catch statistics, include; sea catfishes (10%), Indian mackerel (7%), Indian oil sardine (6%), croakers & drums (6%), Largehead hairtail (6%), Shrimps (*Parapenaeopsis* 3%; *Metapenaeus* 2%; and, *Penaeus* 1%); *clupeids* (5%), groupers (4%), longtail tuna (3%), mullets (3%), *carangids* (3%), narrow-barred Spanish mackerel (2%), anchovies (2%), rays/stingrays/mantas (2%) and requiem sharks (1%). The category 'marine fishes nei' was reported as 5% of the total catch and small catches of other species combined represented about 29% of total catches.

The SAU catch reconstructions estimate the total catch to be greatly in excess of the reported catches, up to ten times the catch for the latest year of the SAU estimates (2010). Major species groups presented amongst the reconstructed catch, include; lizard fishes (14%), pony fishes (8%), pelagic percomorphs (8%), *carangids* (7%), Porgies/ seabreams (6%), mackerels (5%), croakers & drums (4%), inshore squids (4%), cuttlefishes (4%), bigeyes/glasseyes/bulleyes (4%), natantian decapods (4%), Threadfin & dwarf breams (3%), *penaeid* shrimps (3%), herrings & sardines (2%), blue swimming crabs (2%), anchovies (1%), sea catfishes (1%) and goatfishes/red mullets (1%). Small catches of other species combined represented approximately 17% of total catches.

It has not been possible to break down the catch profile of Pakistan into the recognised fleets. All risks have therefore been estimated based on the total national catch.

5.12.4 IUU influencing factors

5.12.4.1 Legislation and governance

Pakistan's original Fisheries Act dates from 1897, immediately creating potential management issues as the legislation was enacted before the onset of industrial fishing practices. However,, more recent legislation pertaining to marine fisheries has been passed, including the Exclusive Fishery Zone (Regulation of Fishing) Act, 1975 and the Deep Sea Fishing Policy of 1995, both of which have since undergone various amendments, and Pakistan's jurisdiction of national waters is laid out in the Territorial Waters and Maritime Zone Act of 1976.

Within Pakistan the Ministry of Food, Agriculture and Livestock (MinFAL) supervises national fisheries, with the Marine Fisheries Department (MFD) responsible for fisheries management and development. Moreover fisheries administrations known as Directorates of Fisheries also exist at a provincial level in Northwest Frontier Province, Punjab, Sindh and Balochistan. Provinces are also subject to specific additional fisheries legislation such as the Sindh Fisheries Ordinance of 1980 and the Balochistan Sea Fisheries Act No. IX of 1971.

Pakistan is a Commission Contracting Party member of IOTC and signed the UNCLOS Convention in 1997, but is yet to produce an NPOA-IUU. The country has a relatively poor ranking globally compared to other States according to the World Bank Governance Indicators (173rd out of 212 –

82nd percentile). As such any risks relating to direct corruption or a weak regulatory framework would be likely to exist and with a relatively high level of risk i.e. risks such as “Obstruction of bribery of fisheries officers” and “Falsification of documents”. Risks are likely to be higher than the level observed in most regional States. (See Table 159).

5.12.4.2 Licensing and reporting requirements

The operation of any fishing vessel or gear without a license is prohibited under the 1975 legislation. Under the original Deep Sea Fishing Act of 1995 Pakistan’s EEZ (beyond the 12 mile territorial seas) was divided in two, with Zone 1 (12-35 miles) reserved for ‘traditional small-scale fishermen’ and Zone 2 (35-200 miles open for licensed industrial vessels to operate. Zone 2’s maximum capacity was stated at 50 tuna longliners and 20 stern trawlers and licenses were obtainable for such vessels upon payment of 500,000 rupees, with fishing trips capped at 90 days for longliners and 60 for a trawler (Article 10). Licensees were also prohibited for transshipping catch, instead required to land all catch at Korangi Fisheries Harbour (Article 13). It should be noted that the small-scale fishery in Pakistan is open access, with no controls on the number of boats in operation, whilst capacity management is carried out in the industrial sector through the issuance of non-transferable permits to the companies involved (FAO, 2009).

The Exclusive Fishery Zone (EFZ) Act does not state any requirements for nationally-flagged vessels to report their catch, keep logbooks or carry VMS, although industrial vessels operating in Pakistan’s EEZ are reportedly monitored through VMS (FAO, 2009.), in a system which has been acknowledged to be very effective (Pramod & Pitcher, 2008).

Foreign fleets have historically fished legally in Pakistan’s waters, primarily under joint ventures aimed at further developing the fisheries sector (Hornby et al., 2014). These foreign operations have repeatedly been suspended and resumed in attempts to balance between foreign investment and reduction of fleet over capacity, and currently EEZ access is permitted to vessels flagged to other states if fishing is carried out under joint ventures with Pakistani companies (Funge-Smith *et al.*, 2015).

Certain catch statistics in Pakistan are acknowledged to be unreliable, with illegally transhipped catch, in addition to catches from foreign trawlers operating under licenses within Pakistani waters, allegedly not included in reported statistics by the Directorate of Fisheries during the period of this study (District of Gwadar, Balochistan, 2004). Moreover national inshore fishing communities have accused foreign-flagged vessels of under-reporting their catch through transshipping illegally before submitting their catch volumes, and broader inconsistencies within Pakistan’s catch data have been attributed to large quantities of unreported bycatch, human errors in data submissions and the failure of national authorities to include subsistence catches in submitted data (Hornby et al., 2014).

In some cases catches by Pakistan’s inshore fleet are acknowledged to have been recorded at a local level, with catch inspections and monitoring undertaken in areas of the Balochistan and Sindh coastlines. However, catch inspections in the congested fishing port of Karachi are also acknowledged to be inconsistent (MRAG, 2005).

5.12.4.3 Restrictions, fines and penalties

The EFZ Act bans the use of dynamite and poison fishing gears (Article 5) but does not prescribe any other restrictions on potentially destructive gear such as trawl nets, although the legislation does state the ability of the government to promulgate further rules relating to mesh sizes (Article 16). The Act also confers powers of inspection and seizure on fisheries officers if violations of the legislation are suspected (Articles 7-8), and a maximum punishment of 5,000 rupees¹⁶⁸ is proscribed for any violations of the provisions (Article 9). The EFZ Act was amended in 1983 to include substantially higher penalties of a ten million rupee fine and/or up to five years in prison¹⁶⁹. A three year prison sentence is also stated as a punishment for violation of the Territorial Waters Act. Evidence suggests that prison sentences are imposed for IUU fishing offences, such as in a 2010 report which detailed the release of 12 Indian fishermen after 32 months imprisonment¹⁷⁰.

In addition to the prescriptions of the core legislation, a range of further management measures have been enacted including prohibitions of various destructive gears (including mesh sizes restrictions) and spatio-temporal closures, for example in the shrimp recruitment season and in shrimp nursery areas (FAO, 2009). Certain restrictions are also prescribed at the provincial level, such as a ban on targeting hilsa shad with set or fixed bag nets in Sindh and a ban on mechanised trawlers fishing within three miles of the coast in Balochistan (Khan, in De Young, 2006). Moreover small scale-artisanal fishers have been supported by the designation of coastal zones which are reserved solely for their usage (FAO, 2009).

5.12.4.4 MCS protocols and enforcement capacity

MCS and enforcement in Pakistan's EEZ is overseen by a federal agency the Maritime Security Agency (MSA) with support from the national coastguard and navy. The capacity of the MSA was recently stated at three aircraft, four corvettes (in operation since 1990) and nine fast response boats in addition to various other small craft, with upcoming plans to increase this capacity. Pakistan devotes significant enforcement effort to the IUU flashpoint at the Indian EEZ border, although the deterrent effect on IUU fishing in the area is acknowledged to be limited (Funge-Smith *et al.*, 2015).

5.12.4.5 Port state

Pakistan's national catch is predominantly landed in the industrial port of Karachi which accounts for 80-90% of all landings, however the port is recognised to be insufficient in size to effectively process the number of industrial vessels which land there (Hornby *et al.*, 2014). Pakistan has not ratified the FAO Port State Measures Agreement, and at a national workshop in

¹⁶⁸ 100 Pakistan rupees= USD 0.94 as of 06/11/2015. www.oanda.com

¹⁶⁹ The Exclusive Fishery Zone (Regulation of Fishing) (Amendment) Ordinance, 1983.

¹⁷⁰ ("12 Indian fishermen leave for Wagha," 2010.)

2013 WWF-Pakistan highlighted the importance of implementing the agreement in order to tackle IUU fishing¹⁷¹.

5.12.4.6 Market state

Pakistan is a major seafood exporting nation, whilst imports are negligible in comparison, with 151,000 tonnes exported in 2006 (FAO, 2009). Moreover Pakistan is one of the top twenty fishmeal-producing nations, acting as a prominent regional exporter, and the country is also one of the largest global producers of shrimp (Hornby et al., 2014) with the shrimp fishery generating substantial revenue from exports to Europe and the USA. Furthermore Pakistan ranks in the top 15 nations globally for shark exports, and also exports tuna regionally to Iran and Sri Lanka (FAO, 2009).

5.12.5 Summary of IUU incidences

The literature and online media review uncovered substantial evidence of IUU fishing in the Pakistani EEZs, with certain flashpoints becoming apparent. These incidences are summarised below, divided between national and foreign fleets with linkages to more specific fleet types when possible.

5.12.5.1 National fleets

Limited evidence of IUU by the domestic fleet was uncovered in online news articles, with a 2010 report alleging that authorities in Sindh province had failed to enforce restrictions on trawl nets, leading to the ongoing use of destructive small mesh sizes and bag nets by illegal fishing operators which was in turn threatening socio-economically valuable coastal fisheries¹⁷². A similar situation is described in Balochistan province by 2014 article which also refers to the damage caused in coastal area by illegal mesh sizes¹⁷³.

It should also be noted that Pakistani vessels have been implicated in IUU activity within the EEZs of states not included in this study, including Iran, Yemen and Somalia. A number of the vessels involved are dual-flagged between Pakistan and other states.

Foreign vessels are only allowed to fish in the Pakistan EEZ as part of a joint venture operation and only greater than 20nm from shore. Although this policy still exists, no joint venture trawlers have been licensed since 2005 and no longliners have been licensed since 2009.

5.12.5.2 Foreign fleets

The collated online media articles related to IUU fishing by foreigners in Pakistan are dominated by incidents involving Indian-flagged vessels, with large numbers of crew and boats seized. The border

¹⁷¹ ("Marine ecology: Vessels must be registered to curb illegal fishing, say experts - The Express Tribune," 2013.)

¹⁷² ("Sindh govt fails to crack down on fishermen," 2010)

¹⁷³ ("Illegal netting dwindles export of quality fish", The Nation 2014.)

between the EEZs of India and Pakistan is a focal point of IUU activity, with both countries arresting citizens of the other in large numbers. Statistics from collated news reports illustrate the scale of Indian IUU fishing in Pakistan, with a 2010 article describing the release of 442 Indian fishers with a further 176 remaining in detention¹⁷⁴. Furthermore an Indian media source reported in 2015 that 75 Indian boats and 400 fishers had been arrested by Pakistan in the preceding six months¹⁷⁵, and another article in the same year stated that 858 Indian boats were in Pakistani custody along with 344 fishers¹⁷⁶. The media review encountered numerous other articles detailing frequent seizures of Indian boats by Pakistani authorities, with reports collated from 2008 up to 2015. Despite the enforcement efforts of both countries, IUU fishing on the India-Pakistan maritime border is acknowledged to continue unabated, with socio-economic drivers outweighing the risk of arrest (Funge-Smith *et al.*, 2015).

Pakistan is also threatened by illegal fishing from Iranian vessels. These vessels are often unregistered and unlicensed in either country or registered in both countries. Most of the potential illegal fleet are gillnetters that operate throughout the north-western Indian Ocean having been found fishing as far south as the Seychelles. As gillnetters these vessels target pelagic fish, smaller vessels targeting small pelagics such as mackerels and sardines, larger vessels targeting tuna and tuna-like species.

Aside from the Indian and Iranian fleets, illegal fishing vessels from various states including Russia, Taiwan, Japan and Korea have allegedly encroached into the Pakistani EEZ during the period of this study. A 2009 article reports an accusation by WWF that vessels from these states had specifically targeted sharks and cetaceans in Pakistan's waters. The article also suggests that collusion between domestic authorities and foreign operators was enabling the IUU fishing to continue, in addition to emphasising the lack of sufficient monitoring¹⁷⁷. Moreover the operation of foreign vessels under joint ventures has also been allegedly used as a cover for illegal fishing activities, with vessels reportedly fishing within closed areas and undertaking illegal transshipments in order to reduce their reported catches. Conflicts between the foreign joint venture operators and Pakistani fishing communities have also been described, with the gear and vessels of national operators damaged by larger foreign boats competing for the same fishing grounds (Khan, 2006).

¹⁷⁴ ("12 Indian fishermen leave for Wagha," 2010)

¹⁷⁵ ("47 Indian fishermen captured by Pakistan; 8 boats seized," 2015)

¹⁷⁶ ("801 Pak-captured Indian boats untraceable: Gujarat govt," 2015.)

¹⁷⁷ ("Foreign trawlers fishing in Pak waters: WWF, The Nation, 2009.

5.12.6 IUU risk identification

5.12.6.1 Unlicensed/unauthorised fishing with territorial sea, contiguous zone or Exclusive Economic Zone

Given the highlighted evidence of ongoing IUU events in Pakistani waters, in addition to limited enforcement capacity, the risk of unlicensed/unauthorised fishing is apparent across the identified fleet segments. All national fleets will be assessed as one segment for this risk, and the illegal Indian fleet will also be considered in isolation given the dominance of Indian nationals in reported IUU fishing activities in Pakistan's waters. The remaining foreign fleets under other flags which are also known to undertake IUU fishing will be grouped as a further fleet segment for analysis of this risk.

5.12.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Given the discussed weaknesses in Pakistan's reported catch data, and the substantial discrepancies between the reported FAO catches and the SAU catch reconstructions, risks related to misreporting or failing to report catch must be considered in Pakistan. Due to the lack of available information about reporting offences specific to the fleet segments identified in the fleet breakdown, the national and foreign fleets will be assessed as two separate risks for this category. It should be noted that Pakistan's reporting obligations are generally poorly defined in the legislation, and therefore certain misreporting/non-reporting of catch may not necessarily be in contravention of national laws.

5.12.6.3 Non-compliance with other licence conditions and/or legislation

A range of spatio-temporal fisheries closures have been enacted in Pakistan, aimed at protecting key commercial species and vulnerable areas, however the evidence indicates that these measures are violated by illegal fishing vessels. Therefore the level of risk linked to these violations must be assessed. Furthermore numerous references to the use of prohibited and destructive fishing gears within Pakistan's EEZ have been identified, including illegal mesh sizes, fixed nets and bag nets, creating an evident risk which requires evaluation.

5.12.6.4 Post-harvest IUU

Three separate post-harvest risks have been identified for Pakistan. Transshipment outside of ports is prohibited for licensed vessels by national legislation, however reports of illegal transshipment by foreign vessels in order to falsify reported landings have been highlighted. This is noted as a particular problem for local vessels transshipping catch to Iranian which is landed in Gwader, Iran, thereby enhancing the under-reporting of catch in Pakistan. Furthermore, in light of the overcrowded nature of Pakistan's primary catch landing port in Karachi, and the lack of compliance with international port state measures, an evident risk exists that IUU catch is landed in national ports without detection. Pakistan's global prominence as a seafood exporter also creates a risk of IUU catches passing through national supply chains before distribution abroad, and this possibility will also be assessed separately.

5.12.6.5 Other offences

A general risk of the harvest of ETP species within Pakistan's waters is apparent, particularly given Pakistan's high levels of shark exports which is likely to act as a driver for the targeting of potentially ETP shark species. Gillnetters such as the Iranian fleet are particularly non-discriminatory and although targeting tunas they are likely to have high catches of sharks and potential catches of cetaceans and turtles. Furthermore the literature specifically refers to the illegal fishing of sharks and cetaceans by foreign fleets, indicating a potentially significant risk within Pakistan's EEZ which requires evaluation. In addition vessels operating within Pakistan's EEZ have been acknowledged to carry out dual flagging, and this practice has therefore been classed as a separate as a standalone risk under this category.

Table 98 shows the IUU risks that have been identified as possible risks for Pakistan

Table 98 Specific risks identified for Pakistan.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed/unauthorised fishing by national fleets
	Unlicensed/unauthorised fishing by Indian and Iranian fleets
	Unlicensed/unauthorised fishing by other foreign fleets
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of/unreported catch by national fleets
	Misreporting of/unreported catch by foreign fleets
Non-compliance with other licence conditions and/or legislation	Fishing within spatio-temporal closed areas
	Use of prohibited and destructive gears
Post-harvest IUU	Illegal, unreported or unregulated transshipment
	Landing of IUU catch in national ports
	Export of IUU catch through national supply chains
Other offences	Issues related to the flag of fishing vessels (dual flagging)
	Harvest of ETP species

5.12.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 99), impact (Table 100) and level of inherent risk (Table 101) for Pakistan based on the risks identified in Table 98.

Table 99 Assessment of risk likelihood – Pakistan.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed/unauthorised fishing by national fleets	High	Weak	Likely
Unlicensed/unauthorised fishing by Indian and Iranian fleets	Very High	Weak	Almost certain
Unlicensed/unauthorised fishing by other foreign fleets	High	Very Weak	Almost certain
Misreporting of/unreported catch by national fleets	Moderate	Weak	Likely
Misreporting of/unreported catch by foreign fleets	High	Weak	Likely
Fishing within spatio-temporal closed areas	Very High	Very Weak	Almost certain
Use of prohibited and destructive gears	Very High	Very weak	Almost certain
Illegal, unreported or unregulated transshipment	Moderate	Weak	Likely
Landing of IUU catch in national ports	High	Weak	Likely
Export of IUU catch through national markets	High	Weak	Likely
Issues related to the flag of fishing vessels (dual flagging)	Moderate	Weak	Likely
Harvest of ETP species	Very High	Weak	Almost certain

Table 100 Assessment of risk impact – Pakistan.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by national fleets	High	Vulnerable	Major
Unlicensed/unauthorised fishing by Indian and Iranian fleets	High	Vulnerable	Major
Unlicensed/unauthorised fishing by other foreign fleets	High	Highly Vulnerable	Serious
Misreporting of/unreported catch by national fleets	Moderate	Vulnerable	Major
Misreporting of/unreported catch by foreign fleets	High	Vulnerable	Major
Fishing within spatio-temporal closed areas	High	Highly Vulnerable	Serious
Use of prohibited and destructive gears	Very High	Highly Vulnerable	Serious
Illegal, unreported or unregulated transshipment	High	Moderate	Major
Landing of IUU catch in national ports	Moderate	Moderate	Moderate
Export of IUU catch through national markets	High	Moderate	Major
Issues related to the flag of fishing vessels (dual flagging)	Very Low	Moderate	Minor
Harvest of ETP species	High	Highly Vulnerable	Serious

Table 101 Assessment of inherent risk – Pakistan.

Specific risk	Likelihood	Impact	Risk
Unlicensed/unauthorised fishing by national fleets	Likely	Major	High
Unlicensed/unauthorised fishing by Indian and Iranian fleets	Almost certain	Major	Serious
Unlicensed/unauthorised fishing by other foreign fleets	Almost certain	Serious	Serious
Misreporting of/unreported catch by national fleets	Likely	Major	High
Misreporting of/unreported catch by foreign fleets	Likely	Major	High
Fishing within spatio-temporal closed areas	Almost certain	Serious	Serious
Use of prohibited and destructive gears	Almost certain	Serious	Serious
Illegal, unreported or unregulated transshipment	Likely	Major	High
Landing of IUU catch in national ports	Likely	Moderate	High
Export of IUU catch through national markets	Likely	Major	High
Issues related to the flag of fishing vessels (dual flagging)	Likely	Minor	Moderate
Harvest of ETP species	Almost certain	Serious	Serious

5.12.8 Impacts of IUU

The assessment of specific IUU risks for Pakistan returned generally high scores, with all but one risk scored at a minimum level of high and five risks attaining the level of serious. The serious risk attributed to unlicensed fishing by Indian vessels reflects the large scale of encroachment into the Pakistani EEZ by Indian nationals, with foreign fleets under other flags also scoring a serious level in light of the fishing practices undertaken by the vessels involved. Moreover national fleets also scored a high level for unlicensed/unauthorised fishing, and the consequences of these practices are likely to be substantial. The presence of large unlicensed fleets within Pakistan's waters undermines effective data-based fisheries management, with catch and effort data unobtainable for the illegal fleet segments, creating a pool of unknown catch outside of any reported statistics. Moreover catch by unlicensed vessels deprives legitimate fishing fleets of catch, thus undermining the sustainability of the country's fishing industry, particularly given that unlicensed fishing in Pakistan is acknowledged to target the commercially critical shrimp and hilsa shad fisheries. This catch is also

likely to bypass systems of state revenue generation such as taxation, with unlicensed vessels also not paying the required fees for fishing permits.

The risk of misreporting or failing to report catch by licensed fleets was scored at a high level for both national and foreign fleets, as catch reporting is generally inconsistent and poorly defined in the national legislation, although it has been noted that some catch reporting mechanisms have been described as sound at a provincial level. Errors and omissions in catch reporting leads to inaccurate catch data which is often highly aggregated and a poor representation of true catch volumes. Thus stock assessments are undermined and the impact of the country's national fishing fleet becomes more difficult to quantify, with the management of commercially valuable and/or threatened species likely to be weakened as a consequence.

Pakistan's fisheries management measures include a range of spatio-temporal closures, and the risk of illegal fishing within these closures was scored at a severe level, given the evidence for violations and the high value of the species covered by the closures, such as shrimp. In addition the closures are likely to cover areas or temporal periods particularly vulnerable to fishing, such as nursery areas and breeding seasons. Therefore fishing inside such closures can negatively affect replenishment of key stocks, potentially reducing juvenile recruitment. Moreover closed areas may contain habitats especially sensitive to fishing pressure such as mangroves, seagrass and coral reefs, thus heightening the adverse impact of violations. This risk is closely linked to the use of prohibited and/or destructive gears, which was also ranked as severe in Pakistan in light of the prevalence of various damaging gear such as trawls, set bag nets and general small mesh sizes, particularly in the lucrative shrimp fishery. Such gear types are generally indiscriminate and result in high levels of bycatch of both non-target species and undersized target species. These gear types are likely to result in unsustainably high offtake levels with substantial wider environmental impacts.

Under the post-harvest risk section, IUU transshipments and the landing and export of IUU catch were all scored at a high level. The presence of carrier vessels to facilitate illegal transshipment increases the capacity of the satellite fleets of illegal fishing vessels in the surrounding area, which can fish for longer periods without returning to shore and thus can increase their fishing pressure on the target area. In Pakistan illegal transshipment has particularly been linked to misreporting of catch, thus undermining the validity of national fisheries statistics. Loopholes which allow the landing and export of illegal catches increase the incentives to carry out illegal fishing by providing market opportunities for the products involved, and also bring illegal catches into market competition with legitimately caught seafood, thus potentially having potential economic consequences.

Dual flagging in Pakistan was only scored at a moderate risk level, however such practice can allow vessels to avoid requirements or restrictions of certain flag states by changing flag as they enter or depart certain fishing grounds, thus undermining flag state control efforts and allowing vessels to escape detection for other illegal fishing offences.

The harvest of ETP species was also scored as a severe risk for Pakistan, given the presence of a large number of such species in Pakistani waters and the evidence that illegal fishing targets animals such as sharks and cetaceans. The risk is further exacerbated by Pakistan's prominent role in export of shark fins, which may potentially involve ETP sharks. Species such as sharks and cetaceans are especially vulnerable to fishing pressure, whether targeted or as a result of bycatch, and their populations can decline rapidly as a result of uncontrolled illegal fishing.

5.12.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

All the rate estimations for Pakistan were applied to the national catch data as a whole, with the available data not able to be disaggregated by fleet.

The prevalence of unlicensed fishing activities within Pakistan's EEZ is reflected in the overall rates of 5-25% applied to the various fleet segments, with the highest upper limit of 25% applied to national fleets as a whole in light of the highlighted widespread violations by Pakistani vessels, in addition to the large size of the fleets concerned. Smaller upper limits of 10 and 15% are applied to Indian, Iranian and other foreign fleets that fish illegally in Pakistani waters.

Misreporting is a very clear unknown for the Pakistani fleet, particularly given the extremely high estimates. We have estimated a very high rate of 10-40% for the domestic fleets and between 5 and 10% because of their relative contributions to the foreign vessels.

Factors such as the use of prohibited and destructive gear, harvest of ETP species, fishing inside spatio-temporal closures and the various post-harvest risks, although important to the risk assessment component of the Pakistan case study, would not add to the estimated level of IUU fishing and are therefore not assigned separate rate estimation values in the table below.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Pakistan EEZ can be found in Table 102.

Table 102 Summary of estimated rates-Pakistan

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by national fleets	1,2,3	Mixed	1990-2013	10	25	0	0
Unlicensed/unauthorised fishing by Indian and Iranian fleets	4	Mixed	1990-2013	5	15	0	0
Unlicensed/unauthorised fishing by other foreign fleets	5	Mixed	1990-2013	2	10	0	0
Misreporting of/unreported catch by national fleets	1,2,3	Mixed	1990-2013	0	0	10	40
Misreporting of/unreported catch by foreign fleets	4,5	Mixed	1990-2013	0	0	5	10
Fishing within spatio-temporal closed areas	All	Hilsa shad, mixed	1990-2013	0	0	0	0
Use of prohibited and destructive gears	All	Mixed	1990-2013	0	0	0	0
Illegal, unreported or unregulated transshipment	All	Mixed	1990-2013	0	0	0	0

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Landing of IUU catch in national ports	All	Mixed	1990-2013	0	0	0	0
Export of IUU catch through national markets	All	Mixed	1990-2013	0	0	0	0
Issues related to the flag of fishing vessels (dual flagging)	All	Mixed	1990-2013	0	0	0	0
Harvest of ETP species	All	Sharks, cetaceans, other ETP species	1990-2013	0	0	0	0

5.12.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 112,142 and 333,396t per annum (i.e. 28.67-85.24%). Illegal catches contribute an estimated 13.17 to 38.74% and unreported catches 15.50-46.49%. Losses from Illegal, Unreported and Unregulated fishing in the Pakistan EEZ are estimated to average between USD 195.27 and 612.34 million per annum.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 103 and as first landed value in Table 104. Profiles of the estimated level of illegal and unreported fishing combined in Pakistan can be found in Figure 30 (catch in t) and Figure 31 (catch value in USD).

Table 103 Summary of estimated IUU by year in Pakistan (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	365878	53782	158184	63273	189820	0	0
1991	399590	57143	168067	67227	201680	0	0
1992	431267	58805	172957	69183	207548	0	0
1993	499159	67132	197449	78979	236938	0	0
1994	418574	58819	172998	69199	207597	0	0
1995	404444	55479	163173	65269	195808	0	0
1996	395397	55168	162258	64903	194710	0	0
1997	422265	58651	172503	69001	207004	0	0
1998	433456	60064	176659	70663	211990	0	0
1999	474665	61934	182159	72864	218591	0	0
2000	437601	55852	164270	65708	197123	0	0
2001	420698	54463	160187	64075	192224	0	0
2002	418104	54100	159117	63647	190940	0	0
2003	399040	49414	145334	58134	174401	0	0
2004	386653	51545	151602	60641	181922	0	0
2005	340206	44315	130340	52136	156407	0	0

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	349421	45605	134132	53653	160958	0	0
2007	340056	43451	127797	51119	153356	0	0
2008	343414	43696	128517	51407	154220	0	0
2009	334007	41835	123045	49218	147654	0	0
2010	337916	40690	119676	47870	143611	0	0
2011	334777	40295	118514	47406	142217	0	0
2012	349050	42241	124237	49695	149084	0	0
2013	351747	42117	123873	49549	148648	0	0

Table 104 Summary of the estimated value of IUU (USD) by year in Pakistan (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	845.87	99.35	290.03	123.39	407.04	0.00	0.00
1991	875.52	101.19	295.39	125.74	415.17	0.00	0.00
1992	905.56	102.01	297.73	126.87	419.49	0.00	0.00
1993	1055.09	116.85	340.94	145.69	483.63	0.00	0.00
1994	791.76	89.08	259.98	110.87	367.04	0.00	0.00
1995	863.25	95.87	279.69	119.66	397.92	0.00	0.00
1996	824.08	92.03	268.49	114.84	381.74	0.00	0.00
1997	866.15	96.61	281.86	120.51	400.34	0.00	0.00
1998	959.78	108.18	315.66	134.81	447.15	0.00	0.00
1999	1050.50	115.98	338.41	144.51	479.26	0.00	0.00
2000	971.37	106.45	310.61	132.64	439.93	0.00	0.00
2001	945.47	104.21	304.07	129.86	430.76	0.00	0.00
2002	943.27	103.86	303.03	129.46	429.59	0.00	0.00
2003	697.53	73.62	214.87	91.62	303.24	0.00	0.00
2004	623.55	67.47	196.92	83.92	277.53	0.00	0.00
2005	537.98	57.45	167.70	71.45	236.17	0.00	0.00
2006	563.35	60.15	175.56	74.86	247.79	0.00	0.00
2007	578.63	61.29	178.84	76.37	253.26	0.00	0.00
2008	560.86	60.23	175.86	74.72	246.07	0.00	0.00
2009	603.42	65.27	190.55	80.99	266.85	0.00	0.00
2010	617.82	65.75	191.97	81.63	269.07	0.00	0.00
2011	682.53	73.75	215.31	91.59	302.09	0.00	0.00
2012	777.63	85.19	248.70	105.80	349.03	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2013	789.71	85.97	250.96	106.86	352.94	0.00	0.00

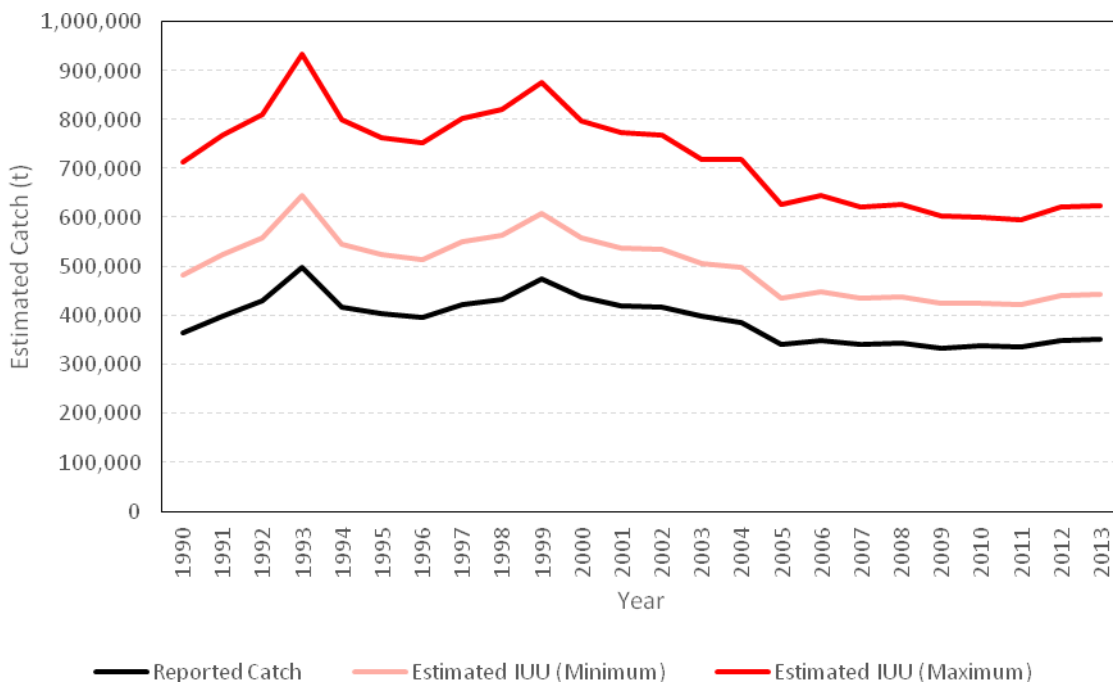


Figure 30 IUU Catch Profile (Pakistan) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

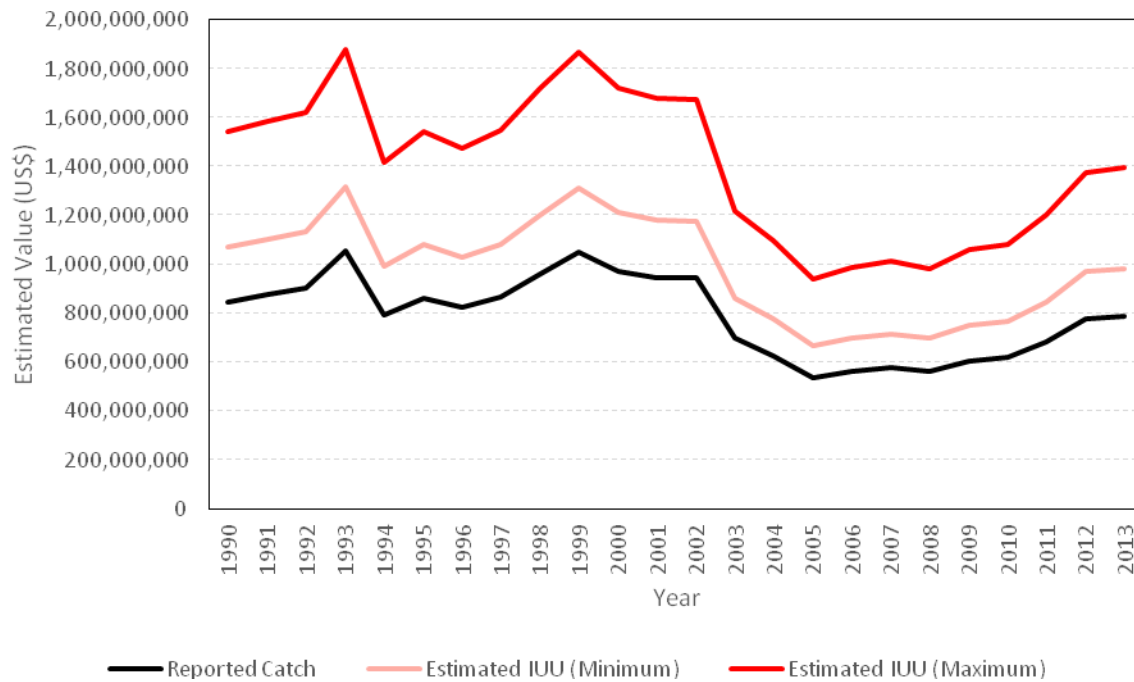


Figure 31 IUU Catch Value Profile (Pakistan) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.13 Papua New Guinea (Indian Ocean only)

5.13.1 Introduction

This scope of this study restricts the analysis to the part of the Papua New Guinean waters that are found in the Indian Ocean, the so called “dog leg waters” due to the shape of the EEZ of PNG that extends out into the Indian Ocean. In the Indian Ocean, the PNG EEZ covers an area of only 19,680 km² with an additional territorial sea area of 2,225 km², compared to the overall PNG EEZ of over 1,640,000 km² and a territorial sea area of approximately 750,000 km². This area is bounded to the west by Indonesia, the south by Australia and to the east by the Torres Strait Protected Zone (TSPZ) Joint Authority (PZJA) where traditional fishing and the commercial fisheries are managed jointly by both Australia and PNG.

It is interesting to note that in 2015 PNG has stopped all commercial fishing activities in and around the dog leg waters¹⁷⁸. Although PNG will request the eighty vessels that are licensed to fish in these waters to leave, and therefore losing the commercial licensing revenue that this brings in, the risks of keeping the dog leg open and at risk of illegal fishing and a potential for a ban on exports to the European Union still a possibility the decision to close these waters has been made. Reopening fishing opportunities in the dog leg waters will be discussed and reviewed when appropriate.

¹⁷⁸ <http://www.emtv.com.pg/article.aspx?slug=Dogleg-Closed&>

5.13.2 Fleet breakdown

The fleet breakdown for this small area is not clearly defined though it can be assumed that domestic PNG fisheries outside the TSPZ consist of a similar large number and variety of small scale commercial fisheries found in the Torres Strait Protected Zone that covers both the PNG and Australian waters and the small area of the PNG EEZ stretching southwest into the Indian Ocean.

Table 105 Fleet breakdown for Papua New Guinea.

#	Description	Gear	Flag(s)	Target species	Comment
1	Commercial	Varied	PNG	Prawns, tropical rock lobster, Spanish mackerel, pearl shell, barramundi, other finfish, crab, <i>Trochus spp.</i> and sea cucumbers. Possible offshore tuna resources.	Assumed to be the same as for TSPZ fisheries.
2	Artisanal	Varied	PNG	Varied, The artisanal catch is thought to be made up of 30% coastal bay, lagoon, and reef fishes; 10% pelagics with the remainder being crustacean, molluscs other invertebrates and seaweed	MRAG (2005)
3	Illegal commercial fleet	Trawl, Longlines, Nets	Indonesia Thailand	Prawns, pelagics (tuna and tuna-like), sharks and demersal species.	

5.13.3 Catch breakdown by fleet

The value of the FAO's official catch statistics for Papua New Guinea in relation to this small area are limited, catches made specifically for the PNG territorial sea and EEZ in the Indian Ocean are not broken down to a usable degree and a simple breakdown of catch data for the area based on area has been made (i.e. 0.9% of national catches).

Due to the small number of vessels, breakdown between commercial and artisanal fisheries and the overall size and composition of the catch in this area, it has not been practical to break down the total catch by individual fleet types, and consequently all catch data will be analysed as a single entity.

5.13.4 Analysis of IUU related factors

The commercial fisheries in the areas adjacent to and inside the Torres Strait area of Papua New Guinea include prawns, tropical rock lobster, Spanish mackerel, pearl shell, barramundi, other finfish, crab, *Trochus spp.* and sea cucumbers. Inside the Torres Strait area tropical rock lobster, pearl shell, Spanish mackerel, dugong and turtle are managed jointly under an agreement with Australia (Treaty between Australia and the Independent State of Papua New Guinea concerning Sovereignty and Maritime Boundaries in the area between the two Countries, including the area known as Torres Strait, and Related Matters)¹⁷⁹. Catches made in the Torres Strait are shared by Australia and PNG based on a negotiated share of the catch.

For the domestic artisanal fishery a Traditional Inhabitant boat licence (TIB) is not required for traditional fishing. The traditional fisheries include those for dugong, turtle and all other species. Many different gear types are used for a variety of species including handlines, free diving, spearfishing, cast-nets and gill-nets. Restrictions are made on the amount able to be harvested based on bag limits for rock lobster and sea cucumbers.

The wide variety of fishing gears and target species would in general imply an increased risk of under-reporting and the possibility of illegal fishing as vessels may fish for a variety of species but only report those they are licensed to target or recognised bycatch species. This is in some way mitigated within the region by the strong regulatory framework in the neighbouring waters but a recognised level of illegal and unreported fishing will occur. No foreign longline fishing is allowed under the PNG regulatory framework and the domestic fishery is highly regulated with a limited level of effort (100 vessels and 1200 hooks per vessel per day) although the actual level of effort is a great deal below this with only between 20 – 50 tuna longliners actually fishing. Foreign purse seining is licensed with agreements in place with a number of distant water fleets (including China, Japan, Korea, Taiwan, Vanuatu and the Philippines) (FAO, 2010).

The Papua New Guinea Fisheries Management Act (No. 48 of 1998 amended 2015) and the Fisheries Management Regulation (2000) set out the management framework, relevant offences and penalties for national fisheries. Fisheries in the Torres Strait in particular, which are covered by this study were covered by the Fisheries (Torres Strait Protected Zone) Act (1984) and implemented by the Fisheries (Torres Strait Protected Zone) Regulation (1987). Penalties under this act can include fines from K100 (USD 34) to K 100,000 (USD 34,000) or imprisonment for a period of between six months and one year, or both and seizure of foreign vessels may be ordered by the court. Fines have

¹⁷⁹ <http://www.austlii.edu.au/au/other/dfat/treaties/1985/4.html>

been updated recently (2015) but for the period of this study the 1998 could also apply. Financial sanctions are clearly defined for most fisheries offences with penalties ranging between K 2,000 or K 5,000 (USD 675 – USD 1,700) for crew and K100,000 and K1,000,000 (USD 34,000 – USD 340,000) for corporations. Seizure of vessels is provided for within the Act. An alternative penalty of imprisonment is included in the Act of up to 5 years for most offences and 10 years where the offence involves a weapon or a Fisheries Officer or observer has been threatened. Papua New Guinea however sits within the lower 25% of the World Bank Governance Indicators (based on 2012 values) which could lead to the potential for a lower rate of prosecution success or the risk of corruption entering the legal process that would decrease the effectiveness of any deterrent (See Table 159).

Australia and Papua New Guinea are required to cooperate in the conservation and management of the commercial fisheries of the Torres Strait Protected Zone. Regular specific fisheries discussions are held between Australia and Papua New Guinea which leads to an enhanced management of the resources. Protection of the resources is also higher by the nature of Australia being involved in the management and MCS of the resources. IUU fishing for *bêche-de-mer* by PNG fishers outside PNG waters but in the region has been shown to occur in the Torres Strait which although in Australian waters, acknowledged the traditional fisheries rights for fisheries from PNG to continue to fish the northern section of the reef in a traditional manner. However, PNG fishers started to fish illegally on the Australian side of Warrior Reef in 1991 particularly for the more valuable, larger sandfish (*Holothuria scabra*). The Australian authorities increased patrolling in response and this resulted in the apprehension and prosecution of fishers and confiscation of fishing gear (Lokani, 1996).

In general terms, PNG has a strong regulatory framework with specific fisheries management plans in place for different species¹⁸⁰ that define the licensing requirements, effort and gear restrictions, quotas and spatio-temporal closures. Clear policy and transparent procedures will need to continue to be applied though to ensure the regulatory framework continues to be perceived as being strong and effective.

The Papua New Guinea National Fisheries Authority (NFA) has an enforcement unit¹⁸¹ tasked with MCS and combating IUU fishing. One of the core functions of the NFA enforcement unit is to “Cooperate with agencies to provide effective patrols of fisheries waters and the Torres Strait Protected Zone”, although the amount of time that would typically be spent in this area is not

¹⁸⁰ <http://www.fisheries.gov.pg/PolicyandRegulation/ManagementPlans/tabid/87/Default.aspx>

¹⁸¹

<http://www.fisheries.gov.pg/FisheriesAuthority/BusinessGroups/MonitoringControlandSurveillance/Enforcement/tabid/190/Default.aspx>

known. The NFA also has an Observer Programme Unit¹⁸² that monitors compliance with licencing conditions for commercial fishing vessels. The PNG NFA is one of the best enforcement units in the Pacific region, which is regarded as having some of the best coordinated control and surveillance activities in the world. PNG itself has a high level of surface patrols which was estimated at approximately 190 sea days with nominated patrol boats under WCPFC HSB&I provisions. PNG has a strong track record of arresting and escorting vessels to port for investigation with highly trained staff. PNG also has limited aerial surveillance of about 120 hours per year currently though this is an increase on historic levels when aerial surveillance was not commonly available. These aerial surveillance patrols are made by agreement with Australia and New Zealand, mainly on shelf-based fisheries. PNG additionally has a community surveillance scheme called the 'wantok' system although this is more shore-based.

The entire PNG MCS system was reviewed in 2009 (Souter *et al.* 2009) and was very highly regarded with a strong regulatory framework for licensing, good MCS (observers, VMS, at sea and aerial surveillance and VMS) and visible coordination between the different elements i.e. VMS informing aerial surveillance of targets and areas to patrol. The only weakness highlighted by the review was in the prosecution of IUU, where a lot of possible IUU cases were not investigated or prosecuted due to lack of staff and that there were concerns that NFA is too lenient on domestic based vessels with minor violations and that licensing problems and delays were allowing some uncertainty in investigation and prosecutions. Political interference to encourage development in the fisheries sector may also be leading to investigations/prosecutions of violations not being followed through.

PNG has clear port State control measures in place (Souter *et al.* 2009). Offshore fisheries unload their catch at a variety of locations, although the larger tuna fisheries are different with longliners landing their catch at Port Moresby to enable airfreight of sashimi grade tuna out of PNG. Domestic purse seiners land their catches into domestic processing facilities, foreign ports and some transshipment occurs again with the catch eventually being landed in foreign ports with processing facilities. Foreign licensed purse seiners either tranship to a reefer for transfer to foreign ports for processing or deliver directly to their home port. Transshipment is required to take place at the designated ports of Manus, Kavieng, Rabaul, Wewak, Lae, Vanimo, Alotau, Misima and Port Moresby.

The small-scale commercial catch typical of the Indian Ocean catch is mainly landed in small local ports. Subsistence fishery landings occur at coastal villages throughout the country, roughly in proportion to the distribution of the population (FAO, 2010).

Papua New Guinea has a relatively poor ranking globally compared to other States according to the World Bank Governance Indicators (169th out of 212 – 80th percentile). As such any risks relating to

182

<http://www.fisheries.gov.pg/FisheriesAuthority/BusinessGroups/MonitoringControlandSurveillance/ObserverProgramme/tabid/191/Default.aspx>

direct corruption or a weak regulatory framework would be likely to exist and with a relatively high level of risk i.e. risks such as “Obstruction or bribery of fisheries officers” and “Falsification of documents”. Risks are likely to be higher than the level observed in most regional States, although the influence of neighbouring Pacific States in fisheries matters i.e. Coordination of MCS and IUU matters within FFA Members would somewhat mitigate these risks (See Table 159).

5.13.5 IUU risk identification

There is a known risk of unlicensed/unauthorised fishing by national vessels in the PNG EEZ. This would only be related to fishing in closed areas or seasons as domestic vessels are licensed and only closures would realistically apply.

Within the limited area of interest to this study compared to the wider EEZ and territorial sea of PNG there is a recognised risk of unlicensed/unauthorised fishing by foreign vessels with the highest risk coming from Indonesian vessels crossing the western border of the EEZ, i.e. illegal access by Indonesian vessels (trawling, netting and line fishing) into the dogleg. It is unlikely that any unlicensed fishing vessels will cross over from Australian waters. These vessels are probably in competition with the PNG artisanal and local commercial fisheries for demersal species and possibly sharks. An example calculation of the level of illegal operations was made for 2004 in MRAG (2005). Hereof the 65 intercepts made in this area of PNG waters in 2004, 83% were of Indonesian vessels and of these, 5 illegal Indonesian boats were arrested, i.e. 8% of total. An estimate by the NFA suggested that only 5% of illegal vessels are detected by the fishery patrol and therefore the estimated number of illegal Indonesian vessels would be at least 100. A catch of 150t per vessel per year was used to estimate an illegal catch of 15,000t per year of largely demersal fish and a possible 10t of shark product per trip, although potentially considerably more if only fins were taken during the period of concern.

The most likely form of IUU is the misreporting or failure of domestic and foreign vessels to accurately report their catch and this would apply to all fisheries.

Associated with any fishing by foreign vessels are the risks of Illegal transshipping in the PNG EEZ and the risk of the landing of illegal and unreported catch outside of ports.

The presence of a number of recognised protected or endangered species in the waters of interest and legal fisheries for a number of these species in neighbouring waters (i.e. TSPZ) means that there will be a risk that fisheries may illegally harvest or transfer a number of protected species (sea cucumbers, turtles etc.) and claim that they have been harvested in the legal fisheries.

Table 106 shows the IUU risks that have been identified as possible risks for PNG.

Table 106 Specific risks identified for Papua New Guinea.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed/unauthorised fishing by national vessels
	Unlicensed/unauthorised fishing by foreign vessels
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of/failure to report catch by national vessels
Post-harvest IUU	Illegal transshipping in EEZ and/or ports
	Landing of illegal and unreported catch outside of ports
Other offences	Illegal harvest/possession of sharks or other protected species (sea cucumbers, turtles etc.)

Table 107 summarises the IUU risks that have been identified and matches them to the fleets that they apply to.

Table 107 Matching risks to fleets (Papua New Guinea).

Risk category	Specific risk	Fleets at risk *
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed/unauthorised fishing by national vessels	1 and 2
	Unlicensed/unauthorised fishing by foreign vessels	3
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of/failure to report catch by national vessels	1 and 2
Post-harvest IUU	Illegal transshipping in EEZ and/or ports	3
	Landing of illegal and unreported catch outside of ports	3
Other offences	Illegal harvest/possession of sharks or other protected species (sea cucumbers, turtles etc.)	1 and 3

NB: * Fleets although separated here for risks will be considered as one fleet in the analysis.

5.13.6 Summary of IUU incidences

The arrest by PNG of a United States purse seiner in the early years of the tuna fishery which helped bring the domestic and foreign purse seine fleet into a legitimate state and once the majority of vessels are behaving responsibly it forces those remaining vessels to come into line rather than fish illegally and risk being reported by the licensed fleet. As noted in MRAG (2005) “The ability to show an occasional ‘bite’ is important in encouraging compliance with licensing requirements”.

The example given in section 5.13.5, for 2004 in the dogleg shows a high number of potential IUU incidences for vessels from Indonesia. A number of other examples of IUU fishing from Indonesia exist in press records and through other sources i.e. two Indonesian fishing vessels (Mutiara Jaya 17 and Mutiara Jaya 18) were found guilty 2001 of fishing in Papua New Guinea waters without a valid and applicable licence. The two vessels had been apprehended by PNG HMS Seeadler in the dog leg. The captains of the two stern trawlers were fined K80,000 (USD 27,200) and K 70,000 (USD 23,800) and the court ordered that both fishing vessels be forfeited to the State. The vessels were sold back to their owner for K 1 million (USD 340,000). Illegal fishing activities continue to occur outside the range of this study with five vessels from Thailand recently being arrested in 2014 in the dogleg area¹⁸³.

Other incidences have been reported i.e. a Chinese vessel was fined K 50,000 (USD 17,000) for violating the beche-de-mer closure¹⁸⁴ in 2012.

The risk of illegal fish being transhipped at sea is highlighted by the case of the Silver Sea 2. Although outside of the scope of the study having occurred in 2015, it is typical of the risk that has been apparent for a number of years and was detected through remote sensing techniques only recently deployed in the area. The Silver Sea 2 was detained in Indonesia, carrying an estimated USD 2 million worth of catch on board, on suspicion of illegal fishing. The Silver Sea 2 was first identified through remote sensing derived high-resolution photo, showing fish being loaded from smaller trawlers onto the refrigerated vessel in PNG waters. Indonesian authorities were informed when it crossed into their waters on its way home to Thailand and detained the vessel. This is a clear example of the complex nature of IUU and transhipment related offences in particular.

5.13.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 108), impact (Table 109) and level of inherent risk (Table 110) for the dogleg region of the Papua New Guinea EEZ based on the risks identified in Table 106.

¹⁸³ <http://www.emtv.com.pg/article.aspx?slug=Illegal-Fishing-Vessels-Apprehended&>

¹⁸⁴

<http://www.fisheries.gov.pg/FisheriesAuthority/NewsandMedia/MediaReleases/AsianLoggingshipslappedK50000fines/tabid/302/Default.aspx>

Table 108 Assessment of risk likelihood – Papua New Guinea.

Specific risk	Incentives	Deterrents *	Likelihood
Unlicensed/unauthorised fishing by national vessels	Moderate	Moderate	Moderate
Unlicensed/unauthorised fishing by foreign vessels	High	Moderate	Likely
Misreporting of/failure to report catch by national vessels	Moderate	Weak	Likely
Illegal transshipping in EEZ and/or ports	High	Moderate	Likely
Landing of illegal and unreported catch outside of ports	High	Weak	Likely
Illegal harvest/possession of sharks or other protected species (sea cucumbers, turtles etc.)	High	Moderate	Likely

* Deterrent level would be strong for most of the PNG EEZ but is weaker on the southern coast and the dogleg in particular as further away from the main bulk of the commercial tuna fisheries.

Table 109 Assessment of risk impact – Papua New Guinea.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by national vessels	Moderate	Moderate	Moderate
Unlicensed/unauthorised fishing by foreign vessels	High	Moderate	Major
Misreporting of/failure to report catch by national vessels	Moderate	Moderate	Moderate
Illegal transshipping in EEZ and/or ports	High	Moderate	Major
Landing of illegal and unreported catch outside of ports	High	Moderate	Major
Illegal harvest/possession of sharks or other protected species (sea cucumbers, turtles etc.)	Moderate	Highly Vulnerable	Major

Table 110 Assessment of inherent risk – Papua New Guinea.

Specific risk	Likelihood	Impact	Risk
Unlicensed/unauthorised fishing by national vessels	Moderate	Moderate	Moderate
Unlicensed/unauthorised fishing by foreign vessels	Likely	Major	High
Misreporting of/failure to report catch by national vessels	Likely	Moderate	High
Illegal transshipping in EEZ and/or ports	Likely	Major	High
Landing of illegal and unreported catch outside of ports	Likely	Major	High
Illegal harvest/possession of sharks or other protected species (sea cucumbers, turtles etc.)	Likely	Major	High

5.13.8 Impacts of IUU

There are clear impacts from illegal fishing on the management of the stocks due to the unknown level of catch and effort from both national and any foreign vessels fishing illegally. Stocks will not be able to be managed to their maximum potential where large unknowns relating to illegal fishing exist. There are also direct losses of revenue to the Papua New Guinean national economy through taxes of national boats and licensing revenue from foreign vessels and potential indirect losses due to any depletion of the commercially exploited stocks.

Illegal fish caught by foreign vessels are also unlikely to be landed in Papua New Guinea, more likely they will be removed to ports in Indonesia and Thailand which will result in a loss in potential taxation and other benefits to local industry that could have accrued if fished legally by local vessels.

Illegal fishing vessels are unlikely to adhere to national or international requirements on environmental aspects of fishery management. This may lead to increased bycatch, incidental mortality and discards (waste), additionally illegal gear may damage the environment i.e. trawl or dredge gears in sensitive habitats i.e. noting the ban on trawl gear in the dogleg. The increased incidental mortality and bycatch of ETP species will lead to problems with any stock assessment of these species which may often difficult to do with full data provisions due to the low numbers of these species. Environmental damage to specific habitats may lead to modification of local ecosystems, changes in quite sensitive balances and species composition which may have possible negative impacts for commercially important fisheries).

For some ETP species there may be a loss or limitation of expansion for tourism related to for high profile species (i.e. turtles and sharks) that have be shown to have a high intrinsic value.

Where IUU is known to occur it demonstrates a clear lack of flag State control (of national vessels) and coastal State control (of foreign and national vessels). Both will be regarded as negative factors to importing countries and may result in possible export bans (i.e. EU red cards). This led to both Papua New Guinea and the Philippines being issued a warning by the EU over insufficient action to fight illegal fishing in 2014. Both countries were given a 'yellow card' warning and a reasonable time for them to respond to the warning and take measures to rectify the situation with an agreed action plan to address their shortcomings. The warning to PNG was lifted in October 2015 after actions were taken to the satisfaction of the EU¹⁸⁵.

Where illegal transshipment and bunkering at sea exists and is not monitored in any way the illegal or in some cases legal fleets transshipping will have an increased and possibly unknown capacity to fish as they will not be required to come into port on a regular basis. This may skew stock assessments and may result in an increase in compliance problems as fishing vessels do not return to port for regular inspections. There is also an increased likelihood of labour issues, such as indentured or child labour, as fishing vessels do not return to port and cannot be inspected and the crew do not have the opportunity to report any labour abuses to the relevant authorities.

¹⁸⁵ <http://www.pina.com.fj/?p=pacnews&m=read&o=10695163435617291b85d9a713dd1e>

5.13.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

There is an estimated “Moderate” risk of unlicensed or unauthorised fishing by national vessels in the dogleg area of the PNG EEZ. Although the risk exists there is not a large amount of evidence of occurrence and therefore a lower end of the range of 2 – 10% has been applied.

Unlicensed or unauthorised fishing by foreign vessels however has been shown to be occurring throughout the period of the study primarily by Indonesian vessels fishing across the border but more recently by Thai vessels expanding their areas of operation. The risk was estimated as high and a value of 10-30% has been applied although this may actually be an underestimate of the actual level.

The misreporting of or failure to report catch by national vessels particularly the artisanal sector is estimated as high, due to the lack of confidence in the catch statistics from this sector. An additional 10-25% has been applied to the catches relating to this risk.

Illegal transshipping and the landing of illegal and unreported catch outside of national ports, although being complicating factors that would add to the effort and catch of IUU fish and remove them from national catch statistics not been duplicated here as the catch would be considered as part of the estimated catch by unlicensed and unauthorised domestic and foreign vessels.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the dogleg zone of the Papua New Guinea EEZ can be found in Table 111.

Table 111 Summary of estimated rates – Papua New Guinea “dogleg”.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by national vessels	National	All	1990 – 2013	2	10	0	0
Unlicensed/unauthorised fishing by foreign vessels	Foreign	All	1990 – 2013	10	30	0	0
Misreporting of/failure to report catch by national vessels	National	All	1990 – 2013	0	0	10	25
Illegal transshipping in EEZ and/or ports	All	All	1990 – 2013	0	0	0	0
Landing of illegal and unreported catch outside of ports	National	All	1990 – 2013	0	0	0	0
Illegal harvest/possession of sharks or other protected species (sea cucumbers, turtles etc.)	All	All	1990-2013	0	0	0	0

5.13.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the adjusted FAO catch data (adjusted proportionally to the size of the dogleg area only) the total illegal and unreported catches represent on average between 27,077 and 79,999t per annum (i.e. 22 and 65%). Illegal catches contribute an estimated 12-40% and unreported catches between 10 and 25% in addition to the reported catch. It should be clearly noted that the estimate of reported catch is higher than it is anticipated but that the percentages estimated would remain the same.

If the catch estimates are valid then the losses from Illegal, Unreported and Unregulated fishing in the Papua New Guinea “dogleg” are estimated to average between USD 55.35 and 163.54 million per annum.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 112 and as first landed value in Table 113. Profiles of the estimated level of illegal and unreported fishing combined in the dogleg area of Papua New Guinea can be found in Figure 32 (catch in t) and Figure 33 (catch value in USD).

Table 112 Summary of estimated IUU by year in the Papua New Guinea “dogleg” (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	11985	1438	4794	1199	2996	0	0
1991	12790	1535	5116	1279	3198	0	0
1992	13030	1564	5212	1303	3258	0	0
1993	12437	1492	4975	1244	3109	0	0
1994	12951	1554	5181	1295	3238	0	0
1995	25921	3110	10368	2592	6480	0	0
1996	24510	2941	9804	2451	6128	0	0
1997	32948	3954	13179	3295	8237	0	0
1998	65098	7812	26039	6510	16274	0	0
1999	42375	5085	16950	4238	10594	0	0
2000	96608	11593	38643	9661	24152	0	0
2001	111763	13412	44705	11176	27941	0	0
2002	128100	15372	51240	12810	32025	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2003	163830	19660	65532	16383	40957	0	0
2004	229499	27540	91800	22950	57375	0	0
2005	241072	28929	96429	24107	60268	0	0
2006	240049	28806	96019	24005	60012	0	0
2007	234392	28127	93757	23439	58598	0	0
2008	209327	25119	83731	20933	52332	0	0
2009	216837	26020	86735	21684	54209	0	0
2010	212598	25512	85039	21260	53149	0	0
2011	171712	20605	68685	17171	42928	0	0
2012	243790	29255	97516	24379	60948	0	0
2013	200180	24022	80072	20018	50045	0	0

Table 113 Summary of the estimated value of IUU (USD) by year in the Papua New Guinea “dogleg” (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	38.47	4.62	15.39	3.85	9.62	0.00	0.00
1991	65.63	7.88	26.25	6.56	16.41	0.00	0.00
1992	70.59	8.47	28.23	7.06	17.65	0.00	0.00
1993	56.47	6.78	22.59	5.65	14.12	0.00	0.00
1994	34.68	4.16	13.87	3.47	8.67	0.00	0.00
1995	75.80	9.10	30.32	7.58	18.95	0.00	0.00
1996	86.80	10.42	34.72	8.68	21.70	0.00	0.00
1997	105.67	12.68	42.27	10.57	26.42	0.00	0.00
1998	185.84	22.30	74.34	18.58	46.46	0.00	0.00
1999	123.86	14.86	49.54	12.39	30.96	0.00	0.00
2000	213.45	25.61	85.38	21.35	53.36	0.00	0.00
2001	239.80	28.78	95.92	23.98	59.95	0.00	0.00
2002	254.46	30.54	101.78	25.45	63.61	0.00	0.00
2003	299.04	35.89	119.62	29.90	74.76	0.00	0.00
2004	416.03	49.92	166.41	41.60	104.01	0.00	0.00
2005	436.33	52.36	174.53	43.63	109.08	0.00	0.00
2006	410.12	49.21	164.05	41.01	102.53	0.00	0.00
2007	387.89	46.55	155.16	38.79	96.97	0.00	0.00
2008	364.76	43.77	145.90	36.48	91.19	0.00	0.00
2009	367.17	44.06	146.87	36.72	91.79	0.00	0.00
2010	464.00	55.68	185.60	46.40	116.00	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2011	366.42	43.97	146.57	36.64	91.61	0.00	0.00
2012	536.97	64.44	214.79	53.70	134.24	0.00	0.00
2013	438.08	52.57	175.23	43.81	109.52	0.00	0.00

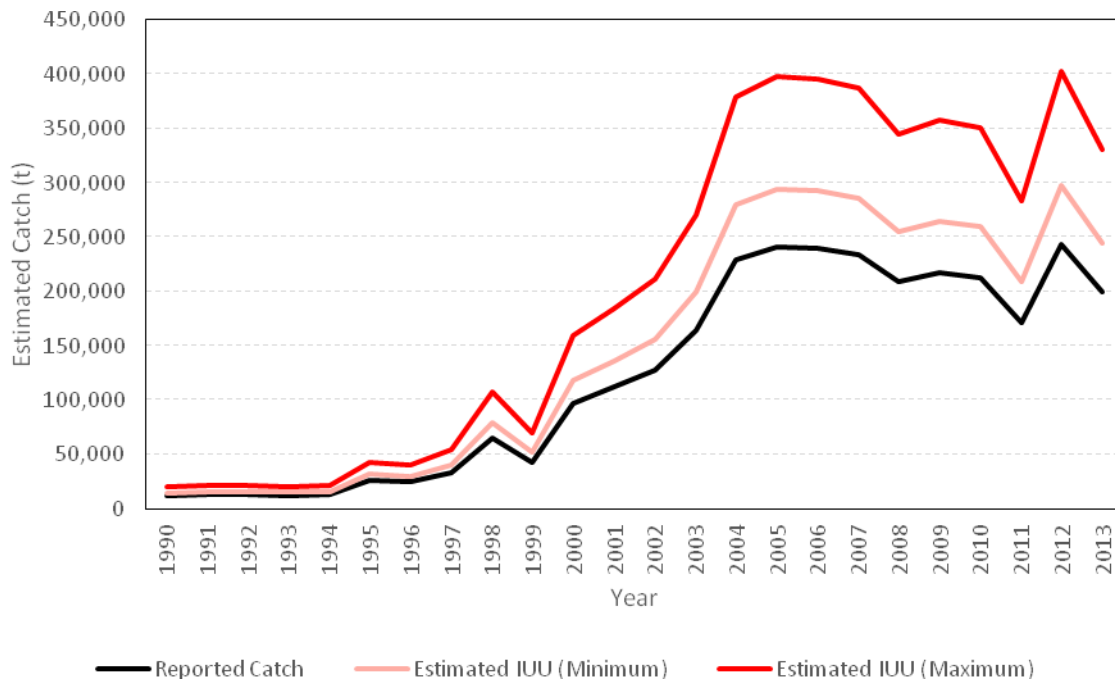


Figure 32 IUU Catch Profile (Papua New Guinea “dogleg”) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

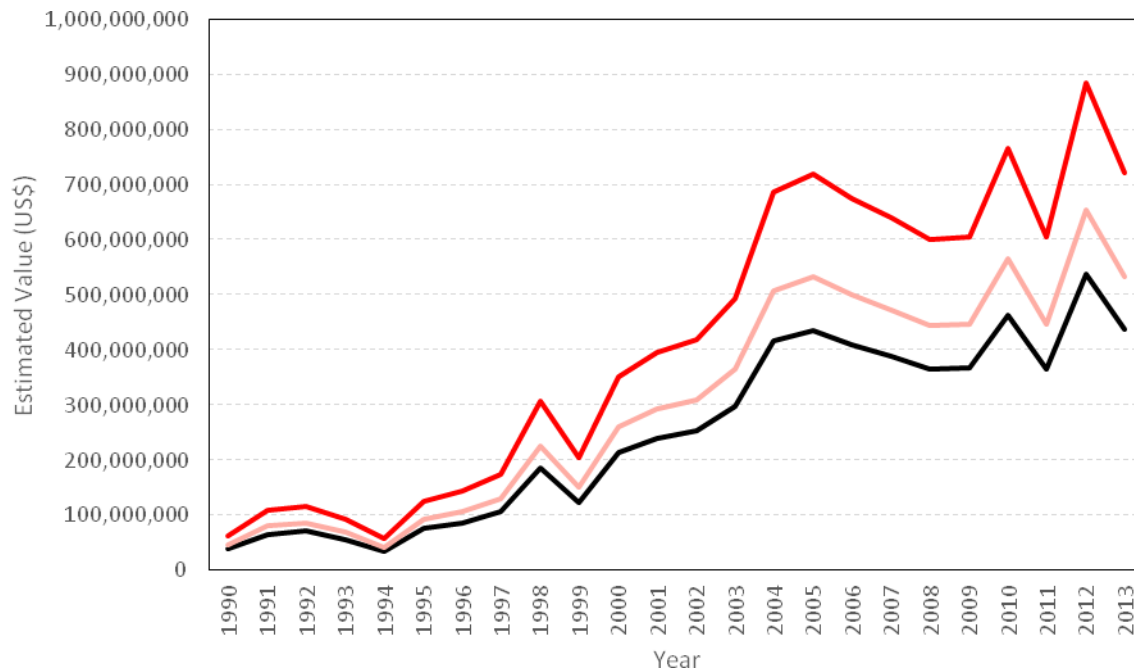


Figure 33 IUU Catch Value Profile (Papua New Guinea “dogleg”) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.14 The Philippines

5.14.1 Introduction

The Philippines is comprised of over 7,000 islands, with the EEZ and other territorial waters totalling 2,200,200 km². A large number of marine protected areas have been created by the Philippines, including the Tubbataha national marine park which is a UNESCO World Heritage site. The Philippines EEZ shares borders with Palau and Indonesia to the east and south, China to the north and Malaysia, in addition to the disputed territories of the South China Sea, to the west. Indeed maritime boundary disputes between the Philippines and neighbouring states are a key factor in the IUU risk assessment.

