The 2nd Regional Scientific and Technical Committee Meeting for the SEAFDEC/UN Environment/GEF Project on Establishment and Operation of a Regional System of Fisheries *Refugia* in the South China Sea and Gulf of Thailand

21st – 23rd May 2019
Thansur Sokha Hotel, Kampot Province (Fisheries Refugia Site), Cambodia

BEST PRACTICE FISHING GEARS AND METHODS

PCU in collaboration with SEAFDEC/TD

I. Issues and threats from fisheries to coastal resource and habitat in The South China Sea

The South China Sea is a global centre of shallow water marine biological diversity that supports significant fisheries that are important to the food security and export income of Southeast Asian countries. These fisheries are characterised by high levels of fishing effort from the small-scale sector. Accordingly, all inshore waters of the South China Sea basin are subject to intense fishing pressure. This situation of high small-scale fishing pressure and declining fisheries resources has contributed to the adoption of unsustainable fishing methods to maintain catch and increase incomes in the short-term. These include the use of destructive fishing gear and practices, such as the operation of demersal trawls and push nets in seagrass areas, and the detonation of explosives and release of fish poisons in coral reef areas. Small-scale inshore fishing pressure has therefore been identified as a significant cause of the degradation and loss of coastal habitats in the South China Sea. By these reasons, the rate of loss of coastal habitats has been implemented by countries bordering the South China Sea, the decadal rate of loss of such habitats remains high, e.g., seagrass beds (30 percent), mangroves (16 percent), and coral reefs (16 percent)(Vo et al, 2013)[1]. This continued decline in the total area of habitats critical to the life cycles of most aquatic species, combined with the high levels of coastal community dependence on fish, has raised serious concerns for the long-term sustainability of small-scale fisheries in the region. With fish production being intrinsically linked to the quality and area of habitats and the heightened dependence of coastal communities on fish, a need exists to improve the integration of fish habitat considerations and fisheries management in the region.

II. The use of destructive and/or unsustainable fishing gear and practices in The South China Sea

This issue is prevalent across a range of fisheries and habitat types in the South China Sea. For example, destructive and/or unsustainable fishing gear and practices have been identified as key threats to fish stocks and their habitats in the mangrove areas at Trat in Thailand and at Batu Ampur in Indonesia, the extensive seagrass areas of Bolinao in the Philippines and Kampot in Cambodia, and at the regionally significant coral reef areas at Belitung in Indonesia, Masinloc in the Philippines and Phu Quoc in