The Philippines was given a ‘yellow card’ warning by the EU in June 2014 for its failure to sufficiently tackle IUU fishing¹⁸⁶. However, following various actions by the Filipino government in response to

¹⁸⁶ Commission Decision of 10 June 2014 on notifying a Third Country that the Commission considers as possible of being identified as non-cooperating Third Countries pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing (2014/C/185/03).

the threat of EU trade sanctions, including legislative reform and increases of MCS capacity, the 'yellow card' was lifted in April 2015¹⁸⁷.

In 2012 the Philippines was the second highest ranked Southeast Asian nation in terms of total fish catches, behind only Indonesia. In 2011 the municipal fishing sector was valued at P72.03 billion (Philippine pesos¹⁸⁸) and the commercial sector was valued at P58.62 billion (Philippines NPOA-IUU, 2013).

5.14.2 Fleet breakdown

According to SEAFDEC the national commercial fishing fleet was estimated to number over 8,000 vessels in 2012, ranging in size from 3 GT to 150 GT (the commercial fleet is divided into small, medium and large-scale according to GT), in addition to an unknown number of motorised and non-motorised 'municipal' vessels below 3 GT, although the FAO reported that the municipal fleet numbered at 777,700 vessels by 2002 (FAO, 2005). Furthermore it was estimated that c. 1.3 million people were involved in the municipal fishing industry, as well as a further 16,497 in commercial operations (SEAFDEC, 2012).

Table 114 Fleet breakdown for the Philippines.

Number	Description	Gear	Flag(s)	Target species	Comment
1	Municipal vessels (i.e. bancas and pumpboats)	Mixed small nets, traps, dynamite	Philippines	Mixed demersal/reef/small pelagic species, tuna and tuna like species	
2	Small-scale commercial	Longline, purse seine, other	Philippines	Tuna and tuna-like species, small pelagics, shrimp	
3	Medium-scale commercial	Longline, purse seine,	Philippines	Tuna and tuna-like species, small pelagics, shrimp	

¹⁸⁷ Commission Decision of 14 April 2015. Notice of information of the termination of the demarches with a third country notified on 10 June 2014 of the possibility of being identified as non-cooperating third country pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing (2015/C/142/05).

¹⁸⁸ 1 Philippine peso = USD 0.021 as of September 2015

Number	Description	Gear	Flag(s)	Target species	Comment
		other			
4	Large-scale commercial	Longline, purse seine, other	Philippines	Tuna and tuna-like species, small pelagics, shrimp	
5	Chinese industrial	Longlines, pole and line, drift nets	China	Tuna, tuna-like species, other large pelagics, marine turtles, sharks.	
6	Other foreign fleets	Mixed artisanal and industrial gears	Vietnam, Indonesia, Malaysia, Taiwan	Mixed reef, demersal and pelagic species	

5.14.3 Catch breakdown by fleet

Total FAO reported catches total over 40,000,000 tonnes for the Philippines between 1990 and 2010. The FAO data for the Philippines indicates a dominance of small pelagic species such as *Sardinella* spp. and *Scads nei* (*Decapterus* spp.) which together account for around 30% of the recorded catch. Various tuna species (skipjack, frigate, bullet, kawakawa and yellowfin) account for a further 21%, with skipjack representing the largest proportion of catch for a single species at 7.3%. Several invertebrate species also feature, with squids *nei* (*Loligo* spp.), blue swimming crab (*Portunus pelagicus*) and *Penaeus* shrimp spp. accounting for 4.84%.

Catch data and proportions obtained from FAO sources allow a breakdown between the municipal fleet (#1) and the commercial fleet (combined #2, #3 and #4) (see Table 115) (FAO, 2006). The three commercial fleets have therefore been combined into one for the risk analysis.

Table 115 Catch breakdown for the Philippines national catch.

Species	Commercial		Municipal	
	Tonnage	Percentage	Tonnage	Percentage
Roundscad	254659	81.98	55980	18.02
Indian sardines	130024	76.45	40051	23.55
Frigate tuna	114760	64.08	64326	35.92
Skipjack	114077	100.00	0	0.00
Yellowfin tuna	87473	68.75	39767	31.25
Big-eyed scad	39621	38.11	64354	61.89
Fimbriated sardine	36358	100.00	0	0.00
Slipmouth	36313	51.99	33528	48.01
Indian mackerel	32037	41.54	45083	58.46
Anchovies	28654	40.30	42447	59.70
Others	235660	33.53	467147	66.47
Squid	0	0.00	37735	100.00
Blue crab	0	0.00	31433	100.00

The SAU catch reconstruction for the Philippines arrived at a similar figure between 1990 and 2010 as the FAO data, with a figure of 37.5 million tonnes, however it should be noted that the SAU reconstruction totalled at almost double the FAO reported catches for the Philippines between 1950 and 2010. Nonetheless the SAU data contains a similar range of species to the FAO data, with shortfin scad (*Decapterus macrosoma*) accounting for 13% of catch, tuna and tuna-like species also accounting for 13% and *Sardinella* spp. accounting for 9%. Squid and other aquatic invertebrates comprised an additional 7.5%.

5.14.4 IUU influencing factors

5.14.4.1 Legislation and governance

Fisheries in the Philippines are governed by the Philippine Fisheries Code of 1998, under the responsibility of the Bureau of Fisheries and Aquatic Resources (BFAR) within the Department of Agriculture. It should be noted that an amendment (RA10654) to the Fisheries Code was passed in 2015 which introduced a number of new laws and harsher penalties in an attempt to tackle IUU

fishing, and the following sections will consider both the original legislation and the amended version.

It should be noted that certain aspects of fisheries governance are devolved from a national level to municipal authorities, such as the responsibility for managing the country's large artisanal fisheries and enacting other aspects of fisheries management on a local scale. The municipal authorities hold jurisdiction over a coastal zone extending for 15 km, whilst the central national government is responsible for the remainder of the national EEZ.

The Philippines is a member of a number of RFMOs, including IOTC, ICCAT, CCSBT and WCPFC. In addition the country has signed both the UNCLOS and UNFSA conventions, and produced an NPOA-IUU in 2013. The country has an average ranking globally and also compared to other States in the region according to the World Bank Governance Indicators (118th out of 212 – 56th percentile). As such any risks relating to direct corruption or a weak regulatory framework would be likely to exist but with a low to moderate level of risk only. Risks such as “Obstruction or bribery of fisheries officers” and “Falsification of documents” are likely to exist but not contribute greatly to the level of IUU observed in most regional States (See Table 159).

5.14.4.2 Licensing and reporting requirements

Licensing of municipal vessels is carried out by the Local Government Unit (LGU) whilst BFAR is responsible for authorising commercial licenses which are valid for three years after issuing. The Fisheries Code states that all fishing activities require a license, lease or permit; however, exemption is stated for ‘fishing for daily food sustenance or for leisure’ (Section 86). All commercial vessels greater than 3 GT are required to be registered with the Maritime Industry Authority (MARINA), whilst responsibility for municipal vessel registration falls to LGUs in the vessel's area of operation.

Historically the licensing and reporting regime for national vessels has been open to abuse, with vessels of over 3 GT (only eligible for commercial licenses) able to obtain municipal licenses and thus circumvent the restrictions and reporting requirements placed on commercial vessels (Alesna *et al.*, 2004).

The Fisheries Code sets out the reporting requirements for commercial vessels, specifically stating that information must be collected in logbooks on catch, spoilage, landing points, quality and value of catch, transshipment and sales (Section 38). However, catch and effort data has historically been inadequate for application to fisheries management, and the NPOA recognises the inaccuracy of fishing statistics obtained from the existing logbook system, whilst stating that alternative catch documentation schemes will be explored in the future. Reporting requirements are not stated in the current legislation for municipal vessels (the ‘Reportorial Requirements’ section of the legislation only refers to commercial vessels), meaning that a substantial proportion of national catch is likely to be poorly documented, misreported or unreported entirely. Moreover a ‘fundamental unreliability’ of reported catch data in the Philippines is caused by blurring between the ill-defined municipal and commercial fleet segments, with ratios used by national authorities to increase the estimated catches of one sector in proportion to the other (Palomares & Pauly, 2014).

The original fisheries legislation makes no specific provisions for the regulation of transshipments by nationally-flagged vessels; however, provision for national transshipment regulation is included in the

amended version. It should be additionally noted that the original legislation did not state a requirement for national vessels to carry VMS, although the 2015 version does include provisions for an expanded MCS system and penalties for tampering with VMS equipment. Moreover the NPOA states that a supplementary piece of legislation (Fisheries Administrative Order 241) requires all nationally-flagged vessels operating on the high seas to carry 'transponders'.

The Fisheries Code makes no provision for the issuing of licenses to foreign fishing vessels, stating that it is illegal for 'any foreign person, corporation or entity' to fish in national waters. However, joint fishing ventures between national and foreign fishing companies are permitted on the proviso that 60% of the venture is Filipino-owned.

5.14.4.3 Restrictions, fines and penalties

The 1998 version of the Fisheries Code states the penalty for unauthorised commercial fishing as a fine of P 10,000 and six months imprisonment for the officers of the vessel, whilst unauthorised municipal fishing was liable to a fine of P 5,000. However, the amended legislation contains tougher penalties, with a maximum fine of up to P 1,000,000 for large commercial vessel officers. The amendment also contains heavy penalties for nationally-flagged boats which are convicted of illegal (without the requisite national permits), unreported or unregulated fishing activities on the high seas or in foreign EEZs, with a maximum fine of P 45,000,000 for large commercial vessels.

Under the Fisheries Code, commercial vessels are banned from fishing within municipal waters or within 15 km of the shoreline (Section 90). However, small or medium commercial vessels may be granted additional permissions to fish within municipal areas fish not closer than 10.1 km from the coastline, at a depth of greater than seven fathoms (Section 18). The coastal areas within these limits are reserved for municipal vessels, and residents of each municipality are given priority to exploit local fisheries resources (Section 21). The LGUs are also given responsibility for aspects of fisheries management, including the authority to close municipal waters which are deemed to be overfished. In addition to LGUs, the Fisheries Code also includes the creation of Fisheries and Aquatic Resources Management Councils (FARMC), which consist of fishermen's organisations or cooperatives which aim to provide management inputs at the municipal and national level (Sections 68-79).

The Fisheries Code specifically bans the use of 'superlight' fishing gear by commercial vessels in municipal areas, with all superlight usage 'regulated' although no specific regulations are defined in the text (Section 44). Moreover fishing using explosives, poisons, electricity, muro ami techniques and fine mesh nets is specifically prohibited (Sections 88-89). Under the original fisheries legislation, use of these illegal gears carried penalties between six months to ten years in prison, in addition to fines of up to P 100,000, depending on the exact nature of the offence. Again the amended legislation introduces tougher penalties of up to P 3,000,000 for large commercial vessels in addition to the potential prison sentence. The Fisheries Code also carries specific penalties for the offences of fishing in closed areas, reserves and overfished areas (Section 95). The amended version additionally includes new provisions for observers to be deployed on nationally-flagged fishing vessels with power to board and carry out inspections, stating that Filipino distant water fishing vessels and all commercial vessels are required to sail with an observer onboard. This represents a development of the national observer programme which was initiated in 2009 as part of compliance with WCPFC requirements.

The penalty for violations by foreign vessels is stated in the original legislation as USD 100,000 in addition to seizure of the vessel, gear and catch, with the amended legislation increasing the penalty to a maximum of USD 2,400,000 for offenders who are repeatedly caught fishing in internal waters. The legislation also refers separately to the regulation of transshipments by foreign vessels involving fish caught outside of national waters, stating that all such activities must be carried out in registered national ports (Section 42).

5.14.4.4 MCS protocols and enforcement capacity

Maritime enforcement in the Philippines is undertaken by BFAR, the Philippines Coast Guard and the national navy. However, national enforcement capacity is insufficient to effectively police the vast Philippines EEZ, particularly remote areas of high IUU activity. A 2015 article stated capacity at only twenty enforcement vessels, with 100 new patrol boats ordered to arrive within the year to bolster BFAR's activities against marine poaching¹⁸⁹. The NPOA states a number of future measures aimed at addressing the gaps in enforcement capacity, including the creation of a new integrated MCS network and a 'Fisheries Law Enforcement Manual of Operation' which will standardise protocols for enforcement activities.

In some municipalities the responsibility for enforcement is devolved to the level of the LGUs through the Bantay Dagat (Guardians of the Sea) programme whereby composite teams of law enforcement personnel and municipal fishers carry out MCS duties, with small patrol boats provided for local use.

Where IUU is known to occur it demonstrates a clear lack of both flag State control (of Philippines national vessels) and coastal State control (of foreign and national vessels operating in the Philippines EEZ). Both factors will be regarded as negative factors to importing countries and as a result the Philippines was issued a warning by the EU over insufficient action to fight illegal fishing in 2014. The Philippines were given 6 months to respond to the warning and take measures to rectify the situation with an agreed action plan to address their shortcomings.

5.14.4.5 Port state

Ports in the Philippines are managed by the Philippine Fisheries Development Authority (PFDA), with the largest proportion of landings taking place at Navotas Fish Port Complex in the capital city of Manila (FAO, 2006). The country has not signed the FAO Port State Measures Agreement, and it has been argued that a drive by the government to create new fishing ports has exacerbated levels of foreign intrusion into the Philippines EEZ by providing new opportunities for foreign vessels to land potentially illegal catch (MRAG, 2005). However, the 2015 amendment to the Fisheries Code included a revised section on port state measures for foreign vessels which includes prior

¹⁸⁹ "Philippines buys 100 patrol boats to combat poachers | mb.com.ph | Philippine News," 2015.

notification of entry, restrictions on landings and transshipments, and requirements for catch documentation and inspections.

5.14.4.6 Market state

The Fisheries Code stipulates that all post-harvest infrastructure must be registered and licensed at a municipal level by the LGUs (Section 60). Moreover the legislation also states a specific penalty of six months to two years in prison for profiting from the sale of illegal catch.

The Philippines is a major regional and global market for seafood products, with tuna exports alone increasing in value from USD 64 million in 2000 to USD 242 million by 2012. Moreover overall exports of seafood to the EU from the Philippines reaching 73,000 tonnes in 2010, a 40% increase from 2005 (CBI, 2012). One reported incident in 2014 which illustrates the potential for Filipino markets to provide a conduit for IUU fishing products was the seizure of 5,000kg of shark fin from a van in Cebu, with a market value of P 15 million. The report stated that the fins were destined for export to Hong Kong¹⁹⁰.

5.14.5 Summary of IUU incidences

IUU fishing activities are pervasive throughout the Philippines, and the relevant information uncovered by the project's literature and media review is summarised below, with incidences linked to the relevant section of the fleet breakdown in Table 114 where possible.

The implementation of fisheries legislation in the Philippines to tackle IUU fishing has been weak, with a generally low conviction rate. For example, out of 1,000 fishermen arrested for illegal fishing in Palawan, only 29 were jailed and a number of seized vessels later returned to their home state (Funge-Smith *et al.*, 2015). Moreover the laws regulating fishing gears are recognised to be poorly enforced, and use of destructive techniques such as dynamite and cyanide is widespread, in addition to the use of fine mesh nets which do not comply with national standards. The NPOA-IUU also acknowledges that the prescribed fines for IUU offences (previous to the amendments in 2015) did not amount to a sufficient deterrent in light of the incentives to undertake IUU fishing in the Philippines.

5.14.5.1 National vessels

The review of online media identified a number of reported IUU incidents involving Filipino nationals operating within both the municipal and commercial fleet sectors across several of the major islands including Luzon, Mindanao, Cebu and Palawan. The reports also identified the use of specific illegal gears including trawls, fine mesh nets, dynamite and muro ami by national fishers. The number of fishermen arrested in individual incidents ranged from individuals up to larger groups of 30-35. In

¹⁹⁰ "Shark fins worth P15M seized | mb.com.ph | Philippine News," 2014.

addition it has been postulated that national fishermen may sell the catch of certain species on to foreign IUU vessels, specifically in the Palawan IUU hotspot (see section 1.1.5.2).

5.14.5.2 Foreign vessels

Within the Philippines there are identified hotspots where IUU fishing activity by foreign fleets is concentrated, such as the waters off Palawan Island in the west of the Philippines EEZ which are recognised as a focal point for the poaching of ETP species such as marine turtles by predominantly Chinese, Taiwanese and Vietnamese vessels,¹⁹¹. Between 2000 and 2008 over 1,000 arrests of foreigners for IUU activities near Palawan were recorded, and more recently Chinese fishers were prosecuted for various IUU offences including turtle poaching in 2014¹⁹². The illegal targeting of marine turtles by Chinese and Malaysian vessels is also a major issue in the Taganak islands, in the extreme south of the Philippines EEZ, which are known as the ‘Turtle Islands’ due to their importance as a nesting site for green and hawksbill turtle species. The vulnerability of these islands is heightened by their remoteness from Filipino enforcement infrastructure and their proximity to the Malaysian coast. Moreover the scale of IUU fishing in the Philippines is illustrated by statistics from the Taganak islands, where 571 IUU incidents were recorded by the Filipino navy (Funge-Smith *et al.*, 2015). The collusion of Filipino government personnel in IUU activities undertaken by foreign vessels has also been alleged in this area.

Aside from marine turtles a number of other ETP species are known to be targeted by foreign vessels, and the online media review also encountered reported seizures of tuna species (including yellowfin) and shark from illegal Vietnamese vessels near Palawan in 2014^{193,194}. It should also be noted that a Taiwanese longliner intercepted in 2015 was reported as operating illegally whilst flying a Filipino flag¹⁹⁵.

Illegal Chinese vessels are also known to operate in the area of Scarborough Shoal, again targeting ETP species. This area of IUU activity is exacerbated by border disputes between the Philippines and China, which both claim sovereignty of the shoal.

¹⁹¹ “13 Vietnamese arrested in Philippines over sea turtles | Bangkok Post: news,” 2013.

¹⁹² “PH convicts Chinese ‘poachers’ despite Beijing’s warnings | mb.com.ph | Philippine News,” 2014.

¹⁹³ “7 Vietnamese fishermen caught off Palawan | mb.com.ph | Philippine News,” 2014.

¹⁹⁴ “12 Vietnamese jailed in Philippines for illegal fishing | mb.com.ph | Philippine News,” 2014.

¹⁹⁵ “Taiwanese poachers charged | mb.com.ph | Philippine News,” 2015.

5.14.6 IUU risk identification

5.14.6.1 Unlicensed/unauthorised fishing with territorial sea, contiguous zone or Exclusive Economic Zone

Due to the combination of factors discussed above, which include border disputes, weak enforcement capacity, high incentives/insufficient deterrents and the vast size of the Philippines EEZ, there is an evident risk of unlicensed/unauthorised fishing by both national and foreign vessels. Due to prohibition of all illegal fishing by Fisheries Code, all foreign fishing activity is therefore unauthorised. For the purposes of the risk assessment, foreign vessels will be divided into 1) Chinese and Taiwanese vessels, and 2) vessels of other nationalities. Assessment of national vessels will be subdivided into municipal and commercial risks as per the divisions of the national fleet sector.

5.14.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Despite being subject to catch reporting requirements, the literature indicates that data obtained from the national commercial fleet has historically been limited in both quality and coverage, creating the risk that commercial vessels are not complying with reporting obligations. Municipal vessels are not required under the Fisheries Code to report catch, however the risk of municipal catch being unreported altogether will be considered as part of this sub-section of the assessment.

5.14.6.3 Non-compliance with other licence conditions and/or legislation

The use of a broad range of prohibited and destructive fishing gears has been reported in the reviewed literature on the Philippines, despite their prohibition under national law, and consequently a risk evidently exists in this regard. In addition a risk of fishing inside closed areas has been identified, based on the evidence of the entry of IUU vessels into protected areas such as Tubbataha national park. This risk has been divided into national and foreign vessels, which will be assessed separately.

5.14.6.4 Post-harvest IUU

Given that regulation of both national and foreign transshipment activities has been historically limited, in addition to supplementary evidence of illegal transshipping in the literature, a risk of illegal transshipment and/or bunkering has been identified. It has also been stated in the literature that foreign vessels have landed illegal catch in national ports, creating a further post-harvest risk. Furthermore the potential for ETP and CITES listed species to be sold within the Philippines and exported elsewhere has also been identified as a risk within this section.

5.14.6.5 Other offences

The literature on the Philippines contains extensive references to the illegal harvesting of turtles, corals, sharks, tuna and other ETP species, and therefore this factor must also be considered as a risk for the Philippines. The risk of commercial vessel encroachment into municipal waters will also be evaluated in this section.

Table 116 shows the IUU risks that have been identified as possible risks for the Philippines

Table 116 Specific risks identified for the Philippines.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed/unauthorised fishing by Chinese/Taiwanese vessels
	Unlicensed/unauthorised fishing by other foreign fleets
	Unlicensed/unauthorised fishing by national municipal vessels
	Unlicensed/unauthorised fishing by national commercial vessels
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of catch by national commercial vessels
	Misreporting of /unreported catch by national municipal vessels
Non-compliance with other licence conditions and/or legislation	Fishing with prohibited and destructive gears
	Fishing within spatio-temporal closed areas
Post-harvest IUU	Illegal and unreported transshipment
	Export of ETP and CITES species
	Landing of illegal catch in national ports by foreign vessels
Other offences	Harvest of ETP and CITES species
	Incursion of industrial vessels into reserved artisanal areas

5.14.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 116), impact (Table 117) and level of inherent risk (Table 118) for the Philippines based on the risks identified in Table 116.

Table 117 Assessment of risk likelihood – The Philippines.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed/unauthorised fishing by Chinese/Taiwanese vessels	Very High	Very weak	Almost certain
Unlicensed/unauthorised fishing by other foreign fleets	High	Weak	Likely
Unlicensed/unauthorised fishing by national municipal vessels	Moderate	Weak	Likely
Unlicensed/unauthorised fishing by national commercial vessels	Moderate	Weak	Likely
Misreporting of/unreported catch by national commercial vessels	High	Moderate	Likely
Misreporting of /unreported catch by national municipal vessels	High	Weak	Likely
Fishing with prohibited and destructive gears	Very High	Very Weak	Almost certain
Fishing within spatio-temporal closed areas	High	Very weak	Almost certain
Illegal and unreported transshipment	High	Weak	Likely
Export of ETP and CITES species	High	Weak	Likely
Landing of illegal catch in national ports by foreign vessels	High	Weak	Likely
Harvest of ETP and CITES species	Very High	Very Weak	Almost certain
Incursion of industrial vessels into reserved artisanal areas	High	Weak	High

Table 118 Assessment of risk impact – The Philippines.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by Chinese/Taiwanese vessels	Moderate	Vulnerable	Major
Unlicensed/unauthorised fishing by other foreign fleets	Moderate	Vulnerable	Major
Unlicensed/unauthorised fishing by national municipal vessels	Moderate	Moderate	Moderate
Unlicensed/unauthorised fishing by national commercial vessels	Moderate	Moderate	Moderate
Misreporting of/unreported catch by national commercial vessels	High	Moderate	Major
Misreporting of /unreported catch by national municipal vessels	Moderate	Moderate	Moderate
Fishing with prohibited and destructive gears	High	Highly Vulnerable	Serious
Fishing within spatio-temporal closed areas	High	Highly Vulnerable	Serious
Illegal transshipment	Very low	Moderate	Minor
Sale and export of ETP and CITES species	Very low	Highly Vulnerable	Moderate
Landing of illegal catch in national ports by foreign vessels	Moderate	Moderate	Moderate
Harvest of ETP and CITES species	High	Highly Vulnerable	Serious
Incursion of industrial vessels into reserved artisanal areas	High	Vulnerable	Major

Table 119 Assessment of inherent risk – The Philippines.

Specific risk	Likelihood	Impact	Risk
Unlicensed/unauthorised fishing by Chinese/Taiwanese vessels	Almost certain	Serious	Severe
Unlicensed/unauthorised fishing by other foreign fleets	Likely	Major	High
Unlicensed/unauthorised fishing by national municipal vessels	Likely	Major	High
Unlicensed/unauthorised fishing by national commercial vessels	Likely	Moderate	High
Misreporting of catch by national commercial vessels	Likely	Major	High
Misreporting of /unreported catch by national municipal vessels	Likely	Major	High
Fishing with prohibited and destructive gears	Almost certain	Serious	Severe
Fishing within spatio-temporal closed areas	Almost certain	Serious	Severe
Illegal transshipment	Likely	Minor	Moderate
Sale and export of ETP and CITES species	Likely	Minor	Moderate
Landing of illegal catch in national ports by foreign vessels	Likely	Moderate	High
Harvest of ETP and CITES species	Almost certain	Serious	Severe
Incursion of industrial vessels into reserved artisanal areas	High	Major	High

5.14.8 Impacts of IUU

The assessment of the specific IUU risks identified for the Philippines returned consistently high scores, with several risks classified at the highest level of Severe, both almost certain to occur and causing a serious impact. The overall high scores of the risk assessment were driven by a combination of a vast EEZ, poor enforcement capacity, weak legislative deterrents, the large size of the fleets operating within the EEZ and the ecological vulnerability of the species and habitats exposed to IUU practices in the Philippines.

The Chinese and Taiwanese foreign fleets, which were assessed separately due to their prevalence in known IUU activities by non-Filipino vessels in the EEZ, were the only fleet to attain a severe risk level for unlicensed/unauthorised fishing. The specific targeting of marine turtles during unlicensed fishing activities by these fleets, with reported catches of hundreds of animals on individual vessels, is likely to have a severe ecological impact given the long life cycles and low reproduction rates of these species, and indeed all species of marine turtles are classified as globally threatened by the IUCN. Moreover the Chinese and Taiwanese fleets, in addition to vessels of other nationalities (particularly longliners) , will also target high trophic level, threatened and commercially valuable species such as sharks, tunas and tuna-like species, thus undermining effective stock management and depriving national vessels of catch and revenue. The overall risk of the harvest of ETP and CITES listed species was also assessed at a severe level in the Philippines, reflecting the targeting of turtles, sharks, rare reef fish and other species across the fleets in the Philippines, driven by local, national and international market demands. The general high risk of unlicensed/unauthorised fishing by all the national and foreign fleets in the Philippines also severely undermines fisheries management, with catch by illegal vessels either landed outside the Philippines or landed in national ports without monitoring or sanctions, causing data inadequacies and inaccuracies. This is further exacerbated by the high risks of misreported or unreported catch from licensed vessels, which creates additional issues in the validity of national fisheries data.

The threat of fishing with prohibited and destructive gears was also assessed at a severe level, reflecting the evidence of widespread use of gear types including dynamite, cyanide, muro-ami, small mesh sizes and bottom trawls by both national and foreign fleet despite the restrictions placed by national laws. Dynamite is both acknowledged to cause significant long term ecological damage, killing a suite of species indiscriminately and destroying coral habitats, thereby jeopardising the high biodiversity of the reefs in the Philippines. This has additional socio-economic implications for local communities, with dynamited reefs unable to support viable stocks of important reef fish species. Muro-ami fishing causes similar indiscriminate damage to corals, whilst cyanide fishing can cause the extirpation of targeted species wanted for the live fish trade, with the poison killing coral in the process. Illegal trawling and the use of small mesh sizes is also recognised as a severe threat to fisheries sustainability, causing high levels of indiscriminate bycatch and damaging the seabed. The pervasive use of these illegal methods throughout the Philippines therefore has severe implications for both the ecological and economic sustainability of fisheries, with stocks unable to recover following the extreme pressure exerted by such gears.

Illegal fishing within spatio-temporal closed areas was also scored at severe level, with the practice demonstrated to be undertaken by both national and international fleets. MPAs, NTZs or other forms of closure, which are often implemented to protect vulnerable habitats, species and/or stocks, are particularly vulnerable to illegal fishing activities. The presence of illegal foreign vessels in Tubbataha Marine Park provides an illustration of this problem, with a near-pristine UNESCO World Heritage site coming under threat from IUU fishing. The risk of the encroachment of industrial vessels into areas reserved for municipal vessels is closely linked, and this practice can jeopardise the livelihoods of small-scale fishers and communities who are unable to compete with larger commercial vessels and therefore lose access to vital sources of nutrition and income.

5.14.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

Risks of illegal fishing have been identified for both the national commercial and municipal fleets as well as for foreign vessels, of which the Chinese fleet has been assessed separately.

Unlicensed/unauthorised fishing by national municipal and commercial vessels has been assessed as a high risk and therefore an estimate of between 10 and 40% of illegal fishing has been assessed for this fishery.

The rate of illegal fishing of the Chinese fleet was assessed as severe and a rate of between 15 and 30% additional to the reported catch (for those species known to be targeted by the Chinese fleet) has been assigned. Similarly the rate of the other fleets fishing in the Philippines was assessed at a slightly wider range of 2 to 20% but has been applied across the fleets to represent the wider targeting possible by these fleets.

A portion of the Chinese fleet is known to catch turtles in the Philippines EEZ. Records for this are not extensive but due to the high value and profile a separate set of illegal fishing entries for this fleet was created increasing from 0 to 10t at the start of the period covered up to an estimated 0t to 50t in recent years.

The risk to sardinellas and croakers has previously been estimated at 50 to 100 percent illegal (Agnew *et al.* 2009, Pramod *et al.* 2010) and shrimp IUU catch and discards both estimated at between 50 and 250% (discards being assessed as “Marine fishes nei” (MZZ). Overall therefore considering the species caught in the Philippines the rate of under-reporting has been assessed at between 10 and 30%.

A number of additional risks including the use of prohibited and destructive gear, harvest of ETP species and their sale and export, and the possibility of bribery, obstruction or mistreatment of fisheries officers etc. have been identified as occurring in the Philippines. Post-harvest risks typical of the region such as unreported or illegal transshipment, the landing of catch in national ports have also been noted as being possible. Although these risks are important to the overall risk assessment for the Philippines, they would not add to the estimated level of IUU fishing and are therefore not assigned separate rate estimation values.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Philippines EEZ can be found in Table 120.

Table 120 Summary of estimated rates – Philippines.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by Chinese vessels	5	Tuna, tuna-like species, small pelagics, sharks,	1990-2013	10	30	0	0
		Turtles	1990-2013	See text		0	0
Unlicensed/unauthorised fishing by other foreign fleets	6	Mixed	1990-2013	2	20	0	0
Unlicensed/unauthorised fishing by national municipal vessels	1	Mixed	1990-2013	5	20	0	0
Unlicensed/unauthorised fishing by national commercial vessels	2,3,4	Mixed	1990-2013			0	0
Misreporting of/unreported catch by national commercial vessels	2,3,4	Mixed	1990-2013	0	0	10	30
Misreporting of /unreported catch by national municipal vessels	1	Mixed	1990-2013	0	0		
Fishing with prohibited and destructive gears	All	Mixed	1990-2013	0	0	0	0
Fishing within closed areas	1,2,3,4	Mixed	1990-2013	0	0	0	0

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Illegal transshipment	2,3,4,5,6	Tuna and sharks	1990-2013	0	0	0	0
Sale and export of ETP and CITES species and other IUU catch	----	Sharks, turtles, other mixed species	1990-2013	0	0	0	0
Landing of illegal catch in national ports by foreign vessels	5,6	Mixed	1990-2013	0	0	0	0
Bribery/obstruction/mistreatment fisheries officials, fisheries officers or observers	All	---	1990-2013	0	0	0	0
Harvest of ETP and CITES species	All	Sharks, turtles, certain reef fish	1990-2013	0	0	0	0

NB: Rates quoted for illegal and unreported fishing for the Chinese and other foreign fleets are based on total national fleet figures. Rates quoted for illegal and unreported fishing for the national fleets (municipal and commercial) are based on the catch breakdowns in Table 115.

5.14.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 382,566 and 1,395,967 t per annum (i.e. 19.77 and 72.13%). Illegal catches contribute an estimated 9.77 and 42.13% and unreported catches 10 and 30% in addition to the reported catch.

Losses from Illegal, Unreported and Unregulated fishing in the Philippines EEZ are estimated to average between USD 574.77 and 2,001.29 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 121 and as first landed value in Table 122. Profiles of the estimated level of illegal and unreported fishing combined in the Philippines can be found in Figure 34 (catch in t) and Figure 35 (catch value in USD).

Table 121 Summary of estimated IUU by year in the Philippines (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	1990	1596428	151528	669170	159643	0	0
1991	1991	1674241	160145	702733	167424	0	0
1992	1992	1660256	152833	692268	166026	0	0
1993	1993	1628260	144506	674787	162826	0	0
1994	1994	1648404	152090	687594	164840	0	0
1995	1995	1680344	154184	700261	168034	0	0
1996	1996	1611689	149088	672575	161169	0	0
1997	1997	1650318	155348	690762	165032	0	0
1998	1998	1689982	159834	707943	168998	0	0
1999	1999	1727974	163543	723947	172797	0	0
2000	2000	1747190	165888	732403	174719	0	0
2001	2001	1816257	168790	758543	181626	0	0
2002	2002	1902427	184970	800817	190243	0	0
2003	2003	2036649	203885	861828	203665	0	0
2004	2004	2074160	211989	881047	207416	0	0
2005	2005	2130402	215262	903033	213040	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	2006	2162320	220451	918073	216232	0	0
2007	2007	2336285	239580	993006	233629	0	0
2008	2008	2385269	245529	1014539	238527	0	0
2009	2009	2419430	247821	1028127	241943	0	0
2010	2010	2430395	243351	1028484	243040	0	0
2011	2011	2175337	215899	919078	217534	0	0
2012	2012	2131004	214069	902324	213100	0	0
2013	2013	2134430	216063	905043	213443	0	0

Table 122 Summary of the estimated value of IUU (USD) by year in the Philippines (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	1370.18	1517.94	1395.92	1370.18	1370.18	0.00	0.00
1991	1381.48	1534.03	1408.22	1381.48	1381.48	0.00	0.00
1992	1394.65	1554.07	1421.72	1394.65	1394.65	0.00	0.00
1993	1466.41	1705.03	1505.72	1466.41	1466.41	0.00	0.00
1994	1474.17	1711.50	1514.55	1474.17	1474.17	0.00	0.00
1995	1390.40	1591.74	1424.50	1390.40	1390.40	0.00	0.00
1996	1393.89	1603.22	1429.58	1393.89	1393.89	0.00	0.00
1997	1416.86	1656.34	1458.29	1416.86	1416.86	0.00	0.00
1998	1328.76	1497.16	1358.00	1328.76	1328.76	0.00	0.00
1999	1354.90	1528.89	1385.14	1354.90	1354.90	0.00	0.00
2000	1350.18	1522.80	1380.26	1350.18	1350.18	0.00	0.00
2001	1346.41	1512.64	1374.86	1346.41	1346.41	0.00	0.00
2002	1441.12	1628.28	1474.38	1441.12	1441.12	0.00	0.00
2003	1441.37	1634.37	1476.49	1441.37	1441.37	0.00	0.00
2004	1453.49	1658.51	1491.43	1453.49	1453.49	0.00	0.00
2005	1421.21	1598.40	1453.70	1421.21	1421.21	0.00	0.00
2006	1440.92	1604.32	1471.10	1440.92	1440.92	0.00	0.00
2007	1440.68	1611.38	1472.36	1440.68	1440.68	0.00	0.00
2008	1439.29	1595.29	1468.33	1439.29	1439.29	0.00	0.00
2009	1421.62	1566.53	1448.49	1421.62	1421.62	0.00	0.00
2010	1425.44	1584.55	1454.40	1425.44	1425.44	0.00	0.00
2011	1433.87	1581.47	1460.55	1433.87	1433.87	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	1438.93	1591.19	1466.71	1438.93	1438.93	0.00	0.00
2013	1437.24	1594.39	1466.10	1437.24	1437.24	0.00	0.00

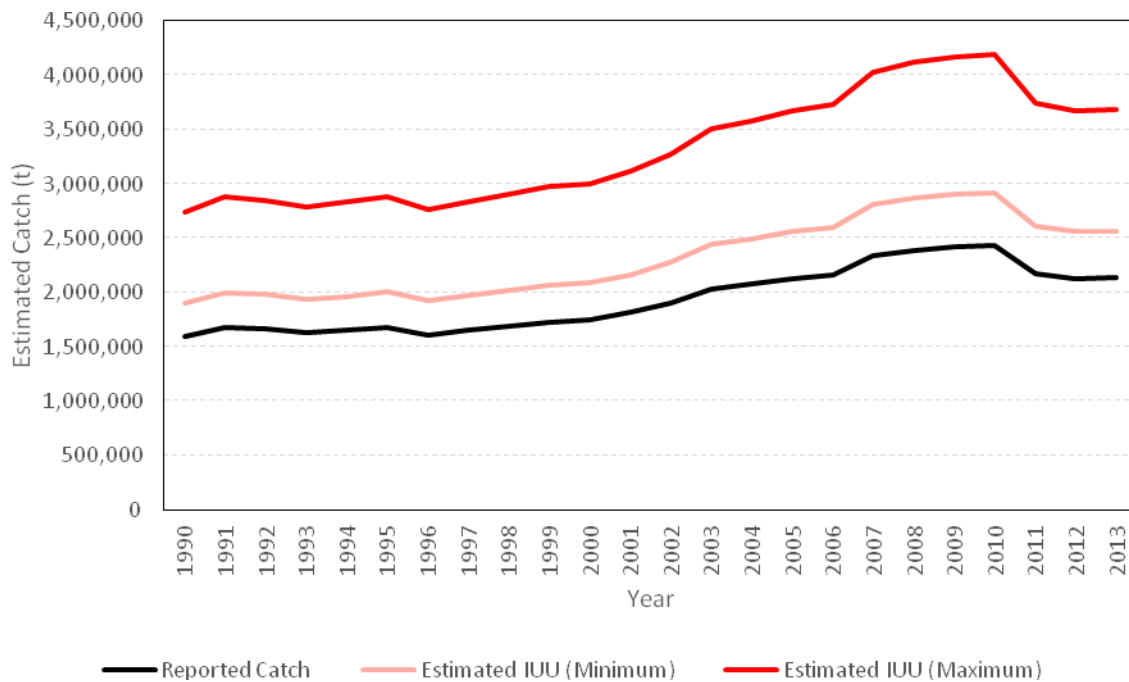


Figure 34 IUU Catch Profile (Philippines) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

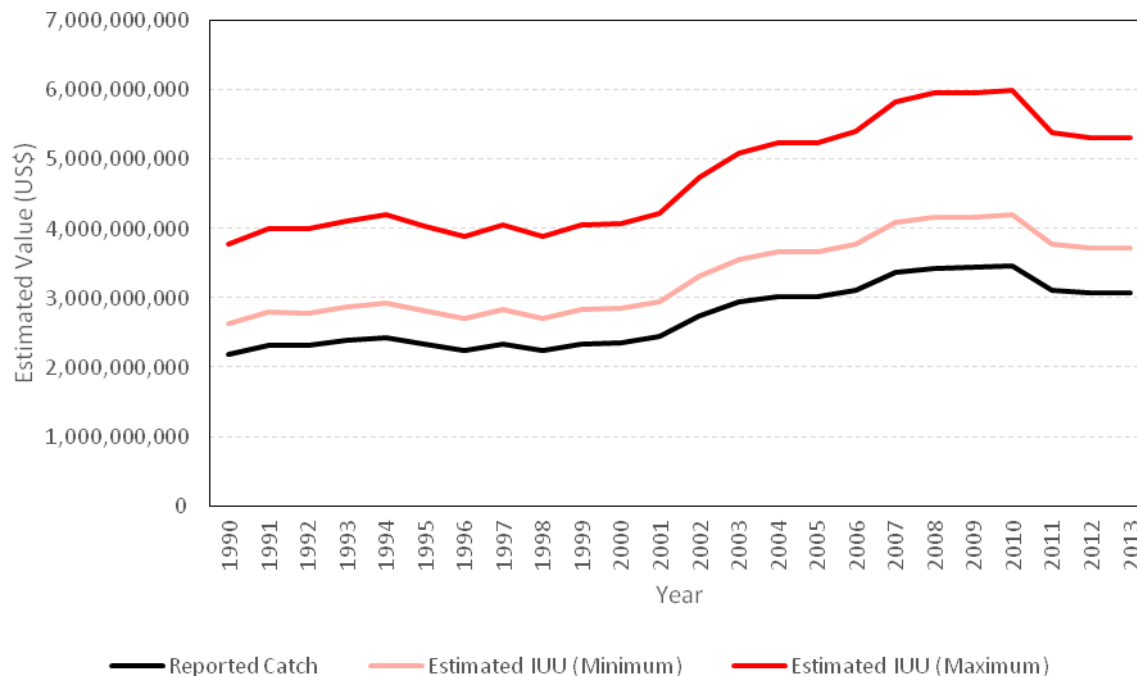


Figure 35 IUU Catch Value Profile (Philippines) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.15 Singapore

5.15.1 Introduction

Singapore is an island state in Southeast Asia, separated from the coast of southern Malaysia by the Johor Strait. The Singaporean EEZ was only declared in 2008, measuring 186 km² in area (the smallest EEZ of any country within this study) with a 614 km² territorial sea. The EEZ borders the neighbouring EEZs of Malaysia and Indonesia. Singapore announced the creation of its first MPA, the Sisters' Island Marine Park, in mid-2014.

5.15.2 Fleet breakdown

According to the Agri-Food and Veterinary Authority of Singapore (AVA) the small national fishing fleet consists of only four offshore vessels and 39 inshore vessels (AVA, 2015).

Due to the small size of the Singaporean national fleet, it is not practical to sub-divide it by gear type. Consequently the risk assessment analysis of IUU fishing in Singapore will treat all fishing vessels as a single fleet (see Table 123), whilst still considering the particular risks associated with specific gears or species when appropriate.

Table 123 Fleet breakdown for Singapore.

Description	Gear	Flag(s)	Target Species	Comment
National fleet	Mixed gears	Singapore	Tuna, mackerel. sharks, rays, other mixed species	

5.15.3 Catch breakdown by fleet

Total catches reported by the FAO for Singapore between 1990 and 2010 amount to 125,510 tonnes. The value of these catch statistics is undermined by poor data quality, with 'marine fishes *nei*' accounting for the largest single portion of reported catch at 35.7%, with the majority of other catch divisions allocated to families or genera *nei*. Only two distinct species, largehead hairtail (*Trichiurus lepturus*) and skipjack tuna (*Katsuwonus pelamis*) appear in the catch data, and these account for minimal proportions at 1.7% and 0.1% percent respectively

The SAU catch reconstructions estimate total catch in Singapore at 371,742 tonnes for 1990-2010, almost triple the FAO reported catches. The largest proportions of the catches are accounted for by kawakawa (*Euthynnus affinnis*) and narrow-barred Spanish mackerel (*Scomberomorus commerson*) as dominant species in Singaporean catch, accounting for 11% and 10.8% respectively, followed by Chondrichthyans *nei* at 6.3%.

Due to the small size of the Singaporean national fleet, it is not practical to break down the total catch by individual fleet types, and consequently all catch data will be analysed as a single entity.

5.15.4 IUU influencing factors

5.15.4.1 Legislation and governance

Fisheries in Singapore are overseen by the AVA and governed by the national Fisheries Act of 1969, which has undergone various revisions in 1970, 1985 and 2002. This sits alongside various supplementary legislation relating to specific components of fisheries management, including the Fishing Gear Rules, 1972, the Fishing Harbour Rules, 1971, the Fishing Vessel Rules, 1969, the Fishing Control and Licensing Rules, 1986, and Composition of Offences Rules, 1994.

Aside from membership of the UNCLOS treaty, which the country signed in July 1994, Singapore is not a member of any of the RFMOs, codes of conduct or treaties which are relevant to fisheries and marine environmental management in the region. However, having only joined the FAO in 2013, Singapore signed a MoU with the organisation in June 2015 which included provisions to tackle IUU fishing. In addition, Singapore endorsed the RPOA IUU in 2007, although an NPOA has not yet been produced. The country sits as one of the highest ranked nations according to the World Bank Governance Indicators (5th out of 212). As such any risks relating to direct corruption or a weak regulatory framework would be reduced, significantly i.e. Obstruction of bribery of fisheries officers and Falsification of documents. (See Table 159).

5.15.4.2 Licensing and reporting requirements

The AVA operates an annual licensing system for the Singaporean fleet, and all fishing vessels are required to obtain a license as stated in the Fisheries Act and also in the Fishing Vessel Rules. The cost of a license ranges from \$66 for smaller vessels up to \$470 for a vessel of over 100 GT (FV Rules, Article 14). However, it should be noted that the licensing system does not consider the flagging or compliance history of vessels when issuing documentation, thus providing a potential loophole for the licensing of vessels with IUU histories (Edeson *et al.*, 2010). Moreover the national legislation does not set out requirements for the use of VMS or catch logbooks by national vessels. However, the Fishing Vessels Rules does state the requirement for vessels to submit to inspection upon application for a license. Licenses are also required to be obtained separately for fishing gear, as stated in the Fishing Gear Rules.

The Fisheries Act does not set out provisions for the licensing of foreign fishing vessels. Additional weaknesses have also been identified in Singapore's flag State measures, with a lack of effective provisions to control the fishing activities of national vessels, including an absence of any obligation for national vessels to carry VMS equipment. However it should be noted that the Fishing Vessels Rules do contain standards for the marking of national vessels according to the engine and license type of the vessel (Article 6). Moreover Singapore was included in the top 10 countries for ownership of flag of convenience (FOC) vessels by a 2007 study (Griggs & Lugten, 2007).

5.15.4.3 Restrictions, fines and penalties

The Fisheries Act specifically prohibits the use of explosive fishing gear, poison gear and trawl nets (Articles 10 & 12), unless the operator is licensed to operate such gears. Regulations on fishing gear are expanded in the Fishing Gear Rules, and the use of any gear without a license is prohibited, with

specific rules laid out regarding the use of static gears such as fishing stakes (Article 4). Fisheries officers are also empowered to remove or demolish fishing gear which fails to comply with the legislation (Article 7).

The standard penalty for violation of the Fisheries Act or the breach of the terms of a licence is a maximum fine of \$10,000 and/or a maximum of 12 months in prison although higher penalties are stated for offences relating to 'dangerous fish' such as piranha, with a maximum fine of \$50,000 (Article 13). Additional fines of \$50 a day are also prescribed for continuing violations by an offender following conviction.

5.15.4.4 MCS protocols and enforcement capacity

Maritime enforcement patrols in Singaporean waters are carried out by the Police Coastguard division of the national police, in collaboration with the Maritime and Port Authority. Singapore possesses a large fleet for maritime enforcement purposes, and new high speed vessels were recently commissioned to further increase capacity, although these were not specifically stated as fisheries enforcement vessels but rather for broader maritime duties¹⁹⁶.

5.15.4.5 Port state

Singapore is one the largest ports globally in terms of tonnage passing through it facilities, and is the world leader in terms of transshipment and bunkering¹⁹⁷. It supports two large ports of direct relevance to fisheries; the Jurong Fishery Port and the Senoko Fishery Port, which are designated as part of national port legislation in the Fisheries (Fishing Harbour) Rules. Jurong operates as a dock for foreign fishing vessels, whilst local fishing vessels sail from Senoko. The unloading of fish outside of the two fishing harbours is specifically prohibited by the Fishing Harbour rules (Article 5). As a port state the large container berths are a potential route in the supply of IUU fish and as a hub for transshipment there is a clear requirement for effective port state control. Ports in Singapore are subject to the Fisheries (Fishing Harbour) Rules, which designates specific harbours for the usage of fishing vessels. Under these regulations vessels are required to submit records of catch upon arrival, and requirements to obtain port clearances are stated in addition to the requirement to submit to inspections. However, loopholes in Singapore's port governance have been highlighted.

Singapore is not a signatory to the FAO Port State Measures Agreement, despite the fact that the country's large ports have been indicated as a port of non-compliance for IUU vessels and specifically illegal toothfish vessels. However, recent inspections by Singaporean authorities of vessels listed on the CCAMLR Non-Contracting Party IUU Vessel List indicate a potential increase in Singapore's engagement with its port state responsibilities as a Non-Contracting Party under CCAMLR.

¹⁹⁶ "New Police boats to better intercept illegal immigrants, terrorists and smugglers - Channel NewsAsia," 2015.

¹⁹⁷ http://news.xinhuanet.com/english/2006-01/12/content_4045562.htm

5.15.4.6 Market state

The in-country fisheries sector is small and fish is primarily imported from nearby nations, with national fishing and aquaculture accounting for less than 5% of total market supply. Singapore is considered the second largest global market for shark fins, with the consequent possibility that illegally caught ETP shark species are passing through Singaporean markets, either from port landings or imports. In addition, Singapore has been highlighted as a potential market channel for the export of illegally caught toothfish to Hong Kong, which has not acceded to CCAMLR and is therefore not subject to toothfish fishery sustainability measures¹⁹⁸.

5.15.5 Summary of IUU incidences

A comprehensive review of grey literature and online media found no reported incidences of IUU fishing being carried out in the Singaporean EEZ. A 2012 article stated that 125 people had been fined for illegal fishing in Singapore during that year, however these statistics appear to relate solely to recreational fishing by individuals¹⁹⁹. Singaporean-flagged vessels have been reported to have been arrested for IUU fishing activities in Indonesia²⁰⁰ and Malaysia in 2015²⁰¹.

Nonetheless, evidence suggests that other types of IUU offences may have taken place within Singapore's ports. The 'Stop Illegal Fishing' group reported that the IUU vessel FV Ray had been detained in Angola in 2012²⁰². Investigations revealed that the vessel had entered Singapore under a different name and flag, before reflagging and being provided with port clearance to leave Singapore after staying almost three years²⁰³. Other IUU vessels including the FV Wuhan 4 (formerly FV Thunder), the Keshan (formerly Baiyangdian) and FV Snake (formerly FV Octopus) are also documented as passing through Singaporean ports between 2012 and 2013, although it should be noted that the Keshan's shipping agent was fined for false documentation.

Singapore's ports have also been highlighted as channels for the landing of toothfish without valid catch documents, in violation of CCAMLR provisions on toothfish harvesting²⁰⁴. Moreover a recent report on IUU hotspots highlighted Singaporean ports as a landing site for tuna caught illegally by Indian vessels (Funge-Smith *et al.*, 2015).

¹⁹⁸ WWF - Singapore and Malaysia asked to close ports to toothfish pirates," 2010.

¹⁹⁹ Fishmalaysia, (2012). 125 fined for illegal fishing activities in 2012.

²⁰⁰ Indonesia detains 2 Singapore-flagged boats off Batam, SE Asia News & Top Stories - The Straits Times, 2015, p. 2.

²⁰¹ Singapore-registered fishing vessel detained by Malaysian authorities - Channel News Asia, 2015.

²⁰² Stop Illegal Fishing, 2012. Angola joins the regional effort to combat IUU fishing.

²⁰³ Paper submitted by Singapore to CCAMLR, 2013. CCAMLR-XXXII/BG/33.

²⁰⁴ Paper submitted by the USA to CCAMLR, 2005. SCIC-05/15 Rev. 1.

5.15.6 IUU risk identification

The IUU risks for the Singaporean national fleet have been assessed and identified within the five predetermined risk categories, with the specific risks summarised for each category in Table 124. Specific risks identified for Singapore.

5.15.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or Exclusive Economic Zone.

Despite Singapore's substantial enforcement capacity, and the small area of the territorial waters, the risk of unlicensed/unauthorised fishing by both national and foreign vessels must be considered. These risks may be accentuated by the lack of provisions for VMS, licences for foreign vessels etc. in the national legislation, as detailed above.

5.15.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Given the lack of specific requirements stated in the national legislation for licensed vessels to carry logbooks, there is an evident risk of the misreporting of catch by licensed vessels, or even a failure to report catch entirely.

5.15.6.3 Post-harvest IUU

The well-documented movement of known IUU vessels through Singapore's waters and ports creates a risk of illegal transshipment and the landing of illegal catch which has been caught outside of Singaporean waters. Moreover the literature has highlighted the risk of IUU products and ETP species passing through Singapore's national and international market channels. The general risk of post-harvest IUU is heightened by the acknowledged weaknesses in Singapore's existing port state controls.

5.15.6.4 Other offences

Other offences which require consideration are primarily related to the use of Singapore's ports by known IUU vessels, specifically the granting of port permissions to IUU vessels and the reflagging of IUU vessels whilst berthed in Singapore. Moreover the use of the Singaporean flag as a FOC will also be considered.

Table 124 Specific risks identified for Singapore.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed/unauthorised fishing by national vessels
	Unlicensed/unauthorised fishing by foreign vessels
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting/failing to report target species and bycatch by national vessels
Post-harvest IUU	Illegal transshipping in EEZ and/or ports
	Landing of illegal and unreported catch
	International export of IUU catch and/or ETP species
Other offences	Issues related to the flag of fishing vessels.
	Lack of port State control for visiting vessels

5.15.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 125), impact (Table 126) and level of inherent risk (Table 127) for Singapore based on the risks identified in Table 124.

Table 125 Assessment of risk likelihood – Singapore.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed/unauthorised fishing by national vessels	Very low	Strong	Rare
Unlicensed/unauthorised fishing by foreign vessels	Low	Strong	Unlikely
Misreporting/failing to report target species and bycatch by national vessels	Moderate	Weak	Likely
Illegal transshipping in EEZ and/or ports	High	Weak	Likely
Landing of illegal and unreported catch	High	Weak	Likely
International export of IUU catch and/or ETP	High	Weak	Likely

Specific risk	Incentives	Deterrents	Likelihood
species			
Issues related to the flag of fishing vessels.	High	Weak	Likely
Lack of port State control for visiting vessels	High	Weak	Likely

Table 126 Assessment of risk impact – Singapore.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by national vessels	Very Low	Moderate	Minor
Unlicensed/unauthorised fishing by foreign vessels	Very low	Moderate	Minor
Misreporting/failing to report target species and bycatch by national vessels	Low	Moderate	Minor
Illegal transshipping in EEZ and/or ports	Very low	Vulnerable	Minor
Landing of illegal and unreported catch	Very low	Vulnerable	Minor
International export of IUU catch and/or ETP species	Very low	Highly Vulnerable	Moderate
Issues related to the flag of fishing vessels.	Very low	Highly Vulnerable ²⁰⁵	Moderate
Lack of port State control for visiting vessels	Very low	Highly Vulnerable ²⁰⁵	Moderate

²⁰⁵ The vulnerability is set at “Highly vulnerable” as thought the stocks exploited are not present in the Singapore EEZ, the vessels that these risks address may be targeting species that would be considered “Highly vulnerable”, i.e. toothfish, sharks etc.

Table 127 Assessment of inherent risk – Singapore.

Specific risk	Likelihood	Impact	Risk
Unlicensed/unauthorised fishing by national vessels	Rare	Minor	Low
Unlicensed/unauthorised fishing by foreign vessels	Unlikely	Minor	Minor
Misreporting/failing to report target species and bycatch by national vessels	Likely	Minor	Moderate
Illegal transshipping in EEZ and/or ports	Likely	Minor	Moderate
Landing of illegal and unreported catch	Likely	Minor	Moderate
International export of IUU catch and/or ETP species	Likely	Moderate	High
Issues related to the flag of fishing vessels.	Likely	Moderate	High
Lack of port State control for visiting vessels	Likely	Moderate	High

5.15.8 Impacts of IUU

Singapore's IUU risk assessment produced some low results for certain specific risks such as unlicensed fishing in comparison to many of the other states in this study. IUU fishing within Singapore's EEZ appears to be very rare, with no incident reports uncovered by this study, and this is likely to be linked to various contributing factors such as a small EEZ, strong enforcement capacity and high overall governance levels. However, the risk assessment returned high scores on a number of post-harvest risks, highlighting the acknowledged role of Singapore as a port and market conduit for IUU fishing products, although it should be noted that these issues primarily pertain to catches from beyond Singapore's EEZ.

Firstly, gaps in Singapore's port state measures have been highlighted as a contributing factor to IUU activities, with the evidence indicating that a number of vessels listed on RFMO IUU lists have passed through Singapore's ports without sanction or punishment, including several which are known to be targeting lucrative, vulnerable toothfish stocks in the Southern Ocean. The illegal fishing operations of these boats undermine the sustainability of stocks and hinder effective, data-driven management by not reporting their catches, thus jeopardising the legal toothfish fleets and violating the jurisdictional area of CCAMLR.

A high risk was also separately applied to issues related to the flag of fishing vessels, which is closely linked to the port state weaknesses discussed in the previous paragraph. Evidence indicates that IUU vessels have reflagged whilst berthed in Singapore, in addition to flagging to Singapore as a FOC, and such actions are acknowledged to have implications for IUU fishing. Reflagging allows IUU vessels to evade detection or sanctions from any particular flag state, and allows the exploitation of states with inadequate systems in place to monitor vessels under their flag.

The risk of the international export of IUU catch and/or ETP species was also assessed at a high level, with evidence implicating Singapore in the export of illegally caught toothfish, shark and tuna. This risk is also intricately linked to the port associated issues discussed above, with IUU catch landed in Singapore's ports before export to other regional markets such as Hong Kong and China. The presence of lucrative, poorly monitored market chains incentivises IUU fishing through increased profitability, and is a likely driver for the illegal toothfish and tuna vessels to land catch in Singapore. Moreover Singapore's position as a major global hub of the shark fin trade creates a conduit for illegally harvested ETP species, as shark fins from multiple species are often aggregated for export, therefore undermining attempts to obtain catch data on vulnerable elasmobranch stocks. Exported IUU products are also likely to result in economic losses to Singapore, with the catch potentially not subject to taxation, export duties and other requirements applied to legal fish.

5.15.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

Firstly it should be noted that Singapore's catch has not been disaggregated between separate fleets, and therefore the estimated rates apply to the catch data as a whole. The evidence for illegal fishing within Singapore's small EEZ is minimal, however small range estimates of 0-2% (domestic) and of 1-3% (foreign) have been applied to national catch in order to acknowledge the potential for this risk to occur.

The highest estimated rate was assigned to misreporting and/or failing to report catch by nationally flagged vessels, although a broad range of 2-15% has been assigned to account for uncertainties. This reflects the lack of reporting requirements in Singapore's national legislation, the evident poor quality of Singapore's reported catches (indicating poor reporting practices) and the SAU estimation that Singapore's true national catches are significantly higher than the reported statistics.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Singapore EEZ can be found in Table 128.

Table 128 Summary of estimated rates-Singapore.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by national vessels	National	All	1990-2013	0	1	0	0
Unlicensed/unauthorised fishing by foreign vessels	National	All	1990-2013	1	3	0	0
Misreporting/failure to report target species and bycatch by national vessels	National	All	1990-2013	0	0	2	15
Illegal transshipping in EEZ and/or ports	National	All	1990-2013	0	0	0	0
Landing of illegal and unreported catch	National	All	1990-2013	0	0	0	0
International export of IUU catch and/or ETP species	National	All	1990-2013	0	0	0	0
Issues related to the flag of fishing vessels.	National	All	1990-2013	0	0	0	0
Lack of port State control for visiting vessels	National	All	1990-2013	0	0	0	0

5.15.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 163 and 1,035t per annum (i.e. 3 and 19%). Illegal catches contribute an estimated 1-4% and unreported catches 2 -15% in addition to the reported catch.

Losses from Illegal, Unreported and Unregulated fishing in the Singapore are estimated to average between USD 0.26 and 1.67 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 129 and as first landed value in Table 130. Profiles of the estimated level of illegal and unreported fishing combined in Singapore can be found in Figure 36 (catch in t) and Figure 37 (catch value in USD).

Table 129 Summary of estimated IUU in Singapore by year 1990 – 2013.

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	11431.00	114.31	457.24	228.62	1714.65	0.00	0.00
1991	11067.00	110.67	442.68	221.34	1660.05	0.00	0.00
1992	9177.00	91.77	367.08	183.54	1376.55	0.00	0.00
1993	9279.00	92.79	371.16	185.58	1391.85	0.00	0.00
1994	11278.00	112.78	451.12	225.56	1691.70	0.00	0.00
1995	10102.00	101.02	404.08	202.04	1515.30	0.00	0.00
1996	9943.00	99.43	397.72	198.86	1491.45	0.00	0.00
1997	9250.00	92.50	370.00	185.00	1387.50	0.00	0.00
1998	7733.00	77.33	309.32	154.66	1159.95	0.00	0.00
1999	6489.00	64.89	259.56	129.78	973.35	0.00	0.00
2000	5371.00	53.71	214.84	107.42	805.65	0.00	0.00
2001	3342.00	33.42	133.68	66.84	501.30	0.00	0.00
2002	2769.00	27.69	110.76	55.38	415.35	0.00	0.00
2003	2085.00	20.85	83.40	41.70	312.75	0.00	0.00
2004	2173.00	21.73	86.92	43.46	325.95	0.00	0.00
2005	1920.00	19.20	76.80	38.40	288.00	0.00	0.00

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	3103.00	31.03	124.12	62.06	465.45	0.00	0.00
2007	3522.00	35.22	140.88	70.44	528.30	0.00	0.00
2008	1623.00	16.23	64.92	32.46	243.45	0.00	0.00
2009	2121.00	21.21	84.84	42.42	318.15	0.00	0.00
2010	1732.00	17.32	69.28	34.64	259.80	0.00	0.00
2011	1618.00	16.18	64.72	32.36	242.70	0.00	0.00
2012	1969.00	19.69	78.76	39.38	295.35	0.00	0.00
2013	1645.00	16.45	65.80	32.90	246.75	0.00	0.00

Table 130 Summary of the estimated value of IUU (USD) by year in Singapore (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	21.56	0.22	0.86	0.43	3.23	0.00	0.00
1991	22.20	0.22	0.89	0.44	3.33	0.00	0.00
1992	16.89	0.17	0.68	0.34	2.53	0.00	0.00
1993	15.49	0.15	0.62	0.31	2.32	0.00	0.00
1994	17.90	0.18	0.72	0.36	2.69	0.00	0.00
1995	14.85	0.15	0.59	0.30	2.23	0.00	0.00
1996	15.73	0.16	0.63	0.31	2.36	0.00	0.00
1997	14.83	0.15	0.59	0.30	2.22	0.00	0.00
1998	13.21	0.13	0.53	0.26	1.98	0.00	0.00
1999	10.28	0.10	0.41	0.21	1.54	0.00	0.00
2000	7.64	0.08	0.31	0.15	1.15	0.00	0.00
2001	4.92	0.05	0.20	0.10	0.74	0.00	0.00
2002	4.23	0.04	0.17	0.08	0.63	0.00	0.00
2003	2.71	0.03	0.11	0.05	0.41	0.00	0.00
2004	2.80	0.03	0.11	0.06	0.42	0.00	0.00
2005	2.36	0.02	0.09	0.05	0.35	0.00	0.00
2006	3.89	0.04	0.16	0.08	0.58	0.00	0.00
2007	4.28	0.04	0.17	0.09	0.64	0.00	0.00
2008	2.08	0.02	0.08	0.04	0.31	0.00	0.00
2009	2.95	0.03	0.12	0.06	0.44	0.00	0.00
2010	2.35	0.02	0.09	0.05	0.35	0.00	0.00
2011	2.33	0.02	0.09	0.05	0.35	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	3.19	0.03	0.13	0.06	0.48	0.00	0.00
2013	2.64	0.03	0.11	0.05	0.40	0.00	0.00

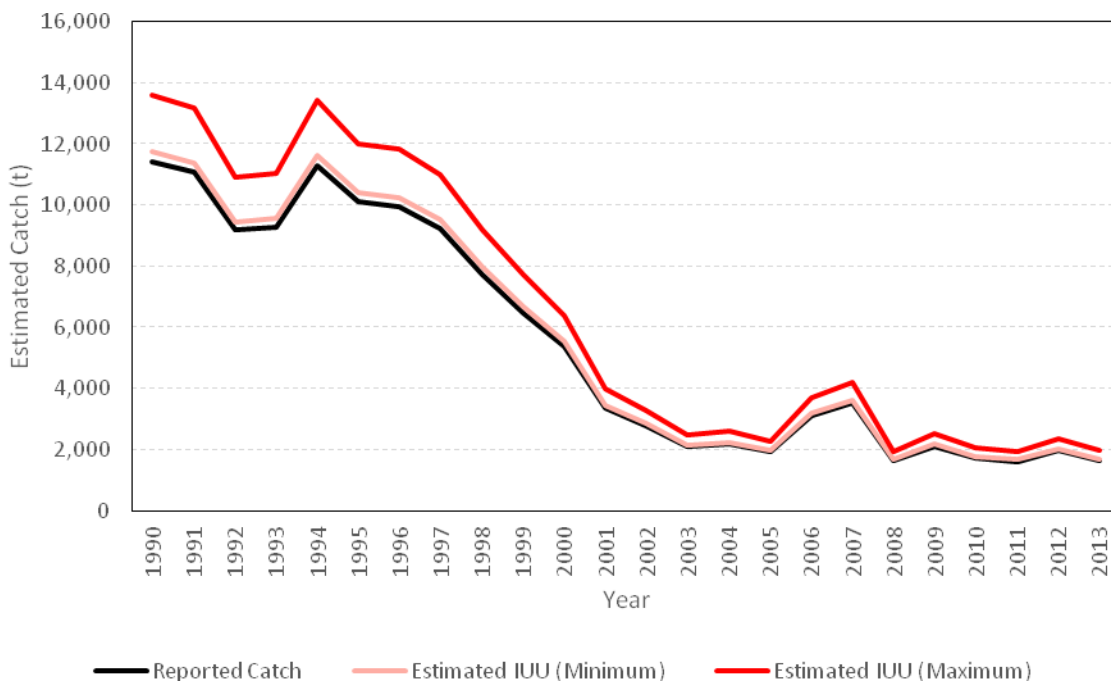


Figure 36 IUU Catch Profile (Singapore) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t).

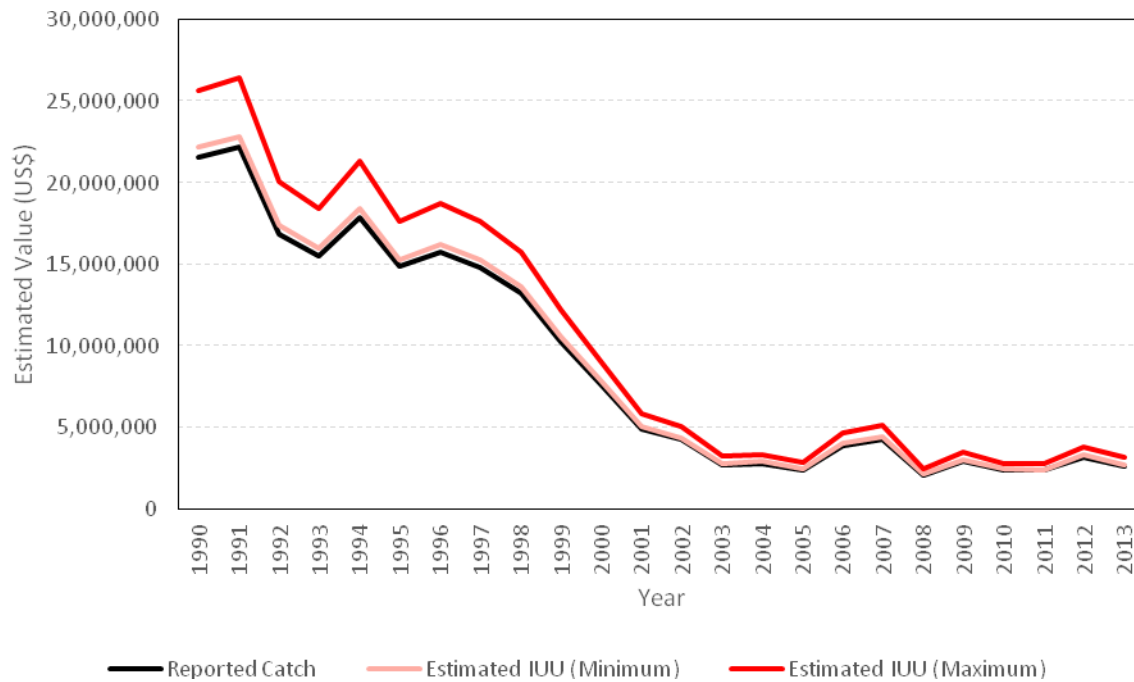


Figure 37 IUU Catch Value Profile (Singapore) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD).

5.16 Sri Lanka

5.16.1 Introduction

The Sri Lankan EEZ covers an area of 474,100 km² with an additional area of 31,170 km² defined as territorial sea and 26,120 km² as contiguous zone. The EEZ shares a single border with India to the north and west, and Sri Lanka and the southernmost point of India stand on the same continental shelf, separated by the Palk Strait. The nation’s continental shelf occupies an area of approximately 26,000 km² (about 11% of the EEZ) with an average width of 15 kilometres and a depth ranging 20-65 metres. The shelf has been previously estimated to provide 70 % of the nation’s total fisheries production (Samaranayake, 2003). The coastal zone harbours diverse marine ecosystems, such as coral reefs, lagoons, mangroves and sea grass beds (Samaranayake, 2003). Sri Lankan waters contain 15 marine protected areas spanning approximately 1,900 km² of the Sri Lankan coast (Wood, 2007).

Sri Lanka’s fisheries sector occupies a key role in Sri Lanka’s social and economic life: fish and fishery products represent an important protein source and the sector contributes approximately 2 % to national GDP (FAO, 2006). The fisheries sector of Sri Lanka is dominated by small-scale operations, with relatively recent increases in privately-owned commercial enterprises (BOBP 1984; Maldeniya and Amarasooriya 1998), and is generally divided into the following subsectors: inland fisheries and aquaculture; coastal fisheries, and offshore fisheries focusing on shark and tuna (IOTC 2004; Preston

1988). These subsectors are estimated to employ approximately 250,000 active fishers and an additional 100,000 people in fisheries related services (FAO, 2013). In 2013, Sri Lanka was the second biggest exporter of fresh and chilled swordfish and tuna to the EU, with approximately €74 million worth of imports²⁰⁶.

On 26 December 2004, the Indian Ocean tsunami severely impacted the Sri Lankan fisheries sector as waves hit two-thirds of the coastline. It is estimated that nearly 80 percent of active fishers were affected and more than 75 percent of the fishing fleet was destroyed or damaged (FAO, 2006). In addition, a large number of small-scale fishing craft and fishing gear were destroyed. Of the 12 fishing harbours, 10 were severely damaged, including breakwaters, shore facilities, buildings, machinery and equipment.

5.16.2 Fleet breakdown

At the end of 2005, Sri Lanka's fishing fleet comprised of 29,312 vessels: 2,492 IBM (Inboard Motor) vessels, 12,670, OBM (Outboard Motor) vessels, and 14,150 non-mechanised traditional vessels, (MFAR, 2006). For the purpose of this study, a breakdown of the fishing fleets operating in or from Sri Lankan waters is presented in Table 131. These fleet classifications have been derived from available information presented in the literature.

Table 131 Fleet breakdown for Sri Lanka.

#	Description	Gear	Flag(s)	Target Species	Comment
1	Tamil Nadu Trawl	Trawl	India	Shrimp	Illegal fleet
2	Foreign Industrial (Excluding India)	Mixed Longline	China Others	Mixed Tuna, sharks	Includes vessels authorised to land catch in Sri Lanka (fish landing permits) but undertake unauthorised fishing within the nations EEZ
3	Domestic Fleet	Multi-gear	Sri Lanka	Mixed	
4	Sri Lankan – Distant water	Driftnets Longlines	Sri Lanka	Skipjack (Katsuwonus)	

²⁰⁶ http://europa.eu/rapid/press-release_STATEMENT-14-314_en.htm

#	Description	Gear	Flag(s)	Target Species	Comment
				<p>pelamis)</p> <p>Yellowfin (Thunnus albacares)</p> <p>Billfish</p> <p>Sharks</p>	

5.16.3 Catch breakdown by fleet

The FAO marine capture statistics provides for the 1990-2010 period reports Sri Lanka's total catch fisheries catch as 5,942,474.5 tonnes, consisting of 35 different species groups. The ten most important species groups/species for the given period in terms of catch volume are Clupeoidea, skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), marine fishes not elsewhere included (nei), *Scombridae* (Mackerels nei), demersal percomorphs nei, Carangids nei, frigate and bullet tunas (*Auxis thazard*, *A. rochei*), Kawakawa (*Euthynnus affinis*), and silky shark (*Carcharhinus falciformis*).

The Sea Around Us (SAU) project provides a reconstruction of Sri Lanka's fisheries catch for the 1950-2008 time period by accounting for unreported catch from fisheries sub-sectors and components, including commercial, subsistence, and discarded catch (O'Meara *et al.* 2011). The total reconstructed catch for the 1950-2008 period was estimated at almost 18 million tonnes, which is over double the total landings reported by Sri Lanka to the FAO. For the 1990-2010 time period, the total reconstructed catch is estimated at 11,912,099 tonnes; again, approximately double that reported to the FAO. The ten most important species groups/species for the 1990-2010 period in terms of catch volume are marine fishes not identified, ponyfish (*Leiognathidae*), Clupeoids, drums and croakers (*Sciaenidae*), Clupeidae, catfish (*Ariidae*), skipjack tuna (*Katsuwonus pelamis*), jacks and trevallies (*Carangidae*), mullet (*Mugilidae*), and hilsa shad (*Tenualosa ilisha*) although this is likely to be a misidentification.

5.16.4 IUU influencing factors

5.16.4.1 Legislation and governance

The Department of Fisheries and Aquatic Resources (DFAR) is the main body charged with fisheries management and control in Sri Lanka. DFAR is divided into six main divisions each with specific functions: Fisheries Management; Fisheries Industries; Monitoring, Control and Surveillance; Fishery Product Quality Control Division; Finance; and, the Administration Division. Infrastructure of the DFAR includes a Head Office located in Colombo, 15 District Assistant Directors' Offices along the

coastal districts, and 148 Fisheries Inspectorate Divisions under the District Offices, which cover all fishing villages²⁰⁷.

DFAR manages Sri Lanka's fisheries in accordance with the Fisheries and Aquatic Resources Act (FARA), No. 2 of 1996 as amended by Acts No. 4 of 2000, 4 of 2004, 22 of 2006, and 35 of 2013. FARA functions as the principal legal instrument governing Sri Lankan fisheries and has the stated objectives of managing, conserving, regulating and developing the fisheries and aquatic resources of Sri Lanka. Under FARA a number of regulations and measures have been adopted with fishery conservation and regulatory functions, and are thus relevant to IUU fishing:

- Fisheries management areas and fisheries management authorities have been introduced;
- Registration of fishing craft
- Fishing operation licences
- Prohibition of destructive fishing practices and dynamiting of fish
- Prohibition or regulation of export and import of fish
- Declaration of closed and open seasons for fishing
- Declaration of fishing reserves
- Aquaculture management licences

Other pertinent legislation relating to the control of fisheries includes the Fisheries (Regulation of Foreign Fishing Boats) Act, No. 59 of 1979 (FFBA), which states provisions for the control of illegal fishing activities by foreign fishing boats.

In 2013, Sri Lanka published a National Plan of Action to Prevent, Deter and Eliminate IUU Fishing (SLNPOA-IUU)²⁰⁸. This document acknowledges IUU as an issue in Sri Lanka, and states that, at the time of publication, FARA does not contain adequate provisions to combat IUU fishing activities of local fishing boats on the high seas and in waters under the jurisdiction of the other States. The SLNPOA-IUU therefore proposes new measures to improve the nation's ability to combat IUU fishing activities conducted by local fishing boats in Sri Lankan waters, waters of national jurisdictions of other coastal States, and high seas, and by foreign fishing boats in Sri Lanka waters.

5.16.4.2 Licensing and reporting requirements

A licensing and registration system for national and foreign-flagged fishing vessels operating within Sri Lanka's waters has historically been in place; however, evidence suggests that this licensing system has several shortcomings as it was prone to circumvention, through the creation of duplicate licenses, and has also had limited coverage throughout the coastal states (Flewwelling, 2001).

²⁰⁷ http://www.fisheriesdept.gov.lk/fisheries_beta/index.php/organizational-structure

²⁰⁸ ftp://ftp.fao.org/fi/DOCUMENT/IPOAS/national/Srilanka/NPO_IUU.pdf

Furthermore, licensing requirements for Sri Lankan fishing boats fishing outside the Sri Lankan EEZ have only recently been implemented²⁰⁹.

The legal provisions for the registration of fishing vessels in Sri Lanka are provided in the Registration of Fishing Boats Regulations, 1980 (Gazette No. 109 of 3 October 1980). This regulation stipulates that no person can use a 'local fishing boat' (as defined by Section 66 of FARA²¹⁰) to fish in Sri Lankan Waters unless a certificate of registration is obtained from DFAR. The application procedure stipulates that a boat of foreign origin can be registered as a local fishing boat if it fits the definition provided in section 66 of FARA²¹⁰, and only if proof is provided that the vessel has not previously engaged in IUU fishing or its previous owner has no legal, beneficial or financial interest in or control of the vessel. Applications received for the registration of fishing boats of foreign origin which have been re-flagged to avoid flag-state controls over IUU fishing are rejected. Chartered fishing boats of foreign origin are not registered under FARA as they cannot be classified as local fishing boats.

The legal provision for the licensing of fishing vessels is contained within Section 6(1) of FARA and the Fishing Operations License Regulations of 1996 (Gazette, No. 948/25 of 07 November 1996)²¹¹, which requires a fishing operation license to be obtained from the Sri Lankan administration before any person/vessel can engage in fishing in Sri Lankan Waters. Fishing licenses can only be issued to fishing boats that have been registered. However, Flewwelling (2001) indicates that, at the time of this study, the licensing system was flawed as it only applied to vessels within government controlled areas and was therefore not comprehensive. This study also suggests that licensing for smaller vessels is reportedly done by province with little verification, and that the duplication of licenses was a concern.

The requirement to register and license fishing vessels has recently been extended to cover the high-seas under the High Seas Fishing Operations Regulations No.1 of 2014²¹². The amendment to FARA also includes penalties for engaging in unauthorised fishing on the high-seas and in waters under national jurisdictions of other coastal States, and fishing in contravention of the regulations made by the Sri Lankan Authorities to give effect to conservation and management measures adopted under UNCLOS, by IOTC and under UN Fish Stocks Agreement and FAO Port State Measures Agreement.

Reporting

²⁰⁹ http://www.fisheriesdept.gov.lk/fisheries_beta/images/High%20Seas%20REG.pdf

²¹⁰ "local fishing boat" is defined (by section 66 of FARA) to mean any fishing boat: (a) wholly owned by the Government of Sri Lanka or any public corporation established by or under any law of Sri Lanka;(b) wholly owned by one or more persons who are citizens of Sri Lanka; or (c) wholly owned by any company, society or other association of persons, Incorporated or established under the law of Sri Lanka, a majority of the voting shares of which are held by

²¹¹ http://www.fisheriesdept.gov.lk/fisheries_beta/index.php/fisheries-act-and-amendments

²¹² http://www.fisheriesdept.gov.lk/fisheries_beta/images/High%20Seas%20REG.pdf

Reporting of fisheries data in Sri Lanka has historically been limited. For the focal study period, no legal requirement for Sri Lankan flagged fishing vessels to maintain a fisheries logbook was in place, and, furthermore, there has been no policy for the regular assessment of fish stocks and the determination of allowable catches. In contrast, foreign flagged fishing vessels within Sri Lanka have been required to maintain written records of catch, effort, transshipments and processing since the implementation of the Fisheries (Regulation of Foreign Fishing Boats) Act 1979 (Reg 8), but it is unclear if this information is/was regularly submitted to the relevant authorities. Given the limited application of fisheries logbooks the primary collection of fisheries data in Sri Lanka is undertaken by random port sampling: Twelve permanent data collectors have been assigned and total sampling is carried out in the major landing sites, while effort data is collected at the minor sites on a regular basis. Data are collected mainly according to the vessel types and are supposed to consider the gear type whenever possible (Dissanayake, 2005). Pramod and Pitcher (2006) report that fisheries data are weak and patchy, and that fishery statistics are based on incomplete original surveys of vessels, gear, and fishermen, and on potentially spurious estimates of fish landings at different sites. Therefore, evidence suggests that Sri Lanka has historically lacked an effective fisheries catch and effort monitoring programme.

Sri Lanka is however in the process of revising its fisheries regulations to require all mechanised, Sri Lankan-flagged vessels to maintain a logbook, and to submit their logbook to an authorised officer every three months (Gazette No. 1755/32 of 25 April 2012). Sri Lanka is collaborating both with IOTC and the BOBLME Project to strengthen the implementation of the logbook scheme.²¹³ The requirement to maintain a logbook is also being extended to Sri Lankan-flagged fishing boats fishing on the high-seas (SLNPOA-IUU).

Additionally, a mandatory catch certification scheme which involves the submission of a catch certificate for all fish to be exported to the EU market is currently being implemented by DFAR (Gazette 1755/32 of 25 April 2012). Importers who import fish into Sri Lanka for re-export are also required under this catch certification scheme to provide, *inter alia*, a catch certificate duly signed by the Competent Authority of the country from where such fish is imported.

5.16.4.3 Restrictions, fines and penalties

Restrictions and prohibitions of fishing activities are presented within Sri Lanka's main fisheries legislation, FARA, and as ancillary regulations created by the MFAR under Section 61 of FARA. Restrictions presented within FARA include Articles 27-29, the prohibition of destructive fishing practices (dynamite and poisons); Article 30, prohibition or regulation on the export from, or import into, Sri Lanka of any species of fish including live fish or any eggs, roe or spawn or any products prepared from such fish, eggs, roe or spawn; Article 34, which grants power to the Minister to declare closed fishing seasons; and Articles 36-37, which grants power to the Minister to declare fishing reserves.

²¹³ (BOBLME (2015) Strengthening the log book recording system for fishing vessels – Sri Lanka. BOBLME-2015-Ecology-34)

Ancillary regulations on fishing activity in Sri Lanka which are relevant to IUU fishing include the Monofilament Nets Prohibition Regulation (2006)²¹⁴, which bans the use, possession, import, transport, purchase or sale of monofilament nets in Sri Lanka; Prohibition of Catching Thresher Shark Regulations, 2012 (Gazette 1768/36 of 27 July 2012)²¹⁵, which bans the capture, retention, transshipment, landing, storage, sale or offer of sale of shark species belonging to the family *Alopiidae*; The Landing of Fish (Species of Shark and Skate) Regulations, 2001 (Gazette 1206/20 of 17 October 2001), which prohibits the landing of sharks and rays unless the fins are attached to the bodies of the fish; The Lobster Fishing Operations Regulations, which prohibits the capture of lobster in the Sri Lankan waters during the months of February, September and October; The Chank Fisheries Management Regulations (Gazette, No. 1298/1 of 21 July 2003), which prohibits trawling and dredging for chank (*Turbinellidae*) and, The Fishing Operations Regulations (1996)²¹⁶, which bans the capture of turtles and marine mammals, bans push nets, harpooning for marine mammals, Moxi net fishing operations, and gill net or trammel net fishing on coral reefs or rocks.

Penalties associated with the violation of fisheries regulations are detailed within two pieces of legislation, FARA (Section 49) and in the FFBA (Sections 15 – 17). FARA provides details on the penalties associated with fishery offences committed by Sri Lankan nationals in Sri Lankan waters, whereas the FFBA provides details on the penalties for IUU offences committed by foreign-flagged vessels in Sri-Lankan waters. Penalties stipulated in FARA (for Sri Lankan nationals) generally include fines or imprisonment: fines range from a minimum value of 3,000 to 500,000 LKR (USD 20–3,500), and minimum imprisonment ranges from 6 months to 5 years²¹⁷. Penalties associated with IUU fishing by foreign fishing boats includes comparatively heavy fines (1.5 million LKR = USD 10,000), surcharge of repatriation costs of the crew, and forfeiture of the relevant fishing boat, fishing equipment and catch. Conversely, in 2013, no legal provisions were in place stipulating penalties for Sri Lankan flagged vessels engaged in IUU fishing on the high seas or waters under the jurisdictions of other coastal States. The only measure in place to prevent Sri-Lankan flagged vessels from engaging in IUU fishing on the high-seas and in waters under the national jurisdictions of other coastal States was the delisting of offending vessels from the Registry of National Fishing Vessels and the cancellation of their fishing licenses. Therefore, despite penalties being in place for Sri Lankan and foreign vessels committing IUU fishing offences in the Sri Lankan EEZ, the fines and penalty system can be considered incomplete/inadequate due to the absence of sanctions for Sri Lankan vessels IUU fishing in the high seas or in waters under national jurisdiction of other States. Indeed, this lack of a deterrent sanctioning system was identified by the EU as a shortcoming and was subsequently included as a reason, inter alia, for the identification of Sri Lankan as a non-

²¹⁴ http://www.fisheriesdept.gov.lk/fisheries_beta/regulations/mono%20filament.pdf

²¹⁵ http://www.fisheriesdept.gov.lk/fisheries_beta/regulations/theresher%20shark.pdf

²¹⁶ http://www.fisheriesdept.gov.lk/fisheries_beta/regulations/operation%20license.pdf

²¹⁷ It should be noted that the penalties associated with the IUU offences have been recently amended (2013)

cooperating third country pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing.

It should be noted that the penalties associated with the given IUU offences have recently been amended in FARA – Amendment 2013 (Act No.35 of 2013), and penalties for additional offences have been introduced, including penalties for Sri Lankan vessels IUU fishing in the high seas or in the jurisdiction of foreign states. For a list of IUU offences and associated penalties for the focal period see Fines and Penalties.

5.16.4.4 MCS protocols and capacity

The Department of Fisheries and Aquatic Resources MCS division co-ordinates with the Sri Lankan Navy to monitor illegal fishing in Sri Lankan waters. Fisheries compliance and monitoring tools in place during the study period included dockside inspections, landing site inspections, and at-sea boarding. However, evidence suggests that Sri Lanka's MCS programme has generally been inadequate to effectively deter and prevent IUU fishing. For example, the FAO (2006) states the 'non-availability of a proper MCS system and VMS' as a constraint to the fisheries sector, and the absence of an effective MCS has also been highlighted as a shortcoming by other sources: A review of the country's shark fisheries by Joseph (1999) states that there is no surveillance, monitoring and control in Sri Lankan fisheries, and that there are general problems with enforcement due to a lack of personnel, funds and facilities; Pramod and Pitcher's (2006) review of Sri Lanka's compliance with the FAO (UN) Code of Conduct for Responsible Fisheries identified Sri Lanka as having no observer programme or VMS in place; and, furthermore, on 15 November 2012, the European Commission identified Sri Lanka as having a lack of an adequate and efficient fisheries monitoring system, with particular reference to Sri Lanka's failure to equip its vessels above 15 m with VMS, to construct a Fisheries Monitoring Centre (FMC), and to implement an adequate catch registration scheme (OJ C 354 17.11.2012, p.1-47).

Recently Sri Lanka has made progress towards establishing an effective vessel monitoring scheme: In November 2011 the use of transponders was made mandatory for Sri Lankan multiday fishing boats fishing in offshore waters by Regulations published in Gazette No. 1730/9 of 01 November 2011²¹⁸; in March 2015 a regulation was introduced requiring all vessels over 10.3 m and deployed for fishing on the high seas to be fitted with satellite based VMS²¹⁹, and a VMS monitoring centre has now been built and the installation of VMS is stated by the Department of Fisheries as ongoing²²⁰. Furthermore, personnel of the VMS monitoring centre have been provided with the necessary

²¹⁸ Registration of Fishing Boat Regulations, 1980 (Gazette No. 109 of 3 October 1980) as amended by Regulations published in Gazette, No. 1430/4 of 30 January 2006

²¹⁹ Implementation of Satellite based Vessel Monitoring System (VMS) for Fishing Boats Operating in High Seas Regulations 2015

²²⁰ http://www.fisheriesdept.gov.lk/fisheries_beta/index.php/high-seas-fishing

training and a radio communication network has been established to facilitate communication between fishing boats and district fisheries offices or FMC. With regards to fisheries observer schemes, it is stated in the SLNPOA-IUU that it is impractical to introduce an observer scheme on boats less than 24 m; however, it is also stated that a mandatory observer scheme for fishing boats over 24 m will be introduced.

5.16.4.5 Port state measures

Fisheries landings in Sri Lanka were made, prior to the tsunami, at 12 main fishery harbour centres, several large and small sites and as many as 700 village-level sites (FAO, 2006). Sri Lanka ratified the FAO Port State Measures Agreement on 20 January 2011; however evidence suggests that, for the focal study period, port state measures have been limited. For example, Pramod and Pitcher (2006) report that distant water long liners with less than 100 GRT frequently use Sri Lankan ports to land IUU catches.

Sri Lanka is in the process of improving national port state measures, and the SLNPOA-IUU communicates the intention to implement regulations necessary to give effect to the FAO Port State Measures Agreement. Section 52-58 of the SLNPOA-IUU provides general statements regarding regulations, protocols and improvements to be made, including the formalisation of procedures for foreign fishing vessels engaged in fishing on the high seas to land catches for processing and re-export; the reporting of vessels suspected of IUU fishing; and, improvements to personnel and infrastructure.

Sri Lanka has an average ranking globally compared to other States according to the World Bank Governance Indicators (105th out of 212 – 50th percentile). As such any risks relating to direct corruption or a weak regulatory framework would neither be reduced nor increased significantly. Risks are likely to exist relating to “Obstruction or bribery of fisheries officers” and “Falsification of documents” but not to the level observed in some other regional States (See Table 159).

5.16.4.6 Market state measures

Evidence suggests that Market State measures in Sri Lanka have been limited as a national catch certification scheme is currently (2015) being implemented for the first time. Therefore, although progress is being made towards implementing Market State Measures, for the purpose of this study it is assumed that Market State Measures are absent for the 1990–2015 period. The new catch certification scheme involves the maintenance of a logbook for all mechanised fishing boats, and the submission of a catch certificate in respect of fish supplied for export to the EU market (Gazette 1755/32 of 25 April 2012). The scheme also requires fish importers who import fish for re-export to fulfil catch certification protocols. Fish exporters exporting processed fish are required to submit process statements to DFAR, providing a catch certificate number, name of the vessel and flag, validation date, catch description, total landed weight, catch processed weight and weight of processed fishery products in respect of all fish products in the export consignment.

5.16.5 Summary of IUU incidences

5.16.5.1 Tamil Nadu trawl fishery

Unlicensed trawling by Indian vessels originating from the province of Tamil Nadu frequently occurs in Sri Lankan waters, and IUU violations of this nature are acknowledged in the grey literature and are well documented in the media. For example, the Sri Lankan Daily Mirror reports that Tamil Nadu trawlers had breached Sri Lankan sovereignty 36,865 times in 2014 and up to March 2015²²¹; in June 2015, 26 Indian fishers were arrested and three trawl vessels seized by the Sri Lankan Navy for poaching in Sri Lankan waters²²²; in July 2014, 38 fishermen from Kottaiappattinam and Rameswaram were arrested by the Sri Lankan navy and charged with crossing the International Maritime Boundary Line²²³; in June 2014, the Sri Lankan Navy arrested 73 Indian fishers and seized 16 trawlers²²⁴; in February 2014, 30 Indian fishers were arrested for fishing illegally within Sri Lankan waters²²⁵; in December 2013, the Sri Lankan Navy on Monday arrested 18 fishermen from Tamil Nadu for fishing illegally between Katchativu and Dhanushkodi²²⁶. Despite the aforementioned articles providing only recent accounts (2013-2015) of this conflict, it is acknowledged that the incursion of Indian Trawlers into Sri Lankan waters is a longstanding issue (Vivekanandan, 2010)²²⁷.

The grey literature corroborates that unlicensed fishing by Tamil Nadu fishers in Sri Lankan waters is common place. For example, Vivekanandan (2010) reports that illegal trawl fishing for shrimp by Tamil Nadu fishers is pervasive in Sri Lanka's Palk Bay and Palk Straits. This situation has resulted in significant conflict between the two nations: Over 100 Indian fishers are thought to have lost their lives in skirmishes with the Sri Lankan Navy or Tamil Tigers, and thousands are thought to have been arrested by the Sri Lankan authorities (Vivekanandan 2010). Furthermore, the value of Sri Lankan industry losses due to the poaching from South Indian fishers has been previously estimated as 78.9 million USD by the Fisheries and Aquatic Resources Minister Rajitha Senarathne²²⁸.

²²¹ <http://www.dailymirror.lk/72909/tamil-nadu-trawlers-defy-sri-lankan-sovereignty-36-865-times>

²²² <http://www.mathrubhumi.com/english/news/india/sri-lankan-navy-arrests-26-indian-fishermen-162114.html>

²²³ <http://www.ndtv.com/south/sri-lanka-navy-arrests-38-tamil-nadu-fishermen-591910>

²²⁴ <http://www.aljazeera.com/news/asia/2014/06/sri-lanka-arrests-scores-indian-fishermen-201468143938309860.html>

²²⁵ <http://www.dailymirror.lk/42562/thirty-more-indian-fishermen-arrested>

²²⁶ <http://www.hindustantimes.com/india/sri-lankan-navy-arrests-18-tamil-nadu-fishermen/story-gFU0it0J8ubVIPUOm4dxYO.html>

²²⁷ <http://www.downtoearth.org.in/content/india-fishing-troubled-sri-lankan-waters>

²²⁸ http://www.shanghaidaily.com/article/article_xinhua.aspx?id=187775

5.16.5.2 Foreign industrial (excluding India)

Sources suggest that unauthorised fishing by foreign industrial fishing vessels occurs in the Sri Lankan EEZ; however, available evidence is scarce. For example, Joseph (1999) reports that a lack of surveillance has enabled significant illegal fishing activity by foreign vessels within Sri Lanka's EEZ. The alleged illegal fishing activity was practiced primarily by foreign tuna longliners which were licensed in Sri Lanka but not officially permitted to fish within the EEZ. However, inadequate MCS has meant that the activities of these boats were not monitored and that they could fish within the EEZ and violate their licence conditions with impunity. Joseph (1999) does not provide an indication of the scale of the issue or the specific origins of the vessels. Flewwelling and Hosch (2006) suggest that a large, illegal foreign fishing fleet has been active in Sri Lankan waters, but also state that this is not confirmed due to a lack of surveillance activity. Furthermore, Pramod and Pitcher (2006) indicate that distant water longliners frequently use Sri Lankan ports to land IUU.

Accounts of IUU fishing activities of foreign industrial vessels, which do not originate from India, are rare in the media. Our media search returned only a single article: In 2012, it was reported that 37 Chinese fishers and two vessels, named YU 6177 and YU 6178, were arrested for illegally trawling within Sri Lanka's territorial waters. The official permission afforded to these vessels was to fish beyond the Exclusive Economic Zone (EEZ) of Sri Lanka, not in its territorial waters where they were found²²⁹.

5.16.5.3 Domestic fleet

A review of the grey literature and media articles reveals that limited information is available on the IUU fishing activities of Sri Lanka's domestic fleet within the nation's EEZ: Sources indicate that a diverse range of IUU fishing activities take place, such as fishing in protected areas and destructive fishing, but documentation of specific incidents are uncommon and the scale of these issues seems to be largely unknown. For example, Joseph (1999) indicates that there is/has been substantial illegal fishing by national fleets in protected areas, engaging in dynamite fishing and capture of juvenile fish from coral reefs and mangrove areas. A review of the status of coral reefs in South Asia by Rajasuriya (2002) somewhat corroborates this point, as it states that both the marine reserves established with coral reefs — the Hikkaduwa Nature Reserve, declared in 1979, and the Bar Reef Marine Sanctuary, declared in 1992 — suffer from poor management and there is no active control of damaging activities. O'Meara *et al.* (2011) report the existence of illegal and destructive fishing gear, such as dynamite and poisons. The widespread use of dynamite is also discussed by Dayaratne (1996). Furthermore, a personal comment from P. Ganapathiraju (as presented in O'Meara *et al.*, 2011) states that catches of sharks and sea cucumbers are likely under-reported, and also calls for further investigations into IUU fishing in Sri Lanka.

²²⁹ <http://archive.indianexpress.com/news/lanka-fishing/985114/>

Sri Lankan nationals are also reported to engage in the illegal harvest of corals. Corals have historically been harvested as a source of lime for Sri Lanka's construction industry, supplying approximately 90 percent of the lime used²³⁰. Coral mining was however made illegal in 1983, but evidence suggests that this legislation was largely ineffective²³⁰. Coral mining therefore continued unabated, and is considered to have destroyed a substantial proportion of the fringing reefs along Sri Lanka's southwestern coast (Rajasuriya, 1997).

5.16.5.4 Sri Lankan distant water

Sri Lankan vessels have been caught fishing illegally on the high seas and in waters under the jurisdiction of other nations. For example, Sri Lankan nationals are frequently arrested for fishing illegally in Indian waters²³¹; Greenpeace previously recorded the illegal fishing activities of two Sri Lankan tuna and shark boats in the Maldives Exclusive Economic Zone (EEZ) in 2012²³², and, subsequently, a Sri Lankan was convicted by the Maldivian authorities, sentenced to six months in prison and fined 500,000 Maldivian rupees (USD 32,425)²³³; and, sources indicate that Sri Lankan flagged vessels illegally fish within the Chagos Marine Reserve, targeting sharks (Anderson *et al.*, 1998) and Beche de Mer (Spalding, 2006; Price *et al.*, 2009).

5.16.6 IUU risk identification

5.16.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.

There is an evident risk of unlicensed/unauthorised fishing within Sri Lanka's territorial sea, contiguous zone or exclusive economic zone, primarily from vessels originating from India. The incursion of vessels from India into the Sri Lankan EEZ is well documented by various sources (see Tamil Nadu Trawl Fishery). Furthermore, evidence suggests that unlicensed fishing activity by nations other than India occurs, but documentation of specific incidents is rare in the public domain.

²³⁰ <https://www.elaw.org/content/sri-lanka-corals-risk-need-protection>

²³¹ <http://www.dailymirror.lk/64569/19-sri-lankan-fishermen-arrested-in-india>

²³ <http://www.ndtv.com/south/11-sri-lankan-fishermen-arrested-in-andhra-pradesh-520814>

²³ <http://www.dailymirror.lk/68395/navy-arrests-37-indian-fishermen>

²³ <http://www.thehindu.com/todays-paper/lankan-boat-seized-for-fishing-sea-cucumber-16-men-held/article5894435.ece>

²³² <http://www.greenpeace.org/international/en/press/releases/Strengthen-fisheries-enforcement-to-stop-pirate-fishing-end-overfishing-crisis--Greenpeace/>

²³³ <http://www.emirates247.com/news/sri-lanka/lankan-fined-for-illegal-fishing-by-maldives-2013-03-10-1.497982>

5.16.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Reporting obligations have historically been weak in Sri Lankan waters. Sri Lankan vessels were not required to maintain a fisheries log book until recently and, despite legislation mandating that foreign-flagged vessels landing catches in Sri Lanka must maintain catch records, there has been no policy compelling these vessels to report catches. Subsequently, non-reporting or misreporting of fish catch data by foreign fishing vessels is suggested to occur²³⁴. Expert opinion indicates that under-reporting of catches of sharks and sea cucumbers is likely to occur (Pramod and Pitcher, 2006; pers. comm. P. Ganapathiraju as presented in O'Meara *et al.*, 2011). Furthermore, a national catch certification scheme is only just being implemented. Thus, evidence suggests that for the given period Sri Lanka's fisheries reporting requirements have been minimal (or non-existent for local fishing boats), and any monitoring of these reporting requirements has been lax.

5.16.6.3 Non-compliance with other licence conditions by licensed/authorised vessels

There is a risk of violations of other licence conditions by licensed/authorised vessels. As previously discussed, the grey literature states that the Sri Lankan domestic fleet may commit several types of violation, such as fishing illegally within protected areas, use of prohibited and destructive fishing gears, lobster fishing in contravention of the Lobster Fisheries Management Regulations²³⁵, dredging or trawling for chank, landing of shark or skate fins (not attached to the bodies of such fish), and the harvest of corals for construction. However, the limited information available in the public domain makes it difficult to determine the severity and pervasiveness of these violations.

5.16.6.4 Post-harvest IUU

For the study period there is a potential risk of post-harvest IUU. It has been suggested (Pramod and Pitcher, 2006) that distant-water long liners frequently use Sri Lankan ports to land IUU catches. This implies that foreign fishing vessels which practice IUU fishing would utilise Sri Lankan ports due to lax port-state measures.

Fishing vessels originating from Sri Lanka are acknowledged to frequently illegally fish within waters of other countries, particularly India. It is therefore prudent to suggest that illegal catches originating from other nations' EEZ may be commonly landed within Sri Lankan ports.

5.16.6.5 Other offences

²³⁴ [http://www.rem.org.uk/documents/Sri Lanka fish policy legislation.pdf](http://www.rem.org.uk/documents/Sri_Lanka_fish_policy_legislation.pdf)

²³⁵ http://www.fisheriesdept.gov.lk/fisheries_beta/regulations/lobster.pdf

Discards

A study conducted by Kelleher (2005) estimates that fisheries discards in Sri Lanka are negligible due to high demand for even small-sized fish for human consumption. Discards comprise less than 0.5% in proportion to landed catch.

Table 132 shows the IUU risks that have been identified as possible risks for Sri Lanka.

Table 132 Specific risks identified for Sri Lanka.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed fishing in EEZ by boats from other regional states – India, Tamil Nadu Trawl Fishery
	Unlicensed fishing in EEZ by boats from other states (i.e. China)
	Unlicensed fishing in EEZ by national vessels
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting and under-reporting of foreign flagged vessels
	No reporting requirements for the domestic fleet (unreported)
Non-compliance with other licence conditions by licensed/authorised vessels	Use of prohibited gears (including dynamite and cyanide)
	Violation of protected areas/seasons
	Falsification/misuse of licence documents
Post-harvest IUU	Landing of illegal and unreported catch (Sri Lankan ports)
Other offences	Illegal harvest/possession of sharks or other protected species (corals, sharks and chank (Turbinellidae))

5.16.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 133), impact (Table 134) and level of inherent risk (Table 135) for Sri Lanka based on the risks identified in Table 132.

Table 133 Assessment of risk likelihood – Sri Lanka.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed fishing in EEZ by national vessels	Low	Weak (1990-2008)	Moderate (1990-2008)
		Moderate (2009-2013)	Unlikely (2009-2013)
Unlicensed fishing in EEZ by boats from other regional states – India, Tamil Nadu Trawl Fishery	High	Weak (1990-2008)	Likely
		Moderate (2009-2013)	
Unlicensed fishing in EEZ by boats from other states (i.e. China)	High	Weak (1990-2008)	Likely
		Moderate (2009-2013)	
Misreporting and under-reporting of foreign flagged vessels	High	Weak	Likely
No reporting requirements for the domestic fleet (unreported)	High	Very Weak	Almost Certain
Use of prohibited gears (including dynamite and cyanide)	High	Weak	Likely
Violation of protected areas/seasons	Very High	Weak	Almost Certain
Falsification/misuse of licence documents	High	Weak	Likely
Landing of illegal and unreported catch (Sri Lankan ports)	High	Weak	Likely
Illegal harvest/possession of sharks or other protected species (corals, sharks and chank (Turbinellidae))	Very High	Weak	Almost Certain

Table 134 Assessment of risk impact – Sri Lanka.

Specific risk	Catch	Vulnerability	Impact
Unlicensed fishing in EEZ by national vessels	Very High	Vulnerable	Serious
Unlicensed fishing in EEZ by boats from other regional states – India, Tamil Nadu Trawl Fishery	High	Vulnerable	Major
Unlicensed fishing in EEZ by boats from other states (i.e. China)	Low	Moderate	Minor
Misreporting and under-reporting of foreign flagged vessels	Moderate	Vulnerable	Major
No reporting requirements for the domestic fleet (unreported)	Very High	Vulnerable	Serious
Use of prohibited gears (including dynamite and cyanide)	Moderate	Vulnerable	Major
Violation of protected areas/seasons	High	Highly Vulnerable	Serious
Falsification/misuse of licence documents	Very Low	Vulnerable	Minor
Landing of illegal and unreported catch (Sri Lankan ports)	Very Low	Moderate	Minor
Illegal harvest/possession of sharks or other protected species (corals, sharks and chank (Turbinellidae))	Low	Highly Vulnerable	Major

Table 135 Assessment of inherent risk – Sri Lanka.

Specific risk	Likelihood	Impact	Risk
Unlicensed fishing in EEZ by national vessels	Moderate (1990-2008)	Serious	High (1990-2008)
	Unlikely (2009-2013)		High (2009-2013)
Unlicensed fishing in EEZ by boats from other regional states – India, Tamil Nadu Trawl Fishery	Likely	Major	High
Unlicensed fishing in EEZ by boats from other states (i.e. China)	Likely	Minor	Moderate
Misreporting and under-reporting of foreign flagged vessels	Likely	Major	High
No reporting requirements for the domestic fleet (unreported)	Almost Certain	Serious	Severe
Use of prohibited gears (including dynamite and cyanide)	Likely	Major	High
Violation of protected areas/seasons	Almost Certain	Serious	Severe
Falsification/misuse of licence documents	Likely	Minor	Moderate
Landing of illegal and unreported catch (Sri Lankan ports)	Likely	Minor	Moderate
Illegal harvest/possession of sharks or other protected species (corals, sharks and chank (Turbinellidae))	Almost Certain	Major	Severe

5.16.8 Impacts of IUU

There are clear impacts of unlicensed fishing by national and foreign vessels in Sri Lanka's EEZ. For example, the management of stocks will be negatively affected due to the consequential unknowns relating to harvest rates and stock status. There will also be direct losses to the Sri Lanka's economy through the loss of licensing revenues from national and foreign boats, and indirect losses associated with the depletion of commercially exploited stocks. Furthermore illegal fish caught by foreign vessels are unlikely to be landed in Sri Lanka, and it is more likely they will be landed in ports in

India. This will result in a loss of national revenue in the form of potential taxation and other potential benefits to local industry.

Misreporting and under-reporting of foreign fleets coupled with no reporting requirements for the domestic fleet will have similar impacts as previously mentioned as this form of IUU will result in unknown harvests and stocks. Again there is the potential loss of national revenue from potential taxation on landings.

The impacts of the use of prohibited gears such as dynamite and cyanide will potentially have negative impacts on the marine environment and fisheries production as these gears are considered highly destructive. The extent of impact on the marine environment will depend on the extent of these activities.

The violation of protected areas/seasons is likely to have profound impacts. Publicly available evidence, although not extensive, suggests that there has been extensive destructive fishing within Sri Lanka's protected areas using destructive gears/practices. Thus illegal fishing of this nature may have extensively damaged sensitive marine habitats within Sri Lanka.

The falsification/misuse of licence documents has likely had direct losses to the Sri Lanka's economy through the loss of licensing revenues.

Landing of illegal and unreported catch in Sri Lankan ports by distant water longliners due to lax port state measures will function to perpetuate IUU fishing in the region as it offers a 'safe haven' where IUU fishing vessels can land their catches with impunity.

The illegal harvest or possession of sharks or other protected species (corals, sharks and chank (Turbinellidae)) is likely to have substantial impacts both on the target populations and the marine environment. Coral harvesting has apparently been extensive throughout Sri Lanka and this highly destructive practice has undoubtedly had negative impacts on coral reef fisheries production.

5.16.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

The highest risks indicated by the risk assessment that would contribute to a higher level of IUU fishing are Unlicensed fishing in EEZ by national vessels "Unlicensed fishing in EEZs by boats from other regional States" and "No reporting requirements for the domestic fleet (unreported)".

The risk of "Unlicensed fishing in EEZs by national vessels" has been estimated at a high level. This is based on the evidence suggesting that the licensing system has several shortcomings, such as being prone to circumvention through the creation of duplicate licenses and it had limited coverage throughout the coastal states. Significant numbers of fishers are therefore considered to have been fishing illegally throughout the focal period and a 5 – 20% illegal catch level is suggested, though improvements in the control of the fisheries in recent years have suggested a decrease in the upper end of the range to 15%. Illegal fishing in Sri Lanka's EEZs by boats from other regional States is considered to be responsible for substantial quantities of catch. The high incentives and high number of vessels combined with the weak deterrents for Indian trawl fishery leads us to suggest an illegal catch level of 2–20% above the national reported catches for shrimp and demersal finfish.

Misreporting by foreign flagged vessels operating under agreement in the Sri Lankan EEZ are estimated to have a misreporting rate of between 0-5%, representing the small number of vessels but increased size.

The absence of reporting requirements for the domestic fleet is also considered to have potentially resulted in significant quantities of unreported catch. Catch monitoring is regarded as largely inadequate and has limited coverage and 10–100% range is therefore suggested although this may be an underestimate of the scale of the problem.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Sri Lankan EEZ can be found in Table 136.

Table 136 Summary of estimated rates – Sri Lanka.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed fishing in EEZ by national vessels	3	Mixed	1990-2008 2009-2013	5 5	20 15	0	0
Unlicensed fishing in EEZ by boats from other regional states – India, Tamil Nadu Trawl Fishery	1	Shrimp Demersal	1990-2013	2	20	0	0
Unlicensed fishing in EEZ by boats from other states (i.e. China)	2	Mixed	1990-2013	1	10	0	0
Misreporting and under-reporting of foreign flagged vessels	2	Mixed	1990-2013	0	0	0	5
No reporting requirements for the domestic fleet (unreported)	3	Mixed	1990-2013	0	0	10	100
Use of prohibited gears (including dynamite and cyanide)	1,2,3	Reef fish Mixed	1990-2013	0	0	0	0
Violation of protected areas/seasons	1,2,3	Mixed	1990-2013	0	0	0	0
Falsification/misuse of licence documents	3	Mixed	1990-2013	0	0	0	0
Landing of illegal and unreported catch (Sri	2	Mixed	1990-2013	0	0	0	0

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Lankan ports)							
Illegal harvest/possession of sharks or other protected species (corals, sharks and chank (Turbinellidae))	2,3,4	Sharks Coral Chank Other	1990-2013	0	0	0	0

NB: Rates are based on national catch levels as no breakdown of catches by fleet segment was possible.

5.16.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 42,572 and 360,651 t per annum (i.e. 16.03 and 135.81%). Illegal catches contribute an estimated 6.23-32.90% and unreported catches 9.80-102.91% in addition to the reported catch.

Losses from Illegal, Unreported and Unregulated fishing in the Sri Lankan EEZ are estimated to average between USD153.72 and 1,298.13 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 137 and as first landed value in Table 138. Profiles of the estimated level of illegal and unreported fishing combined in Sri Lanka can be found in Figure 38 (catch in t) and Figure 39 (catch value in USD).

Table 137 Summary of estimated IUU by year in Sri Lanka (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	156128	10326	57065	15400	161700	0	0
1991	190439	12730	70884	18806	197458	0	0
1992	186933	12183	66642	18395	193146	0	0
1993	214671	13920	76010	21064	221172	0	0
1994	236087	15006	80957	23035	241865	0	0
1995	219527	13531	71322	21329	223956	0	0
1996	237936	14880	79146	23219	243798	0	0
1997	243257	14813	77410	23573	247514	0	0
1998	253220	15602	82087	24644	258762	0	0
1999	278723	17024	89357	26961	283094	0	0
2000	264410	15925	82453	25597	268773	0	0
2001	241220	14788	77241	23546	247233	0	0
2002	247032	15191	79143	24256	254689	0	0
2003	292839	17954	93556	28661	300935	0	0
2004	302074	18689	97719	29724	312101	0	0
2005	185103	11281	58294	18172	190808	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	243313	14977	77747	24008	252080	0	0
2007	266523	16454	85782	26253	275654	0	0
2008	279388	17218	89773	27468	288413	0	0
2009	290382	18065	94568	28696	301303	0	0
2010	337777	21054	110780	33253	349152	0	0
2011	368644	23031	121328	36327	381436	0	0
2012	406849	25414	134417	39909	419048	0	0
2013	430743	27030	143278	42342	444586	0	0

Table 138 Summary of the estimated value of IUU (USD) by year in Sri Lanka (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	462.78	28.62	147.96	46.09	483.91	0.00	0.00
1991	555.98	34.51	178.92	55.38	581.52	0.00	0.00
1992	579.88	35.66	183.40	57.72	606.05	0.00	0.00
1993	679.24	41.58	213.14	67.56	709.40	0.00	0.00
1994	712.33	43.41	221.99	70.72	742.53	0.00	0.00
1995	737.31	44.47	225.23	73.17	768.28	0.00	0.00
1996	762.27	46.17	234.61	75.71	794.95	0.00	0.00
1997	795.22	47.80	241.44	78.84	827.87	0.00	0.00
1998	801.98	48.34	244.64	79.59	835.67	0.00	0.00
1999	847.41	50.99	258.19	83.92	881.17	0.00	0.00
2000	882.84	52.76	265.04	87.52	919.01	0.00	0.00
2001	828.11	49.81	251.19	82.29	864.07	0.00	0.00
2002	862.41	51.95	261.97	85.84	901.30	0.00	0.00
2003	994.25	59.94	302.81	98.86	1038.07	0.00	0.00
2004	1005.25	60.84	308.17	100.09	1050.94	0.00	0.00
2005	622.54	37.38	187.92	61.95	650.47	0.00	0.00
2006	909.89	54.89	276.79	90.70	952.32	0.00	0.00
2007	1051.72	63.50	320.56	104.81	1100.53	0.00	0.00
2008	1110.41	67.06	338.80	110.62	1161.49	0.00	0.00
2009	1187.56	71.83	363.01	118.45	1243.70	0.00	0.00
2010	1369.12	82.84	419.10	136.44	1432.61	0.00	0.00
2011	1590.30	96.03	484.67	158.55	1664.74	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	1807.59	109.06	550.38	180.06	1890.64	0.00	0.00
2013	1904.36	115.06	581.31	189.78	1992.65	0.00	0.00

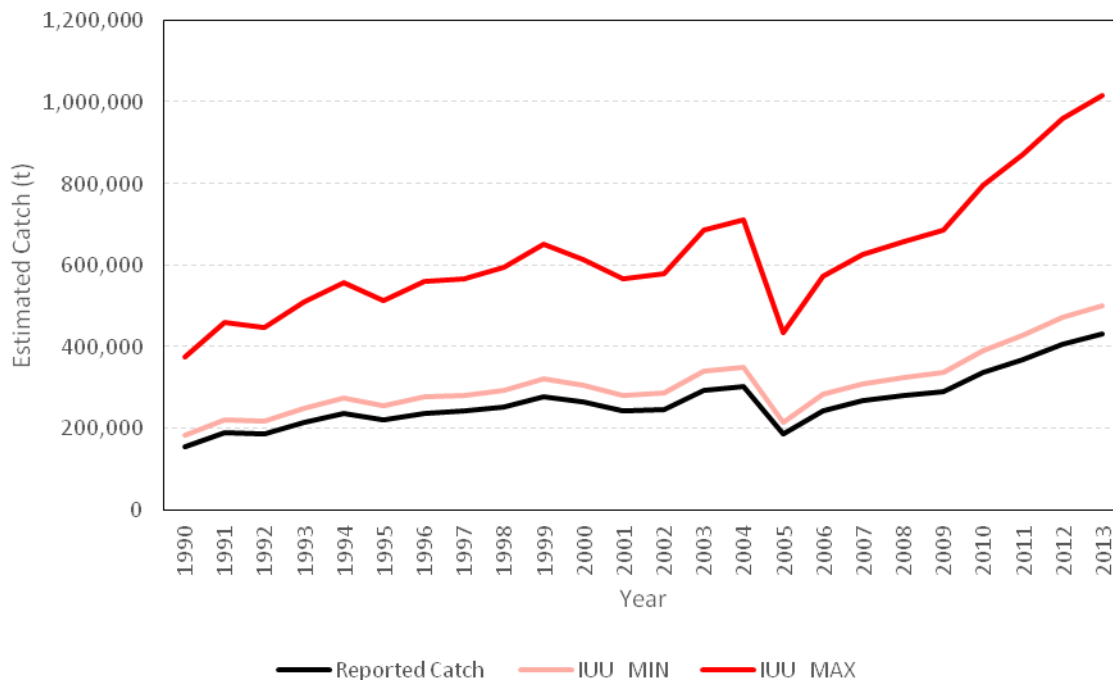


Figure 38 IUU Catch Profile (Sri Lanka) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

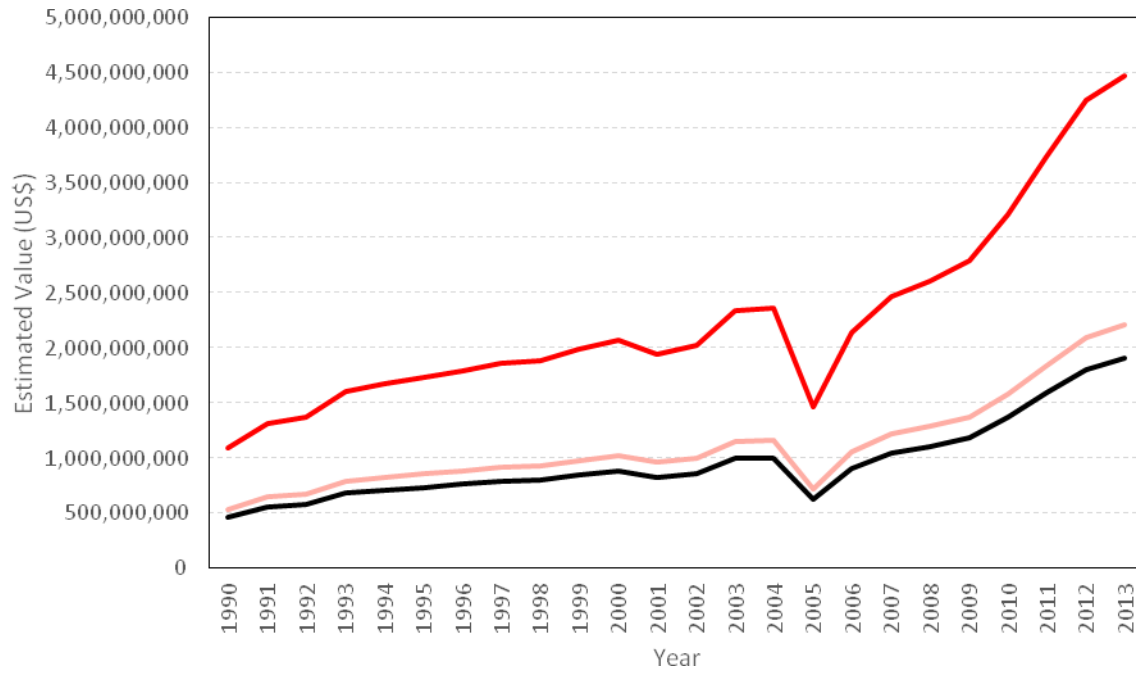


Figure 39 IUU Catch Value Profile (Sri Lanka) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.16.11 Fines and penalties

Table 139 Sri Lankan Fishery Management Measures and Penalties for Non-Compliance.

(Source: SLNPOA-IUU http://ftp.fao.org/fi/DOCUMENT/IPOAS/national/Srilanka/NPO_IUU.pdf)

#	Provision in the Act/regulations	Management measure	Penalty for non-compliance
1	Section 6, 7, 8, 9, 29, 61/Fishing Operations Regulations of 1996 (Gazette, No. 948/25 of 07-11-1996)	A license issued by DG is required to undertake the fishing activities in Sri Lanka Waters.	Imprisonment of either description for a term not exceeding six months or to a fine not less than LKR 3000 or to both such imprisonment and fine (Section 49 (2) FARA) (To be amended as fine not exceeding LKR 25,000)
2	Section 15/Registration of Fishing Boats Regulations, 1980 (Gazette, No. 109 of 10 March 1980)	Fishing boats used for fishing in Sri Lanka Waters should be registered under FARA as local fishing boats.	Fine not less than LKR 2000 (To be amended as fine not exceeding LKR 25,000)
3	Section 27 as amended by Act, No. 4 of 2004	Use of poisonous, explosive or stupefying substances (including dynamite) or other noxious or harmful material for fishing or dumping of poisonous, explosive, stupefying or other obnoxious or harmful material in Sri Lanka Waters is banned.	Imprisonment of either description for a term not less than three years and not exceeding five years and a fine not less than LKR 100,000 or on a second or subsequent conviction imprisonment of either description for a term not less than five years and not exceeding seven years and a fine not less than LKR 500,000 (Section 49 (3) FARA as amended by Act, No. 4 of 2004)

#	Provision in the Act/regulations	Management measure	Penalty for non-compliance
4	Section 28/ Fishing Operations Regulations of 1996 (Gazette, No. 948/25 of 07 November 1996)	<p>The following fishing operations are banned:</p> <ul style="list-style-type: none"> • Push net fishing operations • Harpooning for marine mammals • Moxi net fishing operations • Gillnet or trammel net fishing operations on coral reefs or rocks 	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 3000 or both such imprisonment and fine (Section 49 (2)) (To be amended as fine not exceeding LKR 25,000) ²³⁶

²³⁶ NB: This text is reproduced as it is defined in the legislation.

#	Provision in the Act/regulations	Management measure	Penalty for non-compliance
5	Section 61/Lobster Fisheries Management Regulations (Gazette, No. 1123/2 13 March 2000)	Spiny lobster fishing operations in the sea area belonging to the Southern coastal belt between the estuaries of Bentota River and Kumbukkan River require validation of the license issued for fishing operations for south coast lobster. Catching or keeping in possession of spiny lobster with external eggs, lobster of species <i>Panulirus homarus</i> with a carapace length less than 10 cm or tail length less than 14 cm, or lobster of any other species with a carapace length less than 6 cm or tail length less than 10 cm is banned.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 2000 or both such imprisonment and fine (Section 49 (5)) (To be amended as fine not exceeding LKR 50,000)
6	Section 34/(Notification published in Gazette, No. 1601/36 of 15 May 2009)	Lobster fishing operations are banned during the months of February, September and October, which have been declared as closed seasons for fishing of lobster.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 3000 or both such imprisonment and fine (Section 49 (2)) (To be amended as fine not exceeding LKR 25,000)
7	Sections 28 and 61/ Monofilament nets prohibition regulations	Use of monofilament nets for fishing is banned.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 3000 or both such imprisonment and fine (Section 49 (2)) (To be amended as fine not exceeding LKR 25,000)

#	Provision in the Act/regulations	Management measure	Penalty for non-compliance
8	Section 61/Chank Fisheries Management Regulations, 2003 (Gazette, No. 1298/1 of 21 July 2003)	Dredging operations or trawling operations for the purpose of taking chank, and keeping in possession of any chank less than 70 mm in diameter are banned.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 2000 or to both such imprisonment and fine (Section 49 (5)) (To be amended as fine not exceeding LKR 50,000)
9	Section 61/Landing of Fish (Species of Shark and Skate) Regulations, 2001 (Gazette 1206/20 of 17 October 2001)	No fins of shark or skate should be landed unless such fins attached to the bodies of the respective fish.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 2000 or to both such imprisonment and fine (Section 49 (5)) (To be amended as fine not exceeding LKR 50,000)
10	Section 4 of Fisheries (Regulation of Foreign Fishing Boats) Act, No. 59 of 1979	No foreign boat should be used for fishing or related activities in Sri Lanka Waters except under the authority of a permit issued by DG with approval of the Minister	Fine not exceeding LKR 1.5 million and repatriation costs of the crew, forfeiture of the boat and fishing equipment (Section 15 (a) of FFBA)
11	Section 61/Fish catch data collection regulations, 2012 (Gazette 1755/32 of 25 April 2012)	Mechanized fishing boats fishing in Sri Lanka Waters are required to maintain logbooks issued by DFAR, maintain a record of the catch of each fishing trip in the logbook, and furnish a certificate of the catch to the Competent Authority in the prescribed form.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 2000 or to both such

#	Provision in the Act/regulations	Management measure	Penalty for non-compliance
		Fish should not be imported for re-export without a catch certificate and health certificate issued by the Competent Authority of the importing country	Imprisonment and fine (Section 49 (5) (To be amended as fine not exceeding LKR 25,000)
12	Section 61/Prohibition of Catching Thresher Shark Regulations, 2012 (Gazette 1768/36 of 27 July 2012)	Catching, transporting or selling thresher shark (Family Alopiidae) is banned.	Imprisonment of either description for a term not exceeding six months or a fine not less than LKR 2000 or to both such imprisonment and fine (Section 49 (5) (To be amended as fine not exceeding LKR 25,000)

5.17 Thailand

5.17.1 Introduction

The Thai EEZ covers an area of 179,900 km² with an additional area of 31,470 km² defined as territorial sea and 15,840 km² as contiguous zone. In the Indian Ocean, the Thai EEZ shares borders with Myanmar to the north, India and Indonesia to the west and Malaysia to the south. In the Gulf of Thailand, Thailand shares borders with Malaysia to the south and Cambodia and Vietnam to the east. A recent report by the Environmental Justice Foundation (EJF) described the Gulf of Thailand as ‘among the most overfished regions on the planet’ with CPUE reducing by more than 86% since 1966 (EJF, 2015). Moreover the national Department of Fisheries (DoF) recorded a catch decline of more than 50% between 1990 and 2012. In 2012 Thailand’s annual marine catch was estimated by the DoF at 1.5 million tonnes, worth USD 1.6 billion (DoF, 2012).

In April 2015 the European Union issued a ‘yellow card’ warning in response to a failure by Thailand to sufficiently tackle the problem of IUU fishing. Thailand has since taken several steps to address the concerns raised by the EU, including an amendment to the previous fisheries legislation which entered into force in mid-2015²³⁷. The details of this amendment and its consequences including a new national Fisheries Management Plan in November 2015, are discussed under section 1.1.4.1.

5.17.2 Fleet breakdown

Thailand’s fishing fleet is substantial, numbering c.57,000 vessels in 2011 according to the national government, however it has been suggested that as little as one sixth of this fleet may be registered, thus creating a large national IUU fleet. Indeed DoF statistics from 2012 listed only 18,089 registered vessels by gear type (DoF Registry, 2012). Furthermore 3,384 registered trawlers are recorded in the latest official statistics, but government figures have acknowledged that the true number of operational trawlers may be close to 10,000 (EJF, 2015). An article in national media also reported that, under the new measures introduced by the revised fisheries law, almost 20,000 vessels of all sizes were now classed as operating illegally²³⁸. Around 70% of the total estimated fleet size is comprised of ‘small scale’ vessels, which are classed under national regulations as vessels of under 5 GT which are either non-powered or use inboard and outboard motors.

According to data obtained by SEAFDEC between April 2011 and March 2012, 234 joint venture fishing vessels under foreign flags were operating in Thai waters. Burmese vessels accounted for 78% of this foreign fleet, with vessels from Iran, Papua New Guinea and Yemen also included. A number of Thailand’s bilateral fishing agreements have lapsed since 2011, with only one ongoing agreement with Papua New Guinea as of April 2015.

²³⁷ The New Fisheries Act B.E. 2558 (2015).

²³⁸ (“Fishermen warn of huge losses | Bangkok Post: news,” 2015)

It has not been possible to break down the catch profile of Thailand into the recognised fleets indicated in Table 140. All risks have therefore been estimated based on the total national catch.

Table 140 Fleet breakdown for Thailand.

Number	Description	Gear	Flag(s)	Target species	Comment
1	National small scale fleet	Mixed gears	Thailand	Mixed reef, demersal, pelagic species	
2	National purse seine fleet	Purse seine, often with light lures	Thailand	Tuna, tuna like-species, anchovy, other small pelagics	Many vessels are unregistered
3	National trawl fleet	Otter board, pair and beam trawls	Thailand	Mixed pelagic and demersal species, 'trash fish'.	Known to use illegal gear and fish in prohibited areas. Many vessels are unregistered
4	Foreign fleets	Otter board trawls, surrounding nets	Myanmar, Iran, PNG, Yemen, Vietnam	Sea cucumber, tuna and tuna-like species, other mixed species	

5.17.3 Catch breakdown by fleet

Weaknesses and inconsistencies in Thailand's reported catches during the study period have been widely acknowledged (Flewelling, 2001; MRAG, 2005), and the value of data available from the FAO is severely limited by the high levels of aggregation within the national catch, which totals at 52,429,598 tonnes between 1990 and 2010. Marine fishes *nei* account for 37.8% of the reported catch, with anchovies *nei* (Engraulidae) accounting for the largest proportion of catch for a single family at 6.2%. Indian scad (*Decapterus russelli*) accounts for the largest proportion for a single species at 2.8%.

It should be noted that the SAU catch reconstructions for the Thai EEZ are divided into two areas, specifically the Andaman Sea and the Gulf of Thailand, but the catches are combined for the purpose of this study, with total catches amounting to 47,722,624 tonnes between 1990 and 2013 (Teh *et al.*, 2015). Threadfin and dwarf brems *nei* (Nemipteridae) account for the largest portion of the reconstruction at 14.5%, followed by ponyfishes/slipmouths *nei* (Leiognathidae) at 8.2% and lizardfishes *nei* (Synodontidae) at 8%. Indian mackerel (*Rastrelliger kanagurta*) accounts for the largest proportion of catch for a single species at 7%. It should be noted that, although the FAO

catches for this report's study period are slightly higher than the catch reconstruction, the overall SAU catches for Thailand from 1950-2010 were calculated at 2.8 times higher than the FAO's reported catches over the same period.

5.17.4 Analysis of IUU related factors

5.17.4.1 Legislation and governance

The primary piece of legislation governing Thai fishing fleets is the Fisheries Act of 1947, which was recently updated in 2015 in response to the EU yellow card. This section will consider both the original legislation, which applies to the time period of the catch data used by this study, and the implications of new measures which entered into force in June 2015. It should be noted that the 'antiquated' fishing legislation is acknowledged to have hindered effective management (DoF, 2009), as the legislation entered into force before the development of Thailand's large industrial fleet.

Thailand is a member of the RPOA-IUU, and committed to finalising and implementing an NPOA-IUU as part of measures undertaken in response to the EU yellow card, which were laid out by the Minister of Agriculture and Cooperatives in an IUU Fishing Roadmap in February 2015²³⁹. In addition Thailand has been a Commission Contracting Party to IOTC since 1999, is listed as a cooperating non-member of WCPFC, and signed the UNCLOS convention in 2011.

Thailand has a slightly higher than average ranking globally compared to other States according to the World Bank Governance Indicators (97th out of 212 – 46nd percentile). As such any risks relating to direct corruption or a weak regulatory framework are likely to exist but with a relatively low to moderate level of risk i.e. for risks such as "Obstruction or bribery of fisheries officers" and "Falsification of documents". Risks are likely to be lower than the level observed in most regional States (See Table 159).

5.17.4.2 Licensing and reporting requirements

Institutional mechanisms for fishing fleet control are complex, with the DoF responsible for the issuing of fishing permits and gear licenses whilst the Marine Department registers and licenses fishing vessels. This divided responsibility creates weaknesses in Thailand's flag state controls, with insufficient cooperation between agencies and inconsistencies between vessel registries (European Commission, 2015)²⁴⁰. A separate piece of legislation, the Thai Vessel Act, stipulates that all powered vessels or vessels of greater than 6 GT must be registered²⁴¹.

²³⁹ ("Thailand adopts IUU sanctions in first update to fisheries act since 1947 | Undercurrent News," 2015)

²⁴⁰ Commission Decision of 21 April 2015 on notifying a third country of the possibility of being identified as a non-cooperating third country in fighting illegal, unreported and unregulated fishing. (2015/C 142/06).

²⁴¹ Thai Vessels Act, B.E. 2481 (1938).

In 1989 a supplementary regulation was passed with regard to the application by nationally-flagged vessels for licenses to fish overseas, stipulating that all Thai vessels must receive authorisation before undertaking fishing overseas²⁴². However, reporting obligations for national vessels fishing overseas are not stated as license conditions. In general the reporting obligations of Thai vessels have been poorly defined in the historical legislation, and effective fisheries data collection mechanisms have been limited (Edeson *et al.*, 2010), with no provision in the Fisheries Act for any Thai vessels to carry VMS or submit to any inspection. In response to the EU yellow card, Thailand has increased its efforts to roll out VMS within the nation fleet, with the Thai embassy stating that VMS had been installed on over 1,500 vessels since July 2015.

The rights of foreign fishing vessels in Thailand are stated in legislation dating from 1939, which stipulates that no partnerships or companies may obtain licenses to fish in Thai waters unless seventy percent of its capital is owned by Thai nationals, in addition to partners and directors having Thai nationality (Section 5)²⁴³. The legislation also states that, unless fishing agreements have been enacted with the responsible flag state, vessels flying foreign flags or under foreign ownership are not permitted to fish in Thai waters. Thai vessels are also prohibited from operating with foreign crew on board (Section 7).

5.17.4.3 Restrictions, fines and penalties

The 1947 legislation sets out a range of penalties for various fishing offences, however the penalties are often low. For example, fishing without registration or operating unregistered fishing gear carry a fine of just 100 baht (THB) and/or one month in prison (Section 25-26)²⁴⁴. Other offences carry higher penalties, with unlicensed fishing punishable with 2,000-10,000 THB fines and 1-6 months in prison depending on the area in which fishing activities were carried out (Sections 9, 11, 13, 16.2), in addition to a similar punishment for poison fishing (Section 19). Fishing with explosives carries the highest penalty, with a maximum fine of 100,000 THB and up to five years in prison upon conviction (Section 20). In addition to these restrictions on destructive gear, the use of trawl gears within three kilometres of the coastline has been prohibited since 1972, although violations of this provision by commercial trawlers are acknowledged to be widespread (EJF, 2015)²⁴⁵. The minimum permitted mesh size for trawl nets is also set at 25mm, although this measure is also acknowledged to be poorly enforced, and moreover scientific recommendations have stated that a much larger minimum mesh size is required to improve sustainability (Davies *et al.*, 2009)²⁴⁶. Various other regulations have since been enacted in support of the Fisheries Act, which stipulate a number of seasonal, spatial and

²⁴² Regulation of the Fisheries Department on the application for a license for overseas fisheries B.E. 2532 (1989).

²⁴³ Act Governing the Right to Fish in Thai Fishery Waters, B.E. 2482 (1939).

²⁴⁴ 100 THB = USD 2.78 as of 15/09/2015.

²⁴⁵ ("Fishermen protest illegal trawler operations | Bangkok Post: news," 2013)

²⁴⁶ Davies *et al.*, 2009. Defining and estimating global marine fisheries bycatch. *Marine Policy*.

species-specific closures to limit fishing activity, such as the prohibition of crab fishing within the spawning season (1993) and a ban on trawl and push net gear use within Phang Nga Bay (1998) (Panjarat, 2008). It should be also noted the Fisheries Act does not contain any provisions for the regulation of transshipments.

The 2015 amendment has increased some of the penalties discussed above and brought in a number of new measures to increase control of national vessels and reduce IUU activities. The amended legislation caused an outcry amongst owners and crews of unregistered fishing vessels, particularly trawlers, who were forced to stay in dock once the new Fisheries Law entered into force to avoid new sanctions for operating whilst unregistered, fishing without a license or fishing with illegal gear²⁴⁷.

Powers of boarding, inspection and seizure of foreign vessels are also given to national officials in cases where violations of Thai law are suspected (Sections 9-10). The penalty for fishing in Thai waters without carrying the required license is given as a maximum of 200 THB (Section 12).

5.17.4.4 MCS protocols and enforcement capacity

During the period of this study Thailand has operated a fisheries enforcement fleet (including air surveillance) both in coastal and offshore areas, with a capacity of approximately 100 vessels (Flewwelling 2001), however it has been noted that the effectiveness of both the coastal and offshore enforcement assets has been undermined by outdated, poorly maintained patrol vessels (De Young, 2006). Effective enforcement has been further reduced by additional issues such as corruption and misconduct by the relevant authorities, lack of coordination amongst agencies involved in MCS and poor levels of stakeholder engagement, with many fishermen ignorant of enforcement issues and policies (McDorman, 2000).

In general local fishing authorities are ill-equipped to enforce management measures such as exclusion zones or reserved nearshore areas, with many provincial patrol teams lacking even basic equipment such as boats and radios. The country's 2015 IUU Roadmap includes provisions for improving MCS capacity, including the establishment of 18 new MCS centres and repairs to existing surveillance vessels. Moreover the Thai embassy recently published data on surveillance activities undertaken between October 2014 and August 2015, with 451 operations conducted. These resulted in the ongoing investigation of 827 vessels for fishing without a license, in addition to 443 cases being brought against offenders.

Alongside revisions to the relevant legislation, the Thai government also announced the creation of the national Command Centre for Combatting Illegal Fishing (CCCIF) in May 2015.

²⁴⁷ ("PM refuses to delay new trawler rules | Bangkok Post: news," 2015.)

5.17.4.5 Port state

Thailand has not signed the FAO Port State Measures Agreement, and weaknesses have previously been highlighted within national port controls, including the lack of requirements for vessels to provide advance notice of entry and the absence of measures to designate ports (Edeson *et al.*, 2010). Moreover Thailand's Andaman Sea fisheries have historically not been subject to any landing site or dockside catch inspections (De Young, 2006), and the EU recently published information received from the Thai authorities which indicated that only 10% of landings in national ports were verified²⁴⁸, with the landing of unmonitored IUU catch in Thailand acknowledged to be widespread (EJF, 2015).

However, Thailand has recently implemented additional port state measures as part of the suite of responses to the EU yellow card warning, specifically in the form of a Port In, Port Out (PIPO) system. The creation of 26 PIPO control centres in coastal provinces was also announced to facilitate implementation of new port regulations, with new PIPO controls applicable to vessels of over 30 GT²⁴⁹. In an example of the potential impact of new port state measures, a 2015 news report highlighted that Cambodian vessels had ceased to illegally land their catch in Thai ports²⁵⁰. Moreover, the Thai government recently pledged to ratify the Port State Measures Agreement as part of their programme of anti-IUU actions (Thai Embassy, 2015).

5.17.4.6 Market state

The value of Thailand's seafood exports was stated at USD 6.9 billion for 2013, of which 40% was comprised of shrimp, and imports by the EU from Thailand were valued at USD 0.9 billion. Evidence indicates that Thailand's international seafood supply chains contain products from companies known to carry out IUU fishing activities, particularly with regard to shrimp exports, with illegally small mesh sizes used to trawl both for wild shrimp and also 'trash fish' species the latter of which are used to produce fishmeal for shrimp aquaculture and livestock feed (Teh *et al.*, 2015). A 2014 report highlighted Thailand as the third largest fishmeal producer globally between 2001 and 2009, and the country is also a major exporter of fishmeal, with a peak of c. 110,000 tonnes exported in 2013 (Achavanuntakul *et al.*, 2014).

Companies known to perpetrate IUU fishing have been shown to supply major fishmeal manufacturers which in turn are linked to shrimp export operations, indicating how illegal catch has infiltrated Thailand's supply chains (EJF, 2015). Thus, Thai seafood businesses should be considered

²⁴⁸ Commission Decision of 21 April 2015 on notifying a third country of the possibility of being identified as a non-cooperating third country in fighting illegal, unreported and unregulated fishing. (2015/C/142/06). European Commission.

²⁴⁹ Thailand's Roadmap on IUU Fishing (2015). Royal Thai Government.

²⁵⁰ "New rules scare away illegal Cambodian fishing boats | Bangkok Post: news," 2015

as directly profiting from IUU activities, and the EU noted April 2015 that Thailand was unable to ensure that seafood products in its supply chains were not sourced from IUU operators²⁵¹.

5.17.5 Summary of IUU incidences

IUU incidences in Thailand are sub-divided between national and foreign fleets, with incidents linked to specific fleet types where possible.

5.17.5.1 National fleets

IUU fishing is acknowledged to be widespread throughout Thai waters, with national legislation frequently violated and poorly enforced, and the scale of the problem has been exacerbated by virtue of the fact that a large proportion of the national fleet has historically been unregistered, making all fishing undertaken by such boats illegal, unregulated and probably misreported or unreported. The DoF stated in 2009 that the most common groups of national vessels known to carry out IUU fishing were push-netters, anchovy purse-seiners and trawlers (DoF, 2009). Substantial evidence indicates that violations of the 3 km coastal exclusion zone by trawlers are commonplace, causing economic and social impacts in addition to environmental damage. Encroachment by trawlers is acknowledged as a driver of conflicts between small-scale and commercial fishers, with the former's gear often destroyed by trawls in addition to the reduction in resources available for small-scale operators.

It should be noted that Thai fleets are known to operate illegally in the EEZs of a number of other countries covered by this study. In 2015 the EJF collated statistics which showed that Thai vessels had been arrested in the waters of Vietnam, Myanmar, India, Indonesia, Bangladesh, Malaysia and Cambodia between 1980 and 2010, with a total of 3,142 vessels seized.

5.17.5.2 Foreign fleets

A review of national media outlets found several recently reported incidents of IUU fishing activities by foreign vessels within Thai waters. In 2014 two Vietnamese boats carrying 18 crew of Cambodian and Vietnamese nationality were seized near Songkhla, allegedly targeting lucrative sea cucumbers²⁵². Moreover the seizure of a further two Vietnamese boats was reported near Songkhla in 2015, with the 12 crew arrested on charges of not submitting vessel registration papers upon request, failing to maintain a logbook and non-compliance with PIPO measures²⁵³. A further three Vietnamese trawlers were also reportedly seized in 2015, again in the region of Songkhla, with the 23 crew charged with illegal fishing in addition to violation of immigration laws. The article

²⁵¹ Commission Decision of 21 April 2015 on notifying a third country of the possibility of being identified as a non-cooperating third country in fighting illegal, unreported and unregulated fishing. (2015/C 142/06).

²⁵² ("2 Vietnamese boats, 18 crew nabbed | Bangkok Post: news," 2014)

²⁵³ ("12 Vietnamese fishermen detained | Bangkok Post: news," 2015)

containing the report of the latter incident also states that 67 Vietnamese fishing vessels had been seized in the previous nine months²⁵⁴.

5.17.6 IUU risk identification

5.17.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or Exclusive Economic Zone

In light of the acknowledged presence of large numbers of unregistered Thai vessels operating within the EEZ, there is an evident risk of unlicensed and/or unauthorised fishing by nationally-flagged operators. Given the size of the national trawl fleet, and the uniquely destructive nature of the gear type, the trawl portion of the national fleet will be risk assessed separately, and the large small-scale portion of the fleet will also be separated in order to reflect the scale and heterogeneity of Thailand's fishing fleet.

5.17.6.2 Non-compliance with reporting obligations by licensed/authorised vessels

Given the historical lack of clear reporting obligations in fisheries legislation, the misreporting or failure to report catch by Thai vessels may not be classed as non-compliance with national law. However, given the lack of reporting mechanisms and the poor quality of the data submitted by the DoF, a clear risk exists for national vessels misreporting or failing to report catch. Moreover, given the evidence for the operation of illegal foreign vessels inside the Thai EEZ, a separate reporting risk for foreign fleets should be considered.

5.17.6.3 Non-compliance with other licence conditions and/or legislation

The large, poorly controlled Thai national fleet is evident at risk of fishing inside closed areas such as MPAs, in addition to seasonal and spatial closed areas. The particular risk of trawl vessels encroaching within the 3 km restricted coastal zones will also be considered as part of this risk. Thai vessels are also widely acknowledged to use various destructive gear types, including trawl nets with illegally small mesh sizes (particularly in the targeting of trash fish) and push nets, and thus the use of such gears must be evaluated as a separate risk.

5.17.6.4 Post-harvest IUU

Thailand's historical lack of thorough port state controls creates a risk that IUU catch has been landed in national ports, both from the large unregistered portion of the national fleet and also from foreign vessels permitted to land their catch without robust monitoring. In addition the impact of the acknowledged presence of IUU seafood products in Thailand's international supply chains should also be assessed.

²⁵⁴ ("Three Vietnamese boats seized for illegal fishing | Bangkok Post: news," 2015)

5.17.6.5 Other offences

Due to the identified incidences of the targeting of ETP species, in addition to the risk that such species will be caught as non-targeted bycatch by the large-scale indiscriminate fishing methods being operated in Thai waters, the risk posed by the harvest of ETP species must be included. The risk of industrial vessels encroaching into nearshore areas reserved for small-scale fishing will also be considered separately, given the evidence for this practice and the potentially major negative consequences.

Table 141 shows the IUU risks that have been identified as possible risks for Thailand.

Table 141 Specific risks identified for Thailand.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed/unauthorised fishing by national trawl fleet
	Unlicensed/unauthorised fishing by national purse seine fleet
	Unlicensed/unauthorised fishing by national small-scale fleet
	Unlicensed/unauthorised fishing by foreign fleets
Non-compliance with reporting obligations by licensed/authorised vessels	Misreporting of/unreported catch by national fleets
	Misreporting of/unreported catch by licensed foreign fleets
Non-compliance with other licence conditions and/or legislation	Fishing within spatio-temporal closed areas
	Use of prohibited and destructive gears
Post-harvest IUU	Unreported and unregulated transshipment
	Landing of IUU catch in national ports by national and foreign vessels
	Entry of IUU catch (both from Thai vessels and foreign imports) into fishmeal/aquaculture/processing supply chains
Other offences/issues	Harvest of ETP species
	Incursion of industrial fisheries into restricted artisanal zones

5.17.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of likelihood (Table 142), impact (Table 143) and level of inherent risk (Table 144) for Thailand based on the risks identified in Table 141.

Table 142 Assessment of risk likelihood – Thailand.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed/unauthorised fishing by national trawl fleet	High	Very weak	Almost certain
Unlicensed/unauthorised fishing by national purse seine fleet	High	Very weak	Almost certain
Unlicensed/unauthorised fishing by national small-scale fleet	Moderate	Very weak	Likely
Unlicensed/unauthorised fishing by foreign fleets	Moderate	Weak	Likely
Incursion of industrial vessels into restricted artisanal zones	High	Weak	Likely
Misreporting of/unreported catch by national fleets	High	Weak	Likely
Misreporting of/unreported catch by licensed foreign fleets	Moderate	Weak	Likely
Use of prohibited and destructive gears	Very High	Weak	Almost certain
Unreported and unregulated transshipment and bunkering	Moderate	Very Weak	Moderate
Landing of IUU catch in national ports by national and foreign vessels	High	Very Weak	Almost certain
Entry of IUU catch (both from Thai vessels and foreign imports) into fishmeal/aquaculture/processing supply chains	Very high	Weak	Almost certain
Harvest of ETP species	Moderate	Weak	Likely

Table 143 Assessment of risk impact – Thailand.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by national trawl fleet	High	Highly Vulnerable	Serious
Unlicensed/unauthorised fishing by national purse seine fleet	High	Moderate	Major
Unlicensed/unauthorised fishing by national small-scale fleet	Moderate	Moderate	Moderate
Unlicensed/unauthorised fishing by foreign fleets	Moderate	Moderate	Moderate
Incursion of industrial vessels into reserved artisanal areas	High	Vulnerable	Major
Misreporting of/unreported catch by national fleets	High	Vulnerable	Major
Misreporting of/unreported catch by licensed foreign fleets	Moderate	Moderate	Moderate
Use of prohibited and destructive gears	High	Highly Vulnerable	Serious
Unreported and unregulated transshipment	Low	Moderate	Minor
Landing of IUU catch in national ports by national and foreign vessels	Moderate	Moderate	Moderate
Entry of IUU catch (both from Thai vessels and foreign imports) into fishmeal/aquaculture/processing supply chains	High	Vulnerable	Major
Harvest of ETP species	Moderate	Highly Vulnerable	Major

Table 144 Assessment of inherent risk – Thailand.

Specific risk	Likelihood	Impact	Risk
Unlicensed/unauthorised fishing by national trawl fleet	Almost certain	Serious	Severe
Unlicensed/unauthorised fishing by national purse seine fleet	Almost certain	Major	Severe
Unlicensed/unauthorised fishing by national small-scale fleet	Likely	Moderate	High
Unlicensed/unauthorised fishing by foreign fleets	Likely	Moderate	High
Incursion of industrial vessels into reserved artisanal areas	Likely	Major	High
Misreporting of/unreported catch by national fleets	Likely	Major	High
Misreporting of/unreported catch by licensed foreign fleets	Likely	Moderate	High
Use of prohibited and destructive gears	Almost certain	Serious	Severe
Unreported and unregulated transshipment	Moderate	Minor	Moderate
Landing of IUU catch in national ports by national and foreign vessels	Almost certain	Moderate	High
Entry of IUU catch (both from Thai vessels and foreign imports) into fishmeal/aquaculture/processing supply chains	Almost certain	Major	Severe
Harvest of ETP species	Likely	Major	High

5.17.8 Impacts of IUU

Thailand was assigned consistently high levels across the IUU risk assessment, with four risks assessed at the highest level of severe. The large numbers of unlicensed national purse seine and trawl vessels operating within Thailand's EEZ render effective, data-informed fisheries management near impossible, with state control over these fleet segments close to non-existent and inadequate measures for quantifying catch. The available data on declining catch volumes and CPUE within Thai waters reflects the impacts of these uncontrolled domestic fleets, which have decimated commercially valuable stocks in the Gulf of Thailand and undermined both the ecological and economic sustainability of the target fisheries. Unlicensed fishing was also assessed at a high level for domestic small-scale fleets and foreign fleets, further increasing the quantities of illegal catch which will not be reported and will contribute to undermining fisheries sustainability. Given the size of Thailand's small scale fleet, significant pressure is likely to be exerted on the marine resources of nearshore areas and vulnerable shallow habitats within the range of small boats. The combination of over-capacity unlicensed fleets and decreasing domestic catches is also having further impacts at a

regional level, with Thai vessels increasingly encroaching on the EEZs of neighbouring states in the search for new fishing grounds.

Risks relating to misreporting of catches were scored at a high level for Thailand across all fleet segments, reflecting the acknowledged inadequacies in the catch reporting mechanisms for its licensed fleets and the high levels of aggregation in national catch statistics. Failures to report catch correctly prevent the catch and effort of licensed fleets from being quantified effectively, and undermine effective management of key target commercial stocks due to a lack of accurate data.

The risk of prohibited and destructive gear usage was also scored at a 'severe' level, largely due to the operation of the large national trawl fleet (both the unlicensed and licensed components) of an estimated 10,000 vessels. Scientific recommendations for minimum mesh sizes have not been put into practice for much of the period of this study, and moreover the provisions in national legislation regarding mesh sizes are widely violated. Trawling with small mesh sizes is an indiscriminate fishing technique associated with high levels of bycatch and seabed damage, additionally resulting in high catches of juvenile fish which undermines the recovery of target stocks. Furthermore trawlers are also implicated within the high risk of industrial vessels encroaching into reserved artisanal zones. This practice can have severe impacts on the livelihoods of communities reliant on coastal marine resources as localised fish stocks are undermined by the additional pressure of industrial vessels, often using gear inappropriate for such fisheries.

The pervasive use of trawl gear in Thailand is also heavily linked to the demand for 'trash fish' for conversion into fishmeal destined for the shrimp aquaculture industry, and the entry of IUU catch into these supply chains was also scored at a severe level, with the lack of traceability within Thailand's fishmeal industry creating a strong likelihood that catch from illegally operating vessels is entering 'legitimate' markets. The impact of the presence of IUU catch in Thailand's supply chains is exacerbated by the large scale of the country's shrimp exports, creating a national and international demand for fishmeal which is met by the continuing targeting of 'trash fish' by trawlers potentially operating without a license and/or using destructive gear. Thus the presence of IUU products in markets has a knock-on impact, incentivising ongoing unsustainable and/or illegal practices by Thailand's national fleet. Moreover the links between the trash-fish fishery (indeed overfishing in Thailand more broadly) and human rights abuses on illegal vessels is well documented, thus creating an additional social component to the impacts of IUU products in Thailand's supply chains (EJF, 2015). However, it is beyond the scope of this study to discuss the labour issues within Thailand's domestic fleet in detail.

The harvest of ETP species was also scored at a high risk level for Thailand, with certain species such as sea cucumber known to be targeted within Thailand's EEZ. Moreover Thailand's large fleet of vessels operating indiscriminate gears such as trawls and purse seines with small mesh sizes are likely to entrap ETP species such as sharks, cetaceans and turtles as bycatch. Many of these species are particularly ecologically vulnerable to fishing pressure, and uncontrolled illegal harvesting of these species in defiance of national and international laws can cause rapid population declines and heighten local/regional extinction risks.

5.17.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

In light of the evidence for extensive IUU fishing in Thailand, a number of high estimation rates have been applied to the identified specific risks, with percentages applying to the national catch as whole, as the data have not been disaggregated between fleets.

The highest rates were assigned to the unlicensed national trawl and purse seine fleets, which are acknowledged to fish illegally on a large scale with thousands of vessels operating indiscriminate gears without a license. The range of 15-60% emphasises the significant proportion of catch taken by these fleet segments which is likely to be omitted from national catch statistics. The national small-scale fleet was also given a range of 10-30% in order to reflect the large size of this fleet segment and the significant potential for unlicensed fishing by the vessels involved. The estimated rates also take account of unlicensed foreign vessels which are allocated a rate of 5-10%, given that the evidence suggests foreign illegal fishing is not undertaken within Thailand's EEZ on the same scale as by national vessels but that it is still potentially a significant input, given that it can impact a wide range of species.

A general estimated rate of 5-15% was applied to all the risks related to misreporting/failing to report catch, thus reflecting the inconsistent quality of the national reported catch data and the historical inadequacies within Thailand's catch reporting mechanisms. However, this lower estimate range also takes into account that, during the period of this study, the unlicensed portion of Thailand's national fleets has been significantly smaller than the licensed portion (see section 1.1.2) and therefore the modifying effect of misreported catches is likely to be lower than the effect of the unlicensed catches which have been allocated higher values.

Factors such as the use of prohibited and destructive gear, harvest of ETP species, fishing inside spatio-temporal closures and the various post-harvest risks, although important to the risk assessment component of the Thailand analysis, would not add to the estimated level of IUU fishing and are therefore not assigned separate rate estimation values.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in Thailand's EEZ can be found in Table 145.

Table 145 Summary of estimated rates – Thailand.

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by national trawl fleet	3	Mixed demersals	1990-2013	15	60	0	0
Unlicensed/unauthorised fishing by national purse seine fleet	2	Tuna and tuna-like species, small pelagics	1990-2013	15	60	0	0
Unlicensed/unauthorised fishing by national small-scale fleet	1	Mixed demersals	1990-2013	10	30	0	0
Unlicensed/unauthorised fishing by foreign fleets	4	Mixed	1990-2013	5	10	0	0
Misreporting of/unreported catch by national fleets	1,3	Mixed demersals	1990-2013	0	0	5	15
Misreporting of/unreported catch by national fleets	2	Tuna and tuna-like species, small pelagics	1990-2013	0	0	5	15
Misreporting of/unreported catch by licensed foreign fleets	4	Mixed	1990-2013	0	0	5	15
Fishing within closed areas	All	Mixed	1990-2013	0	0	0	0

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Use of prohibited and destructive gears	All	Mixed	1990-2013	0	0	0	0
Unreported and unregulated transshipment	2,3,4	Mixed	1990-2013	0	0	0	0
Landing of IUU catch in national ports by national and foreign vessels	All	Mixed	1990-2013	0	0	0	0
Entry of IUU catch (both from Thai vessels and foreign imports) into fishmeal/aquaculture/processing supply chains	All	Mixed	1990-2013	0	0	0	0
Harvest of ETP species	All	Sharks, turtles, sea cucumbers, corals, rare reef fish	1990-2013	0	0	0	0

5.17.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 955,249 and 3,078,023 t per annum (i.e. 40.10 and 129.21%). Illegal catches contribute an estimated 26.73%-89.11% and unreported catches 13.37%-40.10% in addition to the reported catch. Losses from Illegal, Unreported and Unregulated fishing in the Thai EEZ are estimated to average between USD 1,024.61 and 3,023.69 million, the second largest in the region.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 146 and as first landed value in Table 147. Profiles of the estimated level of illegal and unreported fishing combined in Thailand can be found in Figure 40 (catch in t) and Figure 41 (catch value in USD).

Table 146 Summary of estimated IUU by year in Thailand (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	2362777	654599	2181998	327300	981899	0	0
1991	2480625	693365	2311218	346683	1040048	0	0
1992	2740217	767149	2557164	383575	1150724	0	0
1993	2752549	764075	2546916	382037	1146112	0	0
1994	2818799	774350	2581166	387175	1161525	0	0
1995	2844409	776819	2589396	388409	1165228	0	0
1996	2808058	753138	2510460	376569	1129707	0	0
1997	2699227	724812	2416039	362406	1087218	0	0
1998	2729639	735666	2452219	367833	1103499	0	0
1999	2745468	722500	2408332	361250	1083749	0	0
2000	2795719	739091	2463635	369545	1108636	0	0
2001	2631474	694143	2313811	347072	1041215	0	0
2002	2643728	689898	2299660	344949	1034847	0	0
2003	2651223	686846	2289488	343423	1030270	0	0
2004	2635969	682634	2275446	341317	1023951	0	0
2005	2615565	679595	2265315	339797	1019392	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	2484803	648611	2162038	324306	972917	0	0
2007	2079351	537257	1790858	268629	805886	0	0
2008	1644832	438999	1463329	219499	658498	0	0
2009	1663846	442834	1476112	221417	664250	0	0
2010	1601320	424628	1415427	212314	636942	0	0
2011	1610418	428020	1426732	214010	642029	0	0
2012	1500200	391972	1306574	195986	587958	0	0
2013	1630047	432977	1443255	216488	649465	0	0

Table 147 Summary of the estimated value of IUU (USD) by year in Thailand (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	4120.72	747.57	2198.68	447.09	1341.27	0.00	0.00
1991	4200.29	762.16	2239.07	456.44	1369.33	0.00	0.00
1992	4498.02	812.92	2385.03	487.64	1462.91	0.00	0.00
1993	4440.25	809.99	2388.93	482.76	1448.27	0.00	0.00
1994	4488.35	804.13	2361.61	481.77	1445.30	0.00	0.00
1995	4435.86	788.23	2311.64	473.06	1419.18	0.00	0.00
1996	4456.30	775.33	2263.62	467.87	1403.60	0.00	0.00
1997	4219.67	734.56	2145.26	443.09	1329.28	0.00	0.00
1998	4252.70	735.87	2142.86	445.44	1336.32	0.00	0.00
1999	4091.89	702.04	2050.49	423.44	1270.32	0.00	0.00
2000	4078.37	701.21	2048.95	422.71	1268.14	0.00	0.00
2001	3995.84	689.44	2015.78	415.31	1245.93	0.00	0.00
2002	4030.19	684.70	1994.68	414.26	1242.78	0.00	0.00
2003	3973.87	677.42	1980.02	408.22	1224.67	0.00	0.00
2004	3862.45	659.46	1930.23	396.72	1190.15	0.00	0.00
2005	3763.37	644.46	1888.23	387.23	1161.68	0.00	0.00
2006	3441.47	584.95	1709.60	352.53	1057.59	0.00	0.00
2007	3025.03	512.40	1496.51	309.07	927.21	0.00	0.00
2008	2334.42	400.59	1168.14	242.08	726.25	0.00	0.00
2009	2484.27	426.58	1243.27	257.96	773.88	0.00	0.00
2010	2608.47	439.24	1268.74	268.47	805.42	0.00	0.00
2011	2547.35	422.67	1214.28	259.99	779.98	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2012	2394.90	396.17	1140.56	243.09	729.27	0.00	0.00
2013	2578.56	428.84	1233.26	263.47	790.40	0.00	0.00

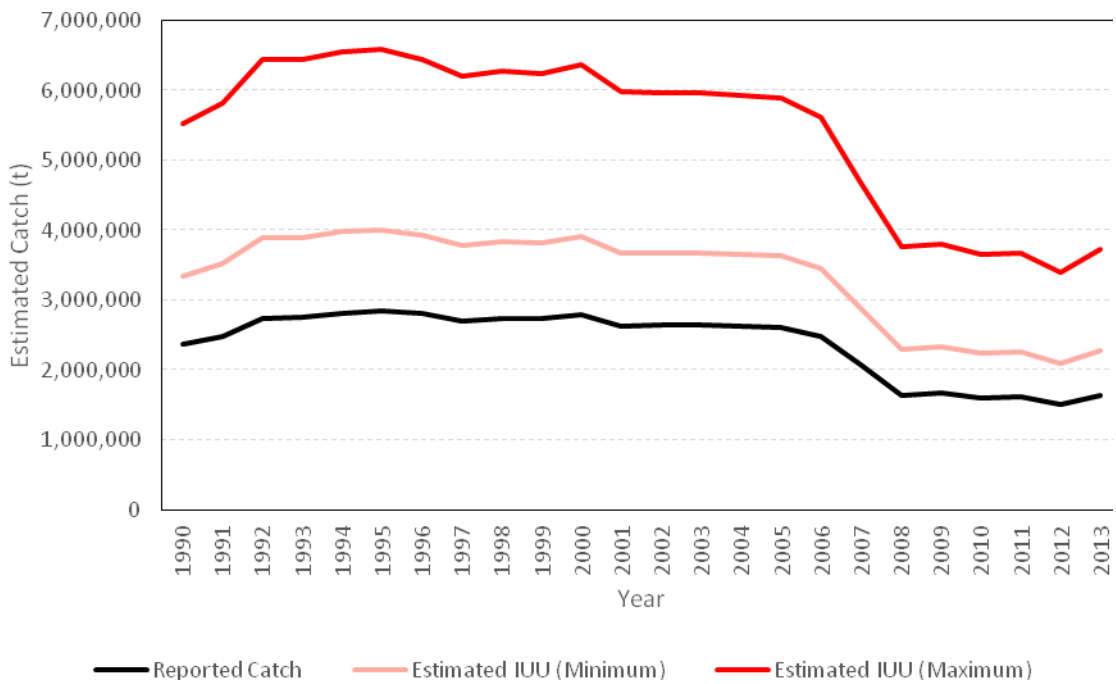


Figure 40 IUU Catch Profile (Thailand) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

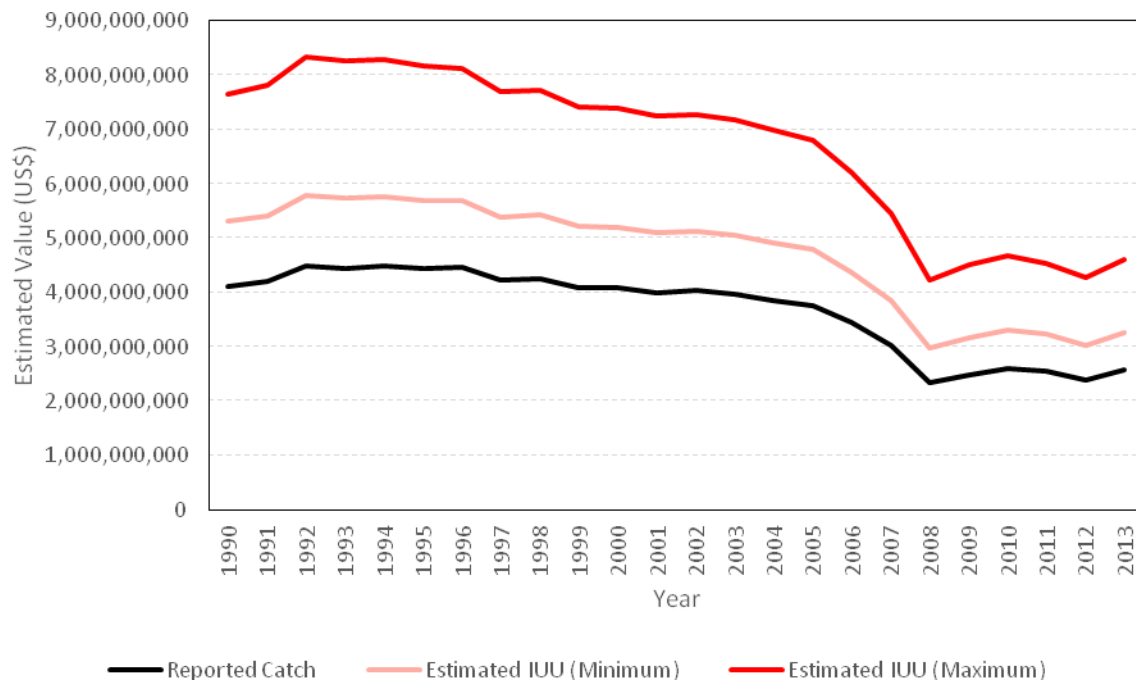


Figure 41 IUU Catch Value Profile (Thailand) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

5.18 Vietnam

5.18.1 Introduction

The Vietnamese EEZ covers an area of 179,900 km² with an additional area of 31,470 km² defined as territorial sea and 15,840 km² as contiguous zone. The Vietnamese EEZ shares borders with Cambodia and Thailand (maritime only) to the west, Malaysia and Indonesia to the south and the PR China to the north. To the east lie the disputed territories in the South China Sea that are claimed by Vietnam along with China, Taiwan (Province of China), the Philippines and Indonesia). If Vietnam’s claims to the disputed areas are included then the total national EEZ amounts to c. 418,000 km² (Teh *et al.*, 2014). A historical disputed area also exists on the boundary with Cambodia, over which the two neighbouring States signed an agreement in 1982 placing an area of over 8000 km² between the two countries in the Gulf of Thailand under the status of “historic internal waters”. In 2012 the Vietnamese government approved an aquatic resources strategy which included the establishment of 10 MCZs by 2015, as part of moving towards an eventual total of 16 national MCZs/MPAs²⁵⁵.

²⁵⁵ Decision No.188/QĐ-TTg of February 13 2012, approving the Program on protection and development of aquatic resources through 2020.

Vietnam's marine fisheries accounted for 87% of the country's total fisheries yield between 1990 and 2010, in addition to 10% of total export income (Teh *et al.*, 2014). The country's government have designated a number of ambitious growth targets for the national fisheries sector, aiming for 11% annual growth between 2011 and 2020 to achieve 7 million tonnes of yield at an export value of \$11 billion, and a further increase to 9 million tonnes and \$20 billion by 2030²⁵⁶. In comparison to these targets, as of 2005 Vietnam's fisheries exports were valued at just USD 2.35 billion (FAO, 2005). Recent declines in national fisheries catch have been reported, with CPUE dropping from 0.6 tonnes per HP in 1994 to less than 0.4 tonnes per HP by 2004²⁵⁷.

5.18.2 Fleet breakdown

Vietnam's national fishing fleets have historically been broadly divided into nearshore and offshore categories, with nearshore vessels classed as those operating at no deeper than 30-50m (depending on the region) in addition to having an engine of less than 90 HP (Teh *et al.*, 2014). Nearshore vessels account for a significantly larger proportion of the overall fleet capacity, estimated at around 86% in 2010, and the Vietnamese government has emphasised the importance of reducing the size of the unsustainably large fleet of small boats exploiting nearshore areas. In 2005 Vietnam's total fishing fleet was estimated at 81,000 vessels, of which 20,000 were operating in offshore areas and only around 100 were capable of deep sea fishing (FAO, 2005). Moreover, the fleet has undergone a significant period of mechanisation during the time covered by this study, with 44,000 mechanised vessels in 1991 (824,000 HP) up to 95,000 (5,735,000 HP) by 2006 (Pomeroy *et al.*, 2009). A 2010 national media article claimed that the fleet had since grown to 130,000 vessels, but this claim could not be verified²⁵⁸. A breakdown of the Vietnamese fleet can be found in Table 148.

²⁵⁶ Prime Ministerial Decision, Approval of the Master Plan for the Development of Seafood 2020, Vision 2030.

²⁵⁷ Fisheries strategy awaits finalisation - Environment - VietNam News," 2005.

²⁵⁸ ("EU rules challenge seafood exporters - Business - VietNam News," 2010)

Table 148 Fleet breakdown for Vietnam.

Fleet	Description	Gear	Flag(s)	Target species	Comment
1	National nearshore fleet	Small gillnets and trawls, handlines, traps, other small gears.	Vietnam	Shrimp, cuttlefish, mixed demersal and reef fish, 'trash fish'	
2	National offshore fleet	Trawl, purse seine, gill nets	Vietnam	Tuna and tuna-like species, scads, mackerel, jacks, bream, lizardfish, 'trash fish'	
3	Chinese industrial fleet	Trawl, purse seine, longline, other industrial gears	China	Small pelagics, squid, other mixed species	
4	Other foreign fleets	Mixed gears	Myanmar, Thailand	Mixed species	

5.18.3 Catch breakdown by fleet

The value of Vietnam's reported catches in terms of being able to breakdown the catch by fleet is significantly undermined by the highly aggregated nature of the data, with "Marine fishes *nei*" accounting for 73.8% of the total 29,032,998 tonnes between 1990-2010, followed by cephalopods *nei* at 10.3%. A number of tuna and tuna like species are identified to species level within the data (skipjack, yellowfin, bigeye and albacore tuna in addition to blue marlin, black marlin and swordfish), presumably to meet RFMO reporting requirements, however these account for only 1.9% of recorded catch when combined. Overall the standard of Vietnam's reported fisheries catch has been described as insufficient to provide the basis for management decisions, with significant under-reporting of total catch (Teh *et al.*, 2014).

The SAU reconstructed data estimates a catch of nearly double the FAO data between 1990 and 2010 with a total of 52, 227, 039 tonnes and indeed the total catch reconstruction between 1950 and 2010 totalled 79 million tonnes, a 75% increase on national reported catches for the same

period. The largest proportion of the SAU catch reconstructions is accounted for by lizardfish *nei* at 16.4%, followed by the broad category of pelagic percomorphs *nei* at 8.7% and ponyfishes/slipmouths *nei* at 8.3%.

The Vietnamese catch has been split along the lines of target specie of the inshore and offshore fleets as described in Table 148, with the tuna and tuna-like species, scads, mackerel, jacks, bream, and lizardfish (identified in the FAO catch statistics as all species belonging to the ISSCAAP group “Tuna, bonitos, billfishes” being allocated to the offshore fleet and all other species groups to the inshore fleet.

5.18.4 IUU influencing factors

5.18.4.1 Legislation and governance

Vietnam’s marine fisheries are regulated primarily by the Fisheries Law of 2003²⁵⁹, with the Ministry of Fisheries Vietnam (MOFI) responsible for governing the sector, with certain responsibilities such as implementation of national policy, some aspects of reporting and MCS activities devolved to ‘Provincial People’s Committees’ (PPCs) (Pomeroy *et al.*, 2009). Vietnam signed the UNCLOS Convention in 1994, and is listed as a Cooperating Non-Member of WCPFC. However, the country is not currently a member of any relevant RFMOs nor has been for the duration of the study. Vietnam is also yet to produce an NPOA-IUU or any other similar action plans in line with international recommendations.

5.18.4.2 Licensing and reporting requirements

The Fisheries Law stipulates that all organisations and individuals involved in fishing activities must obtain a licence with the exception of those not operating from vessels or using vessels of less than 0.5t, with licences specific to fishery, gear, fishing grounds and duration of the licence (Article 16). A vessel must also be registered before a licence can be granted (Article 17). All individuals and organisations in possession of a fishing licence are also required to report their catch according to the location of the relevant vessel’s registration, with masters of vessels responsible for completing a logbook (Article 19). A frame survey method has been used during the study period of this project to estimate catches, although the validity of this approach has been criticized (van Zwieten *et al.*, 2002).

All fishing vessels are subject to inspection with the exception of non-motorised vessels below 15m in length or motorised vessels with less than 20 HP. Provision for a specialised fisheries inspection force is included in the legislation (Article 53), and responsibility for inspections is divided between the MOFI and PPCs depending on the size of the vessel (Article 39). Despite these various provisions,

²⁵⁹ The Fisheries Law of 2003, National Assembly of the Socialist Republic of Vietnam.

there is no stated requirement for national vessels to carry VMS equipment (beyond those stated for vessels fishing within RFMO waters), and regulation of transshipment activities is also lacking. However, as part of its long term marine strategy, the government has stated the importance of developing a fleet of motherships to facilitate a national transshipment programme. The Fisheries Law also makes provisions for foreign fishing vessels, which are only permitted within Vietnamese waters based on 'annual allowable catch capacity' under bilateral agreements or treaties (Article 50).

5.18.4.3 Restrictions, fines and penalties

A 2010 government decree, pursuant to the Fisheries Law, set out a detailed fisheries zoning system, divided into coastal, inshore and offshore areas²⁶⁰. Each zone carries a set of restrictions, with vessels of greater than 90 HP only permitted in the offshore area, vessels of 20-90HP not permitted in the coastal area, and vessels of less than 20 HP or non-motorised vessels confined to the coastal area only. The text also states that 'vessels netting small fishes and mollusks (sic)' are not subject to any capacity limitations within the coastal and inshore zones.

The legislation prohibits the 'illegal exploitation and destruction' of coral reefs, mangroves and various other marine habitats, in addition to any exploitation of fish on 'prohibited lists' or encroachment into marine protected areas and other spatio-temporal closures. Various destructive fishing methods are also banned, with explosives, poison and electric techniques specifically referred to in the text (Article 6).

Punishments for violations of the fisheries legislation are stated as administrative or criminal depending on the seriousness of the offence (Article 58), however no specific fines or penalties are set out within the text of the Fisheries Law. However an additional piece of legislation was promulgated in 2004 which imposed some penalties for foreign vessels, specifically VND10-20 million (approx. USD 450 – 900) for failing to take back fishing equipment after use and up to VND 500 million (USD 22,500) for illegal fishing²⁶¹.

5.18.4.4 MCS protocols and capacity

MCS and maritime enforcement is carried out by the Vietnam Coastguard with support from the Border Guard. Furthermore, in 2012, a national fisheries resources surveillance force was established by the Vietnamese government as a specialised unit within MOFI, tasked with enforcing fisheries legislation through patrols and the detection of violations²⁶². However, throughout the period of this study references to MCS effort within the Vietnamese EEZ has been sporadic and often

²⁶⁰ Decree No.33/2010/ND-CP of March 31, 2010, on the management of fishing activities in sea areas by Vietnamese organisations and individuals.

²⁶¹ Decree No. 137.2004/ND-CP of June 21, 2004.

²⁶² Decree No.102/2012/ND-CP of November 29, 2012, on the organisation and operation of the fisheries resources surveillance force.

ineffective, with capacity lacking in both nearshore and offshore areas and insufficient resources available to the PPCs (Pomeroy *et al.*, 2009). Moreover enforcement capacity specifically around MPAs was quoted by the IUCN as ‘weak to non-existent’²⁶³.

5.18.4.5 Port state

The Fisheries Law mandates PPCs to oversee the management of fisheries ports and landing sites, according to technical standards issued by the MOFI. However, Vietnam’s port state measures are limited in terms requirements for advance notice of entry and designation of specific landing sites (Edeson *et al.*, 2010), and Vietnam has not ratified the FAO Port State Measures Agreement. Nonetheless it should be noted that a 2012 amendment to the Fisheries Law added a new requirement for foreign vessels operating in Vietnamese waters to only use the ports stated on their licence for fishing activities²⁶⁴. Additional port state procedures were also enacted through a circular in 2011²⁶⁵.

5.18.4.6 Market state

Certain regulations and standards for Vietnam’s seafood markets, imports and exports are set out in the Fisheries Law, however the legislation does not specifically refer to any procedures for detecting or preventing the presence of IUU products in the supply chain. The need for fish materials to have a ‘clear origin’ is stated, but only in terms of ensuring food safety and hygiene (Article 43). It should be noted that, following substantial recent declines in demand for shark fin in Hong Kong and China, Vietnam has been identified as the new leading market for the product in the region²⁶⁶, and has additionally been implicated in the illegal export of sea turtles²⁶⁷.

In 2011 additional measures were taken to meet the requirements of exporting seafood to the EU, the largest consumer market for Vietnamese seafood, in the aftermath of the EU IUU Regulation. These include the requirement for catch certificates, in addition to statements of export for imported products destined for processing with Vietnam, with the aim of ensuring that supply chains to the EU do not contain seafood from IUU sources²⁶⁸. Moreover the measures contain provisions

²⁶³ (“New marine admin model sought - Society - VietNam News,” 2015)

²⁶⁴ Decree No.53/2012/ND-CP of June 20, 2012, amending and supplementing a number of articles of the decrees on fisheries.

²⁶⁵ Circular No.28/2011/TT-BNNPTNT of April 15, 2011, providing the validation of catch certificates and statements for exportation into the European market.

²⁶⁶ (“WWF Hong Kong - WWF Announces Changes in Shark Fin Trade Figures – Imports Drop Over 30 Per Cent,” 2014.)

²⁶⁷ (“Vietnam seizes over 1,000 dead endangered sea turtles | Environment | The Guardian,” 2013.)

²⁶⁸ Circular No.28/2011/TT-BNNPTNT.

for the new requirements to be enforced through inspections, which are required to validate catch certificates.

Under the EU's conditions, all Vietnamese fishers were required to complete logbooks for each individual fishing trip, however low literacy and awareness levels amongst fishers hindered the implementation of this measure²⁶⁹. Nonetheless, by July 2011 it was reported that the EU had granted export permits to 380 Vietnamese seafood companies²⁷⁰.

5.18.5 Summary of IUU incidences

The evidence of IUU incidences collected during the literature and media review is summarised below. The acknowledged IUU hotspot of the waters disputed by Vietnam and China in the Gulf of Tonkin will be discussed separately to other incidences involving national or foreign fleets.

5.18.5.1 China-Vietnam disputed waters

The waters of the Gulf of Tonkin (also known as the Beibu Gulf) are claimed by both Vietnam and China, with the consequence that both countries accuse the other of undertaking IUU fishing activities in the other's EEZ, despite the fact that authorised transboundary fishing was authorised in a 'Common Fishing Zone' within the disputed waters. Evidence suggests that significant IUU fishing incursions are made by the fleets of both nations, with 700-850 Chinese vessels and over 3,500 Vietnamese vessels alleged to fish annually in waters claimed by both sides (Funge-Smith *et al.*, 2015). Moreover, a 2014 article reported that Vietnamese forces had expelled over 9,500 Chinese vessels from national waters in the Gulf of Tonkin in the preceding decade²⁷¹. Several news reports describe clashes involving Vietnamese fishers and Chinese enforcement assets, with Vietnamese nationals killed in a 2014 incident in addition to several arrests²⁷². Aside from the fishing activity itself, certain Vietnamese vessels are also alleged to land their catch at Chinese-owned Hainan Island (Funge-Smith *et al.*, 2015). Data on IUU events earlier than this are not available online but it is presumed that a similar level of IUU fishing has taken place throughout the study period.

5.18.5.2 Other national fleet incidences

Limited evidence of IUU fishing by Vietnamese nationals within the country's EEZ was uncovered by the online media review. A 2008 article reported pervasive illegal fishing in southeast Camau province by fishers from the local community, stating that the maximum fine of VND 500,000 was an

²⁶⁹ ("Fishermen unaware of new EU rule - Industries - VietNam News," 2009.)

²⁷⁰ ("More seafood companies to export to EU - Economy - VietNam News," 2011)

²⁷¹ ("Over 9,500 Chinese ships illegally fish in Tonkin Gulf in last decade: report," 2014)

²⁷² ("Diplomats travel to Hainan to visit detained fishermen - VietNam News," 2005)

insufficient deterrent, with fishers able to pay and immediately return to fishing²⁷³. In addition, a report from 2015 highlighted the involvement of national fishers in dynamite fishing around Ly Son Island in Quang Nai central province, as well as the encroachment of large vessels into nearshore fishing zones in the same area²⁷⁴. Both these articles indicate the occurrence of IUU fishing by national vessels on a substantial scale in areas of Vietnam, rather than only referring to individual incidents. Indeed the use of other types illegal and destructive gears by the national artisanal fleet, including cyanide, trawls, various nets with small mesh sizes and pushnets, has been previously highlighted (MRAG, 2005). Spatio-temporal closures are also acknowledged to be widely violated, with negative impacts on protected areas and the spawning and feeding grounds of target species²⁷⁵. Moreover the illegal fishing of ETP species in Vietnam is alleged to be rampant, with a single seizure by enforcement agencies in Nha Trang province in 2013 uncovering a haul of 1,000 dead turtles destined for export²⁷⁶.

However, it should be noted that the majority of the collated reports of IUU fishing involving Vietnamese-flagged vessels refer to arrests in the EEZs of other states in the region, indicating that Vietnamese nationals are involved in widespread IUU activities throughout Southeast Asia. Arrests of Vietnamese fishers appeared to occur most frequently in Indonesian and Bruneian waters, with incidents also reported in the Philippines, Thailand, Malaysia, Cambodia and Palau. It has also been reported that the Philippines and Vietnam had recently attempted to reduce IUU incidents involving fleets of the two states by establishing an illegal fishing ‘hotline’ in 2015 to improve communication²⁷⁷.

5.18.5.3 Other foreign fleets

Online media contained limited references to fishing by foreign fleets in Vietnam aside from the Chinese, however a report from a Myanmar news outlet reported the arrest of 64 Burmese and Thai nationals for encroaching within Vietnam’s EEZ²⁷⁸. Other sources also indicate a significant presence of illegal Thai vessels, with 11 vessels and 119 crew reportedly arrested for violating Vietnamese territory in 2003. The vessels were released following an administrative penalty from national authorities (MRAG, 2005).

²⁷³ (“Authorities struggle with fight against illegal fishing - Economy - VietNam News,” 2008.)

²⁷⁴ (“Ly Son’s marine resources diminish - Society - VietNam News,” 2015.)

²⁷⁵ Prime Ministerial Decision, Approval of the Master Plan for the Development of Seafood 2020, Vision 2030.

²⁷⁶ (“Vietnam seizes over 1,000 dead endangered sea turtles | Environment | The Guardian,” 2013.)

²⁷⁷ (“Philippines, Vietnam establish ‘hotline’ to fight illegal fishing | Headlines, News, The Philippine Star | philstar.com,” 2015.)

²⁷⁸ (“Vietnam Detains 64 Fishermen from Burma, Thailand,” The Irrawaddy, n.d.)

5.18.6 IUU risk identification

5.18.6.1 Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone

A portion of Vietnam's large nearshore fleet (vessels less than 0.5 tonnes) are exempted from fishing licence requirements, and therefore should not be considered under this risk category. However, given the large and heterogeneous nature of Vietnam's nearshore fleet, the risk of unlicensed and unauthorised fishing by this segment requires consideration. The national offshore fleets will also be considered separately under this category. Moreover, given the evidently large proportion of foreign IUU fleets accounted for by China, the Chinese fleet will be risk assessed separately from fleets of other flags.

5.18.6.2 Non-compliance with reporting obligations by licenced/authorised vessels

In light of the reporting obligations stated in the Fisheries Law for Vietnamese nationals, a risk of non-compliance by both domestic fleet segments is evident, in addition to a further risk within this category for foreign vessels.

5.18.6.3 Non-compliance with other licence conditions and/or legislation

Given the references to violations of protected areas and other closures in the literature on IUU fishing in Vietnam, the risk of fishing inside spatio-temporal closures will be assessed. The use of prohibited and destructive gears is also widely reported in national waters.

5.18.6.4 Post-harvest IUU

Transshipments are not specifically outlawed in the reviewed Vietnamese legislation, and therefore any the risk of transshipment within the EEZ should be considered as unreported and unregulated rather than illegal. An evident risk of landing catch outside national ports also exists in Vietnam, although it should be noted that this is a localised risk, referring primarily to Vietnamese vessels operating in the Beibu Gulf which land illegally in China. Moreover the potential for IUU fishing products to be imported and exported through Vietnam's markets will also be assessed.

5.18.6.5 Other offences

Substantial evidence indicates the illegal harvest of ETP species such as sharks and turtles in Vietnam, and this risk will therefore be included in the assessment. Moreover the risk of industrial vessels illegally fishing in zones reserved for artisanal purposes will be evaluated separately to other spatio-temporal closure violations.

A summary of the specific risks identified in Vietnam can be found in Table 149.

Table 149 Specific risks identified for Vietnam.

Risk category	Specific risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone.	Unlicensed/unauthorised fishing by national nearshore fleet
	Unlicensed/unauthorised fishing by national offshore fleet
	Unlicensed/unauthorised fishing by Chinese fleet
	Unlicensed/unauthorised fishing by other foreign fleets
Non-compliance with reporting obligations by licenced/authorised vessels	Unreported/misreporting of catch by national nearshore fleet
	Unreported/misreporting of catch by national offshore fleet
	Unreported/misreporting of catch by foreign fleets
Non-compliance with other licence conditions and/or legislation	Fishing inside spatio-temporal closures
	Use of prohibited and destructive gears
Post-harvest IUU	Unreported transshipment
	Landing of catch outside of national ports
	Export of IUU catch
Other offences	Harvest of ETP species
	Incursion of industrial fisheries into restricted artisanal zones

5.18.7 Risk assessment

The following tables represent the results of the risk assessment process, detailing the assessment of risk likelihood (Table 150) the assessment of risk impact (Table 151) and the level of inherent risk for Vietnam (Table 151) across the specific risks summarised in Table 148.

Table 150 Assessment of risk likelihood – Vietnam.

Specific risk	Incentives	Deterrents	Likelihood
Unlicensed/unauthorised fishing by national nearshore fleet	High	Weak	Likely
Unlicensed/unauthorised fishing by national offshore fleet	High	Weak	Likely
Unlicensed/unauthorised fishing by Chinese fleet	Very High	Very Weak	Almost Certain
Unlicensed/unauthorised fishing by other foreign fleets	High	Weak	Likely
Unreported/misreporting of catch by national nearshore fleet	High	Moderate	Likely
Unreported/misreporting of catch by national offshore fleet	High	Moderate	Likely
Unreported/misreporting of catch by foreign fleets	High	Very Weak	Almost Certain
Fishing inside spatio-temporal closures	Moderate	Weak	Likely
Use of prohibited and destructive gears	High	Very Weak	Almost Certain
Unreported transshipment	Moderate	Weak	Likely
Landing of catch outside of national ports	High	Weak	Likely
Export of IUU catch	High	Moderate	Likely
Harvest of ETP species	Moderate	Weak	Likely
Incursion of industrial fisheries into restricted artisanal zones	Very High	Very weak	Almost Certain

Table 151 Assessment of risk impact – Vietnam.

Specific risk	Catch	Vulnerability	Impact
Unlicensed/unauthorised fishing by national nearshore fleet	High	Vulnerable	Major
Unlicensed/unauthorised fishing by national offshore fleet	High	Moderate	Major
Unlicensed/unauthorised fishing by Chinese fleet	Very High	Vulnerable	Serious
Unlicensed/unauthorised fishing by other foreign fleets	Moderate	Vulnerable	Major
Unreported/misreporting of catch by national nearshore fleet	High	Vulnerable	Major
Unreported/misreporting of catch by national offshore fleet	High	Vulnerable	Major
Unreported/misreporting of catch by foreign fleets	Moderate	Moderate	Moderate
Fishing inside spatio-temporal closures	Moderate	Moderate	Moderate
Use of prohibited and destructive gears	High	Highly Vulnerable	Serious
Unreported transshipment	Low	Moderate	Minor
Landing of catch outside of national ports	Moderate	Moderate	Moderate
Export of IUU catch	High	Moderate	Major
Harvest of ETP species	High	Highly Vulnerable	Serious
Incursion of industrial fisheries into restricted artisanal zones	High	Highly Vulnerable	Serious

Table 152 Assessment of inherent risk – Vietnam.

Specific risk	Likelihood	Impact	Risk
Unlicensed/unauthorised fishing by national nearshore fleet	Likely	Major	High
Unlicensed/unauthorised fishing by national offshore fleet	Likely	Major	High
Unlicensed/unauthorised fishing by Chinese fleet	Almost Certain	Serious	Severe
Unlicensed/unauthorised fishing by other foreign fleets	Likely	Major	High
Unreported/misreporting of catch by national nearshore fleet	Likely	Major	High
Unreported/misreporting of catch by national offshore fleet	Likely	Major	High
Unreported/misreporting of catch by foreign fleets	Almost Certain	Moderate	High
Fishing inside spatio-temporal closures	Likely	Moderate	High
Use of prohibited and destructive gears	Almost Certain	Serious	Severe
Unreported transshipment	Likely	Minor	Moderate
Landing of catch outside of national ports	Likely	Moderate	High
Export of IUU catch	Likely	Major	High
Harvest of ETP species	Likely	Serious	Severe
Incursion of industrial fisheries into restricted artisanal zones	Almost Certain	Serious	Severe

5.18.8 Impacts of IUU

With the exception of unreported transshipments, all the specific risks identified for Vietnam were scored at a high or severe level, reflecting the pervasive and damaging nature of IUU activities within the EEZ.

Unlicensed and unauthorised fishing activities by Chinese fleets (incursions into disputed territory by Vietnam) was classed at a severe level given the size of the industrial fleet involved and therefore

the large quantity of catch, in addition to the minimal deterrents from Vietnam given that China also lays claim to the fishing grounds. The Chinese vessels are likely to target commercially valuable species such as small pelagics, squid, tuna and tuna-like species, threatening depletion of key stocks and out-competing Vietnam's fishing fleets operating in the same area. The combination of the disputed nature of the waters and widespread IUU fishing also undermines effective fisheries management and stock assessments for the transboundary stocks involved.

All the other assessed fleet segments, both domestic and foreign, returned a high risk score for unlicensed and unauthorised fishing. These IUU fishing activities are likely to cause significant economic losses to Vietnam, with the unquantified catch and effort of the vessels involved undermining effective management and reducing yields both for small-scale fishers and commercial operators.

Failure to report or misreporting of catch by licensed vessels was also scored at a high level across all fleets, and it should be noted that the portion of the national small-scale fleet exempted from licensing is included in this category. The flaws in Vietnam's catch reporting systems are illustrated by the highly aggregated FAO catch data (see Section 1.1.3) and inadequate catch reporting will inevitably impact fisheries management, with fishing pressure on individual species and critical stocks by Vietnam's legitimate fleets impossible to discern.

A further high risk was assigned to fishing inside spatio-temporal closures, with vulnerable MPAs acknowledged to be poorly protected by enforcement assets and other seasonal closures regularly flouted. The impact of illegal fishing within such closures can be expected to be severe, as such measures are often employed to protect vulnerable habitats such as coral reefs or areas which are critical to fish stock replenishment such as spawning grounds/seasons and nursery areas. Failure to observe such management measures undermines the ability of pressurised stocks to recover, and more broadly threatens biodiversity which may be unable to withstand high levels of extraction. The risk of encroachment into reserved artisanal areas was assessed as a separate risk, and was scored at a severe level, with Vietnam's coastal zone evidently harvested by industrial vessels exceeding the horsepower restrictions. The impacts of industrial vessels encroaching in this manner can be especially severe, with damaging industrial gears such as bottom trawls deployed in sensitive shallow water habitats. Moreover the industrial vessels can deprive coastal communities of socio-economically vital marine resources by outcompeting subsistence and artisanal fishers.

A further severe risk level was identified for the use of prohibited and destructive gears, with reports of a variety of such gears being employed within the Vietnamese EEZ including dynamite, cyanide, trawls, pushnets and small mesh sizes. Such fishing techniques can cause substantial ecological impacts, catching a diverse range of target and non-target species and creating high levels of incidental bycatch. Small mesh sizes on trawl nets prevent juvenile fish from escaping, thus undermining stock recovery, and both trawling and dynamite methods can wipe out benthic habitats, causing long term damage to ecosystem function.

Two post-harvest risks, specifically landing catch outside national ports and the presence of IUU products in national exports, were also both scored at a high level. The documented landing of catch in China by Vietnamese vessels means that the catch will not be monitored in Vietnam and further undermines data availability for effective stock management, in addition to diverting revenue from national catch out of Vietnam. Moreover the documented weaknesses in Vietnam's seafood market

chains during the period of this study (although EU measures in the late 2000s may have improved the situation to some extent) are likely to have facilitated the import and export of illegally caught products. Vietnam's recently increasing prominence as a market for shark fin also increases the likelihood that ETP and CITES listed shark species are passing through national markets in aggregated shipments of shark fin. Furthermore the harvest of ETP species was also assigned a severe risk level, with the evidence indicating deliberate illegal targeting of endangered marine turtles in Vietnam. Turtle species are highly ecologically vulnerable to overfishing, and populations in Vietnamese waters are likely to suffer significant negative impacts from such pressure.

5.18.9 Estimation of rates of Illegal, Unreported and Unregulated fishing

The factors relating to IUU fishing in Vietnam have been applied for specific fleets and to those species targeted as determined species by fleet breakdown allowed this for Vietnamese fisheries.

In terms of the risks identified for the Vietnamese fleet, "Unlicensed/unauthorised fishing by national nearshore fleet" was allocated a rate of between 5 and 30% for the shrimp, cuttlefish and mixed demersal fish targeted. Similarly for the Vietnamese offshore fleet fish tuna and tuna like species and small pelagics a rate of between 5 and 30% was allocated for the majority of the period reduced to 5 to 20% for the most recent period where a reduction due to increased requirements and scrutiny has appeared to reduce the level of illegal fishing. These rates represent the typical rates for these species where a high level of risk has been estimated.

The risk of unlicensed/unauthorised fishing by the Chinese fleet was assessed as severe and therefore a rate of between 15 and 30% has been set. This has a wide range due to the highly unknown nature of the Chinese fleet. These rates have only been applied to those species known to be targeted by this fleet. Other foreign fleets fishing illegally have been set at a lower level of 5 to 15% but this has been applied across the spectrum of fish caught as their target species were not clearly able to be identified.

In terms of misreporting of the national fleet, the nearshore fleet was assigned a rates of 10 to 20% for target species with an additional 100 to 200% allocation based on the shrimp catch to provide an estimate for the under-reporting of the discards from the shrimp fishery. A similar 10 to 20% level was applied to the national offshore fleet for the appropriate target species.

A number of additional risks have been identified such as the use of prohibited and destructive gear, harvest of ETP species, fishing inside spatio-temporal closures and incursion of industrial vessels into restricted artisanal zones as for many other regional States. Post-harvest risks typical of the region such as unreported or illegal transshipment, the landing of catch outside of national ports and the export of IUU catch have also been identified as occurring in Vietnam. Although these risks are important to the overall risk assessment for Vietnam, they would not add to the estimated level of IUU fishing and are therefore not assigned separate rate estimation values.

A summary of the estimated rates of Illegal, Unreported and Unregulated fishing in the Vietnamese EEZ can be found in Table 153.

Table 153 Summary of estimated rates – Vietnam

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
Unlicensed/unauthorised fishing by national nearshore fleet	1	Shrimp, cuttlefish, mixed demersal and reef fish, 'trash fish'	1990-2013	5	30	0	0
Unlicensed/unauthorised fishing by national offshore fleet	2	Tuna and tuna-like species, scads, mackerel, jacks, bream, lizardfish, 'trash fish'	1990-2010	5	30	0	0
			2011-2013	5	20		
Unlicensed/unauthorised fishing by Chinese fleet	3	Small pelagics, squid, other mixed species	1990-2013	15	30	0	0
Unlicensed/unauthorised fishing by other foreign fleets	4	Mixed	1990-2013	5	15	0	0
Unreported/misreporting of catch by national nearshore fleet	1	Shrimp (MZZ discarded) cuttlefish, mixed demersal and reef fish, 'trash fish'	1990-2013	0	0	10	20
						50	200
Unreported/misreporting of catch by	2	Tuna and tuna-like species, scads,	1990-2013	0	0	10	20

Specific risk	Fleet	Species	Period	Rate (Illegal)		Rate (Unreported)	
				Min	Max	Min	Max
national offshore fleet		mackerel, jacks, bream, lizardfish, 'trash fish'					
Unreported/misreporting of catch by foreign fleets	3	Mixed	1990-2013	0	0	0	0
Fishing inside spatio-temporal closures	All	Mixed	1990-2013	0	0	0	0
Use of prohibited and destructive gears	All	Mixed	1990-2013	0	0	0	0
Unreported transshipment	All	Mixed	1990-2013	0	0	0	0
Landing of catch outside of national ports	All	Mixed	1990-2013	0	0	0	0
Export of IUU catch	---	Mixed	1990-2013	0	0	0	0
Harvest of ETP species	All	Sharks, turtles, sea cucumbers, corals, rare reef fish	1990-2013	0	0	0	0
Incursion of industrial fisheries into restricted artisanal zones	2,3,4	Mixed	1990-2013	0	0	0	0

5.18.10 Quantification of Illegal, Unreported and Unregulated fishing

Based on the reported FAO catch data the total illegal and unreported catches represent on average between 501,103 and 1,377,792 t per annum (i.e. 32.98% and 90.69%). Illegal catches contribute an estimated 23-71% and unreported catches 10-20% in addition to the reported catch.

Losses from Illegal, Unreported and Unregulated fishing in the Vietnamese EEZ are estimated to average between USD 669.61 and 1,841.35 million.

The Illegal, Unreported and Unregulated catches compared to the reported catch by year are presented in Table 154 and as first landed value in Table 155. Profiles of the estimated level of illegal and unreported fishing combined in Vietnam can be found in Figure 42 Figure 30 (catch in t) and Figure 43 (catch value in USD).

Table 154 Summary of estimated IUU by year in Vietnam (1990 – 2013).

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	653236	157231	477772	65324	130647	0	0
1991	694248	165092	503747	69425	138850	0	0
1992	729953	173470	529428	72995	145991	0	0
1993	785304	186431	569187	78530	157061	0	0
1994	946322	222333	681247	94632	189264	0	0
1995	990250	230349	708260	99025	198050	0	0
1996	1058708	247507	759691	105871	211742	0	0
1997	1098736	254914	784512	109874	219747	0	0
1998	1155154	265157	819103	115515	231031	0	0
1999	1314593	305698	940045	131459	262919	0	0
2000	1419612	327390	1005029	139634	279267	0	0
2001	1481175	343654	1052933	145784	291567	0	0
2002	1575640	366093	1121314	155173	310345	0	0
2003	1647133	381371	1169467	162184	324368	0	0
2004	1733434	400709	1227972	169941	339883	0	0
2005	1791100	413520	1267663	175534	351067	0	0

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Year	Catch (t)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2006	1823700	421640	1292030	178783	357565	0	0
2007	1876300	433703	1329083	183931	367862	0	0
2008	1946700	450246	1380281	191227	382454	0	0
2009	2091700	483907	1484546	206074	412148	0	0
2010	2220000	512856	1574972	219130	438260	0	0
2011	2308300	531436	1631346	227298	454595	0	0
2012	2510900	568050	1752315	246176	492352	0	0
2013	2608400	585609	1808862	254588	509176	0	0

Table 155 Summary of the estimated value of IUU (USD) by year in Vietnam (1990 – 2013).

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
1990	663.60	165.42	503.21	68.95	137.90	0.00	0.00
1991	721.37	177.57	542.16	74.80	149.61	0.00	0.00
1992	766.21	188.55	575.63	79.41	158.83	0.00	0.00
1993	815.56	200.74	612.90	84.57	169.14	0.00	0.00
1994	1186.35	287.24	879.17	121.87	243.75	0.00	0.00
1995	1289.31	309.68	949.81	132.18	264.36	0.00	0.00
1996	1299.61	313.87	961.74	133.60	267.20	0.00	0.00
1997	1357.77	323.12	995.02	139.51	279.03	0.00	0.00
1998	1461.25	344.30	1063.39	149.91	299.83	0.00	0.00
1999	1600.04	383.78	1178.85	164.51	329.03	0.00	0.00
2000	1913.76	459.84	1411.60	195.94	391.89	0.00	0.00
2001	1999.36	481.87	1477.57	204.78	409.56	0.00	0.00
2002	2124.33	511.48	1568.73	217.61	435.22	0.00	0.00
2003	2233.82	536.18	1646.33	228.73	457.47	0.00	0.00
2004	2250.33	541.29	1662.46	230.80	461.61	0.00	0.00
2005	2348.02	564.49	1733.94	240.71	481.43	0.00	0.00
2006	2386.46	574.44	1763.77	244.69	489.38	0.00	0.00
2007	2463.28	592.95	1820.50	252.53	505.05	0.00	0.00
2008	2569.88	618.66	1898.98	263.40	526.80	0.00	0.00
2009	2763.37	664.88	2040.61	283.22	566.43	0.00	0.00
2010	2928.95	702.70	2158.96	300.18	600.37	0.00	0.00
2011	3046.87	730.46	2240.47	312.20	624.40	0.00	0.00
2012	3285.73	781.11	2403.12	336.46	672.92	0.00	0.00

Year	Catch (million USD)	Illegal		Unreported		Unregulated	
		Min	Max	Min	Max	Min	Max
2013	3400.88	807.26	2485.83	348.17	696.34	0.00	0.00

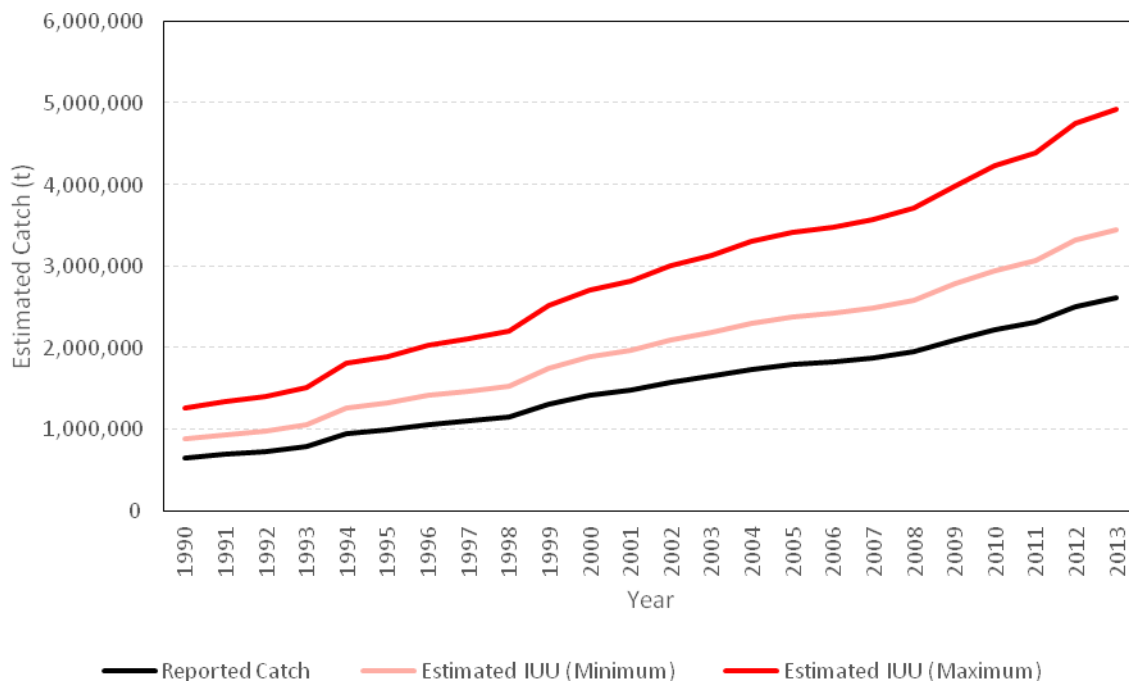


Figure 42 IUU Catch Profile (Vietnam) – Reported catch, estimated lower level of IUU and estimated upper level of IUU (t) 1990-2013.

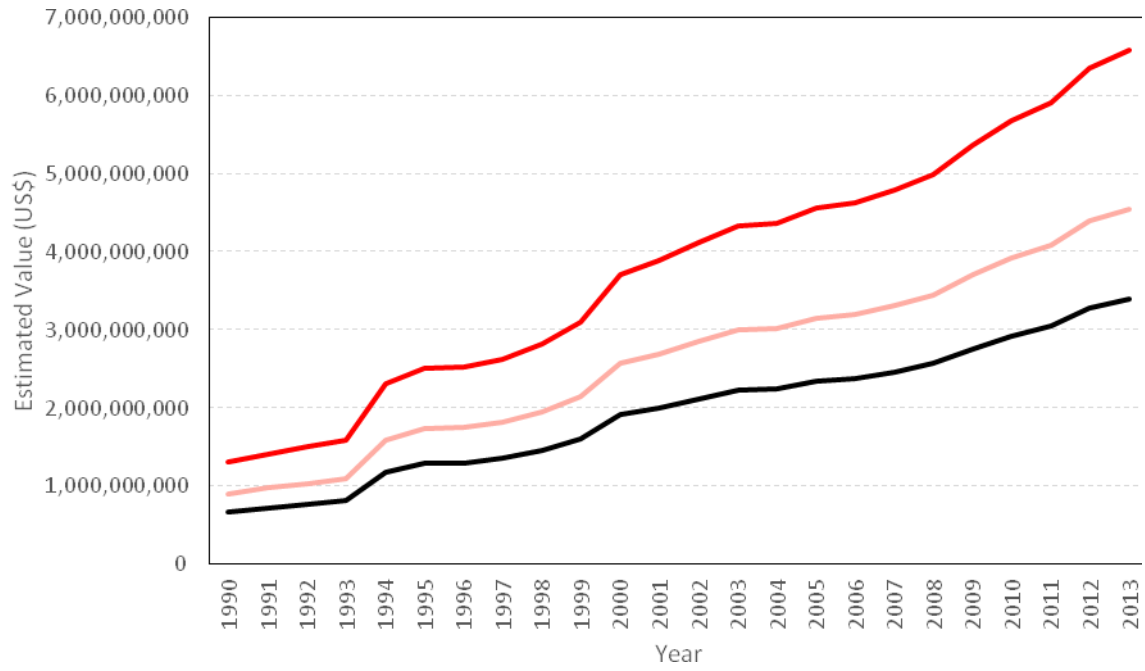


Figure 43 IUU Catch Value Profile (Vietnam) – Reported catch value, estimated lower level of IUU and estimated upper level of IUU (USD) 1990-2013.

6 Regional analysis

6.1 Summary

Overall when combined the average level of IUU catch in the region is approximately 4.5 to 15 million tonnes per year, representing a loss of between USD 6 and USD 21 bn. It should be noted for comparison with the global estimates presented in Agnew *et al.* (2009) that equivalent catches from this region would be estimated at USD 4.05 – USD 13.5 bn. Our current estimate is in line with previous estimates, given the rise in catch in the region over the past 10 years and increases in the prices of many fish species over the same period.

Catch and value profiles for the region over time are presented in Figure 44 and Figure 45, with a breakdown over the period for each country in Table 156 (catch in t) and Table 157 (catch value in USD millions).

6.2 Illegal fishing

Illegal fishing contributes between 16.07 and 50.86% by weight and 13.13 and 40.78% by value to the overall level of IUU across the period 1990 – 2013 in the region. The profiles of illegal catch and catch value against time can be seen in Figure 46 and Figure 47 respectively.

Those countries in the region showing the lowest estimated levels of illegal fishing are those with high proportions of legal tuna fisheries i.e. the British Indian Ocean Territory and the Maldives where high levels of legal catch dominate the catch histories. Those with the highest proportions include Cambodia, Pakistan, East Timor, Thailand and Vietnam. In each of these cases the countries are bordered by nations that fish illegally within the coastal State waters contributing to the high levels of illegal fishing. In terms of catch volume, the country with highest estimated illegal fishing totals was Indonesia. This is simply due to the overall size of Indonesian fisheries.

6.3 Unreported fishing

Unreported fishing contributes between 11.03 and 36.53% by weight and 10.60 and 40.43% by value to the overall level of IUU across the period 1990-2013 in the region. The profiles of unreported catch and catch value against time can be seen in Figure 48 and Figure 49.

Those countries in the region showing the lowest levels of unreported fishing are those with high proportions of legal tuna fisheries and good national catch monitoring and recording i.e. the Maldives or the British Indian Ocean Territory where no commercial national fishery exists. Those with the highest proportions include Cambodia, Myanmar, Pakistan, and Sri Lanka where problems in non- or under-reporting by national fleets are known. The upper limits of the unreported estimates for these countries have often been set artificially high due to lack of data to enable a more well-defined estimate of unreported fishing activity to be made.

6.4 Unregulated fishing

Unregulated fishing, typically takes place beyond waters of national jurisdiction where no RFMO is in place to manage and regulate the fishery. It would only be deemed to occur in national waters if evidence of a complete lack of a regulatory framework for a fishery could be shown (i.e. Somalia

during the civil war). All of the States in the region have a legal framework and management authorities in place and therefore unregulated fishing is not an issue.

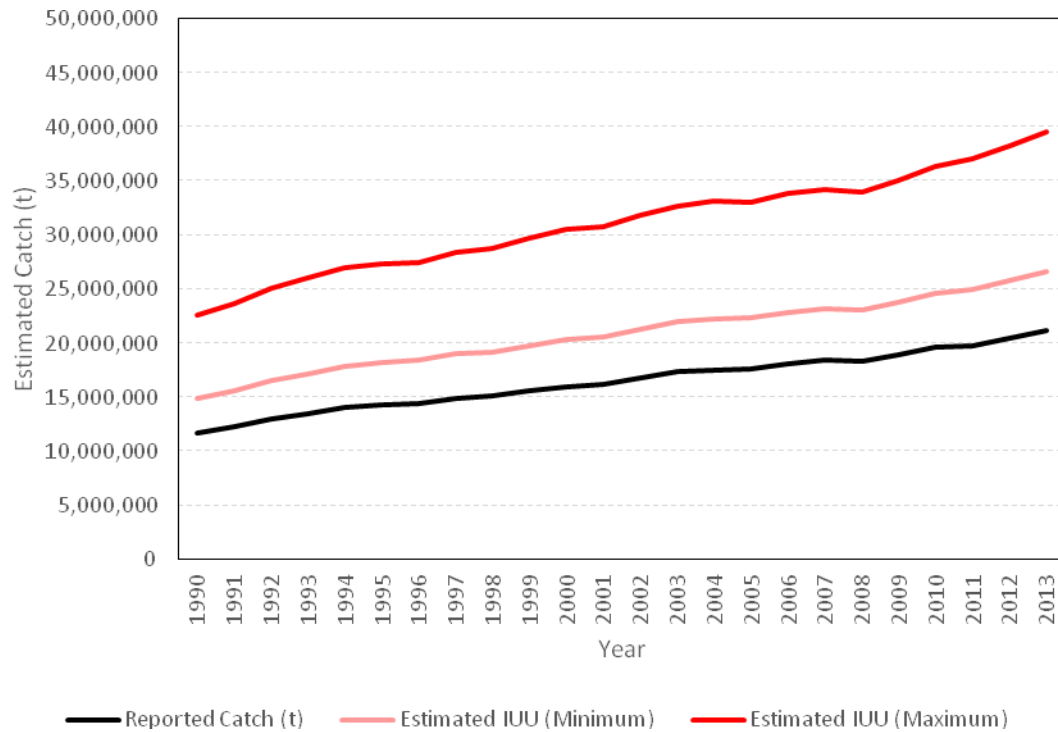


Figure 44 Estimated levels of IUU fishing by weight (t) (minimum and maximum) compared to reported catch for the region (1990-2013).

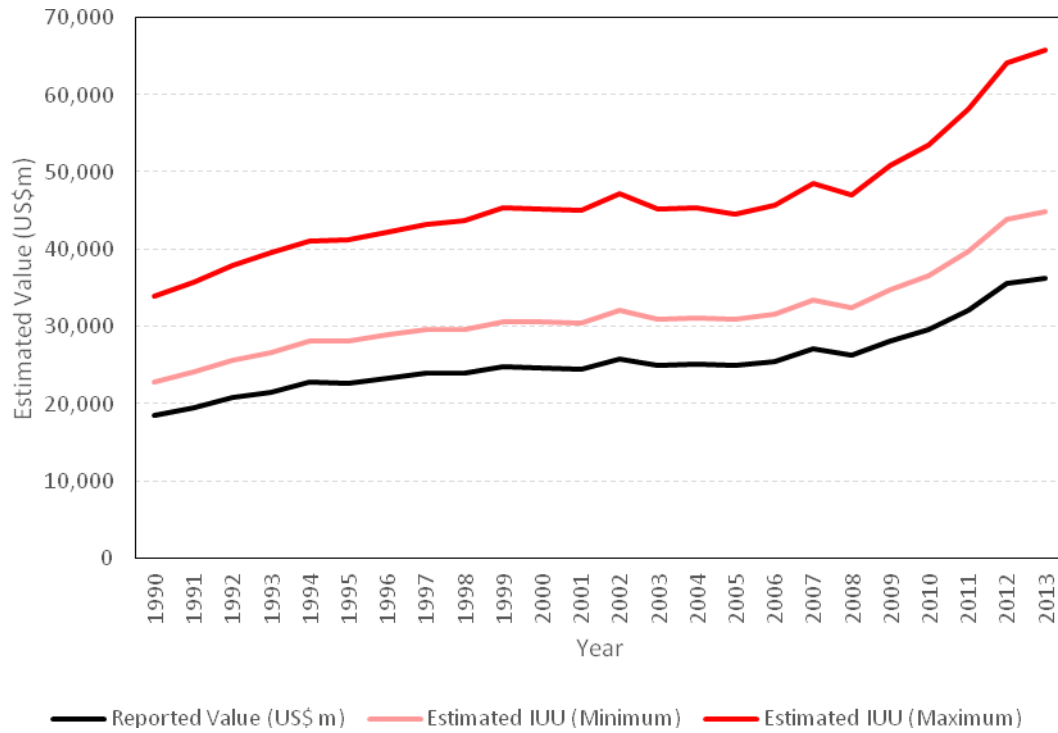


Figure 45 Estimated levels of IUU fishing by value (USD millions) (minimum and maximum) compared to reported value for the region (1990-2013).

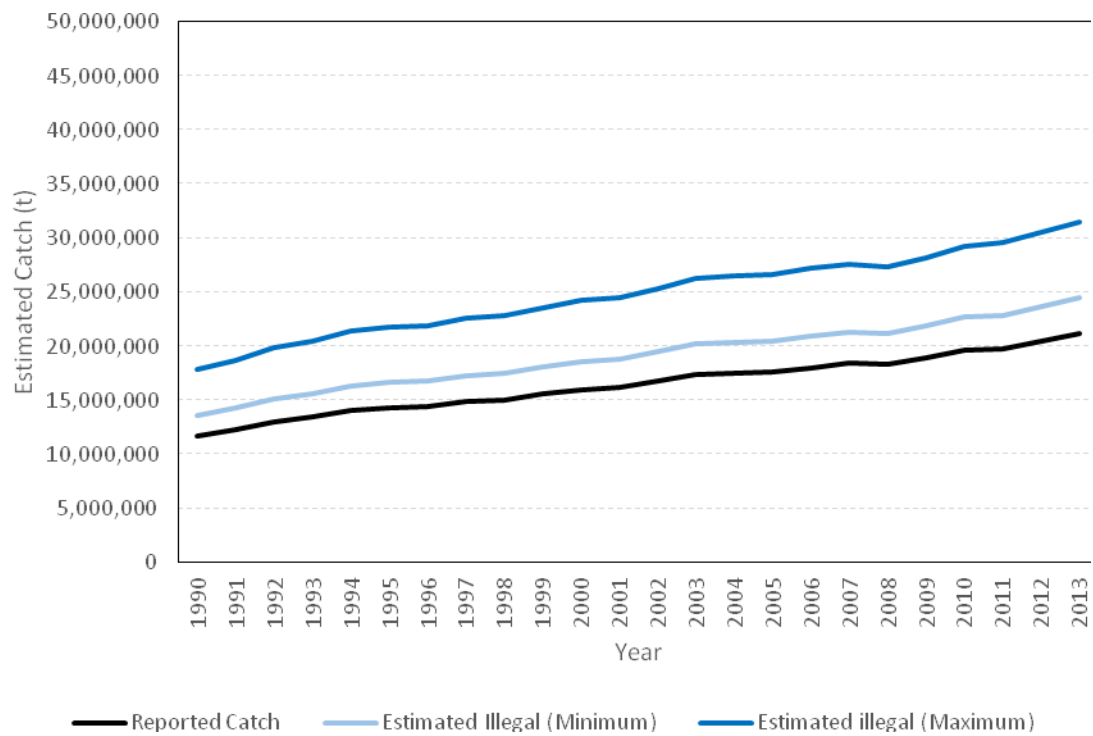


Figure 46 Estimated levels of illegal fishing by weight (t) (minimum and maximum) compared to reported catch for the region (1990-2013).

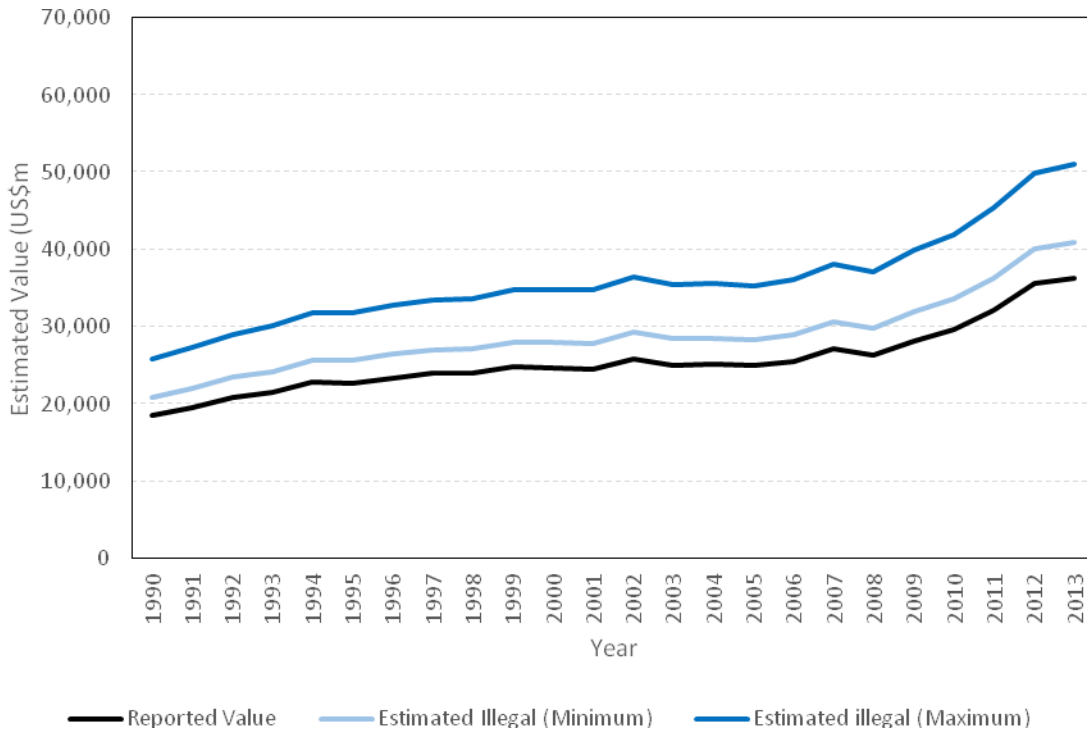


Figure 47 Estimated levels of illegal fishing by value (USD millions) (minimum and maximum) compared to reported value for the region (1990-2013).

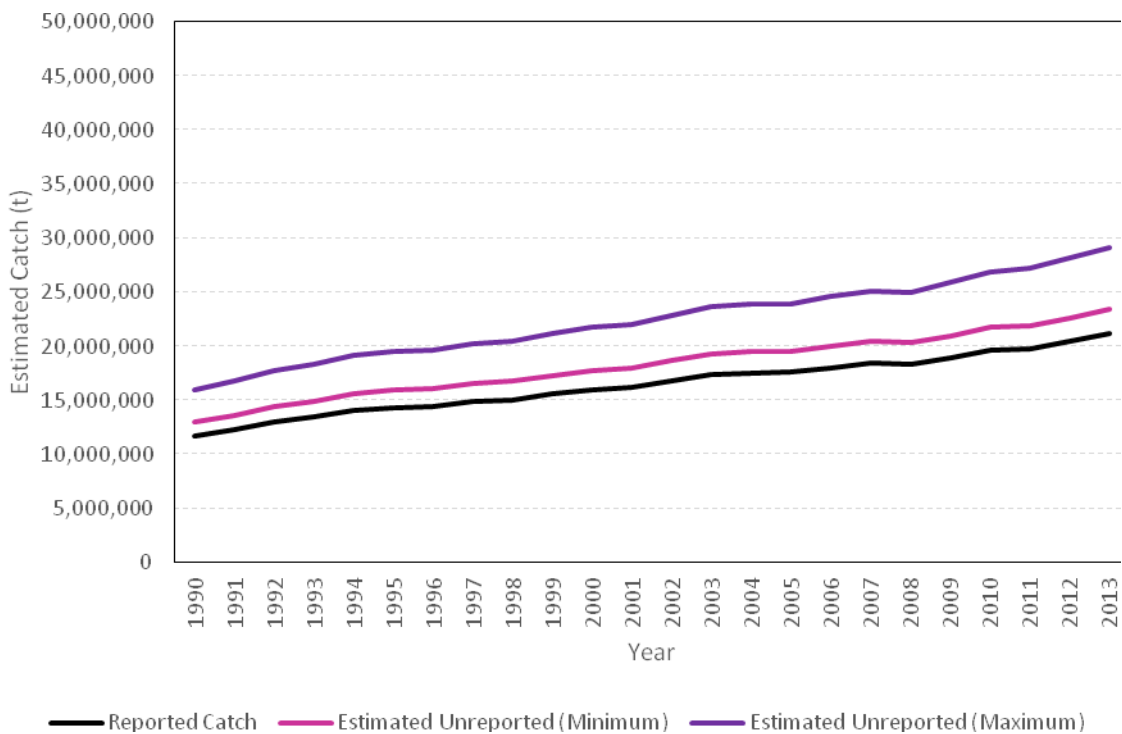


Figure 48 Estimated levels of unreported fishing by weight (t) (minimum and maximum) compared to reported catch for the region (1990-2013).

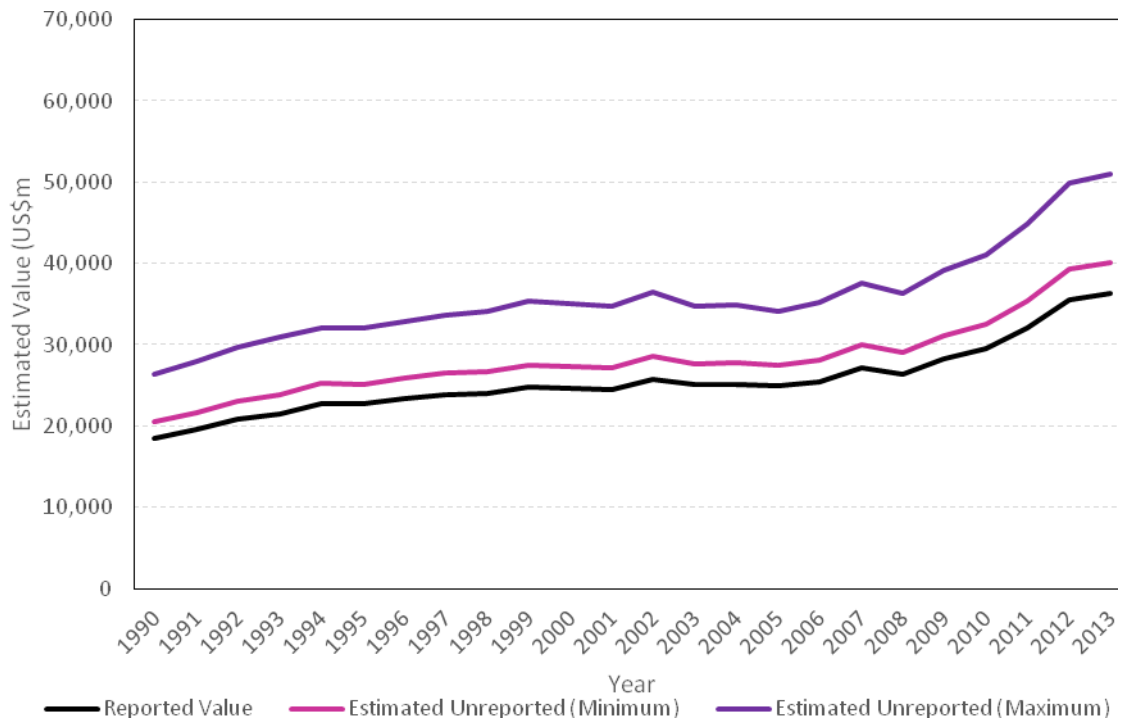


Figure 49 Estimated levels of unreported fishing by value (USD millions) (minimum and maximum compared to reported value for the region (1990-2013).

Table 156 Average and percentage weight (t) (reported, illegal and unreported) by country.

Country	Reported (t)	Illegal (t)		Unreported (t)		Illegal (% by weight)		Unreported (% by weight)	
		Min	Max	Min	Max	Min	Max	Min	Max
Bangladesh	395,425	55,242	216,896	104,945	245,082	13.97%	54.85%	26.54%	61.98%
BIOT	8,279	51	231	-	294	0.62%	2.79%	0.00%	3.55%
Brunei	2,890	58	520	289	723	2.00%	18.00%	10.00%	25.00%
Cambodia	55,012	27,506	110,023	11,552	112,774	50.00%	200.00%	21.00%	205.00%
East Timor	3,417	1,025	2,768	410	1,538	30.00%	81.00%	12.00%	45.00%
India	2,886,954	80,752	490,584	259,521	812,234	2.80%	16.99%	8.99%	28.13%
Indonesia	4,019,097	1,004,774	2,411,458	401,910	1,205,729	25.00%	60.00%	10.00%	30.00%
Malaysia	1,237,941	158,765	533,252	155,388	485,814	12.82%	43.08%	12.55%	39.24%
Maldives	107,695	971	10,570	-	1,077	0.90%	9.81%	0.00%	1.00%
Myanmar	1,161,894	232,379	755,231	116,189	813,326	20.00%	65.00%	10.00%	70.00%
Pakistan	391,141	51,525	151,543	60,617	181,852	13.17%	38.74%	15.50%	46.49%
Papua New Guinea	123,075	14,769	49,230	12,308	30,769	12.00%	40.00%	10.00%	25.00%
Philippines	1,935,394	189,027	815,349	193,539	580,618	9.77%	42.13%	10.00%	30.00%
Singapore	5,448	54	218	109	817	1.00%	4.00%	2.00%	15.00%
Sri Lanka	265,551	16,545	87,373	26,026	273,278	6.23%	32.90%	9.80%	102.91%
Thailand	2,382,094	636,832	2,122,775	318,416	955,249	26.73%	89.11%	13.37%	40.10%
Vietnam	1,519,192	351,182	1,077,950	149,921	299,842	23.12%	70.96%	9.87%	19.74%

Table 157 Average and percentage value (USD millions) (reported, illegal and unreported) by country.

Country	Reported (USD millions)	Illegal (USD millions)		Unreported (USD millions)		Illegal (% by value)		Unreported (% by value)	
		Min	Max	Min	Max	Min	Max	Min	Max
Bangladesh	648.47	100.59	406.46	161.82	355.74	15.51%	62.68%	24.95%	54.86%
BIOT	14.34	0.09	0.40	0.00	0.61	0.60%	2.76%	0.00%	4.23%
Brunei	2.80	0.06	0.50	0.28	0.70	2.00%	18.00%	10.00%	25.00%
Cambodia	62.31	31.15	124.61	13.08	127.73	50.00%	200.00%	21.00%	205.00%
East Timor	3.30	0.99	2.68	0.40	1.49	30.00%	81.00%	12.00%	45.00%
India	6023.72	121.09	778.33	575.70	1759.47	2.01%	12.92%	9.56%	29.21%
Indonesia	4932.85	1077.93	2545.61	493.28	1479.85	21.85%	51.61%	10.00%	30.00%
Malaysia	1979.98	277.78	947.60	259.79	805.22	14.03%	47.86%	13.12%	40.67%
Maldives	203.47	5.16	35.16	0.00	2.03	2.53%	17.28%	0.00%	1.00%
Myanmar	1049.53	367.34	1679.25	410.74	1223.15	35.00%	160.00%	39.14%	116.54%
Pakistan	788.78	86.99	253.88	108.28	358.46	11.03%	32.19%	13.73%	45.45%
Papua New Guinea	251.60	30.19	100.64	25.16	62.90	12.00%	40.00%	10.00%	25.00%
Philippines	2739.06	300.86	1179.57	273.91	821.72	10.98%	43.06%	10.00%	30.00%
Singapore	8.80	0.09	0.35	0.18	1.32	1.00%	4.00%	2.00%	15.00%
Sri Lanka	960.86	58.11	294.22	95.61	1003.91	6.05%	30.62%	9.95%	104.48%
Thailand	3680.11	639.21	1867.48	385.40	1156.21	17.37%	50.75%	10.47%	31.42%
Vietnam	1953.17	469.24	1440.62	200.37	400.73	24.02%	73.76%	10.26%	20.52%

6.5 Species (or species group) related analysis across the region

Analyses of the estimated catch and value of particular species groups have been conducted based on the reported ISSCAAP group to determine if there are any particular trends evident for these species groups over time.

The most prominent ISSCAAP group in the region in terms of catch is not surprisingly “39 – Marine fishes not identified” which combines in this analysis all those reported directly as “Marine fishes nei” and the part of the catch that is made up of species that do not contribute over 2% to a national catch. This group makes up 44.36% of all catches in the region (see Table 158) and an estimated 16.06-49.93% illegal and 10.40%-37.05% unreported.

Those species groups with the highest percentages of illegal or unreported catch include “Squids, cuttlefishes, octopuses” that show an estimated rate of between 20.39 and 66.34% illegally caught, “Shads” 16.85%-71.78, “Miscellaneous aquatic invertebrates” at between 27.94 and 93.09%, “Miscellaneous marine molluscs” 25.78 to 79.43% and “Clams, cockles, arkshells” at between 25.83 and 77.70%.

The highest rates for unreported catches by species group are “Miscellaneous marine crustaceans” (28.02 – 70%), and “Sharks, rays, chimaeras” 13.23-52.80% unreported with 10.21 – 36.34% illegal. Under-reporting issues with crustacean fisheries and shark under-reporting are well known issues.

Table 158 Summary of reported catch (t) and estimates of illegal and unreported fishing by ISSCAAP group (1990-2013).

ISSCAAP Description	Reported catch (t)	Estimated Illegal (min) (t)	Estimated illegal (max) (t)	Estimated Unreported (min) (t)	Estimated unreported (max) (t)
Marine fishes not identified	175,148,164	28,130,607	87,446,315	18,222,635	64,894,135
Miscellaneous pelagic fishes	49,252,553	8,276,829	26,649,742	5,678,264	17,720,321
Herrings, sardines, anchovies	41,919,545	6,368,645	21,175,647	4,755,611	15,300,035
Tunas, bonitos, billfishes	37,805,302	7,274,122	19,450,415	3,704,201	13,025,006
Miscellaneous coastal fishes	35,431,902	4,427,658	15,177,709	4,149,428	12,395,515
Shrimps, prawns	18,664,004	2,503,368	8,776,155	2,113,225	6,633,153
Squids, cuttlefishes, octopuses	12,635,111	2,576,557	8,382,384	1,510,129	4,252,644
Shads	4,948,944	833,815	3,552,561	914,722	1,944,745

ISSCAAP Description	Reported catch (t)	Estimated Illegal (min) (t)	Estimated illegal (max) (t)	Estimated Unreported (min) (t)	Estimated unreported (max) (t)
Sharks, rays, chimaeras	3,764,739	384,394	1,367,947	498,035	1,987,647
Miscellaneous demersal fishes	3,483,833	270,983	1,048,480	390,935	1,444,448
Crabs, sea-spiders	2,891,559	459,115	1,806,696	328,109	992,085
Miscellaneous aquatic invertebrates	1,768,143	493,991	1,645,973	263,231	809,945
Miscellaneous marine molluscs	1,439,042	370,974	1,143,032	150,128	404,388
Clams, cockles, arkshells	1,405,727	363,059	1,092,228	178,249	529,668
Miscellaneous marine crustaceans	1,396,385	114,730	485,320	391,294	978,561
Miscellaneous diadromous fishes	1,209,218	302,200	725,370	120,922	362,725
Red seaweeds	877,209	219,302	526,326	87,721	263,163
Flounders, halibuts, soles	492,584	14,778	88,665	49,258	147,775
Mussels	231,090	69,327	231,090	34,664	103,991
Sea-urchins and other echinoderms	53,807	4,580	18,404	5,381	38,803
Lobsters, spiny-rock lobsters	21,591	2,267	9,661	2,164	4,525
Pearls, mother-of-pearl, shells	7,355	883	2,942	736	1,839

6.6 Analysis of risks

A number of risks identified do not independently contribute to the quantitative assessment but have been used to adjust the quantitative assessment of illegal and unreported fishing. These risks are listed against the countries in which they were assessed to have a significant effect in Table 159.

Of these risks five occur in over 50% of the country risk assessments conducted:

Illegal fishing related to spatio-temporal closures (industrial fisheries into restricted, artisanal zones) – Fishing in an area and/or season in contravention of licensing conditions or conservation and management measures, i.e. industrial vessel encroachment into artisanal closed areas close to shore.

Illegal harvest/possession of sharks or other protected species – Fishing, transportation or possession of protected species (national, RFMO, CITES etc.).

Illegal transshipping – Unlicensed/unauthorised transshipment or transshipment outside of recognised areas or ports.

Landing of catch in unauthorised foreign ports – Unlicensed/unauthorised landing (or transshipment resulting in landing of catch) outside of authorised ports. Typically catches are landed in foreign ports in contravention on national licensing terms and conditions to avoid catch reporting or landing conditions in the coastal State.

Use of prohibited gear – Fishing vessels use fishing gear that is either prohibited or non-compliant with national or RFMO legislation or conservation and management measures, i.e. dynamite or cyanide fishing.

Table 159 Summary of risks identified that have not been assessed as directly contributing to the quantitative assessment by country.

Country	Bribery/obstruction/mistreatment fisheries officials, fisheries	Bunkering (refuelling) at sea	Entry of IUU catch (both from Thai vessels and foreign imports)	Failure to carry an observer when required	Failure to operate VMS inside an EEZ where required	Failure to provide prompt reporting to coastal State	Falsification/misuse of licence documents	Illegal fishing related to spatio-temporal closures	Illegal fishing related to spatio-temporal closures (depth zone)	Illegal harvest/possession of sharks or other protected species	Illegal transshipping	Incursion of industrial fisheries into restricted, artisanal zone	International export of IUU catch and/or ETP species	Issues related to the flag of fishing vessels	Lack of port State control for visiting vessels	Landing of catch in unauthorised foreign ports	Landing of illegal and unreported catch	Misreporting catch position	Non-or delayed logbook submission	Use of prohibited gear	Violation of specific rules on discards
	Bangladesh	1							1	1	1										1
BIOT	1				1			1		1	1									1	
Brunei Darussalam		1						1			1									1	
Cambodia	1						1	1			1		1						1	1	
India								1		1	1	1				1				1	
Indonesia							1	1		1	1					1			1	1	
Malaysia								1		1	1	1	1	1		1				1	
Maldives		1		1	1	1	1			1	1					1		1	1		
Myanmar								1		1	1					1				1	
Pakistan								1					1	1			1			1	
Papua New Guinea					1					1	1					1					

Country	Bribery/obstruction/mistreatment fisheries officials, fisheries	Bunkering (refuelling) at sea	Entry of IUU catch (both from Thai vessels and foreign imports)	Failure to carry an observer when required	Failure to operate VMS inside an EEZ where required	Failure to provide prompt reporting to coastal State	Falsification/misuse of licence documents	Illegal fishing related to spatio-temporal closures	Illegal fishing related to spatio-temporal closures (depth zone)	Illegal harvest/possession of sharks or other protected species	Illegal transshipping	Incursion of industrial fisheries into restricted, artisanal zone	International export of IUU catch and/or ETP species	Issues related to the flag of fishing vessels	Lack of port State control for visiting vessels	Landing of catch in unauthorised foreign ports	Landing of illegal and unreported catch	Misreporting catch position	Non-or delayed logbook submission	Use of prohibited gear	Violation of specific rules on discards
Philippines	1							1		1	1		1			1				1	
Singapore											1		1	1	1		1				
Sri Lanka							1	1		1							1			1	
Thailand			1					1		1	1						1			1	
Timor-Leste		1								1	1					1				1	
Viet Nam								1		1	1	1	1			1	1			1	

7 Future planning and recommendations

During the implementation of this study a number of issues have been encountered. Although these have ultimately not impeded the estimation of IUU they have had an effect on increasing the ranges of our estimates of IUU in many cases and have reduced the contrast between fleets, species and over time.

In order to ensure that any future studies have the best available data to be able to complete analyses of IUU fishing a number of recommendations are provided here:

7.1 Catch data

In order to produce a standardised estimate of IUU the base catch data source needs to be standardised. At present only the catch data reported by States to FAO provides such a baseline, although for some States, i.e. Myanmar, these data have been called into question over their accuracy.

The reconstruction of catches made by the 'SeaAroundUs' programme appear to be very good in terms of accuracy on catches levels and composition for some countries but others appear to be well off the mark, which reduced confidence in the remainder of the reconstructions. They remain however one of the best sources of comparison between official reported catch and the level of under-reporting that has occurred. It should be noted, that many SAU reconstructions conducted through BOBLME are currently considered draft versions and have been circulated for comments to the countries concerned, although versions have already been published on the SAU website²⁷⁹. They clearly show, as with many other papers that catch volumes remain highly estimated in the reported statistics and as the estimates of under-reporting for the region have shown many countries are vastly underestimating the level of catch of many of their fleets. The principle of using an estimate as a basis for an estimate is not the most sound statistically.

It is recommended that for industrial fleets States either implement a logbook programme that collects high quality catch composition to the vessel level. These catch composition data, aggregated to an appropriate level (i.e. fleet and area) should then be produced by each State annually in a publicly available document. Details of the data collection and aggregation process should be provided also to ensure confidence in the data.

For artisanal fleets or for other fleets while logbook systems are not introduced a system of catch sampling is required. Sampling may be conducted by observers at sea, preferred as it will capture all discarded fish as well as those retained, or in port as part of the unloading process. These data should be raised to the fleet level (requiring good fleet data as below) and a summary produced by

²⁷⁹ <http://www.seaaroundus.org/working-papers/> and

each State annually in a publicly available document. Details of the sampling programme and raising process should be provided also to ensure confidence in the data.

Logbook data would also confirm where catches were made. Many of the catches in the region are made within EEZs, but as fleets grow and catches in EEZs decrease with overexploitation, many fleets are extending their areas of operation well outside of their own waters. These catches would need to be considered and verified as catches either in the High Seas or in another State's EEZ.

7.2 Fleet data

For many of the States in the region, it has been possible to identify the fleets operating both legally and illegally within their waters quite simply from official papers, grey literature and limited scientific reports. However, taking this information down a level to be able to identify clearly the number of vessels, sizes of vessels, gear used and target species (where catch data are not recorded) is not readily available. In some cases vessel numbers are vastly underestimated (i.e. Thailand) for the legal fleets let alone any illegal vessels. The exception to this is for the tuna fisheries that report in their fleet data to the relevant RFMO vessel registries (i.e. IOTC for the Indian Ocean and WCPFC for the Pacific and CCSBT for those limited number fishing for southern bluefin tuna).

It is recommended that States in the region ensure that a comprehensive vessel registry is maintained for all industrial and semi-industrial fishing vessels, ideally linked to a licence register to verify the number of boats actively fishing in a given year.

With the logbook or raised sampling data as recommended above a clear breakdown of the catch composition by each fleet will then be available to be used in estimation.

7.3 Catch compositions

Catch composition data for the region is poor with few studies of catch composition at a large enough scale or sampling programmes available publicly to provide a method of readjusting catches. The reconstructions conducted by the SeaAroundUs programme clearly show the difficulties involved in creating an accurate time series. The prevalence of "Marine fishes nei" (ASFIS code MZZ) is very high given this is a highly aggregated catch group. Within the region, over the period 1990-2013, nine of the seventeen countries (Bangladesh, Brunei, Cambodia, Myanmar, Malaysia, Singapore, Thailand, East Timor and Vietnam) have over 30% of their catches reported as MZZ. This does not include other group classifications such as those for species groups (i.e. Marine crustaceans nei, clupeoids nei and cephalopods each of which have contributed over 10% to one of more nations' catch histories).

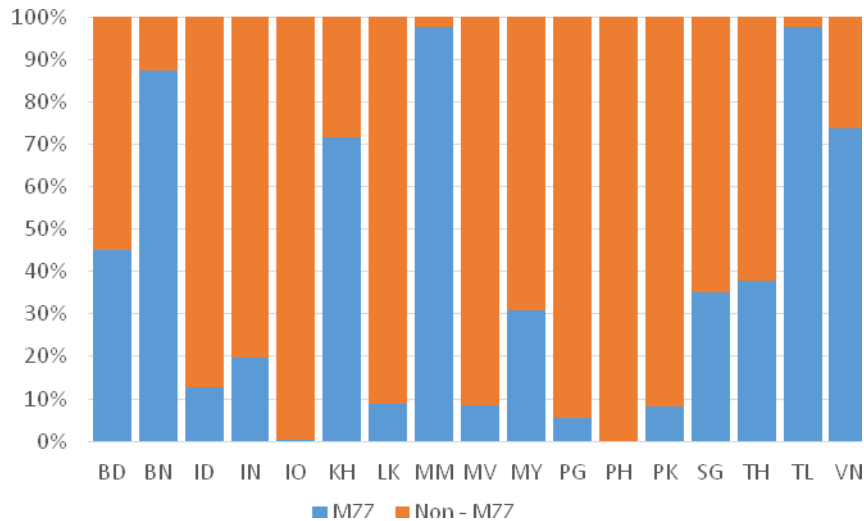


Figure 50 Breakdown of reported catch as "Marine fishes nei" (MZZ) by country aggregated for 1990-2013.

This level of aggregation leads to a clear underestimation of the value of the catch as a default level of value has been required to be applied. It is understood that a full logbook record with every species recorded from every vessel may not be possible in the short term, particularly for many fisheries in the region which are multi-species orientated.

7.4 MCSE information

One of the key elements in developing IUU estimates is to have good quantitative information on the levels of IUU conducted. These data have been extremely difficult if not impossible to locate for many fisheries in this study, leading to larger ranges of estimates and less specific outcomes. In order to estimate the level of IUU a number of simple key indicators are recommended to be evaluated by fleet and year for each country.

- **Number of inspections conducted (land and sea)** – Demonstrating number of activities giving an estimate of the sampling frequency for each fleet for raising any results. NB: Targeting of vessels i.e. non-random inspections should be noted to ensure raising is only conducted on randomly selected vessels.
- **Numbers of infringements or infractions successfully prosecuted (by flag and fishery)** – Demonstrating the infringement rate that can be raised based on the number of inspections and number of days fishing conducted.
- Estimate of the mean observed IUU catch weight and species composition (by flag and fishery)-To allow catches by species to be raised across the fleet.
- **Description of average sanctions** – Financial sanctions i.e. fines, but also the number of times catch, gear or vessels have been seized – To demonstrate the effectiveness of sanctions.

It is recommended that these indicators should be encompassed in a standard annual output to be released publicly to demonstrate capacity where it exists or privately within country to encourage funding to fill gaps in control and enforcement.

We would also recommend developing or updating a NPOA – IUU for each State.

Annex 1 References

Scientific papers, Grey literature, RFMO and NGO papers

Achavanuntakul, S., Piromwarakorn, S., True, J., Yamla-Or, P., Khlongakkhara, S. & Tanangsnakool, K. (2014). *Mapping shrimp feed supply chain in Songkhla province*. Final report to Oxfam.

Act Governing the Right to Fish in Thai Fishery Waters, B.E. 2482, 1939.

Ahmed, N., Troell, M., Allison, E. H., & Muir, J. F. (2010). Prawn post larvae fishing in coastal Bangladesh: challenges for sustainable livelihoods. *Marine Policy*, 34(2), 218-227.

Ainsworth, C.H., Pitcher, T.J., 2005. Estimating Illegal, Unreported and Unregulated catch in British Columbia's marine fisheries. *Fish. Res.* 75, 40–55.

Alam, S. N., Lin, C. K., Yakupitiyage, A., Demaine, H., & Phillips, M. J. (2005). Compliance of Bangladesh shrimp culture with FAO code of conduct for responsible fisheries: a development challenge. *Ocean & coastal management*, 48(2), 177-188.

Alcala, A. C., & Gomez, E. D. (1987). Dynamiting coral reefs for fish: a resource-destructive fishing method. *Human impacts on coral reefs: Facts and recommendations*, 51-60.

Alesna, E.B., Dizon-Corrales, J.Q. and Cabangbang, A. Commercial fisheries licensing system, in Silvestre, G. and Luna, C., eds., (2004). In *turbulent seas: the status of Philippine marine fisheries*. Coastal Resource Management Project, Department of Environment and Natural Resources, Cebu City, Philippines, pp.378.

Ali, M.M., Hossain, M.B., Masud, M.A.-, Alam, M.A., 2015. Fish Species Availability and Fishing Gears Used in the Ramnabad River, Southern Bangladesh. *Asian Journal of Agricultural Research* 9, 12–22. doi:10.3923/ajar.2015.12.22

Alonso, E., Wilson, C., Rodrigues, P., Pereira, M., Griffiths, D., 2013. Policy and Practice: Recommendations for Sustainable Fisheries Development in Timor-Leste (No. Policy Paper #2), Regional Fisheries Livelihoods Programme for South and Southeast Asia-Timor Leste. Ministry of Agriculture and Fisheries (Timor-Leste), RFLP Timor-Leste. Amaral, J. (2010) *Current Fisheries and Aquaculture Policies Relevant to the Regional Fisheries Livelihood Project (RFLP) in Timor Leste*. Policy paper.

Amendment to the Philippine Fisheries Code of 1998, Republic Act No.8550. 2015.

An Estimation of Compliance of the Fisheries of Bangladesh with Article 7 (Fisheries Management) of the UN Code of Conduct for Responsible Fishing [WWW Document], n.d. URL [http://www.researchgate.net/profile/Pramod_Ganapathiraju/publication/274067129_An_Estimation_of_Compliance_of_the_Fisheries_of_Bangladesh_with_Article_7_\(Fisheries_Management\)_of_the_UN_Code_of_Conduct_for_Responsible_Fishing/links/5513c6170cf283ee08348fd2.pdf](http://www.researchgate.net/profile/Pramod_Ganapathiraju/publication/274067129_An_Estimation_of_Compliance_of_the_Fisheries_of_Bangladesh_with_Article_7_(Fisheries_Management)_of_the_UN_Code_of_Conduct_for_Responsible_Fishing/links/5513c6170cf283ee08348fd2.pdf) (accessed 7.10.15).

APEC, (2008). Case Study on Illegal, Unreported and Unregulated (IUU) fishing off the east coast of peninsular Malaysia. Final report.

Atkins, R., 2013. Australian Fisheries Management Authority helps combat illegal fishing. Australian Fisheries Management Authority.

Azad, A.K, 2009. Maritime Security of Bangladesh: Facing the Challenges of Non-Traditional Threats. Bangladesh Institute of International and Strategic Studies (BISS), Dhaka.

Badruddin, M. & Gillet, R. (1996) Translations of Indonesian fisheries law relevant to fisheries management in the Extended Economic Zone. Unpublished report, FAO project: Strengthening marine fisheries development in Indonesia, Technical paper 9, TCP/INS/4553

Bailey, M., & Sumaila, U. R. (2015). Destructive fishing and fisheries enforcement in eastern Indonesia. *Mar Ecol Prog Ser*, 530, 195-211.

Bailey, M., Flores, J., Pokajam, S., Sumaila, U.R., 2012. Towards better management of Coral Triangle tuna. *Ocean & Coastal Management* 63, 30–42. doi:10.1016/j.ocecoaman.2012.03.010

Barbosa, M., & Booth, S. (2009). Timor Leste's Fisheries Catches (1950-2009); Fisheries under different regimes. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Barbosa, M., Booth, S., 2009. TIMOR-LESTE 'S FISHERIES CATCHES (1950-2009): FISHERIES UNDER. Fisheries Centre Research Reports 17, 39.

Baticados, D., 2004. Fishing cooperatives? Participation in managing nearshore resources: the case in Capiz, central Philippines. *Fisheries Research* 67, 81–91. doi:10.1016/j.fishres.2003.07.005

Bay of Bengal Programme (BOBP-IGO), 2009 (a) . Report of the National Workshop on Monitoring, Control and Surveillance in Marine Fisheries. Bangladesh. (No. BOBP/REP/110). Cox's Bazaar, Bangladesh.

Bay of Bengal Programme (BOBP-IGO). 2009 (b). Report of the Regional Strategic Meeting on European Union's Regulation on Illegal, Unreported and Unregulated Fishing, BOBP/REP/118. BAY OF BENGAL PROGRAMME INTER-GOVERNMENTAL ORGANISATION, Chennai, India.

Bennett, E., Neiland, A., Anang, E., Bannerman, P., Atiq Rahman, A., Huq, S., Bhuiya, S., Day, M., Fulford-Gardiner, M., Clerveaux, W., 2001. Towards a better understanding of conflict management in tropical fisheries: evidence from Ghana, Bangladesh and the Caribbean. *Marine Policy* 25, 365–376. doi:10.1016/S0308-597X(01)00022-7

Bhathal B. (2005) Historical reconstruction of Indian marine fisheries catches, 1950–2000, as a basis for testing the Marine Trophic Index. Fisheries Centre Research Reports 13(5). Fisheries Centre, University of British Columbia, 2005.

Bhattacharjee, R., 2015. Delimitation of Indo-Bangladesh Maritime Boundary.

BOBP. 1984. Marine small-scale fisheries of Sri Lanka: a general description. FAO-SIDA BOBP/INF/6, 65 pp.

Booth, S. and Pauly, D. (2011). Myanmar's marine capture fisheries 1950-2008: Expansion from the coast to the deep waters. Sea Around Us Project, Fisheries Centre, University of British Columbia. . In: BOBLME (2011) Fisheries catches for the Bay of Bengal Large Marine Ecosystem since 1950. BOBLME-2011-Ecology-16. pp 101-134.

Cambodia.pdf [WWW Document], n.d. URL <http://www.seafdec.or.th/iuu/profiles/Cambodia.pdf> (accessed 6.23.15).

Campbell SJ, Hoey AS, Maynard J, Kartawijaya T, Cinner J, et al. (2012) Weak Compliance Undermines the Success of No-Take Zones in a Large Government-Controlled Marine Protected Area. PLoS ONE 7(11): e50074. doi:10.1371/journal.pone.0050074

Catch Certification Scheme of Sri Lanka; Guidelines to the stakeholders, 2013. . Fishery Products Quality Control Unit Department of Fisheries & Aquatic Resources, Colombo, Sri Lanka.

Catch, B.C.M.F., 2014. Fisheries Centre.

CCAMLR, (2006). Landings and trade of toothfish in Singapore. Paper submitted by the USA. SCIC-05/15 Rev.1.

CCAMLR, (2013). Clarification on the IUU-listed vessel Ray port visit and other instances of IUU-listed vessel port visits. Paper submitted to CCAMLR by Singapore. CCAMLR-XXXII/BG/33.

Centre for the Promotion of Imports from developing countries (CBI), (2012). *The Philippine seafood sector: a value chain analysis*. The Netherlands.

CESAR, H. (1996). Economic analysis of Indonesian coral reefs. The World Bank Environment Department Paper, Environmental Economics Series, Washington, D.C.

Chagos feels the pinch: assessment of holothurian (sea cucumber) abundance, illegal harvesting and conservation prospects in British Indian Ocean Territory-Price-2009-Aquatic Conservation: Marine and Freshwater Ecosystems-Wiley Online Library [WWW Document], n.d. URL <http://onlinelibrary.wiley.com/doi/10.1002/aqc.1054/abstract> (accessed 7.9.15).

Chandrapal, G.D. (2005). Status of trash fish utilisation and fish feed requirements in aquaculture – India. Paper presented at the Regional Workshop on Low Value and Trash Fish in the Asia-Pacific Region. Hanoi. June 7-9, 2005.

Chu, S., Koy, B., Li, V., Suos, S., Tat, S., Thuch, N., Vann, M. & Nelson, V. 1999. Case study: trawling in Kompong Som Bay. DANIDA Coastal Zone Management Project. Cambodia, Ministry of Environment.

Churchill, R.R., Owen, D., 2010. The EC common fisheries policy. Oxford University Press, Oxford; New York.

Cinco, E., Teh, L., Zylich, K. and Pauly, D. (2015). Reconstructing the marine and estuarine fisheries of Brunei Darussalam. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Cinco, E.A., Teh, L.C., Zylich, K., Pauly, D., 2015. Fisheries Centre.

Circular No.28/2011/TT-BNNPTNT of April 15, 2011, providing the validation of catch certificates and statements for exportation into the European market. Republic of Vietnam.

Clarke, S, Hosch, G, 2013. Traceability, legal provenance & the EU IUU Regulation. FMP Consulting & Sasama consulting.

Climatic and anthropogenic factors changing spawning pattern and production zone of Hilsa fishery in the Bay of Bengal [WWW Document], n.d. URL <http://www.sciencedirect.com.ezproxy.york.ac.uk/science/article/pii/S2212094715000031> (accessed 7.9.15).

Commission Decision of 10 June 2014 on notifying a Third Country that the Commission considers as possible of being identified as non-cooperating Third Countries pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing. (2014/C/185/03). (Philippines)

Commission Decision of 14 April 2015. Notice of information of the termination of the demarches with a third country notified on 10 June 2014 of the possibility of being identified as non-cooperating third country pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing. (2015/C/142/05). (Philippines).

Commission Decision of 21 April 2015 on notifying a third country of the possibility of being identified as a non-cooperating third country in fighting Illegal, Unreported and Unregulated fishing. (2015/C/142/06). European Commission. (Thailand)

Comprehensive Marine Fishing Policy 2004 [WWW Document], n.d. URL <http://dahd.nic.in/fishpolicy.htm> (accessed 7.15.15).

Constitution of Brunei-Darussalam, Fisheries Order 2009.

Consultation on Indian Ocean Tunas, Victoria, 9–14 November 1998. pp. 21–25.

Corpus, L. (2014). Reconstructing Singapore's marine fisheries catch, 1950-2010. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Country profile of Singapore Addressing the IUU Fishing in the Southeast Asian Region [WWW Document], n.d. URL <http://www.seafdec.or.th/iuu/profiles/Singapore.pdf> (accessed 8.3.15).

Country Profile of Brunei Darussalam Addressing the IUU in Southeast Asian Region [WWW Document], n.d. URL <http://www.seafdec.or.th/iuu/profiles/Brunei.pdf> (accessed 8.3.15).

Crimes relating to fisheries, Law No. 12/2004. East Timor.

Dalabajan, D., 2005. Fixing the broken net: Improving enforcement of laws regulating cyanide fishing in the Calamianes Group of Islands, Philippines (No. 15), SPC Live Reef Fish Information Bulletin. Environmental Legal Assistance Center, Philippines.

Das, P. (2003) No let-up in Olive Ridley killings, *The Hindu*, 8 January 2003.

Davies, R., Cripps, S., Nickson, A. & Porter, G. (2009). Defining and estimating global marine fisheries bycatch. *Marine Policy*. doi:10.1016/j.marpol.2009.01.003.

Dayaratne, P. (1996) Environment aspects of Marine Fisheries of Sri Lanka.

de Graaf, G., 2014. Review of fisheries data collection systems in Myanmar. Bay of Bengal Large Marine Ecosystem Project. BOBLME-2014-Ecology-27..55pp

De Young, C, 2006. Review of the state of world marine capture fisheries management: Indian Ocean (FAO Fisheries Technical Paper No. 488). FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, Rome.

De Young, C., ed. (2006). Review of the state of world marine capture fisheries management: Indian Ocean. *FAO Fisheries Technical Paper*. No. 488. FAO. Rome.

Decision No.188/QD-TTg of February 13 2012, approving the Program on protection and development of aquatic resources through 2020. Vietnam.

Decree No. 137.2004/ND-CP of June 21, 2004. Republic of Vietnam.

Decree No.102/2012/ND-CP of November 29, 2012, on the organisation and operation of the fisheries resources surveillance force. Republic of Vietnam.

Decree No.33/2010/ND-CP of March 31, 2010, on the management of fishing activities in sea areas by Vietnamese organisations and individuals.

Decree No.53/2012/ND-CP of June 20, 2012, amending and supplementing a number of articles of the decrees on fisheries. Republic of Vietnam.

Deep Sea Fishing Policy, Ministry of Food, Agriculture and Livestock. Government of Pakistan, 1995.

Department of Animal Husbandry Dairying and Fisheries. (2014). Report of the Technical Committee to Review the Duration of the Ban Period and to Suggest Further Measures to Strengthen the Conservation and Management Aspects. (Available at: <http://dahd.nic.in/dahd/WriteReadData/Report%20of%20the%20Technical%20Committee%20to%20Review%20the%20Duration%20of%20the%20Ban%20Period%2022%20Sept.%202014.pdf>)

Department of Fisheries Malaysia, 2013. Malaysia's national plan of action to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing (Malaysia's NPOA-IUU).

Department of Fisheries, Ministry of Agriculture and Cooperatives, (2014). *Annual report to the Western and Central Pacific Fisheries Commission*. Thailand annual fishery report.

Department of Fisheries, Ministry of Agriculture and Cooperatives (2009). *The Master Plan: Marine fisheries management of Thailand*.

Department of Fisheries, Ministry of Agriculture and Cooperatives, (2012). Vessel Registry. Thailand.

Department of Fisheries, Ministry of Agriculture and Cooperatives, (2012). Yearbook: Statistics on Fishery Production. Thailand.

Dirhamsyah, 2012. IUU fishing in Indonesia's live reef fisheries. *Australian Journal of Maritime & Ocean Affairs* 4, 44–52. doi:10.1080/18366503.2012.10815700

Dissanayake, D. C. T., & Sigurdsson, T. (2005). Monitoring and assessment of the offshore fishery in Sri Lanka. Fisheries Training Programme, Iceland.

Divya Varkey, Ganapathiraju Pramod, Tony J. Pitcher, 2006. An Estimation of Compliance of the Fisheries of India with Article 7 (Fisheries Management) of the UN Code of Conduct for Responsible Fishing. doi:10.13140/2.1.3059.5528

DoF. (2001). Brief on Department of Fisheries Bangladesh. Department of fisheries. Ministry of Fisheries and Livestock. Dhaka. Bangladesh. 8 pp.

Dogleg Waters Closed [WWW Document], 2015. URL <http://www.emtv.com.pg/article.aspx?slug=Dogleg-Closed&> (accessed 9.21.15).

Doma D (2011) Assessment of the Status of Marine Fisheries Resources and Management Practices in Sre Ambel Lagoon, Cambodia. Funded by Rufford Small Grant Foundation, Phnom Penh. 156 p.

Dozens Arrested in Malacca Strait Over Illegal Fishing, n.d. . The Jakarta Globe.

Dozens dead in Russian trawler disaster [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/national-news/13883-dozens-dead-in-russian-trawler-disaster.html> (accessed 7.3.15).

Dutta, S., n.d. In pursuit of a \$500 million harvest, India is gearing up for a deep dive. Quartz.

Edeson, W. Tsamenyi, M. Palma, M. McCrea, J. (2010). Framework Study for Model Fisheries Legislation in South East Asia, Report on Cambodian Legislation. Available at: <http://rpoaiuu.org/images/pdf/model/cambodia.pdf>

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Singapore*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Brunei Darussalam*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Cambodia*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Indonesia*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Malaysia*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Papua New Guinea*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Singapore*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Thailand*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of the Philippines*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Timor-Leste*. Report prepared by ANCORS, University of Wollongong, Australia.

Edeson, W., Tsamenyi, M., Palma, M., McCrea, J. (2010). *Framework Study for Model Fisheries Legislation in Southeast Asia-Report on Legislation of Vietnam*. Report prepared by ANCORS, University of Wollongong, Australia.

Environmental Justice Foundation, (2015). *Pirates and Slaves: How overfishing in Thailand fuels human trafficking and the plundering of our oceans*. Final report.

European Commission, (2015). Commission Decision of 21 April 2015 on notifying a third country of the possibility of being identified as a non-cooperating third country in fighting Illegal, Unreported and Unregulated fishing. (2015/C 142/06).

Exclusive Fishery Zone (Regulation of Fishing) Act, Government of Pakistan, 1975.

Fabinyi, M., Dalabajan, D., 2011. Policy and practice in the live reef fish for food trade: A case study from Palawan, Philippines. *Marine Policy* 35, 371–378. doi:10.1016/j.marpol.2010.11.001

FAO (2007) Collected papers of the APFIC regional workshop. “Low Value and Trash Fish in the Asia-Pacific Region”. Asia Pacific Fishery Commission, Bangkok. 267 p.

FAO (2010) Report of the second Workshop on the Assessment of Fishery Stock Status in South and Southeast Asia. Bangkok, 5-9 October 2009. Food and Agriculture Organization of the United Nations Rome. 54 p

FAO (2014). *The State of World Fisheries and Aquaculture*

FAO (2015), FAO Statistics and Information Service of the Fisheries and Aquaculture Department. Total Fishery Production 1950-2013. FISHSTAT Plus (Food and Agriculture Organization of the United Nations, Rome, 2015)

FAO 2015, Fisheries and Aquaculture Department, Statistics and Information Service Fish Stat J: Universal software for fishery statistical time series, 2015.

FAO Fisheries & Aquaculture-Fishery and Aquaculture Country Profiles-The Democratic Republic of Timor-Leste [WWW Document], n.d. URL <http://www.fao.org/fishery/facp/TLS/en#CountrySector-SectorSocioEcoContribution> (accessed 8.3.15).

FAO, (2006). Fishery and aquaculture profile of the Philippines.

FAO, (2009). Fishery and aquaculture profile of the Islamic Republic of Pakistan.

FAO, (2014). The State of World Fisheries and Aquaculture: Opportunities and Challenges.

FAO, 2008. Adapting to emerging challenges – Promotion of arrangements for the management of fisheries and aquaculture in Asia-Pacific. Food and Agriculture Organisation of the United Nations, Bangkok.

FAO, FISHERY MONITORING, CONTROL AND SURVEILLANCE (MCS) AND THE CONTROL OF ILLEGAL FISHING (Workshop Report), 2012. , REGIONAL WORKSHOP ON MARINE FISHERIES MANAGEMENT AND ENFORCEMENT. FAO, Port Louis, Mauritius.

FAO. (2006) Fishery and Aquaculture Country Profile, Sri Lanka. Available at: <http://www.fao.org/fi/oldsite/FCP/en/LKA/profile.htm>

FAO. (2010). Fishery and Aquaculture Country Profile, Bangladesh. Available at: <http://www.fao.org/fishery/facp/BGD/en#pageSection2>

FAO. (2011). Fishery and Aquaculture Country Profile, Cambodia. Available at: ftp://ftp.fao.org/fi/document/fcp/en/FI_CP_KH.pdf

FiA. (2010) Strategic Planning Framework 2010-2019 for Fisheries – Cambodia

Fidelman, P., Evans, L., Fabinyi, M., Foale, S., Cinner, J., Rosen, F., 2012. Governing large-scale marine commons: Contextual challenges in the Coral Triangle. Marine Policy 36, 42–53. doi:10.1016/j.marpol.2011.03.007

Fisheries (Fishing Gear) Rules, 1972. Singapore.

Fisheries (Fishing Harbour) Rules, 1971. Singapore.

Fisheries (Fishing Vessels) Rules, 1986. Singapore.

Fisheries (Prohibition of Method of Fishing) Regulations, 1980. Malaysia.

Fisheries Act 1947, Thailand.

Fisheries Decree Law of East Timor, No.5/2004.

FISHERIES, M., ALASKA, I.A., n.d. Fisheries Centre Research Reports. Fisheries Centre Research Reports 16, 9.

Flaaten, O., 2013. Institutional quality and catch performance of fishing nations. *Marine Policy* 38, 267–276. doi:10.1016/j.marpol.2012.06.002

Flewweling, P. and Hosch, G. (2006) Country Review: Sri Lanka, 163-174 pp. In: De Young, C. (ed.) Review of the state of world marine capture fisheries management: Indian Ocean. FAO Fisheries Technical Paper. No. 488, Rome, FAO. 2006. 458p.

Flewwelling, P. (2001) Fisheries Management and MCS in South Asia, FAO/FISHCODE Project, GCP/INT/648/NOR: Field Report C-6 (En) Rome, FAO, 56p.

Flewwelling, P. (2001). Fisheries Management and MCS in South Asia: Comparative Analysis. FAO, Rome.

Flewwelling, P. (2001). Fisheries Management and MCS in South Asia. FAO/FISHCODE Project, GCP/INT/648/NOR: Field Report C-6: 56pp.

Flewwelling, P., & Hosch, G. (2006). Country review: Bangladesh. Review of the State of World Marine Capture Fisheries Management: Indian Ocean, (488), 97.

Flewwelling, P., & Hosch, G. (2006). Country Review: Indonesia. Review of the State of the World Marine Capture Fisheries Management: Indian Ocean, edited by C. De Young. FAO, Fisheries Technical Paper, 488, 127.

Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Department, 2014. The State of world fisheries and aquaculture: opportunities and challenges. Food and Agriculture Organization of the United Nations, Rome.

Fund, I.M., 2008. Maldives: Poverty Reduction Strategy Paper. International Monetary Fund.

Funge-Smith, S.J., Lee, R. & Leete, M. 2015. *Asia-Pacific Fishery Commission: Regional review of Illegal, Unreported and Unregulated (IUU) fishing by foreign vessels*. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand. RAP Publication 2015/09. 168 pp.

Ganapathiraju, P., 2012. Illegal and unreported fishing: global analysis of incentives and a case study estimating illegal and unreported catches from India (PhD). University of British Columbia, Canada.

Ganapathiraju, P., n.d. Illegal, Unreported and Unregulated Marine Fish Catches in the Indian Exclusive Economic Zone [WWW Document]. URL http://www.academia.edu/5749719/Illegal_Unreported_and_Unregulated_Marine_Fish_Catches_in_the_Indian_Exclusive_Economic_Zone (accessed 7.24.14).

Ganesan, N., 2001. Thailand's Relations with Malaysia and Myanmar in Post-Cold War Southeast Asia. *Japanese Journal of Political Science* 2. doi:10.1017/S1468109901000160

Gianni, M. and Simpson, W. (2005). The Changing Nature of High Seas Fishing: how flags of convenience provide cover for Illegal, Unreported and Unregulated fishing. Australian Department of

Agriculture, Fisheries and Forestry, International Transport Workers' Federation, and WWF International. pp. 83.

Gillet, R. (2008). Global study of shrimp fisheries. FAO.

Gillett, R. (2004). The Marine Fisheries of Cambodia. Food and Agriculture Organization of the United Nations, Rome 2004. [Electronic version].

GOPA Consortium, 2013. COMPLIANCE OF IMPORTS OF FISHERY AND AQUACULTURE PRODUCTS WITH

Grafton, R. Q., Hilborn, R., Squires, D., Tait, M., & Williams, M. (2009). Handbook of marine fisheries conservation and management. Oxford University Press.

Greenpeace (India), Hamid, A., n.d. What I talk about when I talk about F***ing.

Greenpeace (India), n.d. Greenpeace exposes pirate fishing practices off Andaman coast. Greenpeace exposes pirate fishing practices off Andaman coast Governance gaps in marine fisheries allow Illegal, Unreported and Unregulated fishing to go unabated in the EEZ.

Greenpeace exposes pirate fishing practices off Andaman coast | Greenpeace India [WWW Document], n.d. URL <http://www.greenpeace.org/india/en/Press/Greenpeace-exposes-pirate-fishing-practices-off-Andaman-coast/> (accessed 7.16.15).

Griggs, L., & Lugten, G. (2006). Veil over the nets (unravelling corporate liability for IUU fishing offences). *Marine Policy*, 31, 159-168.

Griggs, L., Lugten, G., 2007. Veil over the nets (unravelling corporate liability for IUU fishing offences). *Marine Policy* 31, 159–168. doi:10.1016/j.marpol.2006.05.015

Gupta, C., Sharma, M., 2012. Contested Coastlines: Fisherfolk, Nations and Borders in South Asia. Routledge.

Gwadar, Balochistan, (2004). www.bdd.sdnpk.org/districts/gwadar/fisheries%20gwadar.html

Halim A, Mous P (2006) Community perceptions of marine protected area management in Indonesia. The Nature Conservancy Tech Rep NA04NOS4630288 for the National Oceanic and Atmospheric Administration, Bali

Hamid, A., 2012. Permit to plunder the sea. *The Hindu*.

Hemmings, M., Harper, S. & Zeller, D. (2014). Reconstruction of total marine catches for the Maldives. In BOBLME (2015) Reconstructed total fisheries catches for the countries of the Bay of Bengal Large Marine Ecosystem: 1950-2010. BOBLME-2015-Ecology-25.. (Draft report/working paper for country consultation).

Heriyanto, P., n.d. A Lot More Talk by ASEAN Than Action – ASEAN News–Development News Around ASEAN.

Ho, J., Bateman, S., 2013. Maritime Challenges and Priorities in Asia: Implications for Regional Security. Routledge.

Hoda, S. M. S. (1985). Identification of Coastal fish varieties of Pakistan. Pak. Agric, 7, 38-44.

Hornby, C. Arun Kumar, M., Bhathal, B., Pauly, D. & Zeller, D. (2015). Reconstruction of the Andaman and Nicobar Islands (India) marine fish catch from 1950-2010. In BOBLME (2015) Reconstructed total fisheries catches for the countries of the Bay of Bengal Large Marine Ecosystem: 1950-2010. BOBLME-2015-Ecology-25. (Draft report/working paper for country consultation).

Hornby, C., Khan, M. M., Zylich, K., & Zeller, D. (2015). Fisheries Centre. Reconstruction of total marine fisheries catches for India: 1950-2010. In BOBLME (2015) Reconstructed total fisheries catches for the countries of the Bay of Bengal Large Marine Ecosystem: 1950-2010. BOBLME-2015-Ecology-25. (Draft report/working paper for country consultation).

Hornby, C., Khan, M., Zylich, K. & Zeller, D. (2014). Reconstruction of Pakistan's marine fisheries catches 1950-2010.

Hussain, M.G, Enauml Hoq, Md, 2010. Sustainable Management of Fisheries Resources of the Bay of Bengal (No. SBOBLMEP Pub./Rep. 2.). Bay of Bengal Large Marine Ecosystem.

Hussain, S., 2011. Background report of fishery products (The Maldives). Ministry of Fisheries and Agriculture, Maldives.

Illegal and unreported fishing: global analysis of incentives and a case study estimating illegal and unreported catches from India [WWW Document], n.d. URL <http://elk.library.ubc.ca/handle/2429/41730> (accessed 7.10.15).

Illegal, Unreported and Unregulated fisheries catch in Raja Ampat Regency, Eastern Indonesia [WWW Document], n.d. URL <http://www.sciencedirect.com/science/article/pii/S0308597X09000980> (accessed 7.8.15).

Illegally sized nets harming fish stocks-Myanmar Food Security Information Network [WWW Document], 2014. URL <http://www.fsinmyanmar.net/food-security-updates/local-and-regional-news/item/467-illegally-sized-nets-harming-fish-stocks> (accessed 7.29.14).

Indian bottom trawling destroys marine ecosystem [WWW Document], n.d.

Indian Ocean Tuna Commission (IOTC), 2014. Report of the Eleventh Session of the Compliance Committee (No. IOTC-2014-CoC11-R[E]). Indian Ocean Tuna Commission (IOTC), Colombo, Sri Lanka.

International Transport Workers' Federation, (2005). Flags of Convenience states: <http://www.itfglobal.org/flags-convenience/flags-convenien-183.cfm>

IOTC Compliance Report for: Sri Lanka (No. IOTC-2014-CoC11-CR25 Rev1[E]), 2014. , IOTC Compliance Report. Indian Ocean Tuna Commission (IOTC).

IOTC Secretariat, 2014. Report of the Regional Workshop to Support Compliance with IOTC Requirements for the Collection and Reporting of Fisheries Data to the IOTC [WWW Document]. URL

<http://www.iotc.org/documents/report-regional-workshop-support-compliance-iotc-requirements-collection-and-reporting> (accessed 7.24.14).

IOTC. (2004). Report of the Sixth Session of the IOTC Working Party on Tropical Tunas Victoria, Seychelles, 13–20 July, 2004. IOTC-2004-WPTT-R[EN]. 52 pp

Islam, M. M., & Chuenpagdee, R. (2013). Negotiating risk and poverty in mangrove fishing communities of the Bangladesh Sundarbans. *Maritime Studies*, 12(1), 1-20.

Islam, M. S. (2003). Perspectives of the coastal and marine fisheries of the Bay of Bengal, Bangladesh. *Ocean & Coastal Management*, 46(8), 763-796.

Islam, M.S., 2003. Perspectives of the coastal and marine fisheries of the Bay of Bengal, Bangladesh. *Ocean & Coastal Management* 46, 763–796. doi:10.1016/S0964-5691(03)00064-4

IUU fishing in BIOT waters by fishing vessels flagged in Sri Lanka (No. IOTC-2014-CoC-1-08b [E]), 2014. . Indian Ocean Tuna Commission (IOTC), 11th IOTC Compliance Committee Meeting.

Jacquet, J.L., Pauly, D., 2008. Trade secrets: Renaming and mislabeling of seafood. *Marine Policy* 32, 309–318. doi:10.1016/j.marpol.2007.06.007

JALA Advocacy Network for North Sumatra Fisherfolk in cooperation with the Environmental Justice Foundation. When fishing turns deadly: The environmental and social impacts of illegal trawling in North Sumatra

Jayasooriya, J.A.D.B, Bandara, H.M.U, 2013. Analysis of Catch Assessment of Tuna Fisheries in Sri Lanka, 15th Working Party on Tropical Tuna. Ministry of Fisheries and Aquatic Resources Development Sri Lanka, San Sebastian, Spain.

Jensen, K.R. & Ing T. (2014) Lots of information collected about marine living resources, but where is it? And can it be trusted? *Cambodian Journal of Natural History*, 2014, 1–3.

JIANYUE, X., 2015. Illegal fishing cases on the rise in Singapore's parks, reserves. www.todayonline.com.

Joseph, L. (1999) Management of shark fisheries in Sri Lanka. In Case studies of the management of elasmobranch fisheries, Shotton R (Ed.). FAO Fisheries Technical Paper 378/1, Food and Agriculture Organization for the United Nations, Rome; 339–367 pp.

Kabir, D. S., & Muzaffar, S. B. (2002). The review of the present state of protected areas of Bangladesh. *Bangladesh environment*, 2002, 389-403.

Kamal M. (2000) Assistance to Fisheries Research Institute—A Report Prepared for the “Assistance to Fisheries Research Institute”. In: Acamey B, Dhaka, editors. Consultancy Report on Marine Fisheries Resource Management, BGD/89/012, FRI-GOB/UNDP/FAO.

Kelleher, K. (2004) Collateral damage: Discards in the world's marine fisheries. An update. FAO Technical Report 470: 131pp.

Kelleher, K. (2004) Collateral damage: Discards in the world's marine fisheries. An update. FAO Technical Report 470: 131pp.

Kelleher, K. (2005). Discards in the world's marine fisheries: an update (No. 470). Food & Agriculture Org.

Kelleher, K. (2005). Discards in the world's marine fisheries: an update (No. 470). Food & Agriculture Org.

Khan MG (2010). Bangladesh coastal and marine fisheries, and environment. pp. 1-35 In Hussain MG and Hoq ME (eds.), Sustainable Management of Fisheries Resources of the Bay of Bengal. Bangladesh Fisheries Research Institute, Bangladesh.

Khan, B. A., Ahmed, L., Ali, L., Nishat, A., Karim, M., Hossain, A. M. M., & Chowdhury, S. N. (1997). Report. National Workshop on Fisheries Resources Development and Management in Bangladesh. In National Workshop on Fisheries Resources Development and Management in Bangladesh, Dhaka (Bangladesh), 29 Oct-1 Nov 1995.

Khan, W.M. (2006) Country Review: Pakistan, 281-296 pp. In: De Young, C., ed. (2006). Review of the state of world marine capture fisheries management: Indian Ocean. *FAO Fisheries Technical Paper*. No. 488. Rome, FAO, 458pp.

Khatun, F. A., Rahman, M., & Bhattacharya, D. (2004). Fisheries subsidies and marine resource management: lessons from Bangladesh (Vol. 3). UNEP/Earthprint.

Koldewey, H.J., Curnick, D., Harding, S., Harrison, L.R., Gollock, M., 2010. Potential benefits to fisheries and biodiversity of the Chagos Archipelago/British Indian Ocean Territory as a no-take marine reserve. *Marine Pollution Bulletin* 60, 1906–1915. doi:10.1016/j.marpolbul.2010.10.002

Krell, B., Skopal, M. & Ferber, P. (2011) Koh Rong Samloem and Koh Kon Marine Environmental Assessment, Preah Sihanouk Province. Marine Conservation Cambodia, Koh Rong, Cambodia.

Kusuma, I, 2014. Indonesian Efforts In Combating IUU Fishing.

Law amending the Law Relating to the Fishing Rights of Foreign Fishing Vessels. The State Law and Order Restoration Council Law No.15/93. Myanmar, 1993.

Law relating to the Fishing Rights of Foreign Fishing Vessels. The State Law and Order Restoration Council Law. Myanmar, 1989.

Lee, R., Funge-Smith, S., 2015. Fishing capacity management in Asia-The FAO IPOA – Capacity.

Leng P. (2013) Assessment of fishing practices in marine fisheries management areas around Koh Rong and Koh Rong Sanleom, Cambodia. *Cambodian Journal of Natural History*, 2013, 113–114.

Lokani, 1996. Illegal fishing for sea-cucumber (bêche-de-mer) by Papua New Guinea artisanal fishermen in the Torres Strait protected zone. *SPC Bêche-de-mer Information Bulletin* 8, 2–6.

M'sians jailed for illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2010/07/23/msians-jailed-illegal-fishing> (accessed 7.3.15).

Majid, A., Wasim, M., Khaliluddin, M. (1992). Commercially important marine fishes of Pakistan. *Dept. Composition, Compilation and Translation: Federal Government Urdu Science College, Karachi, 263.*

Mak, K.K.W., Yanase, H., Renneberg, R., 2005. Cyanide fishing and cyanide detection in coral reef fish using chemical tests and biosensors. *Biosensors and Bioelectronics* 20, 2581–2593. doi:10.1016/j.bios.2004.09.015

Malaysia Will Not Burn Foreign Boats To Stop Illegal Fishing-Shahidan, 2015. . www.bernama.com.

Malaysia's National Plan of Action to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing (Malaysia's NPOA-IUU). 2013.

Maldeniya, R. & Amarasooriya, D. 1998. Tuna fisheries in Sri Lanka: an update. 7th Expert

Maldives National Defence Force, 2012. Coast Guard apprehends illegal fishing vessel.

Marine Fisheries Ordinance 1983 (Ordinance No. XXXV) (Bangladesh), 1983. , Bangladeshi Law.

Marine Fisheries Rules, 1988.

Mazid, M. A. (1994). Evaluation of prawn farming on socio-economic aspects. Fisheries Research Institute, Mymensingh, Bangladesh.

McDorman, T.L. (2000) Final report on legal advice to Thailand. Field Report C-4, FAO, Rome. CP/INT/648/NOR, 174pp.

Merchant Shipping (Registration of Fishing Vessels and Pleasure Craft) Regulations of Brunei Darussalam, 2011.

Miller, D.D., Sumaila, U.R., 2014a. Flag use behavior and IUU activity within the international fishing fleet: Refining definitions and identifying areas of concern. *Marine Policy* 44, 204–211. doi:10.1016/j.marpol.2013.08.027

Ministry of Marine Affairs and Fisheries (MMAF) (2014) Indonesia Marine and Fisheries Book

Mohamed, K. (2015). Future of India's Marine Fisheries. (Available at: <http://www.cmfri.org.in/uploads/files/Future%20of%20indias%20marine%20fisheries%20jan%202015.pdf>)

Mohammad, N., 2011. COMPLIANCE WITH THE FISHERIES LAWS AND POLICIES IN BANGLADESH: AN EMPIRICAL STUDY. Presented at the 9th International Conference on Environmental Compliance and Enforcement, British Columbia, p. 7.

Mohammed, E. Y. and Wahab. A. (2013). Direct economic incentives for sustainable fisheries management: the case of Hilsa conservation in Bangladesh. International Institute for Environment and Development, London

Mohan, R, n.d. Indian Tuna Scheme: "Fount of Corruption and Malpractice. www.atuna.com.

Moir-Clark, J., Duffy, H., Pearce, J., Mees, C.C., 2015. Update on the catch and bycatch composition of illegal fishing in the British Indian Ocean Territory (BIOT) and a summary of abandoned and lost fishing gear. Presented at the IOTC Working Party on Ecosystems and Bycatch (2015), IOTC, Olhao, Portugal, p. 10.

Morgan G (2006) Country review: India (West coast). pp. 221-236 In Young CD (ed.) Review of the state of world marine capture fisheries management: Indian Ocean. FAO Fisheries Technical Paper 488, Rome.

Morgan, G, Staples, D, 2006. The history of industrial marine fisheries in Southeast Asia The history of industrial marine fisheries in Southeast Asia (No. RAP PUBLICATION 2006/12). Food and Agriculture Organisation of the United Nations, Bangkok.

Mous, P., Pet-Soede, L., Erdmann, M., Cesar, H., Sadovy, Y., & Pet, J. (2000). Cyanide fishing on Indonesian coral reefs for the live food fish market-What is the problem. Collected essays on the economics of coral reefs. Kalmar, Sweden: CORDIO, Kalmar University, 69-76.

Move to issue licence for fishing in extended Bay of Bengal areas [WWW Document], 2012. URL http://www.thefinancialexpress-bd.com/old/more.php?news_id=135173&date=2012-07-02

MPA Global. (2015). Marine Protected Areas in Sri Lanka.

MRAG, (2005). Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries. Marine Resources Assessment Group, London, UK.

Muallil, R.N., Mamauag, S.S., Cabral, R.B., Celeste-Dizon, E.O., Aliño, P.M., 2014. Status, trends and challenges in the sustainability of small-scale fisheries in the Philippines: Insights from FISHDA (Fishing Industries' Support in Handling Decisions Application) model. Marine Policy 44, 212–221. doi:10.1016/j.marpol.2013.08.026

Muro ami fishermen rescued in Palawan | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/muro-ami-fishermen-rescued-in-palawan/> (accessed 7.6.15).

Murshed-e-Jahan, K., Belton, B., Viswanathan, K.K., 2014. Communication strategies for managing coastal fisheries conflicts in Bangladesh. Ocean & Coastal Management 92, 65–73. doi:10.1016/j.ocecoaman.2014.01.003

Myanmar Marine Fisheries Law, State Law and Order Restoration Council Law No. 9/90 (25 April 1990).

National Fishery Sector Overview PNG [WWW Document], n.d. URL ftp://ftp.fao.org/fi/document/fcp/en/FI_CP_PG.pdf (accessed 7.31.15).

National Plan of Action for Combating Illegal, Unreported and Unregulated Fishing in Timor-Leste, 2013.

Nazira, K., Yongtong, M., Kalhor, M. A., Memon, K. H., Mohsin, M., & Kartika, S. (2015). A Preliminary Study on Fisheries Economy of Pakistan: Plan of Actions for Fisheries Management in Pakistan.

NOAA, (2013). *Improving International Fisheries Management*. Report to Congress pursuant to Section 403 (a) of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. USA.

Noncompliance a major threat in fisheries management-Experiences from the artisanal coastal fisheries of Bangladesh-Munich Personal RePEc Archive [WWW Document], n.d. URL <http://mpra.ub.uni-muenchen.de/32330/> (accessed 7.9.15).

Nugent, P., McDonagh, J., Mees, C.C., 2010. British Indian Ocean Territory (Chagos archipelago)-Fisheries Conservation and Management Zone-The inshore fishery in 2009. Presented at the British Seychelles Fisheries Commission (2010), Victoria, Seychelles, p. 20.

O'Meara, D., Harper, S., Perera, N. and Zeller, D. (2011) Reconstruction of Sri Lanka's fisheries catches: 1950-2008. Sea Around Us Project, Fisheries Centre, University of British Columbia.. In: BOBLME (2011) Fisheries catches for the Bay of Bengal Large Marine Ecosystem since 1950. BOBLME-2011-Ecology-16. pp 135-146.

OECD (2013), *OECD Review of Fisheries: Policies and Summary Statistics 2013*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/rev_fish-2013-en

Ohman, M. C., Rajasuriya, A., & Lindén, O. (1993). Human disturbances on coral reefs in Sri Lanka: a case study. *Ambio*, 22(7), 474-80.

Ordinance to amend the Exclusive Fishery Zone (Regulation of Fishing) Act, Government of Pakistan, 1983.

Pacific Countries Tackle IUU Fishing and Work to Promote Sustainable Fisheries in the Coral Triangle Region: NOAA Fisheries [WWW Document], n.d. URL http://www.nmfs.noaa.gov/ia/slider_stories/2013/09/si_workshops.html (accessed 7.10.15).

Palin, C., Gaudin, C., Espejo-Hermes, J., Nicolaidis, L., European Parliament, Directorate-General for Internal Policies of the Union, Group of Policy Advisers Consortium, 2013. Compliance of imports of fishery and aquaculture products with EU legislation. Publications Office, Luxembourg. http://bookshop.europa.eu/en/compliance-of-imports-of-fishery-and-aquaculture-products-with-eu-legislation-pbBA0313512/downloads/BA-03-13-512-EN-2/BA0313512EN2_002.pdf?FileName=BA0313512EN2_002.pdf&SKU=BA0313512EN2_PDF&CatalogueNumber=BA-03-13-512-EN-2

Palomares, M. & Pauly, D., eds. (2014). Philippine marine fisheries catches: a bottom up reconstruction, 1950-2010. In BOBLME (2015)

Panjarat, S, 2008. Sustainable Fisheries in the Andaman Sea coast of Thailand, The United Nations-Nippon Foundation Fellowship Programme 2007-2008.

Panjarat, S. (2008). Sustainable fisheries in the Andaman coast of Thailand. Research thesis undertaken as part of the United Nations-Nippon Foundation Fellowship Programme.

Parliament of the Democratic Socialist Republic of Sri Lanka, 2013. Fisheries and Aquatic Resources (Amendment) Act, No.35 of 2013.

Pauly, D. and Budimartono, V. (2015). Marine Fisheries Catches of Western, Central and Eastern Indonesia, 1950-2010. Fisheries Centre Working Paper #2015-61, University of British Columbia, Vancouver, 51 p.

Pe, M. (2004). National Report of Myanmar on the Sustainable Management of the Bay of Bengal Large Marine Ecosystem (BOBLME), GCP/RAS/179/WBG.

Permal, S., n.d. Malaysia's And Indonesia's Security Concerns and Priorities in the Strait of Malacca: Similarities and Differences.

Petrossian, G., Weis, J.S., Pires, S.F., 2015. Factors affecting crab and lobster species subject to IUU fishing. *Ocean & Coastal Management* 106, 29–34. doi:10.1016/j.ocecoaman.2015.01.014

Petrossian, G.A., 2014. Preventing Illegal, Unreported and Unregulated (IUU) fishing: A situational approach. *Biological Conservation*. doi:10.1016/j.biocon.2014.09.005

Pet-Soede L, Erdmann MV (1998). An overview and comparison of destructive fishing practices in Indonesia. Secretariat of the Pacific Community (SPC) Live Reef Fish Bulletin 1998; 4:28–36

Pet-Soede, C., Cesar, H. S. J., & Pet, J. S. (1999). An economic analysis of blast fishing on Indonesian coral reefs. *Environmental Conservation*, 26(02), 83-93.

Pitcher, T.J., Watson, R., Valtýsson, H., Guénette, S., n.d. Estimating illegal and unreported catches from marine ecosystems: a basis for change. *Fish Fish* 3, 317–339.

PLI-VNM-05-[Consultancy-report-(Y3)-National-Tuna-Management-Plan-June2012].pdf, n.d.

Poh, T.-M., Fanning, L.M., 2012. Tackling illegal, unregulated, and unreported trade towards Humphead wrasse (*Cheilinus undulatus*) recovery in Sabah, Malaysia. *Marine Policy* 36, 696–702. doi:10.1016/j.marpol.2011.10.011

Polacheck, T., 2012. Assessment of IUU fishing for Southern Bluefin Tuna. *Marine Policy* 36, 1150–1165. doi:10.1016/j.marpol.2012.02.019

Pramod, G. (2010) Illegal, Unreported and Unregulated Marine Fish Catches in the Indian Exclusive Economic Zone, Field Report, Policy and Ecosystem Restoration in Fisheries, Fisheries Centre, University of British Columbia, BC, Vancouver, Canada, 30 pages.

Pramod, G. (2010). Illegal, Unreported and Unregulated Marine Fish Catches in the Indian Exclusive Economic Zone, Field Report, Policy and Ecosystem Restoration in Fisheries, Fisheries Centre, University of British Columbia, BC, Vancouver, Canada, 30 pages.

Pramod, G. and Pitcher, T.J. (2006) An Estimation of Compliance of the Fisheries of Sri Lanka with Article 7 (Fisheries Management) of the FAO (UN) Code of Conduct for Responsible Fishing. 20 pages in Pitcher, T.J., Kalikoski, D. and Pramod, G. (eds) Evaluations of Compliance with the FAO (UN) Code of Conduct for Responsible Fisheries. Fisheries Centre Research Reports 14(2): 1192pp.

Pramod, G., & Pitcher, T. J. (2006). An Estimation of Compliance of the Fisheries of Bangladesh with Article 7 (Fisheries Management) of the UN Code of Conduct for Responsible Fishing.

Price, A. R. G., Harris, A., McGowan, A., Venkatachalam, A. J., & Sheppard, C. R. C. (2010). Chagos feels the pinch: assessment of holothurian (sea cucumber) abundance, illegal harvesting and conservation prospects in British Indian Ocean Territory. *Aquatic Conservation: marine and freshwater ecosystems*, 20(1), 117-126

Price, A.R.G., Harris, A., McGowan, A., Venkatachalam, A.J., Sheppard, C.R.C., 2010. Chagos feels the pinch: assessment of holothurian (sea cucumber) abundance, illegal harvesting and conservation prospects in British Indian Ocean Territory. *Aquatic Conservation: Marine and Freshwater Ecosystems*: 20, 117–126.

Prime Ministerial Decision, Approval of the Master Plan for the Development of Seafood 2020, Vision 2030. Republic of Vietnam.

Priyono, B. E., & Sumiono, B. (1997). The marine fisheries of Indonesia, with emphasis on the coastal demersal stocks of the Sunda shelf. In *Status and management of tropical coastal fisheries in Asia*. ICLARM Conf. Proc. 53 (pp. 38-46).

Puthy, E.M, 2007. MARINE FISHERIES RESOURCE MANAGEMENT POTENTIAL FOR MACKEREL FISHERIES OF CAMBODIA.

Rahman M. (2001). The impact of shrimp trawl fisheries on living marine resources of Bangladesh. In *Tropical Shrimp Fisheries and Their Impacts on Living Marine Resources*. FAO Fisheries Circular no. 974, Rome, 2001.

Rahman MM, Z.A. C and Sada MNU. (2003). Coastal Resources Management, Policy and Planning in Bangladesh. pp. 689-756 In Silvestre G, Gerces L, Stobutzki I, Ahmed M, Valmonte-Santos RA, Luna C, Lachica-Aliño L, Munro P, Christensen V and Pauly D (eds.), *Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries*. WorldFish Center, Philippines.

Rajagopalan R (2011) India. pp. 33-49 In Sanders JS, Gréboval D and Hjort A (eds.), *Marine protected areas: country case studies on policy, governance and institutional issues*. FAO Fisheries and Aquaculture Technical Paper 556/1, Rome.

Rajasuriya, A. (1997). Coral Reefs of Sri Lanka: Current status and resource management. In *Regional Workshop on the Conservation and Sustainable Management of Coral Reefs*.

Rajasuriya, A., Zahir, H. U. S. S. E. I. N., Muley, E. V., Subramanian, B. R., Venkataraman, K., Wafar, M. V. M.. & Whittingham, E. M. M. A. (2002). Status of coral reefs in South Asia: Bangladesh, India, Maldives, Sri Lanka. In *Proceedings of the Ninth International Coral Reef Symposium, Bali, 23-27 October 2000*, (Vol. 2, pp. 841-845).

Rao, G.S., n.d. Current status and prospects of fishery resources of the Indian continental shelf. Coastal Fishery Resources of India: Conservation and Sustainable Utilisation 1–13.

Ratner, B.D., Åsgård, B., Allison, E.H., 2014. Fishing for justice: Human rights, development, and fisheries sector reform. *Global Environmental Change* 27, 120–130. doi:10.1016/j.gloenvcha.2014.05.006

Regional Workshop on the Elaboration of National Plans of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing-South Asian Subregion (Ed.), 2006. Report of the FAO Regional Workshop on the Elaboration of National Plans of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing-South Asian Subregion, Bangkok, Thailand, 19-23 June 2006, FAO fisheries report. Food and Agriculture Organization of the United Nations, Rome.

Regulation of the Fisheries Department on the application for a license for overseas fisheries B.E. 2532, 1989. (Thailand).

Repatriation process of 4 Lanka fishermen held off Paradip begins | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/india-others/repatriation-process-of-4-lanka-fishermen-held-off-paradip-begins/> (accessed 7.6.15).

Report of the Eighteenth Session of the Indian Ocean Tuna Commission [WWW Document], n.d. URL <http://www.iotc.org/documents/report-eighteenth-session-indian-ocean-tuna-commission> (accessed 7.24.14).

Report of the FAO-FFA Regional Workshop to Promote the Full and Effective Implementation of Port State Measures to Combat Illegal, Unreported and Unregulated Fishing. Nadi, Fiji, 28 August–1 September 2006. [WWW Document], n.d. URL <http://www.fao.org/docrep/009/a0912e/a0912e00.htm> (accessed 7.9.15).

Report of the Fourth Session of the IOTC Working Party on Neritic Tunas [WWW Document], n.d. URL <http://www.iotc.org/documents/report-fourth-session-iotc-working-party-neritic-tunas> (accessed 7.24.14).

Report of the Regional Workshop to Support Compliance with IOTC Requirements for the Collection and Reporting of Fisheries Data to the IOTC [WWW Document], n.d. URL <http://www.iotc.org/documents/report-regional-workshop-support-compliance-iotc-requirements-collection-and-reporting> (accessed 7.24.14).

Report of the Regional Workshop to support the implementation of the Resolutions of the IOTC [WWW Document], n.d. URL <http://www.iotc.org/documents/report-regional-workshop-support-implementation-resolutions-iotc> (accessed 7.24.14).

Reporting of vessels in transit through BIOT waters for potential breach of IOTC Conservation and Management Measures. (No. IOTC-2014-CoC-1-08e [E]), 2014. , 11th IOTC Compliance Committee Meeting.

RI to sink 3 foreign ships for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/12/05/ri-sink-3-foreign-ships-illegal-fishing.html> (accessed 7.6.15).

Rich in Fisheries, But Fisherfolk Remain Poor – ASEAN News–Development News Around ASEAN, n.d.

Sadovy, Y., 2010. Humphead wrasse and Illegal, Unreported and Unregulated fishing (No. 19), SPC Live Reef Fish Information Bulletin. University of Hong Kong, China.

Samaranayake, R.A.D.B. (2003). Review of national fisheries situation in Sri Lanka. In G. Silvestre, L. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C. Luna, L. Lachica-Aliño, P. Munro, V. Christensen & D. Pauly, eds. Assessment, management and future directions of coastal fisheries in Asian countries, pp. 987–1012. WorldFish Center Conference Proceedings 67.

Samoilys, M.A., Martin-Smith, K.M., Giles, B.G., Cabrera, B., Anticamara, J.A., Brunio, E.O., Vincent, A.C.J., 2007. Effectiveness of five small Philippines' coral reef reserves for fish populations depends on site-specific factors, particularly enforcement history. *Biological Conservation* 136, 584–601. doi:10.1016/j.biocon.2007.01.003

Sathianandan, T. V., Jayasankar, J., Kuriakose, S., Mini, K. G., George, G., Syamala, K., ... & Manjeesh, R. (2014). Status of India's Exploited Marine Fishery Resources in 2013. *Marine Fisheries Information Service; Technical and Extension Series*, (221), 3-6.

Sea Resources Management Sdn Bhd, 2008. Case study on Illegal, Unreported and Unregulated (IUU) fishing off the East coast of Peninsular Malaysia (No. APEC#208-FS-01.4). Asia-Pacific Economic Cooperation.

SEAFDEC (2011). Countries profile of Malaysia. Addressing IUU fishing in the Southeast Asian region.

SEAFDEC (2012). Countries profile of Brunei-Darussalam. Addressing IUU fishing in the Southeast Asian region.

SEAFDEC (2012). Countries profile of Myanmar. Addressing IUU fishing in the Southeast Asian region.

SEAFDEC (2012). Countries profile of Thailand. Addressing IUU fishing in the Southeast Asian region.

SEAFDEC (2012). Countries profile of the Philippines. Addressing IUU fishing in the Southeast Asian region.

SEAFOODNEWS.COM, n.d. Crab poaching by Russians in Japanese EEZ rises rapidly, reflecting more enforcement in Russia. *Seafood News*.

Selig, E.R., Bruno, J.F., 2010. A Global Analysis of the Effectiveness of Marine Protected Areas in Preventing Coral Loss. *PLoS ONE* 5, e9278. doi:10.1371/journal.pone.0009278

Shankar, K. and Wright, B. (2000) Editorial: Operation Kachhapa: new problems, new solutions?, *Kachhapa* Volume 2, page 3.

Sheik, A.T. et al (2000). First National Report on the Implementation of the Convention on Biological Diversity. <https://www.cbd.int/doc/world/pk/pk-nr-01-en.doc>.

Silvestre, G., Pauly, D., 1997. Status and Management of Tropical Coastal Fisheries in Asia. *WorldFish*.

Sour, K. 2005. The socio-economic status of coastal fishing communities including health and HIV/AIDS. Prepared for the GCP/RAS/199/SWE Strengthening Capacity in Fisheries Information gathering for Management.

Spalding, M. D. (2006). Illegal sea cucumber fisheries in the Chagos Archipelago. SPC Beche-de-mer Information Bulletin, 23, 32-34.

Spalding, M., n.d. Illegal sea cucumber fisheries in the Chagos Archipelago (No. 23), SPC Beche-de-mer information bulletin.

Sridhar, A., A. Kasturi Rangan, R. Pearlin., V. Natarajan, B. Jairaj, R. Mahadevan 2007. Assessing and enhancing legislative provisions for natural resource conservation in the Gulf of Mannar. Final Report submitted to GoMBRT, Ramanathapuram (63 pages)

Stacey, N., Karam, J., Jackson, M., Kennett, R., Wagey, T., 2015. Knowledge exchange as a tool for transboundary and coastal management of the Arafura and Timor Seas. Ocean & Coastal Management 114, 151–163. doi:10.1016/j.ocecoaman.2015.06.007

Stephen, J., 2015. Fishing for space: Socio-spatial relations of Indian trawl fishers in the Palk Bay, South Asia, in the context of trans-boundary fishing. Amsterdam Institute for Social Science Research.

Stolen Fish/The failure of the LoP scheme [WWW Document], n.d. URL <http://visual.ly/stolen-fish-failure-lop-scheme> (accessed 7.28.14).

Stop Illegal Fishing, 2011. So long and thanks for all the fish: the decline of the Maldivian fishing industry [WWW Document]. URL http://www.stopillegalfishing.com/news_article.php?ID=461

Strengthen fisheries enforcement to stop pirate fishing, end overfishing crisis-Greenpeace | Greenpeace International [WWW Document], n.d. URL <http://www.greenpeace.org/international/en/press/releases/Strengthen-fisheries-enforcement-to-stop-pirate-fishing-end-overfishing-crisis--Greenpeace/> (accessed 7.10.15).

Strengthen fisheries enforcement to stop pirate fishing, end overfishing crisis-Greenpeace [WWW Document], n.d. Greenpeace International. URL <http://www.greenpeace.org/international/en/press/releases/Strengthen-fisheries-enforcement-to-stop-pirate-fishing-end-overfishing-crisis--Greenpeace/> (accessed 8.6.14).

Teh, L. & Teh, L. (2014). Reconstructing the marine fisheries catch of peninsular Malaysia, Sarawak and Sabah, 1950-2010. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Teh, L., Kinch, J., Zyllich, K. & Zeller, D. (2014). Reconstructing Papua New Guinea's marine fisheries catch, 1950-2010. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Teh, L., Shon, D., Zyllich, K. & Zeller, D. (2014). Reconstructing Cambodia's marine fisheries catch, 1950-2010. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Teh, L., Teh, L., Zeller, D. & Cabanban, A. (2009). Historical perspective of Sabah's marine fisheries. Sea Around Us Project, Fisheries Centre, University of British Columbia.

Teh, L., Zeller, D. & Pauly, D. (2015). Preliminary reconstruction of Thailand's fisheries catches: 1950-2010. In BOBLME (2015). Reconstructed total fisheries catches for the countries of the Bay of Bengal Large Marine Ecosystem: 1950-2010. BOBLME-2015-Ecology-25. (Draft report/working paper for country consultation).

Teh, L., Zeller, D., Pitcher, T.J., 2015. Preliminary reconstruction of Thailand's fisheries catches: 1950-2010 In BOBLME (2015). Reconstructed total fisheries catches for the countries of the Bay of Bengal Large Marine Ecosystem: 1950-2010. BOBLME-2015-Ecology-25. (Draft report/working paper for country consultation).

Teh, L., Zeller, D., Zyllich, K., Nguyen, G. & Harper, S. (2014). Reconstructing Vietnam's marine fisheries catch, 1950-2010.

Territorial Waters and Maritime Zone Act, Government of Pakistan, 1976.

Tesfamichael, D., Pitcher, T.J., 2007. Estimating the unreported catch of eritrean Red Sea fisheries. *Afr J Mar Sc* 29, 55–63.

Thai Vessels Act, B.E. 2481 (1938).

Thailand's Roadmap on IUU Fishing (2015). Royal Thai government. <http://www.thaigov.go.th>

The CIA World Fact Book, (2015).

The Fisheries Act 1985, Laws of Malaysia, Act 317 (incorporating all amendments up to 1 January 2006).

The Fisheries Act, 1969 (revised up to 2002), Singapore.

The Fisheries Law of 2003, National Assembly of the Socialist Republic of Vietnam.

THE FISHERIES LAW OF THE MALDIVES, 1987.

The Hate-Love Triangle in the Timor Sea-Part Two-1273799470-FDI Strategic Analysis Paper-14 May 2010 (Part Two).pdf [WWW Document], n.d. URL [http://www.futuredirections.org.au/files/1273799470-FDI%20Strategic%20Analysis%20Paper%20-%202014%20May%202010%20\(Part%20Two\).pdf](http://www.futuredirections.org.au/files/1273799470-FDI%20Strategic%20Analysis%20Paper%20-%202014%20May%202010%20(Part%20Two).pdf) (accessed 7.3.15).

The National Biodiversity Strategy and Action Plan of Timor-Leste (2011-2020).

The New Fisheries Act. B.E. 2558, 2015. (Thailand)

The Philippine Fisheries Code of 1998, Republic Act No. 8550.

Theberge, M.M., Dearden, P., 2006. Detecting a decline in whale shark *Rhincodon typus* sightings in the Andaman Sea, Thailand, using ecotourist operator-collected data. *Oryx* 40, 337. doi:10.1017/S0030605306000998

THEME II: CURRENT STATUS IN CAPACITY REDUCTION AND CONTROL OF IUU FISHING [WWW Document], n.d. URL <http://www.fao.org/docrep/010/ah999e/ah999e06.htm> (accessed 6.23.15).

Touch, S. T., & Todd, B. H. (2001). The inland and marine fisheries trade of Cambodia. Oxfam America, Phnom Penh, Cambodia. 147p.

Ullah H, Gibson D, Knip D, Zylich K and Zeller D. (2014). Reconstruction of total marine fisheries catches for Bangladesh: 1950-2010. In BOBLME (2015) Reconstructed total fisheries catches for the countries of the Bay of Bengal Large Marine Ecosystem: 1950-2010. BOBLME-2015-Ecology-25. (Draft report/working paper for country consultation).

UNEP (2008) National Report on Seagrass in the South China Sea. UNEP/GEF/SCS Technical Publication No. 12. United Nations Environment Programme, Bangkok, Thailand

US Department of Commerce, 2013. Improving International Fisheries Management. (Report to Congress.). National Oceanic and Atmospheric Administration.

Van Zwieten, P., van Densen, W. & van Thi, D. (2002). Improving the usage of fisheries statistics in Vietnam for production planning, fisheries management and nature conservation. *Marine Policy* 26. pp. 13-34.

Varkey, D. A., Ainsworth, C. H., Pitcher, T. J., Goram, Y., & Sumaila, R. (2010). Illegal, Unreported and Unregulated fisheries catch in Raja Ampat Regency, Eastern Indonesia. *Marine Policy*, 34(2), 228-236.

Varkey, D.A., Ainsworth, C.H., Pitcher, T.J., Goram, Y., Sumaila, R., 2010a. Illegal, Unreported and Unregulated fisheries catch in Raja Ampat Regency, Eastern Indonesia. *Marine Policy* 34, 228–236. doi:10.1016/j.marpol.2009.06.009

Varkey, D.A., Ainsworth, C.H., Pitcher, T.J., Goram, Y., Sumaila, R., 2010b. Illegal, Unreported and Unregulated fisheries catch in Raja Ampat Regency, Eastern Indonesia. *Marine Policy* 34, 228–236. doi:10.1016/j.marpol.2009.06.009

Vince, J., 2007. Policy responses to IUU fishing in Northern Australian waters. *Ocean & Coastal Management* 50, 683–698. doi:10.1016/j.ocecoaman.2007.05.006

Vivekanandan, V. (2010). Trawl Brawl. *Samudra Report*, 57, 24-27.

Vivekanandan, V., n.d. Whose waters are these anyway? (No. 51), *Samudra Report*.

Williams, M., 2013. Will New Multilateral Arrangements Help Southeast Asian States Solve Illegal Fishing? *Contemporary Southeast Asia: A Journal of International and Strategic Affairs* 35, 258–83. doi:10.1355/cs35-2f

Willoughby N, Monintja D, Badrudin M. (1997) Do fisheries statistics give the full picture? Indonesia's non-recorded fish problems. In: Report of the regional workshop on the precautionary approach to fishery management. 25–28 February, 1997, Medan Indonesia. Bay of Bengal Program, Chennai, India.

Wood, L. J. (2007). MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC & WWF. www.mpaglobal.org

World Fishing & Aquaculture-Illegal fishing operation fined over AUD \$2m [WWW Document], n.d. URL [http://www.worldfishing.net/news101/industry-news/illegal-fishing-operation-fined-over-\\$2m](http://www.worldfishing.net/news101/industry-news/illegal-fishing-operation-fined-over-$2m) (accessed 8.7.15).

World Fishing & Aquaculture-Thai fisheries target value added export processing [WWW Document], n.d. URL <http://www.worldfishing.net/news101/regional-focus/thai-fisheries-target-value-added-export-processing> (accessed 8.22.14).

WWF-Singapore and Malaysia asked to close ports to toothfish pirates [WWW Document], n.d. URL http://wwf.panda.org/wwf_news/?196524/Singapore-and-Malaysia-asked-to-close-ports-to-toothfish-pirates (accessed 9.2.15).

WWF Hong Kong-WWF Announces Changes in Shark Fin Trade Figures – Imports Drop Over 30 Per Cent [WWW Document], 2014. URL <http://www.wwf.org.hk/en/news/?11220> (accessed 11.10.15).

Yee, X.Y., 2015. Nabbed for illegal fishing. The Star Online.

Zeller, D. & Pauly, D. (2014). Reconstruction of domestic fisheries catches in the Chagos archipelago.

Zeller, D., Pauly, D., n.d. THE CHAGOS ARCHIPELAGO: 1950-2010.

Press Articles and Statements

\$11k fine for illegal fishing | The Brunei Times [WWW Document], 2012. URL <http://www.bruneitimes.com.bn/news-national/2012/06/24/11k-fine-illegal-fishing> (accessed 7.3.15).

\$19 million lost due to illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2014/11/09/19-million-lost-due-illegal-fishing> (accessed 7.3.15).

‘Suspicious’ fishing boats continue to surprise maritime security agencies | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/cities/ahmedabad/suspicious-fishing-boats-continue-to-surprise-maritime-security-agencies/> (accessed 7.6.15).

“Catch” yet to be verified-Mergawati | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/Opinion/Columnists/Mergawati/Profile/Articles/2014/12/01/Catch-yet-to-be-verified/> (accessed 7.7.15).

“Fishing boats must have tracking device” [WWW Document], 2014. . NST Online. URL <http://www.nst.com.my/node/7564> (accessed 7.24.14).

“Miscommunication” sparks increase in fishing crimes, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/miscommunication-sparks-increase-fishing-crimes> (accessed 7.7.15).

” despite China warning-Regional | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/Regional/2014/05/12/Philippines-to-charge-poachers-despite-China-warning/> (accessed 7.7.15).

101 Indian fishermen freed [WWW Document], n.d. URL <http://nation.com.pk/politics/05-Sep-2010/101-Indian-fishermen-freed> (accessed 7.6.15).

- 11 Sri Lankan fishermen arrested in Andhra Pradesh [WWW Document], n.d. URL <http://www.ndtv.com/south/11-sri-lankan-fishermen-arrested-in-andhra-pradesh-520814> (accessed 7.15.15).
- 111 fishermen return from Indian jail | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/111-fishermen-return-from-indian-jail-6576> 5 (accessed 7.2.15).
- 112 Indian fishermen remanded to judicial custody in Sri Lanka | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/news-archive/print/112-indian-fishermen-remanded-to-judicial-custody-in-sri-lanka/> (accessed 7.6.15).
- 113 Indian fishermen return home from Pakistani jail [WWW Document], n.d. URL <http://www.hindustantimes.com/india-news/113-indian-fishermen-return-home-from-pakistani-jail/article1-1360742.aspx> (accessed 7.8.15).
- 12 Chinese jailed for illegal fishing in Philippines | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2014/08/06/12-chinese-jailed-illegal-fishing-philippines> (accessed 7.3.15).
- 12 Indian fishermen leave for Wagha [WWW Document], 2010. URL <http://nation.com.pk/national/14-Dec-2010/12-Indian-fishermen-leave-for-Wagha> (accessed 7.6.15).
- 12 Vietnamese fishermen detained | Bangkok Post: news [WWW Document], 2015. URL <http://www.bangkokpost.com/news/general/460132/12-vietnamese-fishermen-detained> (accessed 7.7.15).
- 12 Vietnamese held as suspects of illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/02/09/12-vietnamese-held-suspects-illegal-fishing.html> (accessed 7.6.15).
- 12 Vietnamese jailed in Philippines for illegal fishing | mb.com.ph | Philippine News [WWW Document], 2014. URL <http://www.mb.com.ph/12-vietnamese-jailed-in-philippines-for-illegal-fishing/> (accessed 7.7.15).
- 13 Vietnamese arrested in Philippines over sea turtles | Bangkok Post: news [WWW Document], 2013. URL <http://www.bangkokpost.com/news/asia/375658/13-vietnamese-arrested-in-philippines-over-sea-turtles> (accessed 7.7.15).
- 14 Indian fishermen held, sent to jail | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/14-indian-fishermen-held-sent-to-jail-4699> 2 (accessed 7.2.15).
- 14 Sri Lankan fishermen jailed: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/47456/14-sri-lankan-fishermen-jailed> (accessed 7.7.15).
- 140908-PNG stops illegal fishing-Australian High Commission [WWW Document], n.d. URL <http://png.embassy.gov.au/pmsb/307.html> (accessed 7.8.15).
- 15 rescued while being trafficked to Malaysia | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/online/15-rescued-while-being-trafficked-malaysia-5257> (accessed 7.2.15).
- 15 SL fishermen in Myanmar custody: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/53410/15-sl-fishermen-in-myanmar-custody> (accessed 7.7.15).
- 150 Lankan nationals held while trying to sail to Australia | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/india-others/150-lankan-nationals-held-while-trying-to-sail-to-australia/> (accessed 7.6.15).

- 16 Indians booked for illegal fishing-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/Todays-News-4-31175-16-Indians-booked-for-illegal-fishing> (accessed 7.3.15).
- 16 SL fishermen poaching sea cucumbers off Lakshadweep nabbed: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/45692/16-sl-fishermen-poaching-sea-cucumbers-off-lakshadweep-nabbed> (accessed 7.7.15).
- 19 fishermen, 4 women return home after jail terms in India | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/19-fishermen-4-women-return-home-after-jail-terms-in-india> -3713 (accessed 7.2.15).
- 19 SL fishermen arrested in India: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/64569/19-sri-lankan-fishermen-arrested-in-india> (accessed 7.7.15).
- 2 Vietnamese boats, 18 crew nabbed | Bangkok Post: news [WWW Document], 2014. URL <http://www.bangkokpost.com/news/general/445946/2-vietnamese-boats-18-crew-nabbed> (accessed 7.7.15).
- 20 fishermen held [WWW Document], n.d. URL <http://nation.com.pk/politics/15-Apr-2009/20-fishermen-held> (accessed 7.6.15).
- 21 North Sumatra fishermen reportedly arrested by Malaysian authorities | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2012/11/24/21-north-sumatra-fishermen-reportedly-arrested-malaysian-authorities.html> (accessed 7.6.15).
- 22 Indian fishermen arrested: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/40902/22-indian-fishermen-arrested> (accessed 7.7.15).
- 22 years a slave: Myanmar fisherman reunites with family after long years at sea | The Indian Express [WWW Document], n.d. . Indian Express. URL <http://indianexpress.com/article/world/neighbours/22-years-a-slave-myanmar-fisherman-reunites-with-family-after-long-years-at-sea/> (accessed 7.6.15).
- 25 Indian fishermen in custody: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/41120/25-indian-fishermen-in-custody> (accessed 7.7.15).
- 25 Indian fishermen sent to jail on judicial remand [WWW Document], n.d. URL <http://nation.com.pk/karachi/23-Feb-2013/25-indian-fishermen-sent-to-jail-on-judicial-remand> (accessed 7.6.15).
- 26 fishermen jailed for catching jatka | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/country/26-fishermen-jailed-catching-jatka-73794> (accessed 7.3.15).
- 26 Vietnamese fishermen fined-Nation | The Star Online [WWW Document], 2013. URL <http://www.thestar.com.my/News/Nation/2012/02/29/26-Vietnamese-fishermen-fined/> (accessed 7.7.15).
- 27 Indian fishermen held in bay | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/27-indian-fishermen-held-in-bay-63898> (accessed 7.3.15).
- 27 Indian fishermen remanded for 14 days-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/Todays-News-4-155636-27-Indian-fishermen-remanded-for-14-days> (accessed 7.3.15).

28 Indian fishermen held for intrusion into Bangladesh waters | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/28-indian-fishermen-held-for-intrusion-into-bangladesh-waters-48341> (accessed 7.2.15).

29 held in Punjab for fishing illegally-thenews.com.pk [WWW Document], 2008. URL <http://www.thenews.com.pk/TodaysPrintDetail.aspx?ID=117490&Cat=2&dt=6/9/2008> (accessed 7.3.15).

30 more Indian fishermen arrested: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/40112/30-more-indian-fishermen-arrested> (accessed 7.7.15).

31 Indian fishermen nabbed-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/Todays-News-4-89015-31-Indian-fishermen-nabbed> (accessed 7.3.15).

31 Vietnamese in Jail for Violating Fisheries Act [WWW Document], 2015. URL <http://www.brudirect.com/0-national/national/national-in-the-courts/item/26939-31-vietnamese-in-jail-for-violating-fisheries-act> (accessed 7.7.15).

33 arrested for illegal fishing in Palawan | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/33-arrested-for-illegal-fishing-in-palawan/> (accessed 7.7.15).

33 illegal fishermen nabbed in Limay | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/33-illegal-fishermen-nabbed-in-limay/> (accessed 7.6.15).

36 caught for illegal fishing | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/36-caught-for-illegal-fishing/> (accessed 7.7.15).

38 fishermen arrested for illegal fishing | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/38-fishermen-arrested-for-illegal-fishing/> (accessed 7.7.15).

38 Indian trespassing fishermen held in Bagerhat | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/38-indian-trespassing-fishermen-held-in-bagerhat-63587> (accessed 7.2.15).

39 Indian fishermen held, seven boats seized-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/Todays-News-4-138982-39-Indian-fishermen-held-seven-boats-seized> (accessed 7.3.15).

39 Vietnamese sailors charged with illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2014/06/11/39-vietnamese-sailors-charged-illegal-fishing> (accessed 7.3.15a).

39 Vietnamese sailors charged with illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2014/06/11/39-vietnamese-sailors-charged-illegal-fishing> (accessed 7.3.15b).

4 Malaysian ships netted for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2013/03/28/4-malaysian-ships-netted-illegal-fishing.html> (accessed 7.6.15).

40 Indian prisoners released by Pakistan repatriated | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/india-others/40-indian-prisoners-released-by-pakistan-repatriated/> (accessed 7.6.15).

43 Indian fishermen arrested by Sri Lankan naval personnel [WWW Document], n.d. URL <http://www.hindustantimes.com/india-news/43-indian-fishermen-arrested-by-sri-lankan-naval-personnel/article1-1321075.aspx> (accessed 7.8.15).

45 Indian fishermen arrested-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/Todays-News-4-305442-45-Indian-fishermen-arrested> (accessed 7.3.15).

45 more fishermen jailed in 3 districts | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/45-more-fishermen-jailed-in-3-districts-45672> (accessed 7.3.15).

47 fishing crew charged for illegal transfer of fish | theSundaily [WWW Document], n.d. URL <http://www.thesundaily.my/news/1455422> (accessed 8.7.15).

47 Indian fishermen captured by Pakistan; 8 boats seized [WWW Document], 2015. URL <http://www.hindustantimes.com/india-news/47-indian-fishermen-captured-by-pakistan-8-boats-seized/article1-1338339>. (accessed 7.8.15).

48 Indian fishermen captured by Pakistan; 8 boats seized | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/india-others/48-indian-fishermen-captured-by-pakistan-8-boats-seized/> (accessed 7.15.15).

48 Indonesian fishermen detained in Malaysia | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/05/18/48-indonesian-fishermen-detained-malaysia.html> (accessed 7.6.15).

5 arrested for illegal fishing in Camarines Norte | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/5-arrested-for-illegal-fishing-in-camarines-norte/> (accessed 7.7.15).

5,000kg of hilsa fry seized in capital again | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/city/5000kg-hilsa-fry-seized-capital-again-75827> (accessed 7.3.15).

52 Illegal Vietnamese Fishermen Arrested off Kampot | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/52-illegal-vietnamese-fishermen-arrested-off-kampot-37601/> (accessed 7.3.15).

52 PH fishermen repatriated from Indonesia | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/52-ph-fishermen-repatriated-from-indonesia/> (accessed 7.6.15).

598 Pak nationals in Indian jails despite sentence completion, SC told [WWW Document], n.d. URL <http://nation.com.pk/politics/15-Sep-2010/598-Pak-nationals-in-Indian-jails-despite-sentence-completion-SC-told> (accessed 7.6.15).

6 Bajau men jailed for illegal fishing | The Brunei Times [WWW Document], 2011. URL <http://www.bruneitimes.com.bn/news-national/2011/10/25/6-bajau-men-jailed-illegal-fishing> (accessed 7.3.15).

61 Indian fishermen held over territorial violation [WWW Document], n.d. URL <http://nation.com.pk/karachi/22-Nov-2014/61-indian-fishermen-held-over-territorial-violation> (accessed 7.6.15).

7 Vietnamese fishermen caught off Palawan | mb.com.ph | Philippine News [WWW Document], 2014. URL <http://www.mb.com.ph/7-vietnamese-fishermen-caught-off-palawan/> (accessed 7.6.15).

73 Indian fishermen arrested in Sri Lanka [WWW Document], n.d. URL <http://nation.com.pk/national/08-Jun-2014/73-indian-fishermen-arrested-in-sri-lanka> (accessed 7.6.15).

75 more Indian fishermen arrested: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/44722/75-more-indian-fishermen-netted> (accessed 7.7.15).

77 Lankan fishermen in foreign custody: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/56207/77-lankan-fishermen-in-foreign-custody> (accessed 7.7.15).

801 Pak-captured Indian boats untraceable: Gujarat govt [WWW Document], 2015. URL <http://www.hindustantimes.com/india-news/801-pak-captured-indian-boats-untraceable-gujarat-govt/article1-1326039.aspx> (accessed 7.8.15).

86 Indian fishermen arrested by Sri Lankan navy | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/india-others/86-indian-fishermen-arrested-by-sri-lankan-navy> (accessed 7.6.15).

9 Indian fishermen held in Bay, trawler seized | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/9-indian-fishermen-held-in-bay-trawler-seized-47846> (accessed 7.2.15).

9 Thai Nationals Imprisoned for Illegal Fishing in Brunei Waters [WWW Document], n.d. URL <http://www.bruirect.com/0-national/national/national-in-the-courts/item/6637-9-thai-nationals-imprisoned-for-illegal-fishing-in-brunei-waters> (accessed 7.7.15).

9 Vietnamese guilty of illegal fishing | The Brunei Times [WWW Document], 2011. URL <http://www.bruneitimes.com.bn/news-national/2011/10/04/9-vietnamese-guilty-illegal-fishing> (accessed 7.3.15).

A reprieve, so they can continue to plunder? | Bangkok Post: opinion [WWW Document], n.d. URL <http://www.bangkokpost.com/opinion/opinion/612100/a-reprieve-so-they-can-continue-to-plunder> (accessed 7.7.15).

Abdullah, Mohamad, 2014. Foreign threat to fishing industry [WWW Document]. BorneoPost Online. URL <http://www.theborneopost.com/2014/03/31/foreign-threat-to-fishing-industry/#ixzz2xYsS4Ai9>

Absence of Patrols Has Increased Overfishing, Some Say | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/absence-of-patrols-has-increased-overfishing-some-say-21860/> (accessed 7.10.15).

Again, Hiu Macan Arrested 9 Fishing Boats from Vietnam-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/81739/again-hiu-macan-arrested-9-fishing-boats-from-vietnam> (accessed 7.16.15).

Agency: 4,000 fishermen stranded on some Indonesian islands | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/agency-4000-fishermen-stranded-on-some-indonesian-islands/> (accessed 7.6.15).

All fishing vessels must hoist national flag: Rajitha: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/54097/all-fishing-vessels-must-hoist-national-flag-rajitha> (accessed 7.7.15).

All Parties must defend Northern Fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/36392/all-parties-must-defend-northern-fishermen> (accessed 7.7.15).

Amended fisheries law takes effect; fishing companies air opposition | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/amended-fisheries-law-takes-effect-fishing-companies-air-opposition/> (accessed 7.7.15).

Anderson, C., Sheppard, C., Spalding, M., & Crosby, R. (1998). Shortage of sharks at Chagos. *Shark News*, 10, 1-3.

Angola joins the regional effort to combat IUU fishing [WWW Document], n.d. URL http://www.stopillegalfishing.com/sifnews_article.php?ID=87 (accessed 8.26.15).

Anon (2000) 15 arrested in Orissa for violating Wild Life Protection Act, Press Trust of India, 19 January, 2000.

Anon (2003a) Central Empowered Committee, March 7, 2003. Application No. 46, 34 pages.

Anon (2003b) Forest Guard killed in Gahirmatha, Wildlife Protection Society of India, 11 February, 2003.

Anon (2004a) Fishing boats seized in Bhitarkanika, The Statesman, 13 July 2004.

Anon (2004b) State fishermen told to pay fine, The Hindu, 28 January 2004.

Anon (2005a) Fishermen held for illegal fishing, the Statesman, 23 December, 2005.

Anon (2005b) Fishermen held for illegal fishing, The Statesman, 22 December 2005.

Anon (2006a) 5 trawlers seized, 6 held at Bhitarkanika, Sunday Pioneer, 2 February, 2006.

Anon (2006b) Fight for Olive Ridelys at babu door-Greenpeace confronts wildlife boss with harsh figures, The Telegraph, 4 April, 2006.

Anon (2007a) 11 arrested, 5 vessels seized in Bhitarkanika Sanctuary, Sunday Pioneer, March 20, 2007.

Anon (2007b) 17 fishermen intercepted for illegal fishing, The Statesman, 27 November, 2007.

Anon (2007c) Poachers Suspected as 1800 Olive Ridley Turtle Carcasses Found Along Indian Coast,

Anon (2007d) Twelve arrested for fishing off Gahirmatha coast, The Statesman, 20 March, 2007.

Anon (2008a) 14 Bengal fishermen acquitted, United News of India, 29 November, 2008.

Anon (2008b) Orissa coast: Graveyard of olive ridley turtles, The Deccan Herald, 22 January 2008.

Anon (2008c) Eight marine fishermen arrested, The Statesman, 13 January, 2008.

Anon (2008d) Fishermen nabbed at Gahirmatha, The Statesman, 20 December, 2008.

Anon (2008e) Three trawlers from Andhra seized, The Hindu, 4 December, 2008.

Anon (2008f) Three trawlers seized: 18 fishermen arrested, United News of India, 13 December, 2008.

Anon (2008g) 8 caught fishing in Gahirmatha, The Statesman, 2 December, 2008

Anon (2009a) Six fishermen nabbed near Gahirmatha, The Statesman, 17 January, 2009.

Anon (2009b) 24 fishermen arrested, four trawlers seized, United News of India, 10 February, 2009.

Anon (2009c) 29 fishermen arrested, The Statesman, 3 March 2009.

Anon., 2009. Thai fishing boats seized daily by authorities in southern Burma [WWW Document]. Burma News International. URL <http://www.bnionline.net/index.php/news/imna/5647-thai-fishing-boats-seized-daily-by-authorities-in-southern-burma.html>

Anon., 2014. 9 Thai Nationals Imprisoned for Illegal Fishing in Brunei Waters [WWW Document]. URL <http://www.brudirect.com/0-national/national-in-the-courts/item/6637-9-thai-nationals-imprisoned-for-illegal-fishing-in-brunei-waters> (accessed 7.25.14).

Anon., n.d. 75 fishermen from Tamil Nadu arrested by Sri Lanka Navy-NDTV [WWW Document]. NDTV.com. URL <http://www.ndtv.com/article/south/75-fishermen-from-tamil-nadu-arrested-by-sri-lanka-navy-497634> (accessed 7.28.14b).

Anon., n.d. Almost Half of Illegal Fishing in the World Occur in Indonesia [WWW Document]. URL <http://en.tempo.co/read/news/2014/07/19/056594269/Almost-Half-of-Illegal-Fishing-in-the-World-Occur-in-Indonesia> (accessed 8.12.14a).

Anti-illegal fishing drive intensified | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/anti-illegal-fishing-drive-intensified/>(accessed 7.7.15).

Aquino signs EO to prevent illegal fishing | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/aquino-signs-eo-to-prevent-illegal-fishing/> (accessed 7.6.15).

Aquino: PH can't jail foreign poachers | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/aquino-ph-cant-jail-foreign-poachers/>(accessed 7.7.15).

Arrested Indian fishermen accuse MSA of illegal arrest-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/TodaysPrintDetail.aspx?ID=172911&Cat=4&dt=4/18/2009> (accessed 7.3.15).

Asian Logging ship slapped K50,000 fines [WWW Document], n.d. URL <http://www.fisheries.gov.pg/FisheriesAuthority/NewsandMedia/MediaReleases/AsianLoggingshipslappedK50000fines/tabid/302/Default.aspx> (accessed 7.31.15).

Australia to offer two ships to F-FDTL [WWW Document], n.d. . Guide Post Timor. URL <http://www.guideposttimor.com/pages/lastmonth.pdf> (accessed 7.6.15).

Authorities struggle with fight against illegal fishing-Economy-VietNam News [WWW Document], 2008. URL <http://vietnamnews.vn/economy/179594/authorities-struggle-with-fight-against-illegal-fishing.html> (accessed 7.8.15).

Bangkok Post: Company finds itself caught in Indonesia's net [WWW Document], n.d. URL <http://www.bangkokpost.com/lite/topstories/503921/company-finds-itself-caught-in-indonesia-net> (accessed 7.16.15).

Bangladesh not to lift ban on export of hilsa fish, 2014. . The Hindu.

Bangladesh wins maritime dispute with India over Bay of Bengal, but lacks fishery vessels to profit [WWW Document], n.d. . SeafoodNews. URL <http://www.seafoodnews.com/Story/936253/Bangladesh-wins-maritime-dispute-with-India-over-Bay-of-Bengal-but-lacks-fishery-vessels-to-profit> (accessed 7.31.14).

Bataan no haven for illegal fishers | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/bataan-no-haven-for-illegal-fishers/> (accessed 7.7.15).

Batam police arrest 61 Vietnamese fishermen for illegal fishing [WWW Document], n.d. URL <http://www.antaranews.com/en/news/92168/batam-police-arrest-61-vietnamese-fishermen-for-illegal-fishing> (accessed 7.29.14).

BBC News-Hooking the high seas' fishing "pirates" [WWW Document], n.d. URL <http://news.bbc.co.uk/1/hi/sci/tech/8716064.stm> (accessed 7.8.15).

BBC NEWS | World | Asia-Pacific | Philippines frees Chinese fishermen [WWW Document], n.d. URL <http://news.bbc.co.uk/1/hi/world/asia-pacific/2298483.stm> (accessed 7.8.15).

BFAR toughens up vs illegal fishing activities | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/bfar-toughens-up-vs-illegal-fishing-activities/> (accessed 7.6.15).

BFAR: Amended Fisheries Act meant to deter illegal fishing | News | GMA News Online [WWW Document], n.d. URL <http://www.gmanetwork.com/news/story/535311/news/nation/bfar-amended-fisheries-act-meant-to-deter-illegal-fishing> (accessed 9.3.15).

Bicam approves changes to Fisheries Code | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/bicam-approves-changes-to-fisheries-code/> (accessed 7.6.15).

Big dip in illegal fishing: gov't , National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/big-dip-illegal-fishing-gov%E2%80%99t> (accessed 7.8.15).

Boats caught fishing illegally in Timor-Leste to be destroyed | Macauhub English [WWW Document], n.d. URL <http://www.macauhub.com.mo/en/2015/08/31/boats-caught-fishing-illegally-in-timor-leste-to-be-destroyed/> (accessed 9.2.15).

Brazen ships hauling fish near Antarctica ignore navy patrol | TODAYonline [WWW Document], n.d. URL <http://www.todayonline.com/world/brazen-ships-hauling-fish-near-antarctica-ignore-navy-patrol> (accessed 7.7.15).

Brunei to enforce protection of aquatic life in three areas-Borneo Bulletin Online [WWW Document], n.d. URL <http://borneobulletin.com.bn/brunei-enforce-protection-aquatic-life-three-areas/> (accessed 8.3.15).

Burmese warship patrol seizes Thai fishing boat, lets fisherman flee-Thailand News [WWW Document], n.d. . Thailand Forum. URL <http://www.thaivisa.com/forum/topic/742255-burmese-warship-patrol-seizes-thai-fishing-boat-lets-fisherman-flee/> (accessed 7.29.14).

Cambodia rescues 17 trafficked Cambodians from Thai fishing boats in Indonesia [WWW Document], n.d. URL http://www.stopillegalfishing.com/news_article.php?ID=1398 (accessed 7.10.15).

Cambodian flag flies on boats fishing illegally, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/cambodian-flag-flies-boats-fishing-illegal> (accessed 7.7.15).

Cambodian NGOs, Provincial Officials Applaud Interior Minister's Warning Against Illegal Fishing [WWW Document], n.d. . Radio Free Asia. URL <http://www.rfa.org/english/news/cambodia/ngos-provincial-officials-applaud-interior-ministers-warning-against-illegal-fishing-09092015153353.html> (accessed 9.11.15).

Cambodian Officials Encourage Illegal Fishing in Exchange for Bribes [WWW Document], n.d. URL <http://www.rfa.org/english/news/cambodia/officials-encourage-illegal-fishing-in-exchange-for-bribes-06092015131549.html> (accessed 7.10.15).

Cambodians in bid to escape Thai boats, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/cambodians-bid-escape-thai-boats> (accessed 7.7.15).

Cambodians, Thais face illegal fishing charge | The Brunei Times [WWW Document], 2014. URL <http://www.bruneitimes.com.bn/news-national/2014/07/13/cambodians-thais-face-illegal-fishing-charge> (accessed 7.3.15).

Capacity building helps close the net on illegal fishing [WWW Document], n.d. URL <http://www.afma.gov.au/capacity-building-helps-south-east-asia-close-net-illegal-fishing/> (accessed 7.9.15).

Captain "will fish in Indonesia waters" | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/508439/captain-will-fish-in-indonesia-waters> (accessed 7.7.15).

Cardinale, M., Nugroho, D., Jonson, P., 2011. Serial depletion of fishing grounds in an unregulated, open access fishery. Fisheries Research 108, 106–111. doi:10.1016/j.fishres.2010.12.007

Case Study on the Impacts of Illegal, Unreported and Unregulated (IUU) Fishing in the Sulawesi Sea [WWW Document], n.d. URL http://publications.apec.org/publication-detail.php?pub_id=105 (accessed 7.16.15).

Cebu to buy more patrol boats to curb illegal fishing | News | GMA News Online [WWW Document], n.d. URL <http://www.gmanetwork.com/news/story/500050/news/regions/cebu-to-buy-more-patrol-boats-to-curb-illegal-fishing> (accessed 8.7.15).

Centre asks Andhra Pradesh to release 25 Sri Lankan fishermen [WWW Document], n.d. URL <http://www.ndtv.com/south/centre-asks-andhra-pradesh-to-release-25-sri-lankan-fishermen-548660> (accessed 7.15.15).

China and Vietnam in row over detention of fishermen-BBC News [WWW Document], n.d. URL <http://www.bbc.co.uk/news/world-asia-17471269> (accessed 7.8.15).

China detains six Vietnamese fishermen | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/china-detains-six-vietnamese-fishermen/> (accessed 7.7.15).

China Says Its Flares Didn't Hit Vietnamese Boats [WWW Document], n.d. URL <http://www.irrawaddy.org/asia/china-says-its-flares-didnt-hit-vietnamese-boats.html> (accessed 7.3.15).

China's coastguard detains six Vietnam fishermen | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2014/07/05/china%E2%80%99s-coastguard-detains-six-vietnam-fishermen> (accessed 7.3.15).

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Chinese coast guard fires water cannon at Filipino fishermen | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/world/asia/south-china-sea-south-china-conflict-south-china-issue-philippines-china-south-china-sea/> (accessed 7.6.15).

Chinese fishermen freed in Sri Lanka, navy says-BBC News [WWW Document], n.d. URL <http://www.bbc.co.uk/news/world-asia-19166788> (accessed 7.8.15).

Coast Guard apprehends illegal fishers | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/coast-guard-apprehends-illegal-fishers/> (accessed 7.7.15).

Coastguard Seizes Two Iranian Tuna Vessels Inside Maldivian EEZ [WWW Document], 2009. URL <http://www.atuna.com/NewsArchive/ViewArticle.asp?ID=7571>

Confiscated Sea Turtles | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/confiscated-sea-turtles/> (accessed 7.7.15).

Control of illegal tuna fishing vital | The National [WWW Document], n.d. URL <http://www.thenational.com.pg/?q=node/90236> (accessed 7.6.15).

Cops arrest fishermen with explosives, detonators | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/cities/ahmedabad/cops-arrest-fishermen-with-explosives-detonators/> (accessed 7.6.15).

Correspondent, n.d. Lankan fined for illegal fishing by Maldives [WWW Document]. Emirates 24/7. URL <http://www.emirates247.com/news/sri-lanka/lankan-fined-for-illegal-fishing-by-maldives-2013-03-10-1.497982> (accessed 7.25.14).

Customs officials seize 455 pangolins hidden in crates of fish in Indonesia [WWW Document], n.d. URL <http://news.mongabay.com/2015/07/customs-officials-seize-455-pangolins-hidden-in-crates-of-fish-in-indonesia/> (accessed 8.4.15).

De Lima: 9 Chinese poachers to stay in jail | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/de-lima-9-chinese-poachers-to-stay-in-jail/> (accessed 7.7.15).

Destructive fishing practices “ignored” under S44 | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/564143/destructive-fishing-practices-ignored-under-s44> (accessed 7.7.15).

Detained fishermen leave Brunei for VN-Society-VietNam News [WWW Document], n.d. URL <http://vietnamnews.vn/society/220705/detained-fishermen-leave-brunei-for-vn.html> (accessed 7.8.15).

DFA: Justice is served for Chinese fishermen | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/dfa-justice-is-served-for-chinese-fishermen/> (accessed 7.6.15).

Diplomats travel to Hainan to visit detained fishermen-Politics & Laws | Politics, Business, Economy, Society, Life, Sports-VietNam News-VietNam News [WWW Document], 2005. URL <http://vietnamnews.vn/politics-laws/139581/diplomats-travel-to-hainan-to-visit-detained-fishermen.html> (accessed 7.8.15).

editorial@fis.com, 2015. Seafood businessman sentenced to prison for seabass fraud. FIS.COM.

Eight fishermen detained in KL freed | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2012/12/15/eight-fishermen-detained-kl-freed.html> (accessed 7.6.15).

Enslaved Fishermen Return From Indonesia | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/news/enslaved-fishermen-return-from-indonesia-85879/> (accessed 7.3.15).

Enviro groups urge caution over Myeik “eco-resort” tender [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/national-news/10689-enviro-groups-urge-caution-over-myeik-eco-resort-tender.html> (accessed 7.3.15).

Estimates of illegal and unreported fish in seafood imports to the USA [WWW Document], n.d. URL <http://www.sciencedirect.com/science/article/pii/S0308597X14000918> (accessed 7.9.15).

EU lifting of yellow card warning hailed | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/eu-lifting-of-yellow-card-warning-hailed/> (accessed 7.6.15).

EU reportedly extends Thailand’s “yellow card” deadline -First in Seafood News-Intrafish.com [WWW Document], n.d. URL <http://www.intrafish.com/news/article1420082.ece> (accessed 9.18.15).

EU rules challenge seafood exporters-Business-VietNam News [WWW Document], 2010. URL <http://vietnamnews.vn/economy/business/205668/eu-rules-challenge-seafood-exporters.html> (accessed 7.8.15).

EU verdict sought on fishing laws | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/612884/eu-verdict-sought-on-fishing-laws> (accessed 7.7.15).

EU warns Thailand still not doing enough to end illegal fishing | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/626108/eu-warns-thailand-still-not-doing-enough-to-end-illegal-fishing> (accessed 8.7.15).

Faisal, A., Post, T.J., Thu, S. | N. |, 2009, M. 12, Pm, 1:35, n.d. 38,000 fishing boats unlicensed in East Java [WWW Document]. URL <http://www.thejakartapost.com/news/2009/03/12/38000-fishing-boats-unlicensed-east-java.html> (accessed 7.30.14).

Families suffer as bread earners in Indian jail | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/families-suffer-as-bread-earners-in-indian-jail-52925> (accessed 7.2.15).

Find Fisheries expertise in Brunei Darussalam [WWW Document], n.d. URL <http://www.commonwealthofnations.org/sectors-brunei-darussalam/business/fisheries/> (accessed 8.28.15).

Fish poachers held off Phuket | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/crime/503797/fish-poachers-held-off-phuket> (accessed 7.7.15).

Fisheries busts rise 300pc this year, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/fisheries-busts-rise-300pc-year> (accessed 7.7.15).

Fisheries group warns against intrusions into Indian waters [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/business/1532-fisheries-group-warns-against-intrusions-into-indian-waters.htm> | (accessed 7.3.15).

Fisheries ministry seizes 14 illegal fishing vessels | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/01/28/fisheries-ministry-seizes-14-illegal-fishing-vessels.html> (accessed 7.6.15).

Fisheries strategy awaits finalisation-Environment-VietNam News [WWW Document], n.d. URL <http://vietnamnews.vn/environment/142251/fisheries-strategy-awaits-finalisation.html> (accessed 7.8.15).

Fisheries urge delay in rogue vessel ban | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/606412/fisheries-urge-delay-in-rogue-vessel-ban> (accessed 7.7.15).

Fishermen convert boats for human smuggling | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/features/2014/11/22/fishermen-convert-boats-human-smuggling> (accessed 7.3.15).

Fishermen fined for fishing in foreign seas-Society-VietNam News [WWW Document], n.d. URL <http://vietnamnews.vn/society/263702/fishermen-fined-for-fishing-in-foreign-seas.html> (accessed 7.8.15).

Fishermen fined, vessels seized | The Brunei Times [WWW Document], 2012. URL <http://www.bruneitimes.com.bn/news-national/2012/02/04/fishermen-fined-vessels-seized> (accessed 7.3.15).

Fishermen go on strike: Daily Mirror [WWW Document], n.d. URL <http://www.dailymirror.lk/58711/men-go-on-strike56> (accessed 7.7.15).

Fishermen protest illegal trawler operations | Bangkok Post: news [WWW Document], 2013. URL <http://www.bangkokpost.com/news/politics/364300/fishermen-protest-illegal-trawler-operations> (accessed 7.7.15).

Fishermen repatriated after ordeal, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/fishermen-repatriated-after-ordeal> (accessed 7.8.15).

Fishermen rescued in Indonesia, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/fishermen-rescued-indonesia> (accessed 7.8.15).

Fishermen unaware of new EU rule-Industries-VietNam News [WWW Document], 2009. URL <http://vietnamnews.vn/industries/194681/fishermen-unaware-of-new-eu-rule.html> (accessed 7.8.15).

Fishermen warn of huge losses | Bangkok Post: news [WWW Document], 2015. URL <http://www.bangkokpost.com/news/general/600336/fishermen-warn-of-huge-losses> (accessed 6.23.15).

Fishing boats seized by border guards-Society-VietNam News [WWW Document], n.d. URL <http://vietnamnews.vn/society/205523/fishing-boats-seized-by-border-guards.html> (accessed 7.8.15).

Fishing Company Fined For Operating Outside Its Designated Zone [WWW Document], 2015. URL <http://www.brudirect.com/0-national/national/national-in-the-courts/item/20844-fishing-company-fined-for-operating-outside-its-designated-zone> (accessed 7.7.15).

Fishing in Dire Straits: trans-boundary incursions in the Palk Bay. Economic & Political Weekly, 47(25), 87-96 | Joeri Scholtens-Academia.edu [WWW Document], n.d. URL http://www.academia.edu/8757497/Fishing_in_Dire_Straits_trans-boundary_incursions_in_the_Palk_Bay._Economic_and_Political_Weekly_47_25_87-96 (accessed 7.15.15).

Fishing minnows slam coastal trawlers | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/environment/575691/fishing-minnows-slam-coastal-trawlers> (accessed 7.7.15).

Fishing nets, fish seized in anti-illegal fishing drive | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/fishing-nets-fish-seized-in-anti-illegal-fishing-drive/> (accessed 7.6.15).

Fishing vessel fined MVR700,000 for illegal long line fishing | Minivan News [WWW Document], n.d. URL <http://minivannews.com/news-in-brief/fishing-vessel-fined-mvr700000-for-illegal-long-line-fishing-91240#sthash.AIAGkBeI.dpbs> (accessed 7.7.15).

Fishing, private ships must register by March next year | The Brunei Times [WWW Document], n.d. URL <http://www.bt.com.bn/news-national/2011/09/25/fishing-private-ships-must-register-march-next-year> (accessed 8.28.15).

fishmalaysia» 125 fined for illegal fishing activities in 2012 [WWW Document], n.d. URL <http://www.fishmalaysia.com/125-fined-for-illegal-fishing-activities-in-2012/> (accessed 8.4.15).

Fishy Activity: Two Indonesians Fined for Fishing at Champion 7 Oilfield [WWW Document], n.d. URL <http://www.brudirect.com/national/national/national-in-the-courts/15384-fishy-activity-two-indonesians-fined-for-fishing-at-champion-7-oilfield> (accessed 7.7.15).

Fishy Biz [WWW Document], n.d. URL <http://www.lankabusinessonline.com/news/sri-lanka-over-fished-by-estimated-600-illegal-vessels-report/143877382> (accessed 8.6.14).

Fishy business: industry urges against Thai deal [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/business/8265-fishers-argue-against-renewing-thailand-deal.html> (accessed 7.3.15).

Fishy state of relations Contentious issue of Palk Strait fishing: Can we learn from India's own policy?:: Dailymirror.lk:: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/69953/fishy-state-of-relations-contentious-issue-of-palk-strait-fishing-can-we-learn-from-india-s-own-policy> (accessed 7.7.15).

Five Indian fishermen held [WWW Document], n.d. URL <http://nation.com.pk/national/07-Oct-2010/Five-Indian-fishermen-held> (accessed 7.6.15).

Five Indians caught fishing illegally in Pakistani waters-thenews.com.pk [WWW Document], n.d. URL <http://www.thenews.com.pk/TodaysPrintDetail.aspx?ID=91582&Cat=4&dt=12/24/2007> (accessed 7.3.15).

Five Lanka fishing boats seized [WWW Document], n.d. URL http://www.stopillegalfishing.com/news_article.php?ID=99 (accessed 7.10.15).

Five Lankan fishermen apprehended by Coast Guard [WWW Document], n.d. URL <http://www.ndtv.com/south/five-lankan-fishermen-apprehended-by-coast-guard-512701> (accessed 7.15.15).

Five pump boats impounded for illegal fishing | The Brunei Times [WWW Document], 2010. URL <http://www.bruneitimes.com.bn/news-asia/2010/08/09/five-pump-boats-impounded-illegal-fishing> (accessed 7.3.15).

Five SL fishermen arrested in India:: Dailymirror.lk:: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/52996/five-sl-fishermen-arrested-in-indian> (accessed 7.7.15).

Five Vietnamese fishing boats arrested in Natuna waters | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/04/11/five-vietnamese-fishing-boats-arrested-natuna-waters.html> (accessed 7.6.15).

Forced to fish: Slavery on Thailand's trawlers-BBC News [WWW Document], n.d. URL <http://www.bbc.co.uk/news/magazine-25814718> (accessed 7.8.15).

Foreign trawlers fishing in Pak waters: WWF [WWW Document], 2009. URL <http://nation.com.pk/karachi/13-Apr-2009/Foreign-trawlers-fishing-in-Pak-waters-WWF> (accessed 7.3.15).

Foreigner admits to illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2014/06/22/foreigner-admits-illegal-fishing> (accessed 7.3.15).

Four fishermen held, 200 kg ganja seized-The Hindu [WWW Document], n.d. URL <http://www.thehindu.com/news/national/andhra-pradesh/four-fishermen-held-200-kg-ganja-seized/article7397173.ece> (accessed 7.8.15).

Four Indian boats seized for illegal fishing [WWW Document], n.d. URL <http://nation.com.pk/national/09-Jan-2011/Four-Indian-boats-seized-for-illegal-fishing> (accessed 7.3.15).

Four Malaysian Fishing Vessels Arrested by the MMFA's Patrol Boats on Illegal Fishing Accusation-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/88054/four-malaysian-fishing-vessels-arrested-by-the-mmfas-patrol-boats-on-illegal-fishing-accusation> (accessed 7.16.15).

Four men, youth sentenced to jail term for illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2011/08/04/four-men-youth-sentenced-jail-term-illegal-fishing> (accessed 7.3.15).

Four years of hell at sea, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/four-years-hell-sea> (accessed 7.8.15).

Governments should set 5-year deadline to save oceans from over-fishing-experts | TODAYonline [WWW Document], n.d. URL <http://www.todayonline.com/world/governments-should-set-5-year-deadline-save-oceans-over-fishing-experts> (accessed 7.7.15b).

Govt braces for EU blitz on fishing | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/611452/govt-braces-for-eu-blitz-on-fishing> (accessed 7.7.15).

Govt orders mesh size increased on fishing nets [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/business/5516-govt-orders-mesh-size-increased-on-fishing-nets.htm> | (accessed 7.3.15).

Govt plans to provide ID cards for fishermen [WWW Document], 2013. URL http://asia.ifad.org/web/bangladesh/home?p_p_id=1_WAR_ifad_newsportlet&_1_WAR_ifad_newsportlet_jspPage=%2FView_entry.jsp&_1_WAR_ifad_newsportlet_entryId=9458

Govt revokes licenses of six major fishing firms | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/06/23/govt-revokes-licenses-six-major-fishing-firms.html> (accessed 7.6.15).

Govt to extend fishing ban, revamp regulations | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/04/13/govt-extend-fishing-ban-revamp-regulations.html> (accessed 7.6.15).

Govt to use stricter fishing licensing after moratorium ends | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/12/06/govt-use-stricter-fishing-licensing-after-moratorium-ends.html> (accessed 7.6.15).

Govt. to stop IUU fishing by SL vessels: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/53831/govt-to-stop-iuu-fishing-by-sl-vessels> (accessed 7.7.15).

Hard line on illegal fishing | Dhaka Tribune [WWW Document], n.d. URL <http://www.dhakatribune.com/bangladesh/2014/apr/18/hard-line-illegal-fishing> (accessed 7.29.14).

Harvesting sea of potential-Focus-China Daily Asia [WWW Document], n.d. URL http://www.chinadailyasia.com/focus/2013-11/08/content_15097578.html (accessed 8.27.15).

HC moved to release illegally detained fishermen-The New Indian Express [WWW Document], n.d. URL <http://www.newindianexpress.com/states/kerala/article1481667.ece> (accessed 7.15.15).

Hell on the high seas, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/hell-high-seas> (accessed 7.8.15).

Hilsha shad close to “endangered”, says MFF [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/business/1107-hilsha-shad-close-to-endangered-says-mff.html> (accessed 7.3.15).

How foreign vessels exploit India’s loopholes in fishing laws [WWW Document], n.d. URL <http://live.downtoearth.org.in/news/how-foreign-vessels-exploit-indias-loopholes-in-fishing-laws--37779> (accessed 7.15.15).

The Strategic Planning Framework for Fisheries: 2010-2019. Kingdom of Cambodia. The Strategic Planning Framework. <http://faolex.fao.org/docs/pdf/cam143042.pdf>

Gillett, R. The marine fisheries of Cambodia. FAO/FishCode Review. No. 4. Rome, FAO. 2004. 57p. <http://www.fao.org/docrep/007/j1617e/j1617e00.htm>

Hundreds more detained in Port Blair: fishermen [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/national-news/1611-hundreds-more-detained-in-port-blair-fishermen.html> (accessed 7.3.15).

Hundreds of Thai trawlers keep ashore as Indonesia closes its waters-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/93358/hundreds-of-thai-trawlers-keep-ashore-as-indonesia-closes-its-waters> (accessed 7.16.15).

Illegal Boat Trip To Malaysia | 20 detained in Cox’s Bazar | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/backpage/illegal-boat-trip-malaysia-20-detained-coxs-bazar-70814> (accessed 7.3.15).

Illegal but Common: Life of Blast Fishermen in the Spermonde Archipelago, South [WWW Document], n.d. URL <http://www.seas.ohio.edu/SharingParadise/chozin.pdf> (accessed 7.10.15).

Illegal fish fry catching becomes a common scenario at Chalanbill-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/entertainment/2005/10/02/illegal-fish-fry-catching-becomes-a-common-scenario-at-chalanbill> (accessed 7.7.15).

Illegal fishers nabbed in south turn out to be Filipinos [WWW Document], n.d. URL <http://www.inquirer.net/specialreports/theenvironmentreport/view.php?db=1&article=20100722-282551> (accessed 7.16.15).

Illegal fishing around Pagasa Island worries residents | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/illegal-fishing-around-pagasa-island-worries-residents/> (accessed 7.6.15).

Illegal fishing boat caught by navy off Chon Buri | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/631072/illegal-fishing-boat-caught-by-navy-off-chon-buri> (accessed 7.23.15).

Illegal Fishing Costs Indonesia 3 Billion Dollars A Year – ASEAN News–Development News Around ASEAN, n.d.

Illegal fishing depletes Indian waters, 2012.

Illegal fishing gear “must go” | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/613344/illegal-fishing-gear-must-go> (accessed 7.7.15).

Illegal Fishing on Rise Because of Official Collusion, NGOs Say | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/illegal-fishing-on-rise-because-of-official-collusion-ngos-say-62699/> (accessed 7.3.15).

Illegal fishing penalties put in force-The Nation [WWW Document], 2015. URL <http://www.nationmultimedia.com/national/Illegal-fishing-penalties-put-in-force-30266186.html> (accessed 9.16.15).

Illegal fishing threatens rich marine diversity of Myeik Archipelago [WWW Document], 2014. URL <http://www.mizzima.com/opinion/features/item/11435-illegal-fishing-threatens-rich-marine-diversity-of-myeik-archipelago/11435-illegal-fishing-threatens-rich-marine-diversity-of-myeik-archipelago> (accessed 7.29.14).

Illegal fishing: 11 Vietnamese jailed | The Brunei Times [WWW Document], 2011. URL <http://www.bruneitimes.com.bn/news-national/2011/06/09/illegal-fishing-11-vietnamese-jailed> (accessed 7.3.15).

Illegal fishing: MMEA seize two boats, detain 26 fishermen | New Sarawak Tribune [WWW Document], n.d. URL <http://www.newsarawaktribune.com/news/44336/Illegal-fishing-MMEA-seize-two-boats-detain-26-fishermen/> (accessed 7.16.15).

Illegal fishing: MMEA seizes two boats, detains 18 Vietnamese [WWW Document], 2012. . BorneoPost Online. URL <http://www.theborneopost.com/2012/04/19/illegal-fishing-mmea-seizes-two-boats-detains-18-vietnamese/> (accessed 7.25.14).

Illegal Hilsa fishing goes unabated | Dhaka Herald, n.d.

Illegal netting dwindles export of quality fish [WWW Document], 2014. URL <http://nation.com.pk/national/28-Apr-2014/illegal-netting-dwindles-export-of-quality-fish> (accessed 7.3.15).

Illegal poaching cases on the rise in Singapore, NParks figures show, Environment News & Top Stories-The Straits Times [WWW Document], n.d. URL <http://www.straitstimes.com/singapore/environment/illegal-poaching-cases-on-the-rise-in-singapore-nparks-figures-show?page=9> (accessed 7.7.15).

Illegal Taiwanese ship seized off Batanes; 6 foreigners nabbed | Inquirer Global Nation [WWW Document], n.d. URL <http://globalnation.inquirer.net/122684/illegal-taiwanese-ship-seized-off-batanes-6-foreigners-nabbed> (accessed 7.16.15).

Illegal Tuna fishing In Maldives Waters Denied [WWW Document], n.d. URL <http://www.atuna.com/NewsArchive/ViewArticle.asp?ID=1459> (accessed 7.10.15).

Illegal Vietnamese Fishermen Caught in Nighttime Operation | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/illegal-vietnamese-fishermen-caught-in-nighttime-operation-58171/> (accessed 7.16.15).

Imee alarmed over 14 Taiwanese fishing vessels spotted off Pasuquin | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/imee-alarmed-over-14-taiwanese-fishing-vessels-spotted-off-pasuquin/> (accessed 7.6.15).

In Timor-Leste, Striving to Protect Resources for Local Communities | Human Nature-Conservation International Blog [WWW Document], n.d. URL <http://blog.conservation.org/2012/12/in-timor-leste-striving-to-protect-resources-for-local-communities/> (accessed 7.10.15).

India arrests 30 Pakistani fishermen [WWW Document], n.d. URL <http://nation.com.pk/national/23-Feb-2013/india-arrests-30-pakistani-fishermen> (accessed 7.6.15).

India arrests 9 Pakistani fishermen [WWW Document], n.d. URL <http://nation.com.pk/politics/18-Aug-2009/india-arrests-9-pakistani-fishermen> (accessed 7.6.15).

India fishing in troubled Sri Lankan waters [WWW Document], n.d. . Down To Earth. URL <http://www.downtoearth.org.in/content/india-fishing-troubled-sri-lankan-waters> (accessed 7.28.14).

India hands over 19 fishermen-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/bangladesh/2013/12/23/india-hands-over-19-fishermen> (accessed 7.7.15).

India hopes Bangladesh lifts ban on export of Hilsa fish [WWW Document], n.d. . http://aninews.in. URL <http://www.aninews.in/newsdetail2/story67573/india-hopes-bangladesh-lifts-ban-on-export-of-hilsa-fish.html> (accessed 8.19.14).

INDIA India, more than 900 sea turtles killed by illegal fishing-Asia News [WWW Document], n.d. URL <http://www.asianews.it/news-en/India,-more-than-900-sea-turtles-killed-by-illegal-fishing-30420.html> (accessed 7.30.14).

India repeats warning on illegal fishing [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/business/610-india-repeats-warning-on-illegal-fishing.html> (accessed 7.3.15).

India to file charge sheets against SL fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/40636/india-to-file-charge-sheet-against-sl-fishermen> (accessed 7.7.15).

Indian boat seized, 13 held | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/country/indian-boat-seized-13-held-80330> (accessed 7.2.15).

Indian fishermen begin fast in prison: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/78545/indian-fishermen-begin-fast-in-prison> (accessed 7.7.15).

Indian fishermen indulge in illegal acts in Lankan waters: ICG-timesofindia-economictimes [WWW Document], n.d. URL http://articles.economictimes.indiatimes.com/2015-04-27/news/61578110_1_sri-lankan-navy-indian-fishermen-international-maritime-boundary-line (accessed 7.15.15).

Indian fishermen may be shot if they cross border, says Sri Lanka PM Ranil Wickramasinghe | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/world/asia/indian-fishermen-may-be-shot-if-they-intrude-says-sri-lanka-pm-ranil-wickramasinghe/> (accessed 7.6.15).

Indian Navy admits shooting at “trespassing” fisherman [WWW Document], n.d. URL <http://www.hindustantimes.com/india-news/indian-navy-admits-shooting-trespassing-fisherman/article1-1348326.aspx> (accessed 7.8.15).

India-SL joint meet on Jan 20 on fishermen issue: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/41518/india-sl-joint-meet-on-jan-20-on-fishermen-issu> e (accessed 7.7.15).

Indonesia detains 2 Singapore-flagged boats off Batam, SE Asia News & Top Stories-The Straits Times [WWW Document], n.d. URL <http://www.straitstimes.com/asia/se-asia/indonesia-detains-2-singapore-flagged-boats-off-batam?page=21> (accessed 7.7.15).

Indonesia holds 200 Malaysians in crackdown on illegal fishing | Reuters [WWW Document], n.d. URL <http://www.reuters.com/article/2014/11/19/us-indonesia-fishing-idUSKCN0J318O20141119> (accessed 7.7.15).

Indonesia Nabs Ship Believed to Carry Slave-Caught Fish-The New York Times [WWW Document], n.d. URL http://www.nytimes.com/aponline/2015/08/13/world/asia/ap-as-seafood-from-slaves-boat-seized.html?_r=0 (accessed 8.24.15).

Indonesia recognizes bribery might have enabled slavery in eastern waters [WWW Document], n.d. URL <http://news.mongabay.com/2015/0409-jacobson-fishing-slavery-bribery.html> (accessed 7.16.15).

Indonesia sinks 34 foreign boats to stop illegal fishing | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/asia/660160/indonesia-sinks-34-foreign-boats-to-stop-illegal-fishing> (accessed 9.2.15).

Indonesia sinks 41 boats from PH, others to warn against poaching | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/indonesia-sinks-41-boats-from-ph-others-to-warn-against-poaching/> (accessed 7.6.15).

Indonesia sinks foreign boats to deter illegal fishing: reports-Regional | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/Regional/2015/05/21/Indonesia-sinks-foreign-boats-to-deter-illegal-fishing/> (accessed 7.7.15).

Indonesia sinks Malaysian vessel over illegal fishing-Nation | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/Nation/2015/01/08/Malaysian-fishing-vessel-Indonesia/> (accessed 7.7.15).

Indonesia sinks Vietnamese boats | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2014/12/06/indonesia-sinks-vietnamese-boats> (accessed 7.3.15).

Indonesia takes on China in illegal fishing-ANN [WWW Document], n.d. URL <http://www.asianewsnet.net/Indonesia-takes-on-China-in-illegal-fishing-70915.html> (accessed 7.16.15).

Indonesia takes on China in illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2015/01/26/indonesia-takes-china-illegal-fishing> (accessed 7.3.15).

Indonesia to probe slavery allegations [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/national-news/14010-indonesia-to-probe-slavery-allegations.html> (accessed 7.3.15).

Indonesia to sink 41 boats, including Malaysian-owned vessels, caught fishing illegally-Nation | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/Nation/2015/05/19/Indonesia-to-sink-boats-illegal-fishing/> (accessed 7.7.15).

Indonesian naval ships arrest 22 Philippine fishing boats-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/73074/indonesian-naval-ships-arrest-22-philippine-fishing-boats> (accessed 7.16.15).

Indonesian police arrest 7 in seafood slavery case | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/indonesian-police-arrest-7-in-seafood-slavery-case/> (accessed 7.6.15).

Indo-SL talks:TN mechanised boats to stay ashore for a month | Dailymirror.lk | Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/43110/indu-sl-bilateral-talkstn-mechanised-boats-to-stay-ashore-for-a-month> (accessed 7.7.15).

Inter-agency cooperation key to curb IUU fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/2012/11/28/inter-agency-cooperation-key-curb-iuu-fishin> g (accessed 7.7.15).

International MCS Network Announced Timor Leste as the Winner of Stop IUU Fishing Award 2014 [WWW Document], n.d. URL <http://rpoaiuu.org/index.php/en/71-news/196-international-mcs-network-announced-timor-leste-as-the-winner-of-stop-iuu-fishing-award-2014> (accessed 7.16.15).

INTERPOL meeting in Singapore gathers fisheries investigators | David Higgins | LinkedIn [WWW Document], n.d. URL <https://www.linkedin.com/pulse/interpol-meeting-singapore-gathers-fisheries-david-higgins> (accessed 9.2.15).

Iranian fishermen released from Maldives jail | Minivan News [WWW Document], n.d. URL <http://minivannews.com/news-in-brief/iranian-fishermen-released-from-maldives-jail-7479#sthash.rlvaydcp.dpbs> (accessed 7.7.15).

Islands in focus: Three Thai ships seized for illegally fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/03/24/islands-focus-three-thai-ships-seized-illegally-fishing.html> (accessed 7.6.15).

Issue of the day: Indonesia takes on China | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/01/28/issue-day-indonesia-takes-china.html> (accessed 7.6.15).

Issues of the day: Minister hails sinking of 41 fishing vessels | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/05/22/issues-day-minister-hails-sinking-41-fishing-vessels.html> (accessed 7.6.15).

IUU fishing as transnational organized crime | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/03/27/iuu-fishing-transnational-organized-crime.html> (accessed 7.6.15).

IUU fishing in Palk Bay and Gulf of Mannar: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/36320/iuu-fishing-in-palk-bay-and-gulf-of-mannar> (accessed 7.7.15).

Jacques Maudy, 2014. Dynamite Fishing in Burma's Mergui Archipelago Proves Hard to Stop [WWW Document]. URL <http://www.irrawaddy.org/burma/dynamite-fishing-burmas-mergui-archipelago-proves-hard-stop.html>

Jambi Police detain illegal fishing suspects | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/02/05/jambi-police-detain-illegal-fishing-suspects.html> (accessed 7.6.15).

Jatka seized, 14 fishermen fined | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/jatka-seized-14-fishermen-fined-22191> (accessed 7.2.15).

Jaya seeks immediate release of TN Fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/39198/jaya-seeks-immediate-release-of-tn-fishermen> (accessed 7.7.15).

Joint patrolling could be the answer-SL: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/20603/joint-patrolling-could-be-the-answer-sl> (accessed 7.7.15).

Jokowi orders sinking of 30 foreign boats | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/05/18/jokowi-orders-sinking-30-foreign-boats.html> (accessed 7.6.15).

Kep officials crack down on Vietnamese boats, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/kep-officials-crack-down-vietnamese-boats> (accessed 7.16.15).

Khmer sailor killed in raid on VN fishing boats, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/khmer-sailor-killed-raid-vn-fishing-boats> (accessed 7.8.15).

Khmerization: Vietnamese fishing boats illegally fishing Cambodian territorial waters [WWW Document], n.d. URL <http://khmerization.blogspot.co.uk/2010/08/vietnamese-fishing-boats-illegally.html> (accessed 7.16.15).

Labour minister suggests legal boats "borrow" idled fishermen | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/614360/labour-minister-suggests-legal-boats-borrow-idled-fishermen> (accessed 7.7.15).

Lanka arrests 73 Indian fishermen | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/lanka-arrests-73-indian-fishermen-27677> (accessed 7.3.15).

Lanka Fishing | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/opinion/columns/lanka-fishing/> (accessed 7.6.15).

Lankan boat seized for fishing sea cucumber, 16 men held-Today's Paper-The Hindu [WWW Document], n.d. URL <http://www.thehindu.com/todays-paper/lankan-boat-seized-for-fishing-sea-cucumber-16-men-held/article5894435.ece> (accessed 7.15.15).

Lankan fined for illegal fishing by Maldives [WWW Document], 2013. . Emirates 24/7. URL <http://www.emirates247.com/news/sri-lanka/lankan-fined-for-illegal-fishing-by-maldives-2013-03-10-1.497982> (accessed 8.8.14).

Lankan fishermen apprehended for illegal fishing-Oneindia [WWW Document], n.d. URL <http://www.oneindia.com/2007/01/30/lankan-fishermen-apprehended-for-illegal-fishing-1170232998.html> (accessed 7.15.15).

Lankan fishermen arrested by India: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/61213/six-sl-fishermen-arrested-by-indian-coast-guard> (accessed 7.7.15).

Licensed to Loot: Scandals and Violations within the Letter of Permit Scheme exposed [WWW Document], n.d. . Greenpeace India. URL <http://www.greenpeace.org/india/en/Press/Licensed-to-Loot-Scandals-and-Violations-within-the-Letter-of-Permit-Scheme-exposed/> (accessed 7.28.14).

Local fishermen arrested by SL navy: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/37350/local-fishermen-arrested-by-sl-navy> (accessed 7.7.15).

Locals attack arrested SL fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/29022/locals-attack-arrested-sl-fishermen> (accessed 7.7.15).

Luzon Newsbits for Januray 29, 2015 | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/luzon-newsbits-for-januray-29-2015/> (accessed 7.6.15).

Luzon Newsbits for November 20,2013 | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/luzon-newsbits-for-november-202013/> (accessed 7.7.15).

Ly Son's marine resources diminish-Society-VietNam News [WWW Document], n.d. URL <http://vietnamnews.vn/society/272381/ly-sons-marine-resources-diminish.html> (accessed 7.8.15).

Malaysia bans fish exports to control prices | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2014/01/14/malaysia-bans-fish-exports-control-prices> (accessed 7.3.15).

Malaysia: MMEA detains two foreign ships for illegal fishing [WWW Document], 2014. URL <http://www.namnewsnetwork.org/v3/read.php?id=MjY2OTQy>

Malaysian fishing boats also violated border-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/70199/malaysian-fishing-boats-also-violated-border> (accessed 7.16.15).

Malaysian men fined \$3,000 for illegal fishing in Temburong | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2012/06/04/malaysian-men-fined-3-000-illegal-fishing-temburong> (accessed 7.3.15).

Malaysian ship sunk for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/01/09/malaysian-ship-sunk-illegal-fishing.html> (accessed 7.6.15).

Maldives outlines maritime threats, solutions-RP Defense [WWW Document], n.d. URL <http://rpdefense.over-blog.com/article-maldives-outlines-maritime-threats-solutions-103800727.html> (accessed 7.15.15).

Maldives outlines maritime threats, solutions [WWW Document], n.d. . RP Defense. URL <http://rpdefense.over-blog.com/article-maldives-outlines-maritime-threats-solutions-103800727.html> (accessed 7.25.14).

Maldives, Greenpeace joint patrol to check illegal fishing [WWW Document], n.d. . OWSA. URL <http://southasia.oneworld.net/news/maldives-greenpeace-joint-patrol-to-check-illegal-fishing> (accessed 7.25.14).

Maldives, Sri Lanka to expand cooperation [WWW Document], 2014. URL http://news.xinhuanet.com/english/world/2014-01/22/c_133066085.htm

Man, 3-Year-Old Boy Killed in Separate Illegal Fishing Accidents | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/news/man-3-year-old-child-killed-in-separate-illegal-fishing-accident-75192/> (accessed 7.3.15).

Marine ecology: Vessels must be registered to curb illegal fishing, say experts-The Express Tribune [WWW Document], 2013. URL <http://tribune.com.pk/story/647949/marine-ecology-vessels-must-be-registered-to-curb-illegal-fishing-say-experts/> (accessed 11.10.15).

Marine police bust illegal trawlers | The Brunei Times [WWW Document], n.d. URL http://www.bruneitimes.com.bn/home_news/2008/11/26/marine_police_bust_illegal_trawlers (accessed 7.3.15).

Maritime Security in Timor-Leste – A Fragile Situation | East Timor Law and Justice Bulletin [WWW Document], n.d. URL <http://www.easttimorlawandjusticebulletin.com/2011/09/maritime-security-in-timor-leste.html> (accessed 7.10.15).

Mauritius, Seychelles, Maldives accused of dealing in illegal fish [WWW Document], n.d. URL http://www.stopillegalfishing.com/news_article.php?ID=71 (accessed 7.10.15).

Mindanao Newsbits for December 12, 2014 | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/mindanao-newsbits-for-december-12-2014/> (accessed 7.6.15a).

Ministry sinks another fishing ship | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/02/10/ministry-sinks-another-fishing-ship.html> (accessed 7.6.15).

Ministry to deport Filipino fishermen | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/05/28/ministry-deport-filipino-fishermen.html> (accessed 7.6.15).

Ministry to take legal action against poachers | The Jakarta Post [WWW Document], n.d. URL <http://m.thejakartapost.com/news/2015/07/04/ministry-take-legal-action-against-poachers.html> (accessed 7.6.15).

MIPR beefing up defence against illegal, unregulated fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2011/07/26/mipr-beefing-defence-against-illegal-unregulated-fishing> (accessed 7.7.15).

MMEA Detains 24 Vietnamese Fishermen, Two Trawlers Seized [WWW Document], n.d. URL <http://www.brudirect.com/0-borneo/borneo-sarawak/item/23813-mmea-detains-24-vietnamese-fishermen-two-trawlers-seized> (accessed 7.7.15).

More seafood companies to export to EU-Economy-VietNam News [WWW Document], 2011. URL <http://vietnamnews.vn/economy/213734/more-seafood-companies-to-export-to-eu.htm> | (accessed 7.8.15).

More than 200 tons of fish confiscated | The Jakarta Post [WWW Document], n.d. URL <http://m.thejakartapost.com/news/2011/12/07/more-200-tons-fish-confiscated.html> (accessed 7.6.15).

More than 50 feared dead | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/more-than-50-feared-dead-62350> (accessed 7.2.15).

More trafficking cases uncovered | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/05/15/more-trafficking-cases-uncovered.html> (accessed 7.6.15).

Myanmar charges 128 foreign fishermen | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2009/12/07/myanmar-charges-128-foreign-fishermen> (accessed 7.3.15).

Myanmar detains over 120 Indonesian, Taiwanese fishermen [WWW Document], 2009. URL <http://www.mfasia.org/myanmar/112-myanmar-detains-over-120-indonesian-taiwanese-fishermen>

Myanmar Escorting Boat Crammed With Migrants to “Safe” Area-The Jakarta Globe [WWW Document], n.d. URL <http://thejakartaglobe.beritasatu.com/international/myanmar-escorting-boat-crammed-migrants-safe-area/> (accessed 7.8.15).

Myanmar fisherman goes home after 22 years as a slave | TODAYonline [WWW Document], n.d. URL <http://www.todayonline.com/world/asia/myanmar-fisherman-goes-home-after-22-years-slave> (accessed 7.7.15).

Myanmar fishermen return from India after serving prison, n.d. . Democracy for Burma.

Myanmar offshore fishing season cut to 45 days from 90 [WWW Document], 2013. URL <http://www.oilseedcrops.org/2013/04/27/myanmar-offshore-fishing-season-cut-to-45-days-from-90/>

Myanmar poachers looting Andaman ecology -India | Reuters [WWW Document], 2011. URL <http://www.reuters.com/article/2007/06/07/idUSDEL46065> (accessed 9.10.15).

Myanmar to repatriate 200 Bangladeshi “boat people” [WWW Document], n.d. URL <http://www.brudirect.com/0-world/international-headlines/item/25795-myanmar-to-repatriate-200-bangladeshi-boat-people> (accessed 7.7.15).

Myanmar, Bangladesh agree to cooperate on border security [WWW Document], n.d. . GlobalPost. URL <http://www.globalpost.com/dispatch/news/xinhua-news-agency/140613/myanmar-bangladesh-agree-cooperate-border-security> (accessed 7.29.14).

Myanmar: Illegal Foreign Fishing Boats A Concern [WWW Document], 2013. URL <http://www.lotuscomm.net/news/news-updates/486-myanmar-illegal-foreign-fishing-boats-a-concern>

Myanmar's Myeik Islands Face Promise and Peril [WWW Document], n.d. URL <http://www.irrawaddy.org/magazine/myeik-islands-face-promise-and-peril.html> (accessed 7.3.15).

Myat Nyein Aye, 2013. Severing Thais: fisheries agreement expires [WWW Document]. URL <http://www.mmtimes.com/index.php/business/8586-fishing-industry-to-cut-thai-lines> .html

Nabbed for illegal fishing-Community | The Star Online [WWW Document], 2015. URL <http://www.thestar.com.my/Metro/Community/2015/06/03/Nabbed-for-illegal-fishing-53-fishermen-arrested-for-catching-fish-in-prohibited-area/> (accessed 7.7.15).

Nation marks awakening day, sinks big Chinese boat | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/05/21/nation-marks-awakening-day-sinks-big-chinese-boat.html> (accessed 7.6.15).

Nation works for arrested fishermen-Society-VietNam News [WWW Document], n.d. URL <http://vietnamnews.vn/society/214376/nation-works-for-arrested-fishermen-.html> (accessed 7.8.15).

National News Bureau Of Thailand | Govt allows unregistered boats 2-month period of grace [WWW Document], 2015. URL http://thainews.prd.go.th/website_en/news/news_detail/WNSOC5807100010030 (accessed 9.16.15).

National scene: Malaysian fishing boats seized | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/06/03/national-scene-malaysian-fishing-boats-seized.htm> (accessed 7.6.15).

Navy arrest 53 Thai fishermen for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2010/04/21/navy-arrest-53-thai-fishermen-illegal-fishing.html> (accessed 7.6.15).

Navy arrests 37 Indian fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/68395/navy-arrests-37-indian-fishermen> (accessed 7.7.15).

Navy arrests 47 Indian fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/48628/navy-arrests-47-indian-fishermen> (accessed 7.7.15).

Navy arrests Indonesian and Thai fishing boats [WWW Document], 2014. . Eleven Myanmar. URL http://elevenmyanmar.com/index.php?option=com_content&view=article&id=5129:navy-arrests-indonesian-and-thai-fishing-boats&catid=44&Itemid=384 (accessed 7.29.14).

Navy arrests more illegal boats in Celebes Sea | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/02/27/navy-arrests-more-illegal-boats-celebes-sea.html> (accessed 7.6.15).

Navy nabs 2 Thai-operated boats for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/12/12/navy-nabs-2-thai-operated-boats-illegal-fishing.html> (accessed 7.6.15).

Navy nabs two foreign ships suspected of illegal fishing in Natuna waters | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/11/17/navy-nabs-two-foreign-ships-suspected-illegal-fishing-natuna-waters.html> (accessed 7.6.15).

Navy to sink two more illegal fishing boats | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/12/21/navy-sink-two-more-illegal-fishing-boats.html> (accessed 7.6.15).

New fishery law boosts fight vs illegal fishing | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/new-fishery-law-boosts-fight-vs-illegal-fishing/> (accessed 7.6.15).

New marine admin model sought-Society-VietNam News [WWW Document], 2015. URL <http://vietnamnews.vn/society/272553/new-marine-admin-model-sought.htm> | (accessed 7.8.15).

New Police boats to better intercept illegal immigrants, terrorists and smugglers-Channel NewsAsia [WWW Document], n.d. URL <http://www.channelnewsasia.com/news/singapore/new-police-boats-to/1997530.html> (accessed 9.2.15).

New rules scare away illegal Cambodian fishing boats | Bangkok Post: news [WWW Document], 2015. URL <http://www.bangkokpost.com/news/general/611236/new-rules-scare-away-illegal-cambodian-fishing-boats> (accessed 7.7.15).

Nine Viets nabbed for illegal fishing-Nation | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/Nation/2014/08/12/Nine-Viets-nabbed-for-illegal-fishing/>(accessed 7.7.15).

No big impact from moored fishing boats | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/611284/no-big-impact-from-moored-fishing-boats> (accessed 7.7.15).

No light at end of Thai-Myanmar smuggling tunnel-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/world/2008/04/13/no-light-at-end-of-thai-myanmar-smuggling-tunnel> (accessed 7.7.15).

Novel strategies to address fisheries issue: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/49806/novel-strategies-to-address-fisheries-issue> (accessed 7.7.15).

NST Online, 2014. Agency steps up sea patrols [WWW Document]. NST Online. URL <http://www.nst.com.my/node/12438> (accessed 7.24.14).

Office of Labour Affairs in Malaysia investigates Thai fishermen | กระทรวงแรงงาน [WWW Document], n.d. URL <http://www.mol.go.th/en/anonymouse/foreignlabour/11472> (accessed 7.16.15).

On illegal fishing front, TNI still finding it hard to catch “big fish” | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/12/23/on-illegal-fishing-front-tni-still-finding-it-hard-catch-big-fish.html> (accessed 7.6.15).

Over \$13m in fisheries resources lost to illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bt.com.bn/news-national/2011/07/27/over-13m-fisheries-resources-lost-illegal-fishing> (accessed 7.16.15).

Over 430 vessels apprehended for illegal fishing [WWW Document], n.d. . <http://zeenews.india.com>. URL http://zeenews.india.com/news/nation/over-430-vessels-apprehended-for-illegal-fishing_796495.html (accessed 7.30.14).

Over 9,500 Chinese ships illegally fish in Tonkin Gulf in last decade: report [WWW Document], 2014. URL <http://tuoitrenews.vn/society/22600/over-9500-chinese-ships-illegally-fish-in-tonkin-gulf-over-10-years-report> (accessed 7.16.15).

Overfishing Driving Slavery on Thailand's Seafood Boats [WWW Document], n.d. URL <http://www.irrawaddy.org/asia/overfishing-driving-slavery-thailands-seafood-boats.htm> | (accessed 7.3.15).

PACNEWS-News reader [WWW Document], n.d. URL <http://www.pina.com.fj/?p=pacnews&m=read&o=66729118955666e614c2f3be309818> (accessed 7.8.15).

Pak arrests 26 Indian fishermen for violating maritime boundary [WWW Document], n.d. URL <http://nation.com.pk/karachi/11-Mar-2011/Pak-arrests-26-Indian-fishermen-for-violating-maritime-boundary> (accessed 7.6.15).

Pakistan arrests 24 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/national/13-Oct-2012/pakistan-arrests-24-indian-fishermen> (accessed 7.6.15).

Pakistan arrests 27 Indian fishermen | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/latest-news/pakistan-arrests-27-indian-fishermen/> (accessed 7.6.15).

Pakistan arrests 46 Indian fishermen-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/world/2015/03/07/pakistan-arrests-46-indian-fishermen> (accessed 7.7.15).

Pakistan arrests 47 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/national/19-Apr-2015/pakistan-arrests-47-indian-fishermen> (accessed 7.6.15).

Pakistan arrests 50 Indian fishermen [WWW Document], n.d. URL <http://archive.thedailystar.net/newDesign/story.php?nid=74728> (accessed 7.3.15).

Pakistan arrests 58 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/karachi/20-Sep-2013/pakistan-arrests-58-indian-fishermen> (accessed 7.3.15).

Pakistan Captures 2 Boats with 12 Indian Fishermen off Gujarat Coast: Report [WWW Document], n.d. URL <http://www.ndtv.com/india-news/pakistan-captures-2-boats-with-12-indian-fishermen-off-gujarat-coast-report-722601> (accessed 7.15.15).

Pakistan detains 55 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/national/18-Mar-2013/pakistan-detains-55-indian-fishermen> (accessed 7.6.15).

Pakistan releases 172 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/karachi/16-Feb-2015/pakistan-releases-172-indian-fishermen> (accessed 7.6.15).

Pakistan releases 36 Indian prisoners [WWW Document], n.d. URL <http://nation.com.pk/national/28-Nov-2014/pakistan-releases-36-indian-prisoners> (accessed 7.3.15).

Pakistan releases 57 Indian fishing boats [WWW Document], n.d. URL <http://www.hindustantimes.com/india-news/pakistan-releases-57-indian-fishing-boats/article1-1328957.aspx> (accessed 7.8.15).

Pakistan says India killed 4 "innocent" people on boat, Cong asks Modi govt to come clean [WWW Document], n.d. URL <http://www.hindustantimes.com/india-news/govt-under-pressure-to-explain-who-blew-up-boat-pak-says-probe-on/article1-1318183.aspx> (accessed 7.8.15).

Pakistan says to release 70 Indian fishermen-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/world/2006/12/20/pakistan-says-to-release-70-indian-fishermen> (accessed 7.7.15).

Pakistan to release 100 Indian fishermen-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/world/2009/12/23/pakistan-to-release-100-indian-fishermen> (accessed 7.7.15).

Pakistan to release 115 Indian fishermen-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/world/2007/01/07/pakistan-to-release-115-indian-fishermen> (accessed 7.7.15).

Pakistan uses fishing boats to smuggle heroin: Indian navy spokesman [WWW Document], n.d. URL <http://nation.com.pk/national/21-Apr-2015/pakistan-uses-fishing-boats-to-smuggle-heroin-indian-navy-spokesman> (accessed 7.3.15).

Pakistan's Maritime Security Agency arrests 61 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/national/21-Nov-2014/pakistan-s-maritime-security-agency-arrests-61-indian-fishermen> (accessed 7.6.15).

Palau Burns Vietnamese Boats Caught Fishing Illegally [WWW Document], n.d. URL <http://www.irrawaddy.org/asia/palau-burns-vietnamese-boats-caught-fishing-illegally.html> (accessed 7.3.15).

Palau burns Vietnamese boats caught fishing illegally | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/palau-burns-vietnamese-boats-caught-fishing-illegally-2/> (accessed 7.6.15).

Papua New Guinea to tighten net on illegal fishing | Papua New Guinea [node:field_publication_year] | Oxford Business Group [WWW Document], n.d. URL <http://www.oxfordbusinessgroup.com/news/papua-new-guinea-tighten-net-illegal-fishing> (accessed 7.8.15).

Patrol ships trawl for disorder in Beibu Gulf [WWW Document], n.d. URL http://www.chinadaily.com.cn/cndy/2009-05/28/content_7949444.htm (accessed 7.16.15).

PCG, BFAR arrest 2 Taiwanese fishing illegally in PH waters | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/pcg-bfar-arrest-2-taiwanese-fishing-illegally-in-ph-waters/> (accessed 7.6.15).

Perspectives of the coastal and marine fisheries of the Bay of Bengal, Bangladesh [WWW Document], n.d. URL <http://www.sciencedirect.com.ezproxy.york.ac.uk/science/article/pii/S0964569103000644> (accessed 7.9.15).

PH convicts Chinese "poachers" despite Beijing's warnings | mb.com.ph | Philippine News [WWW Document], 2014. URL <http://www.mb.com.ph/philippines-convicts-chinese-poachers-despite-beijings-warnings/> (accessed 7.6.15).

PH given 6 months to curb ill practices in fishing | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/ph-given-6-months-to-curb-ill-practices-in-fishing/> (accessed 7.6.15).

PH, Indonesia boost maritime ties | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/ph-indonesia-boost-maritime-ties/> (accessed 7.6.15).

PH, Indonesia tackling new fishing agreement | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/ph-indonesia-tackling-new-fishing-agreement/> (accessed 7.6.15).

Philippine court orders 9 jailed Chinese fishermen freed | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/philippine-court-orders-9-jailed-chinese-fishermen-freed/> (accessed 7.6.15).

Philippines arrests 122 Vietnamese fishermen | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2011/05/31/philippines-arrests-122-vietnamese-fishermen> (accessed 7.3.15).

Philippines buys 100 patrol boats to combat poachers | mb.com.ph | Philippine News [WWW Document], 2015. URL <http://www.mb.com.ph/philippines-buys-100-patrol-boats-to-combat-poachers/> (accessed 7.6.15).

Philippines charges China fishermen with poaching | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2014/05/13/philippines-charges-china-fishermen-poaching> (accessed 7.3.15).

Philippines detains 6 Chinese for “illegal fishing” | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2011/12/05/philippines-detains-6-chinese-illegal-fishing> (accessed 7.3.15).

Philippines prepare charges against Taiwan fisherman | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/asia/368535/philippine-prepare-charges-against-taiwan-fisherman> (accessed 7.7.15).

Philippines seizes 23 pangolins | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/2013/04/24/philippine-seizes-23-pangolins> (accessed 7.3.15).

Philippines to charge “poachers

Philippines, Taiwan coast guards engage in standoff | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/philippines-taiwan-coast-guards-engage-in-standoff> (accessed 7.6.15).

Philippines, Vietnam establish “hotline” to fight illegal fishing | Headlines, News, The Philippine Star | philstar.com [WWW Document], 2015. URL <http://www.philstar.com/headlines/2015/03/28/1438563/philippines-vietnam-establish-hotline-fight-illegal-fishing> (accessed 7.16.15).

Phyu, A.S, 2014. Illegal fishing nets blamed for declining catches [WWW Document]. URL <http://www.mmtimes.com/index.php/national-news/10723-illegal-fishing-nets-blamed-for-declining-catches.html>

Pinoy fishermen repatriated, eye damages vs employer | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/pinoy-fishermen-repatriated-eye-damages-vs-employer/> (accessed 7.6.15).

Plan to bring home fishing crews arrested in Indonesia | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/588273/plan-to-bring-home-fishing-crews-arrested-in-indonesia> (accessed 7.7.15).

Plan to cut losses due to illegal fishing | The Brunei Times [WWW Document], 2014. URL <http://m.bt.com.bn/frontpage-news-national/2014/11/23/plan-cut-losses-due-illegal-fishing> (accessed 7.31.15).

Planning for fisheries development in East Timor [WWW Document], n.d. URL <http://www.timoragri.fhost.com.au/ta100/ta104.pdf> (accessed 8.3.15).

Plenty of fish in the sea at Pere | The National [WWW Document], n.d. URL <http://www.thenational.com.pg/?q=node/1016> (accessed 7.6.15).

PM orders release of 100 indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/politics/23-Dec-2009/PM-orders-release-of-100-Indian-fishermen> (accessed 7.3.15).

PM Prayut invokes Section 44 to solve illegal fishing, 2015. . Thai PBS.

PM refuses to delay new trawler rules | Bangkok Post: news [WWW Document], 2015. URL <http://www.bangkokpost.com/news/general/608644/pm-refuses-to-delay-new-trawler-rules> (accessed 7.7.15).

PNG acts on illegal fishing warning-Solomon Star [WWW Document], n.d. URL <http://solomonstarnews.com/news/regional/2618-png-acts-on-illegal-fishing-warning> (accessed 7.8.15).

PNG and Taiwan to co-operate against illegal fishing | Radio New Zealand News [WWW Document], n.d. URL <http://www.radionz.co.nz/international/pacific-news/277265/png-and-taiwan-to-co-operate-aganist-illegal-fishing> (accessed 7.8.15).

PNG calls for greater cooperation | The National [WWW Document], n.d. URL <http://www.thenational.com.pg/?q=node/422> (accessed 7.6.15).

POACHING LOSS WHOPPING 97,500 M/YEAR | Daily News Online: Sri Lanka's National News [WWW Document], n.d. URL <http://www.dailynews.lk/?q=local/poaching-loss-whopping-97500-myear> (accessed 7.15.15).

Police Arrest Illegal Trawlers Off Aceh Coast-The Jakarta Globe [WWW Document], n.d. URL <http://thejakartaglobe.beritasatu.com/news/police-arrest-illegal-trawlers-off-aceh-coas/> (accessed 7.8.15).

Police Officers Arrested in Siem Reap for Extortion of Fishermen | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/news/police-officers-arrested-in-siem-reap-for-extortion-of-fishermen-69002/> (accessed 7.3.15).

Police seek compensation for fishermen [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/national-news/14999-police-seek-compensation-for-fishermen.html> (accessed 7.3.15).

Post, T.J., Thu, B. | A. |, 2013, M. 28, Am, 8:57 with Fadli, n.d. 4 Malaysian ships netted for illegal fishing [WWW Document]. URL <http://www.thejakartapost.com/news/2013/03/28/4-malaysian-ships-netted-illegal-fishing.html> (accessed 7.24.14).

Post, T.J., Thu, J. | N. |, 2015, A. 23, Pm, 2:37, n.d. Death of Susi's staffer due to cardiac arrest, not murder: Police [WWW Document]. URL <http://www.thejakartapost.com/news/2015/04/23/death-susi-s-staffer-due-cardiac-arrest-not-murder-police.html> (accessed 8.26.15). PRESS RELEASE: Maldives pole and line skipjack-tuna you can trust, n.d. . IPNLF.

S Lanka arrests 16 Indian fishermen as tensions rise [WWW Document], n.d. URL <http://nation.com.pk/national/04-Mar-2013/s-lanka-arrests-16-indian-fishermen-as-tensions-rise> (accessed 7.6.15).

S. Sulawesi police haul in illegal fishermen | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2012/04/18/s-sulawesi-police-net-illegal-fishing-boats.html> (accessed 7.6.15).

Sandar OO, S, 2012. Indian repeats warning on illegal fishing [WWW Document]. www.mmtimes.com. URL <http://www.mmtimes.com/2012/business/629/biz62905.html>

Satellite links for 3,000 Lankan fishing vessels | The Sundaytimes Sri Lanka, n.d.

Senate OKs tougher law vs illegal fishing | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/senate-oks-tougher-law-vs-illegal-fishing/> (accessed 7.6.15).

Senate to pass fisheries law and avert ban on PH products | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/senate-to-pass-fisheries-law-and-avert-ban-on-ph-products/> (accessed 7.7.15).

Seven Found on Illegal Fishing Boat in Brunei | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/news/seven-found-on-illegal-fishing-boat-in-brunei-67594/>(accessed 7.3.15).

Seven Pakistani nationals arrested off Jakhau coast | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/cities/ahmedabad/seven-pakistani-nationals-arrested-off-jakhau-coast/> (accessed 7.6.15).

Seven Vietnamese fishermen fined \$16,000 for illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2011/10/14/seven-vietnamese-fishermen-fined-16-000-illegal-fishing> (accessed 7.3.15).

Shark fins worth P15M seized | mb.com.ph | Philippine News [WWW Document], 2014. URL <http://www.mb.com.ph/shark-fins-worth-p15m-seized/> (accessed 7.6.15).

Shrinking Indonesian shark fisheries spur a national action plan [WWW Document], n.d. . Mongabay Environmental News. URL <http://news.mongabay.com/2015/08/shrinking-indonesian-shark-fisheries-spur-a-national-action-plan/> (accessed 8.26.15).

Sick fishermen evacuated for medical care | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/569351/sick-fishermen-evacuated-for-medical-care> (accessed 7.7.15).

Sindh govt fails to crack down on fishermen [WWW Document], 2010. URL <http://nation.com.pk/national/17-Aug-2010/Sindh-govt-fails-to-crack-down-on-fishermen> (accessed 7.3.15).

Sindh govt orders release of 442 Indian fishermen [WWW Document], n.d. URL <http://nation.com.pk/national/29-Aug-2010/Sindh-govt-orders-release-of-442-Indian-fishermen> (accessed 7.6.15).

Singapore, FAO to collaborate on food safety, illegal fishing | Undercurrent News [WWW Document], n.d. URL <http://www.undercurrentnews.com/2015/06/09/singapore-fao-to-collaborate-on-food-safety-illegal-fishing/> (accessed 7.9.15).

Singapore-registered fishing vessel detained by Malaysian authorities-Channel NewsAsia [WWW Document], n.d. URL <http://www.channelnewsasia.com/news/singapore/singapore-registered/1878708.htm> | (accessed 7.9.15).

Six fishermen held for fishing near turtle nesting site in Odisha, 2015. . Odisha Times.

Six fishermen jailed in Bhola for defying ban on fishing | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/country/six-fishermen-jailed-bhola-defying-ban-fishing-4764> (accessed 7.2.15).

Six Indonesian fishermen repatriated from Timor Leste-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/80121/six-indonesian-fishermen-repatriated-from-timor-leste> (accessed 7.10.15).

Six SL fishermen arrested: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/65687/six-sri-lankan-fishermen-arrested> (accessed 7.7.15).

Six Sri Lankan fishermen arrested for entering Indian waters [WWW Document], n.d. URL <http://www.ndtv.com/south/six-sri-lankan-fishermen-arrested-for-entering-indian-waters-481190> (accessed 7.15.15).

Skipper and crew fined for illegal fishing – BorneoPost Online | Borneo , Malaysia, Sarawak Daily News BorneoPost Online | Borneo , Malaysia, Sarawak Daily News | Largest English Daily In Borneo [WWW Document], n.d. URL <http://www.theborneopost.com/2014/05/23/skipper-and-crew-fined-for-illegal-fishing/> (accessed 7.16.15).

SL cries foul over EU action: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/38256/sl-cries-foul-over-eu-action> (accessed 7.7.15).

SL releases 46 Indian fishermen: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/48902/sl-releases-46-indian-fishermen> (accessed 7.7.15).

Slain Fishermen's Neighbors Arrested, Charged With Illegal Fishing | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/slain-fishermens-neighbors-arrested-charged-with-illegal-fishing-2-75042/> (accessed 7.3.15).

Slave labour case starts, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/slave-labour-case-start> (accessed 7.7.15).

Smugglers, security forces prey on Rohingya-bdnews24.com [WWW Document], n.d. URL <http://bdnews24.com/lifestyle/2013/07/17/smugglers-security-forces-prey-on-rohingya> (accessed 7.7.15).

Songkhla fishery activity slows | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/612824/songkhla-fishery-activity-slows> (accessed 7.7.15).

Sorry, we are only protecting ourselves- SL Navy Chief to Karuna: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/40540/sorry-we-are-only-protecting-ourselves-sl-navy-chief-to-karuna> (accessed 7.7.15).

Sri Lanka arrests 54 Indian fishermen | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/world/south-asia/sri-lanka-arrests-54-indian-fishermen-73216> (accessed 7.2.15).

Sri Lanka arrests Indian fishermen after Modi talks [WWW Document], n.d. URL <http://nation.com.pk/international/02-Jun-2014/sri-lanka-arrests-indian-fishermen-after-modi-talks> (accessed 7.6.15).

Sri Lanka arrests more Indian fishermen as tensions rise [WWW Document], n.d. URL <http://nation.com.pk/international/09-Jun-2014/sri-lanka-arrests-more-indian-fishermen-as-tensions-rise> (accessed 7.3.15).

Sri Lanka arrests scores of Indian fishermen [WWW Document], n.d. URL <http://www.aljazeera.com/news/asia/2014/06/sri-lanka-arrests-scores-indian-fishermen-201468143938309860.htm> (accessed 7.28.14).

Sri Lanka detains 32 India fishermen for poaching | TODAYonline [WWW Document], n.d. URL <http://www.todayonline.com/china/india/sri-lanka-detains-32-india-fishermen-poaching> (accessed 7.7.15).

Sri Lanka Navy Arrests 38 Tamil Nadu Fishermen-NDTV [WWW Document], n.d. . NDTV.com. URL <http://www.ndtv.com/article/south/sri-lanka-navy-arrests-38-tamil-nadu-fishermen-562859> (accessed 7.28.14).

Sri Lanka offers harbors to foreign fishing vessels [WWW Document], 2013. URL http://www.lankapage.com/NewsFiles14/Dec18_1387305451.php

Sri Lanka president pardons 5 Indian fishermen on death row-World | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/World/2014/11/19/Sri-Lanka-president-pardons-5-Indian-fishermen-on-death-row/> (accessed 7.7.15).

Sri Lanka president pardons five Indian fishermen on death row | TODAYonline [WWW Document], n.d. URL <http://www.todayonline.com/world/sri-lanka-president-pardons-5-indian-fishermen-death-row> (accessed 7.7.15).

Sri Lankan fishermen detained: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/39472/sri-lankan-fishermen-detained> (accessed 7.7.15).

Sri Lankan navy arrests 18 Tamil Nadu fishermen [WWW Document], n.d. URL <http://www.hindustantimes.com/india-news/sri-lankan-navy-arrests-18-tamil-nadu-fishermen/article1-1167660.aspx> (accessed 7.8.15).

Sri Lankan navy arrests 26 Indian fishermen, India-Mathrubhumi English News Online [WWW Document], n.d. URL <http://www.mathrubhumi.com/english/news/india/sri-lankan-navy-arrests-26-indian-fishermen-162114.html> (accessed 6.23.15).

Stop Illegal Fishing: [WWW Document], n.d. URL http://www.stopillegalfishing.com/sifnews_article.php?ID=87 (accessed 8.26.15).

Strict control of fishing boats expands to all 22 coastal provinces | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/547175/strict-control-of-fishing-boats-expands-to-all-22-coastal-provinces> (accessed 7.8.15).

Stronger law enforcement pushed for Palawan, Tawi-Tawi seas | News | GMA News Online [WWW Document], n.d. URL <http://www.gmanetwork.com/news/story/192957/news/regions/stronger-law-enforcement-pushed-for-palawan-tawi-seas> (accessed 7.16.15).

Super-trawler skipper pleads not guilty to fishing offences, n.d.

Sushil Ramsay (Rear Admiral), 2013. Upsurge in Indo-Myanmar Naval Cooperation [WWW Document]. URL <http://www.spsnavalforces.com/story.asp?mid=32&id=6>

Susi continues legal fight against Hai Fa | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/06/20/susi-continues-legal-fight-against-hai-fa.html> (accessed 8.7.15).

Taiwanese National Arrested for Trafficking Fishermen | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/taiwanese-national-accused-of-trafficking-fishermen-arrested-23576/>(accessed 7.3.15).

Taiwanese poachers charged | mb.com.ph | Philippine News [WWW Document], 2015. URL <http://www.mb.com.ph/taiwanese-poachers-charged/> (accessed 7.6.15).

Taiwanese vessel intercepted anew off Batanes | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/taiwanese-vessel-intercepted-anew-off-batanes/> (accessed 7.6.15).

Tamil Nadu exports fish robbed from Lanka | The Sundaytimes Sri Lanka, n.d.

Tamil Nadu trawlers defy Sri Lankan sovereignty 36,865 times: Dailymirror.lk: Breaking News [WWW Document], n.d. URL [http://www.dailymirror.lk/72909/tamil-nadu-trawlers-defy-sri-lankan-sovereignty-36-865-time](http://www.dailymirror.lk/72909/tamil-nadu-trawlers-defy-sri-lankan-sovereignty-36-865-times) s (accessed 7.7.15).

Tan, R., n.d. wildsingapore news: Malaysia: Ships seized for illegal fishing.

Task force set to fight illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2014/12/10/task-force-set-fight-illegal-fishing.html> (accessed 7.6.15).

Ternate naval patrol watch illegal fishing in n Maluku-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/67069/ternate-naval-patrol-watch-illegal-fishing-in-n-maluku> (accessed 7.16.15).

Thai crackdown on rogue fishing as fears grow over EU ban | The Daily Star [WWW Document], n.d. URL <http://www.thedailystar.net/business/global-business/thai-crackdown-rogue-fishing-fears-grow-over-eu-ban-105922> (accessed 7.2.15).

Thai Fisheries Dept. to introduce Port in – Port out system to 22 seaside provinces, 2015. . National News Bureau of Thailand.

Thai fishery authority attempts to cover up illegal fishing, 2015.

Thai fishing boats seized daily by authorities in southern Burma | democracy for Burma [WWW Document], n.d. URL <https://democracyforburma.wordpress.com/2009/01/07/thai-fishing-boats-seized-daily-by-authorities-in-southern-burma/>(accessed 7.16.15).

Thai fishing boats seized, not sunk, in Indonesia | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/449982/thai-fishing-boats-seized-not-sunk-in-indonesia> (accessed 7.7.15).

Thai fishing industry source of “serious abuse”: ILO [WWW Document], n.d. URL <http://www.mmtimes.com/index.php/national-news/8066-thai-fishing-industry-source-of-serious-abuse-ilo.html> (accessed 7.3.15).

Thai Navy Vessel Fires on Burmese Soldiers [WWW Document], n.d. URL http://www2.irrawaddy.org/article.php?art_id=17313 (accessed 7.3.15).

Thai trawlers warned Indonesia will sink illegal fishing boats | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/449034/thai-trawlers-warned-indonesia-will-sink-illegal-fishing-boats> (accessed 7.7.15).

Thailand adopts IUU sanctions in first update to fisheries act since 1947 | Undercurrent News [WWW Document], 2015. URL <http://www.undercurrentnews.com/2015/06/01/thailand-amends-fisheries-act-for-first-time-since-1947/> (accessed 9.16.15).

Thailand arrests 2 alleged brokers who sent slaves to boats | TODAYonline [WWW Document], n.d. URL <http://www.todayonline.com/world/asia/thailand-arrests-two-key-human-trafficking-suspects> (accessed 7.7.15).

The European Council Regulation on Illegal, Unreported and Unregulated Fishing: An International Fisheries Law Perspective » Brill Online [WWW Document], n.d. URL <http://booksandjournals.brillonline.com/content/journals/10.1163/092735210x12589554057604> (accessed 7.9.15).

The Nation Newspaper: n [WWW Document], n.d. URL <http://www.nationmultimedia.com/webmobile/national/Vietnamese-fishing-trawlers-apprehended-in-Thai-wa-30248861.html> (accessed 7.16.15).

The proceeds of illegal fishing in the Maldives | Minivan News [WWW Document], n.d. URL <http://minivannews.com/society/the-proceeds-of-illegal-fishing-in-the-maldives-1828#sthash.KbuJnG1U.dpbs> (accessed 7.7.15).

Thirty more Indian fishermen arrested: Daily Mirror [WWW Document], n.d. URL <http://www.dailymirror.lk/42562/thirty-more-indian-fishermen-arrested> (accessed 7.7.15).

Three bodies found in freezer of suspected illegal fishing boat off Papua New Guinea-ABC News (Australian Broadcasting Corporation) [WWW Document], n.d. URL <http://www.abc.net.au/news/2014-12-28/bodies-found-in-png-tuna-boat-freezer/5990648> (accessed 7.8.15).

Three Filipinos stand trial in Palu for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/04/22/three-filipinos-stand-trial-palu-illegal-fishing.html> (accessed 7.6.15).

Three fishing boats seized and 11 nabbed in op-Nation | The Star Online [WWW Document], 2015. URL <http://www.thestar.com.my/News/Nation/2015/04/17/Three-fishing-boats-seized-and-11-nabbed-in-op/> (accessed 7.7.15).

Three Malaysian fishing boats nabbed in Riau province waters-ANTARA News [WWW Document], n.d. URL <http://www.antaranews.com/en/news/70625/three-malaysian-fishing-boats-nabbed-in-riau-province-waters> (accessed 7.16.15).

Three Vietnamese boats seized for illegal fishing | Bangkok Post: news [WWW Document], 2015. URL <http://www.bangkokpost.com/news/security/556659/three-vietnamese-boats-seized-for-illegal-fishing> (accessed 7.7.15).

Timor Leste wins the first ever STOP IUU FISHING AWARD [WWW Document], n.d. URL http://www.imcsnet.org/wp-content/uploads/2012/06/Press-Release_Feb-20_English.pdf (accessed 7.10.15).

TN fishermen demand uninterrupted fishing rights in SL waters: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/69905/tn-fishermen-demand-uninterrupted-fishing-rights-in-sl-waters> (accessed 7.7.15).

TN fishermen fast demanding arrested fishermen's release: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/78223/tn-fishermen-fast-demanding-arrested-fishermen-s-release> (accessed 7.7.15).

TN Fishermen protest continuing arrests by Lankan Navy: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/69235/fishermen-protest-arrests-by-lankan-navy> (accessed 7.7.15).

TN lives off SL fishing stocks Two sides talk, but poaching continues: Dailymirror.lk: Breaking News [WWW Document], n.d. URL <http://www.dailymirror.lk/42628/tn-lives-off-sl-fishing-stocks-two-sides-talk-but-poaching-continues> (accessed 7.7.15).

Trafficked Fishermen Arrive in Rangoon from Indonesia [WWW Document], n.d. URL <http://www.irrawaddy.org/burma/trafficked-fishermen-arrive-in-rangoon-from-indonesia.html> (accessed 7.3.15).

Trafficked teens return home , National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/trafficked-teens-return-home> (accessed 7.8.15).

Trapped fishermen returned, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/trapped-fishermen-returned> (accessed 7.8.15).

Trawler trafficking suspect surrenders | Bangkok Post: news [WWW Document], n.d. URL <http://www.bangkokpost.com/news/general/561819/trawler-trafficking-suspect-surrenders> (accessed 7.7.15).

Trawlers flying tattered tricolour being investigated | The Indian Express [WWW Document], n.d. URL <http://indianexpress.com/article/india/regional/trawlers-flying-tattered-tricolour-being-investigated/> (accessed 7.6.15).

Trio Return From Indonesia After Escaping Thai Vessel | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/trio-return-from-indonesia-after-escaping-thai-vessel-65350/>(accessed 7.3.15).

Tuna Fishing News [WWW Document], n.d. URL <http://www.atuna.com/NewsArchive/ViewArticle.asp?ID=7571> (accessed 7.15.15).

Two boats detained by MMEA for illegal fishing | New Sarawak Tribune [WWW Document], n.d. URL <http://www.newsarawaktribune.com/news/44415/Two-boats-detained-by-MMEA-for-illegal-fishing/>(accessed 7.16.15).

Two injured in fishing face-off, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/two-injured-fishing-face> (accessed 7.8.15).

Two nabbed for illegal fishing | The Brunei Times [WWW Document], 2012. URL <http://www.bruneitimes.com.bn/2012/11/26/two-nabbed-illegal-fishing> (accessed 7.3.15).

Two Vietnamese ships impounded for illegal fishing in Natuna | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2013/04/01/two-vietnamese-ships-impounded-illegal-fishing-natuna.html> (accessed 7.6.15).

Two Vietnamese trawlers seized for illegal fishing off Johor's coast-Community | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/News/Community/2014/09/12/One-fish-too-many-Two-Vietnamese-trawlers-seized-for-illegal-fishing-off-Johors-coast> (accessed 7.7.15).

Two Vietnamese vessels seized for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/06/30/two-vietnamese-vessels-seized-illegal-fishing.html> (accessed 7.6.15).

UnderwaterTimes.com | Cambodian Illegal Fishing Crackdown with Vietnamese Leads to Swordfight to the Death [WWW Document], n.d. URL http://www.underwatertimes.com/news.php?article_id=03675249108 (accessed 7.10.15).

Unregulated FADs use threatens tuna industry | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-asia/2014/09/07/unregulated-fads-use-threatens-tuna-industry> (accessed 7.3.15).

Update: 110 Indian fishermen arrested: Daily Mirror [WWW Document], n.d. URL <http://www.dailymirror.lk/40082/update-110-indian-fishermen-arrested> (accessed 7.7.15).

Viet fishermen caught poaching off Zambales | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/viet-fishermen-caught-poaching-off-zambales/> (accessed 7.7.15).

Vietnam crew faces probe for illegal fishing | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2014/09/30/vietnam-crewfaces-probe-for-illegal-fishing> (accessed 7.3.15).

Vietnam Detains 64 Fishermen from Burma, Thailand [WWW Document], n.d. URL http://www2.irrawaddy.org/article.php?art_id=3991 (accessed 7.3.15).

Vietnam seizes over 1,000 dead endangered sea turtles | Environment | The Guardian [WWW Document], n.d. URL <http://www.theguardian.com/environment/2014/nov/25/vietnam-seizes-over-1000-dead-endangered-sea-turtles> (accessed 11.10.15).

Vietnam ship faces illegal fishing charge | The Brunei Times [WWW Document], n.d. URL <http://www.bruneitimes.com.bn/news-national/2011/05/25/vietnam-ship-faces-illegal-fishing-charge> (accessed 7.3.15).

Vietnamese boat sunk in Raja Ampat for illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2015/02/12/vietnamese-boat-sunk-raja-ampat-illegal-fishing.html> (accessed 7.6.15).

Vietnamese Boat, Indonesian Flag – ASEAN News–Development News Around ASEAN, n.d.

Vietnamese fishermen snared in local waters, National, Phnom Penh Post [WWW Document], n.d. URL <http://www.phnompenhpost.com/national/vietnamese-fishermen-snared-local-waters> (accessed 7.8.15).

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Vietnamese trawler caught for illegal fishing off Johor-Community | The Star Online [WWW Document], n.d. URL <http://www.thestar.com.my/Metro/Community/2015/06/06/Vietnamese-trawler-caught-for-illegal-fishing-off-coast-of-Johor> (accessed 7.7.15).

Visayas Newsbits for February 21, 2015 | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/visayas-newsbits-for-february-21-2015/> (accessed 7.6.15).

Visayas Newsbits for May 13, 2015 | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/visayas-newsbits-for-may-13-2015/> (accessed 7.6.15).

Warships sent to Natuna Sea to stop rampant illegal fishing | The Jakarta Post [WWW Document], n.d. URL <http://www.thejakartapost.com/news/2012/09/01/warships-sent-natuna-sea-stop-rampant-illegal-fishing.html> (accessed 7.6.15).

Weak Police Blamed for Fisheries Conflict | The Cambodia Daily [WWW Document], n.d. URL <https://www.cambodiadaily.com/archives/weak-police-blamed-for-fisheries-conflict-17405/> (accessed 7.3.15).

WWF lauds govt efforts for getting “green card” rating for PHL fisheries | mb.com.ph | Philippine News [WWW Document], n.d. URL <http://www.mb.com.ph/wwf-lauds-govt-efforts-for-getting-green-card-rating-for-phl-fisheries/> (accessed 7.6.15).

Annex 2 BOBLME IUU database model

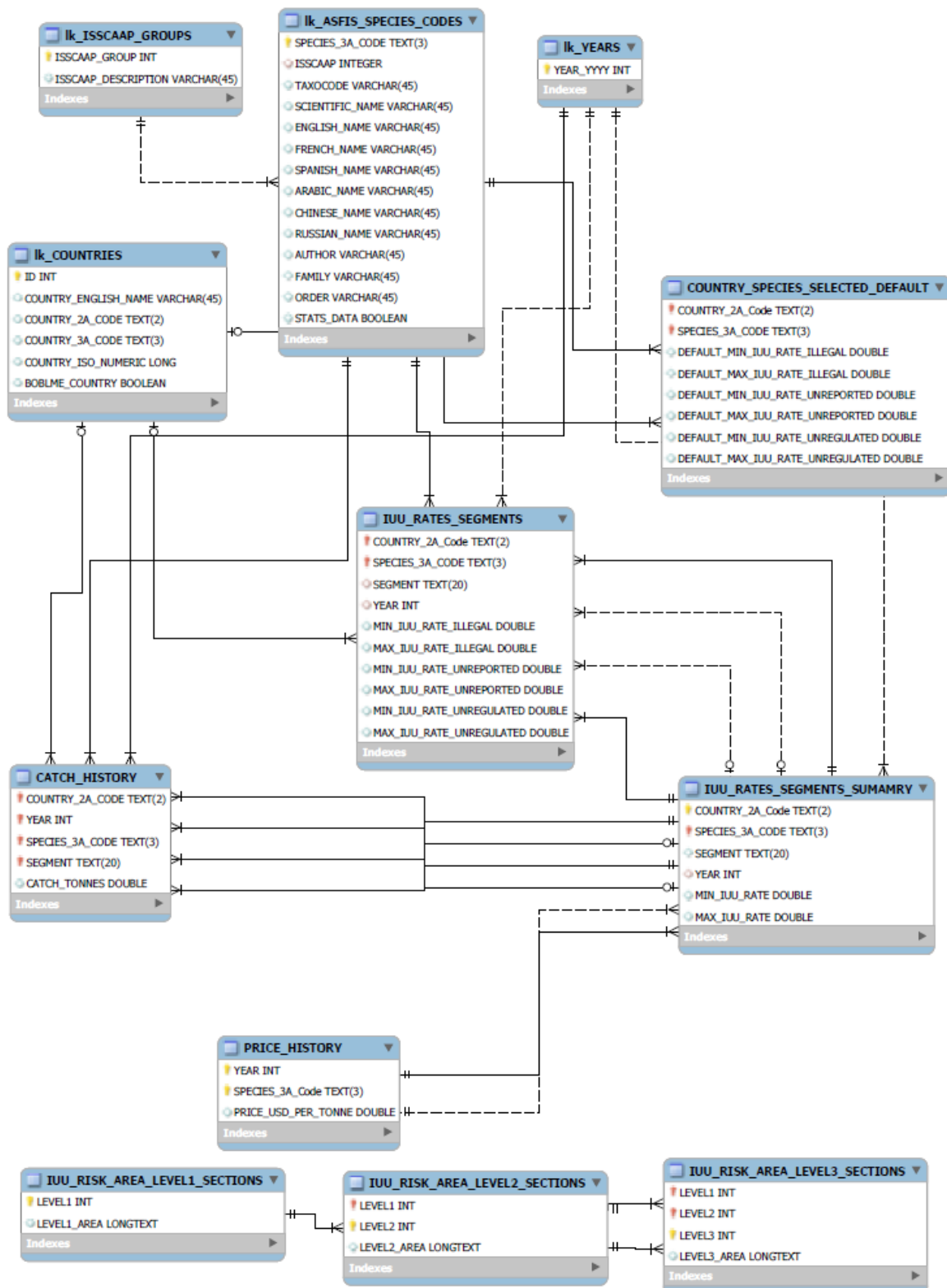


Figure 51 IUU database entity relationship diagram

Annex 3 Identified species of interest for study countries

Bangladesh

Species 3A CODE	Common name	Scientific name
BUC	Bombay-duck	Harpadon nehereus
CAX	Sea catfishes nei	Ariidae
CRU	Marine crustaceans nei	Crustacea
HIL	Hilsa shad	Tenualosa ilisha
KGX	Seerfishes nei	Scomberomorus spp
MZZ	Marine fishes nei	Osteichthyes
OYD	Indian threadfin	Leptomelanosoma indicum
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii

British Indian Ocean Territory

Species 3A CODE	Common name	Scientific name
ALB	Albacore	Thunnus alalunga
BET	Bigeye tuna	Thunnus obesus
BIL	Marlins, sailfishes, etc. nei	Istiophoridae
BLM	Black marlin	Makaira indica
BSX	Groupers, seabasses nei	Serranidae
CUX	Sea cucumbers nei	Holothuroidea
LZX	Emperors nei	Lethrinus spp
MLS	Striped marlin	Tetrapturus audax
MZZ	Marine fishes nei	Osteichthyes
SFA	Indo-Pacific sailfish	Istiophorus platypterus
SKJ	Skipjack tuna	Katsuwonus pelamis
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Species 3A CODE	Common name	Scientific name
SNX	Snappers, jobfishes nei	Lutjanidae
SWO	Swordfish	Xiphias gladius
YFT	Yellowfin tuna	Thunnus albacares

Brunei Darussalam

Species 3A CODE	Common name	Scientific name
CRU	Marine crustaceans nei	Crustacea
DCP	Natantian decapods nei	Natantia
MOL	Marine molluscs nei	Mollusca
MZZ	Marine fishes nei	Osteichthyes
PCX	Pike-congers nei	Muraenesox spp
RAG	Indian mackerel	Rastrelliger kanagurta
SDX	Scads nei	Decapterus spp
SIX	Sardinellas nei	Sardinella spp

Cambodia

Species 3A CODE	Common name	Scientific name
CEP	Cephalopods nei	Cephalopoda
CRA	Marine crabs nei	Brachyura
CUX	Sea cucumbers nei	Holothuroidea
DCP	Natantian decapods nei	Natantia
MOL	Marine molluscs nei	Mollusca

India

Species 3A CODE	Common name	Scientific name
ANX	Anchovies, etc. nei	Engraulidae

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Species 3A CODE	Common name	Scientific name
BUC	Bombay-duck	Harpadon nehereus
BUX	Butterfishes, pomfrets nei	Stromateidae
CAX	Sea catfishes nei	Ariidae
CDX	Croakers, drums nei	Sciaenidae
CEP	Cephalopods nei	Cephalopoda
CGX	Carangids nei	Carangidae
CLU	Clupeoids nei	Clupeoidei
COM	Narrow-barred Spanish mackerel	Scomberomorus commerson
CRU	Marine crustaceans nei	Crustacea
CUT	Hairtails, scabbardfishes nei	Trichiuridae
DCP	Natantian decapods nei	Natantia
DOS	Wolf-herrings nei	Chirocentrus spp
FLX	Flatfishes nei	Pleuronectiformes
GIT	Giant tiger prawn	Penaeus monodon
HIL	Hilsa shad	Tenualosa ilisha
IOS	Indian oil sardine	Sardinella longiceps
MUL	Mullets nei	Mugilidae
MZZ	Marine fishes nei	Osteichthyes
PON	Ponyfishes(=Slipmouths) nei	Leiognathidae
PRC	Percoids nei	Percoidei
RAG	Indian mackerel	Rastrelliger kanagurta
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii
TRE	Jacks, crevalles nei	Caranx spp
ZZZ	Other species combined	Other species combined

Indonesia

Species 3A CODE	Common name	Scientific name
BET	Bigeye tuna	Thunnus obesus
BLC	Blood cockle	Anadara granosa
CAX	Sea catfishes nei	Ariidae
CDX	Croakers, drums nei	Sciaenidae
COM	Narrow-barred Spanish mackerel	Scomberomorus commerson
CUT	Hairtails, scabbardfishes nei	Trichiuridae
DCP	Natantian decapods nei	Natantia
FRZ	Frigate and bullet tunas	Auxis thazard, A. rochei
GIP	Barramundi (=Giant seaperch)	Lates calcarifer
KAW	Kawakawa	Euthynnus affinis
MZZ	Marine fishes nei	Osteichthyes
PBA	Banana prawn	Penaeus merguensis
PON	Ponyfishes (=Slipmouths) nei	Leiognathidae
RAB	Short mackerel	Rastrelliger brachysoma
SAG	Goldstripe sardinella	Sardinella gibbosa
SAM	Bali sardinella	Sardinella lemuru
SDX	Scads nei	Decapterus spp
SKJ	Skipjack tuna	Katsuwonus pelamis
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii
SNA	Snappers nei	Lutjanus spp
SQC	Common squids nei	Loligo spp
STO	Stolephorus anchovies nei	Stolephorus spp
SWR	Red seaweeds	Rhodophyceae

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

TRY	Yellowstripe scad	Selaroides leptolepis
TUX	Tuna-like fishes nei	Scombroidei
YFT	Yellowfin tuna	Thunnus albacares
ZZZ	Other species combined	Other species combined

Malaysia

Species 3A CODE	Common name	Scientific name
CAX	Sea catfishes nei	Ariidae
CDX	Croakers, drums nei	Sciaenidae
CGX	Carangids nei	Carangidae
CLU	Clupeoids nei	Clupeoidei
CLX	Clams, etc. nei	Bivalvia
CRA	Marine crabs nei	Brachyura
CTL	Cuttlefish, bobtail squids nei	Sepiidae, Sepiolidae
DCP	Natantian decapods nei	Natantia
HAS	Torpedo scad	Megalaspis cordyla
JEL	Jellyfishes nei	Rhopilema spp
KAW	Kawakawa	Euthynnus affinis
KGX	Seerfishes nei	Scomberomorus spp
LIX	Lizardfishes nei	Synodontidae
LOT	Longtail tuna	Thunnus tonggol
MZZ	Marine fishes nei	Osteichthyes
PEO	Indian pellona	Pellona ditchela
RAX	Indian mackerels nei	Rastrelliger spp
RES	Mangrove red snapper	Lutjanus argentimaculatus
RUS	Indian scad	Decapterus russelli
SHS	Sergestid shrimps nei	Sergestidae

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

SKX	Sharks, rays, skates, etc. nei	Elasmobranchii
SQU	Various squids nei	Loliginidae, Ommastrephidae
SRX	Rays, stingrays, mantas nei	Rajiformes
STO	Stolephorus anchovies nei	Stolephorus spp
THB	Threadfin breams nei	Nemipterus spp
TRY	Yellowstripe scad	Selaroides leptolepis
ZZZ	Other species combined	Other species combined

Maldives

Species 3A CODE	Common name	Scientific name
BET	Bigeye tuna	Thunnus obesus
BIL	Marlins, sailfishes, etc. nei	Istiophoridae
CUX	Sea cucumbers nei	Holothuroidea
DOT	Dogtooth tuna	Gymnosarda unicolor
FRZ	Frigate and bullet tunas	Auxis thazard, A. rochei
KAW	Kawakawa	Euthynnus affinis
MOL	Marine molluscs nei	Mollusca
MZZ	Marine fishes nei	Osteichthyes
SKJ	Skipjack tuna	Katsuwonus pelamis
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii
SLV	Tropical spiny lobsters nei	Panulirus spp
TUX	Tuna-like fishes nei	Scombroidei
YFT	Yellowfin tuna	Thunnus albacares

Myanmar

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Species 3A CODE	Common name	Scientific name
DCP	Natantian decapods nei	Natantia
JEL	Jellyfishes nei	Rhopilema spp
KAW	Kawakawa	Euthynnus affinis
KGX	Seerfishes nei	Scomberomorus spp
MZZ	Marine fishes nei	Osteichthyes

Pakistan

Species 3A CODE	Common name	Scientific name
ANX	Anchovies, etc. nei	Engraulidae
CAX	Sea catfishes nei	Ariidae
CDX	Croakers, drums nei	Sciaenidae
CGX	Carangids nei	Carangidae
CLU	Clupeoids nei	Clupeoidei
COM	Narrow-barred Spanish mackerel	Scomberomorus commerson
GPX	Groupers nei	Epinephelus spp
HIL	Hilsa shad	Tenualosa ilisha
IOS	Indian oil sardine	Sardinella longiceps
LHT	Largehead hairtail	Trichiurus lepturus
LOT	Longtail tuna	Thunnus tonggol
MET	Metapenaeus shrimps nei	Metapenaeus spp
MUL	Mulletts nei	Mugilidae
MZZ	Marine fishes nei	Osteichthyes
NPP	Parapenaeopsis shrimps nei	Parapenaeopsis spp
PEN	Penaeus shrimps nei	Penaeus spp
RAG	Indian mackerel	Rastrelliger kanagurta

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

RSK	Requiem sharks nei	Carcharhinidae
SRX	Rays, stingrays, mantas nei	Rajiformes
ZZZ	Other species combined	Other species combined

Papua New Guinea

Species 3A CODE	Common name	Scientific name
ALB	Albacore	Thunnus alalunga
BET	Bigeye tuna	Thunnus obesus
BLM	Black marlin	Makaira indica
BUM	Blue marlin	Makaira nigricans
CUX	Sea cucumbers nei	Holothuroidea
DCP	Natantian decapods nei	Natantia
GIP	Barramundi (=Giant seaperch)	Lates calcarifer
GIT	Giant tiger prawn	Penaeus monodon
MET	Metapenaeus shrimps nei	Metapenaeus spp
MUD	Indo-Pacific swamp crab	Scylla serrata
MZZ	Marine fishes nei	Osteichthyes
PBA	Banana prawn	Penaeus merguensis
SKJ	Skipjack tuna	Katsuwonus pelamis
SLV	Tropical spiny lobsters nei	Panulirus spp
SWO	Swordfish	Xiphias gladius
TSH	Trochus shells	Ex Trochus spp
YFT	Yellowfin tuna	Thunnus albacares
ZZZ	Other species combined	Other species combined

Philippines

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Species 3A CODE	Common name	Scientific name
BIS	Bigeye scad	Selar crumenophthalmus
CGX	Carangids nei	Carangidae
FLY	Flyingfishes nei	Exocoetidae
FRZ	Frigate and bullet tunas	Auxis thazard, A. rochei
KAW	Kawakawa	Euthynnus affinis
PEN	Penaeus shrimps nei	Penaeus spp
PON	Ponyfishes(=Slipmouths) nei	Leiognathidae
PRC	Percoids nei	Percoidei
RAB	Short mackerel	Rastrelliger brachysoma
RAG	Indian mackerel	Rastrelliger kanagurta
RAS	Rainbow sardine	Dussumieria acuta
SCD	Blue swimming crab	Portunus pelagicus
SDX	Scads nei	Decapterus spp
SIX	Sardinellas nei	Sardinella spp
SKJ	Skipjack tuna	Katsuwonus pelamis
SNX	Snappers, jobfishes nei	Lutjanidae
SQC	Common squids nei	Loligo spp
STO	Stolephorus anchovies nei	Stolephorus spp
THB	Threadfin breams nei	Nemipterus spp
YFT	Yellowfin tuna	Thunnus albacares
ZZZ	Other species combined	Other species combined

Singapore

Species 3A CODE	Common name	Scientific name
CAX	Sea catfishes nei	Ariidae

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

Species 3A CODE	Common name	Scientific name
CDX	Croakers, drums nei	Sciaenidae
CGX	Carangids nei	Carangidae
CJX	Fusiliers nei	Caesionidae
CLU	Clupeoids nei	Clupeoidei
DCP	Natantian decapods nei	Natantia
DOS	Wolf-herrings nei	Chirocentrus spp
GOX	Goatfishes	Upeneus spp
GPX	Groupers nei	Epinephelus spp
LHT	Largehead hairtail	Trichiurus lepturus
LIX	Lizardfishes nei	Synodontidae
MZZ	Marine fishes nei	Osteichthyes
RAX	Indian mackerels nei	Rastrelliger spp
SKJ	Skipjack tuna	Katsuwonus pelamis
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii
SNA	Snappers nei	Lutjanus spp
SQC	Common squids nei	Loligo spp
SRX	Rays, stingrays, mantas nei	Rajiformes
THB	Threadfin breams nei	Nemipterus spp
TRE	Jacks, crevalles nei	Caranx spp
ZZZ	Other species combined	Other species combined

Sri Lanka

Species 3A CODE	Common name	Scientific name
BET	Bigeye tuna	Thunnus obesus
BLM	Black marlin	Makaira indica

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

CGX	Carangids nei	Carangidae
CLU	Clupeoids nei	Clupeoidei
COM	Narrow-barred Spanish mackerel	Scomberomorus commerson
CRU	Marine crustaceans nei	Crustacea
CUX	Sea cucumbers nei	Holothuroidea
DPX	Demersal percomorphs nei	Perciformes
FAL	Silky shark	Carcharhinus falciformis
FRZ	Frigate and bullet tunas	Auxis thazard, A. rochei
KAW	Kawakawa	Euthynnus affinis
MAX	Mackerels nei	Scombridae
MOL	Marine molluscs nei	Mollusca
MZZ	Marine fishes nei	Osteichthyes
SFA	Indo-Pacific sailfish	Istiophorus platypterus
SKJ	Skipjack tuna	Katsuwonus pelamis
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii
SWO	Swordfish	Xiphias gladius
YFT	Yellowfin tuna	Thunnus albacares
ZZZ	Other species combined	Other species combined

Thailand

Species 3A CODE	Common name	Scientific name
ALB	Albacore	Thunnus alalunga
ANX	Anchovies, etc. nei	Engraulidae
BAR	Barracudas nei	Sphyræna spp
BET	Bigeye tuna	Thunnus obesus
BIG	Bigeyes nei	Priacanthus spp

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

BLM	Black marlin	<i>Makaira indica</i>
BUM	Blue marlin	<i>Makaira nigricans</i>
CDX	Croakers, drums nei	Sciaenidae
CGX	Carangids nei	Carangidae
CTL	Cuttlefish, bobtail squids nei	Sepiidae, Sepiolidae
HAS	Torpedo scad	<i>Megalaspis cordyla</i>
JEL	Jellyfishes nei	<i>Rhopilema</i> spp
KAW	Kawakawa	<i>Euthynnus affinis</i>
LIX	Lizardfishes nei	Synodontidae
LOT	Longtail tuna	<i>Thunnus tonggol</i>
MLS	Striped marlin	<i>Tetrapturus audax</i>
MSV	Green mussel	<i>Perna viridis</i>
MZZ	Marine fishes nei	Osteichthyes
NCL	Short neck clams nei	<i>Paphia</i> spp
OCT	Octopuses, etc. nei	Octopodidae
PEN	<i>Penaeus</i> shrimps nei	<i>Penaeus</i> spp
RAG	Indian mackerel	<i>Rastrelliger kanagurta</i>
RAX	Indian mackerels nei	<i>Rastrelliger</i> spp
RUS	Indian scad	<i>Decapterus russelli</i>
SBF	Southern bluefin tuna	<i>Thunnus maccoyii</i>
SCD	Blue swimming crab	<i>Portunus pelagicus</i>
SFA	Indo-Pacific sailfish	<i>Istiophorus platypterus</i>
SHS	Sergestid shrimps nei	Sergestidae
SIX	Sardinellas nei	<i>Sardinella</i> spp
SKJ	Skipjack tuna	<i>Katsuwonus pelamis</i>
SKX	Sharks, rays, skates, etc. nei	Elasmobranchii

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

SQC	Common squids nei	Loligo spp
SSP	Shortbill spearfish	Tetrapturus angustirostris
SWO	Swordfish	Xiphias gladius
THB	Threadfin breams nei	Nemipterus spp
TUX	Tuna-like fishes nei	Scombroidei
YFT	Yellowfin tuna	Thunnus albacares
ZZZ	Other species combined	Other species combined

Timor-Leste (East Timor)

Species 3A CODE	Common name	Scientific name
CEP	Cephalopods nei	Cephalopoda
CRA	Marine crabs nei	Brachyura
DCP	Natantian decapods nei	Natantia
MZZ	Marine fishes nei	Osteichthyes
SLV	Tropical spiny lobsters nei	Panulirus spp
SWR	Red seaweeds	Rhodophyceae
TTX	Marine turtles nei	Testudinata
TUX	Tuna-like fishes nei	Scombroidei
YFT	Yellowfin tuna	Thunnus albacares

Vietnam

Species 3A CODE	Common name	Scientific name
ALB	Albacore	Thunnus alalunga
BET	Bigeeye tuna	Thunnus obesus
BLM	Black marlin	Makaira indica
BUM	Blue marlin	Makaira nigricans

Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia

CEP	Cephalopods nei	Cephalopoda
CRA	Marine crabs nei	Brachyura
DCP	Natantian decapods nei	Natantia
LOX	Lobsters nei	Reptantia
MOL	Marine molluscs nei	Mollusca
MZZ	Marine fishes nei	Osteichthyes
SKJ	Skipjack tuna	Katsuwonus pelamis
SWO	Swordfish	Xiphias gladius
TUX	Tuna-like fishes nei	Scombroidei
YFT	Yellowfin tuna	Thunnus albacares

Annex 4 RFMO membership for study countries.

ICCAT	IOTC	
No	(2014) NOTED the application for Cooperating Non-Contracting Party status by Bangladesh (IOTC-2014-CoC11-CNCP02).	Bangladesh
No	Yes. As UK(OT).	BIOT
No	No	Brunei
No	No	Cambodia
No	No	East Timor
No	Commission Contracting Party (member)(13 March 1995)	India
No	Commission Contracting Party (member)(9 July 2007)	Indonesia
No	Commission Contracting Party (member) (22 May 1998)	Malaysia
No	Commission Contracting Party (member)(13 July 2011)	Maldives
No	No	Myanmar
No	Yes	Pakistan
No	No	Papua Guinea New
Contracting Party (Member) (2004)	Yes	Philippines
No	No	Singapore
No	Commission Contracting Party (member) (13 June 1994)	Sri Lanka
No	Commission Contracting Party (member)(17 March 1997)	Thailand
No	No	Vietnam

WCPFC	CCSBT	IATTC	
No	No	No	Bangladesh
No	No	No	BIOT
No	No	No	Brunei
No	No	No	Cambodia
No	No	No	East Timor
No	No	No	India
Yes (member)	Extended Commission	Cooperating Member	Indonesia
No	No	No	Malaysia
No	No	No	Maldives
No	No	No	Myanmar
No	No	No	Pakistan
Yes (member)	No	No	Papua New Guinea
Yes (member)	Cooperating non-member	No	Philippines
No	No	No	Singapore
No	No	No	Sri Lanka
Cooperating Non-member	No	No	Thailand
Cooperating Non-member	No	No	Vietnam

Annex 5 Status with respect to relevant multi-lateral agreements for study countries.

FAO Agreement to Promote Compliance with International CMIMs by fishing vessels on the High Seas	FAO Port State Measures Agreement		
No	No		Bangladesh
UK entered into force as part of EU 24/04/2004	UK ratified 7/72011		BIOT
No	No		Brunei
No	No		Cambodia
No	No		East Timor
No	No		India
No	Yes (signed on 22 Nov 2009) but not ratified		Indonesia
No	No		Malaysia
No	No		Maldives
Yes-Entered into force 24/04/2004	Ratified on 22 Nov 2010		Myanmar
No	No		Pakistan
No	No		Papua Guinea
No	No		Philippines
No	No		Singapore
Yes-entered into force 29/08/2014	Ratified on 20 Jan 2011		Sri Lanka
No	No		Thailand
No	No		Vietnam

NPOA-IUU	No (in 2009 they were developing)	Bangladesh
	No	BIOT
	Yes, 2011 according to RPOAIUU website, but no documentation	Brunei
	Yes, 2010, as stated in Country Profile of 'Addressing IUU' report	Cambodia
	Yes, 2013 according to RPOAIUU website, no documentation	East Timor
	No	India
	Yes, during the regional core expert meeting on combating IUU fishing in Southeast Asian region they stated that Indonesia had published their NPOA-IUU.RPOAIUU site states 2012	Indonesia
	Yes, 2013	Malaysia
	No	Maldives
	No	Myanmar
	No	Pakistan
	No	Papua Guinea
	Yes 2013	Philippines
	No	Singapore
	Yes	Sri Lanka
No	Thailand	
No-recommended in 2012 report on tuna	Vietnam	

UNCLOS Convention on the Law of the Sea	UNFSA Convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks	
Yes (27 July 2001)	Yes (5 November 2012)	Bangladesh
	UK as part of the EU (19/12/2003)	BIOT
	No	Brunei
	No	Cambodia
Yes-08/01/2013	No	East Timor
Yes (29 June 1995)	Yes (19 August 2003)	India
Yes (3 February 1986)	Yes (28 September 2009)	Indonesia
Yes (14 October 1996)	No	Malaysia
Yes (7 September 2000)	Yes (30 December 1998)	Maldives
Yes (21 May 1996)	No	Myanmar
Yes-20/02/1997	No	Pakistan
Yes-11/January 1997	Yes, 4/06/1999	Papua New Guinea
Yes, 06/03/1984	Yes, 24/09/2014	Philippines
Yes-17/11/1994	No	Singapore
Yes (19 July 1994)	Yes (24 October 1996)	Sri Lanka
Yes (15 May 2011)	No	Thailand
Yes, 25/07/1994	No	Vietnam

Annex 6 IUU risk assessment categories

1 Fishing vessels, legal personalities and companies (IUU and whitelists)

Specific risk	Specific questions to address risk
1.1 Vessel/Fisher Identification	Vessel identification i.e. vessel name, callsign, country registration number and national and RFMO authorisations to fish (either inside national waters or outside on the high seas or in other zones) is complete to enable identification.
	Each vessel, captain, beneficial owner and agent should be identified as far as possible, this should ideally be transparent.
	Are vessels required to have unique IDs?
	Are Fishermen required to have fisher IDs?
1.2 Vessels on IUU lists.	IUU Lists of RFMOs, (NGOs to be considered but not as clear evidence as evidential value to include is not of the required standard).
	IUU lists of nationals and companies involved in IUU. Evidence of unlicensed fishing occurring.
	Vessels on authorised lists for RFMOs or national authorised lists.
1.3 IUU fishing carried out by vessels flying its flag, by its nationals or by companies based in that country.	EU Yellow Flag recorded under paragraph 31(4)a.
	Scientific and market analysis defining the level of IUU (i.e. RFMO reports).
	NGO and Press reports of IUU incidents (specific to vessels/companies).
	No fishers with previous IUU history in the fishery. Companies involved in industry (producer) organisations existing in the country may reduce risks.
	The history, nature, circumstances, extent and gravity of the manifestations of IUU fishing considered (EU Yellow Flag (5(c))).

2 Fisheries (sustainability, impacts)

Specific risk	Specific questions to address risk
2.1 Status of fisheries and sustainability	Are fisheries operated with output controls i.e. quotas?
	Are stock assessments available for species that incorporate data on discards?
	Are fisheries operating at a level under MSY?
	Bycatch and ecosystem impacts of IUU

2.2 History of IUU	Collect data on previous incidences of IUU within the fishery; NGO and Press reports of IUU incidents (specific to fishery).
2.3 Access to fishery	Are fisheries authorised through a fishing licence system?
2.4 Price	Collect data on species market prices (domestic/international) Low price fish (<USD1000/t) are generally lower risk (i.e. small pelagics), higher priced (>USD5000/t) demersals (i.e. cod and haddock) will be higher risk, high value species are generally higher risk.
	Collect data on any mitigation procedures that may be in place for high value species (i.e. catch documentation schemes, EU catch certificate requirements) in place (i.e. bêche de mer, bluefin tuna)
2.5 MSC certification	MSC certification requires IUU to be low or negligible and has checks to ensure this is the case. If the fishery is going through a FIP process as well/that may indicate improvement within the fishery i.e. Sri Lanka.
2.6 Other certification/FIP processes	What other certification schemes are in place? Are any FIPs ongoing?

8

3 Flag state (activities, corruption, control systems in place)

Specific risk	Specific questions to address risk
3.1 Flag of non-Compliance (FONC)	EU Yellow Flag recorded under paragraph 31(4)a for vessels flying its flag.
	Cooperation with other market, coastal and port States (EU yellow flag 5(a))
	Confirmation effective enforcement measures in respect of the operators responsible for IUU fishing, and in particular whether sanctions of sufficient severity to deprive the offenders of the benefits accruing from IUU fishing have been applied (EU Yellow Flag 5(b)).
	The existing capacity of their competent authorities. (Particularly for developing States (EU Yellow Flag 5(d)).
	Countries with poor records in supplying catch certificates without any checks in place.
3.2 Non-Cooperating	Non-cooperating States i.e. States with non-cooperating history.
	Have they been identified as a “country of interest” within NOAA reports?
3.3 Flag of convenience	Are they known as a FOC by ITF's Fair Practices Committee (a joint committee of ITF seafarers' and dockers' unions).
	Does the national registry responsible for vessel registration ensure that vessels flying their flag are connected to the country
3.4 Corruption	High WB corruption index (see WB Governance Indicators). Governance score-Low scores of governance are particularly vulnerable to incursions and illegal activities perpetrated by all distant water fishing nations in addition to internal weaknesses and corruption.
3.5 Licensing	Are all vessels required to have a licence?
	Are there reports of proportion of vessels unlicensed (national and international)?
	Is there a national (by fishery) licensing and quota allocation system fair, clear and transparent?
	Is this broken down by domestic waters and ABNJ
	Is there a public list of licensed/authorised vessels?
3.6 Fair transparent fisheries agreements	Are fair transparent fisheries agreements in place with DWFNs?
	Are the details of these agreements public?

3.7 RFMO	Membership: Are they a Member of the relevant RFMOs?
	Compliance: Are the flag State compliant with all RFMO requirements and data submissions?

	Engagement: Does the flag State submit additional information/papers to RFMO and actively participate in scientific and compliance committee meetings?
3.8 Multi-lateral agreements i.e. FAO Guidelines or UNCLOS	Are they a contracting/cooperative non-member party to multi-lateral agreements i.e. UNCLOS, UNFSA, FAO Agreements? Implementation of the provisions of the Convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks
3.9 NPOAs (IUU + others)	Is there a specific National Plan of Action (NPOA) in place to combat IUU?
3.10 Flag State Control	How is control exercised – Variety of means (registry, licensing, inspections etc.)?
	What is the estimated level of control exercised by the flag State?
	Indicators of control over its own vessels, national prosecutions when vessels commit IUU fishing.
	VMS coverage on own fleet (all waters)? Do they provide this data to RFMOs?
3.11 Observer Programme	Do they have an observer programme on vessels?
	What percentage coverage?
	What does the observer programme do, i.e. is it compliance, scientific or both?
	Are their electronic alternatives to observers employed in the fishery?
3.12 Cooperation on MCS issues	Do they work with neighbouring or regional States to enhance MCS in their own waters and fleets?
	VMS sharing is implemented?

4 Coastal state (corruption, control systems in place)

Specific risk	Specific questions to address risk
4.1 IUU fishing	Is IUU fishing carried out/supported by fishing vessels operating in its maritime waters?
	EU Yellow Flag recorded under paragraph 31(4)a for vessels operating in its waters. (and Recurrence of IUU Vessels and IUU trade flows)
4.2 Cooperating Authority	The existing capacity of their competent authorities. (Particularly for developing States (EU Yellow Flag 5(d)).
4.3 Effective MCS	Does the coastal State exercise effective MCS in its own waters?
	Number of patrol vessels/patrol vessel days. Aerial surveillance Observers VMS on all vessels operating in coastal State waters.
4.4 Quota management and licensing arrangements	Do these exist in the public domain?
	Are these clear and transparent?
4.5 Sanctions	Are sanctions enforced?
	Relative level of sanctions vs level of IUU fishing.
4.6 Regional cooperation	Does the coastal State cooperate with other neighbouring coastal States and flag States of licensed vessels?
4.7 Fishing capacity	Are there reports of overcapacity within the fisheries or rapid expansion?
	Overcapacity as a clear driver of IUU?

5 Port states (control systems in place, PSMA provisions in place)

Specific risk	Specific questions to address risk
5.1 IUU fishing	Reports of IUU fishing being supported by using national ports
	EU Yellow Flag recorded under paragraph 31(4)a for vessels using its ports.
5.2 Port based control	Inspections (%); Number of Inspectors; Do they have to notify ports of landing;
	Reports of refusal of entry to suspected IUU vessels?
5.3 Designated ports	Are there lists of designated ports assigned to particular species?
5.4 Appropriate ports used by fleets	Are appropriate locations and sizes of ports used? (Map of fishing locations and ports)
5.5 PSMA implemented	Has the FAO Port State Measures Agreement been signed, acceded or implemented?
5.6 Transshipment	Is observation required or is transshipment banned/observation required by RFMO or by coastal States for their own waters?

6 Market state-Traceability and national requirements

Specific risk	Specific questions to address risk
6.1 Chain length	EU Yellow Flag recorded under 4 (b) access of fisheries products stemming from IUU fishing to its market.
	Number of processing and transport elements?
6.2 Chain complexity and transparency	Number of companies and transfers of ownership, amount of processing?
	Is the chain publically known and transparent?
6.3 Uses known PONCs	Are ports known or suspected PONCS and do the ports used have well documented and effective port control and inspection?
	Does processing occur in locations that seem out of context or with history off laundering IUU catches?
6.4 Post landing inspections	Performance of spot audits at key transport hubs and border inspection points?
	Are inspections carried out on the fish after landings i.e. by customs, BIPs and in transit?
6.5 MSC CoC	Is supply chain MSC CoC certified?
6.6 3rd Party Verifications	DNA analysis?
	Supply chain and traceability audits (due diligence) conducted?
	Independent or externally managed?
6.7 CDS/CC certification	Do catch documentation schemes exist for the species?
	Are catch certificates for the EU completed to the satisfaction of the EU MS?
6.8 Distant water without effective verification.	Is there cooperation between flag, coastal and port states?
6.9 Adoption of trade-related measures	Do states cooperate to adopt multi-laterally agreed trade measures?
	Are there any multilateral catch documentation/certification requirements or import/export controls?
6.10 Processing or transshipment vessels involved in market chain.	If transshipment or processing onboard a Klondiker or mother vessels is allowed (licensed) in the fishery, are the Klondiker and transshipment (reefer) vessels on the relevant whitelists (authorised) or blacklists (IUU)?
	Are there independent observer programmes on non-fishing vessels??

Annex 7 World Bank governance indicators for regional coastal states

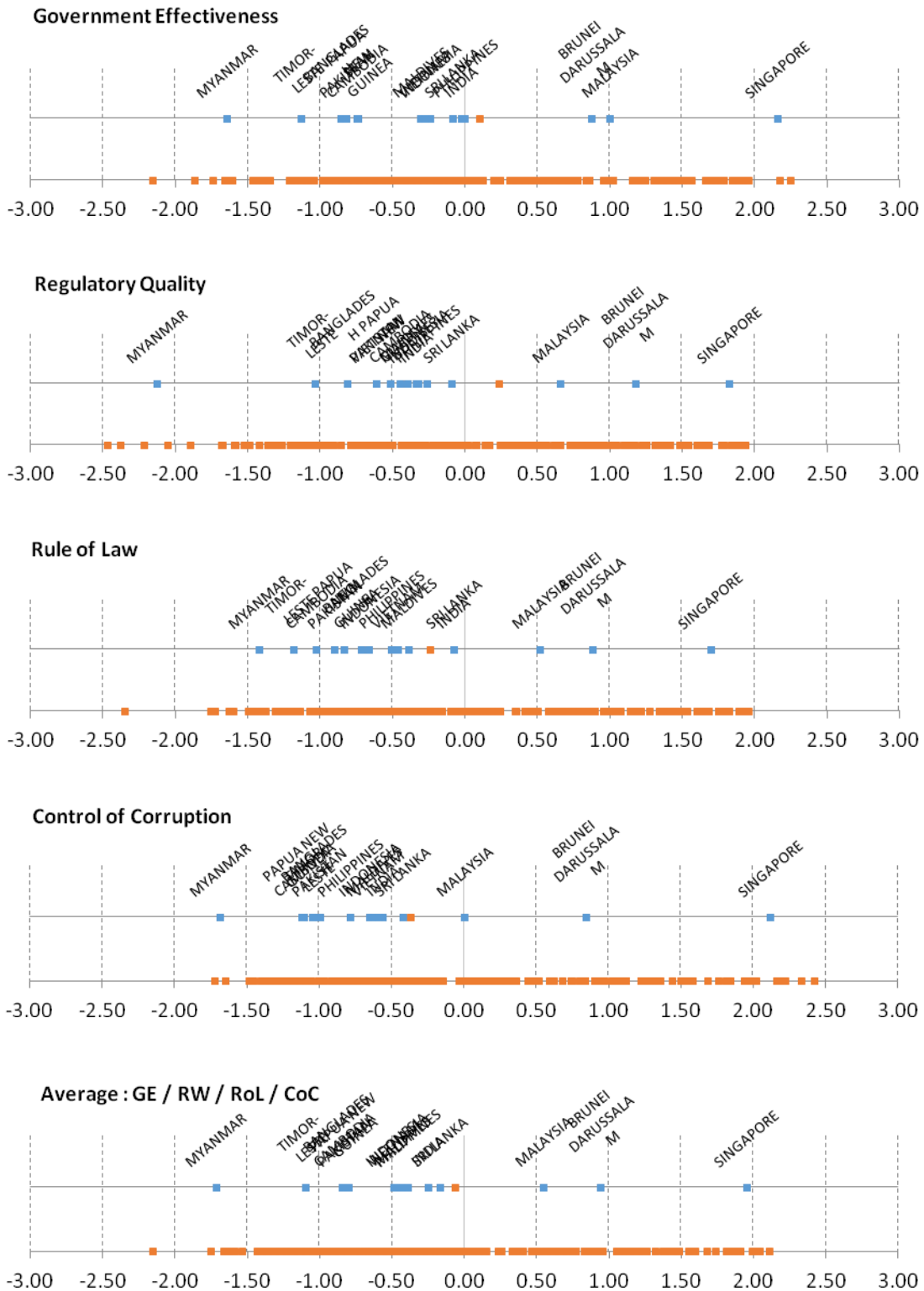


Figure 52 World Bank governance indicators for regional coastal states.

Source: <http://info.worldbank.org/governance/wgi/index.aspx#home>

NB: The four governance indicators above (Regulatory Quality, Rule of Law, Control of Corruption and Government Effectiveness) are those most closely linked to the level of IUU observed and BIOT due to its lack of a domestic population has no scores.

Table 160 Summary of World Bank governance indicators showing rank (out of 212) and percentile for regional study countries.

Country	Code	Average	RANK	Percentile
SINGAPORE	SGP	1.95	5	2%
BRUNEI DARUSSALAM	BRN	0.94	41	19%
MALAYSIA	MYS	0.54	68	32%
THAILAND	THA	-0.07	97	46%
SRI LANKA	LKA	-0.17	105	50%
INDIA	IND	-0.25	109	51%
PHILIPPINES	PHL	-0.39	118	56%
MALDIVES	MDV	-0.43	123	58%
INDONESIA	IDN	-0.47	131	62%
VIETNAM	VNM	-0.49	135	64%
PAPUA NEW GUINEA	PNG	-0.80	169	80%
PAKISTAN	PAK	-0.83	173	82%
CAMBODIA	KHM	-0.83	174	82%
BANGLADESH	BGD	-0.85	175	83%
TIMOR-LESTE	TMP	-1.10	188	89%
MYANMAR	MMR	-1.72	210	99%

Source: <http://info.worldbank.org/governance/wgi/index.aspx#home>

NB: BIOT has no domestic population and therefore does not qualify for any of the indicators.



Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org



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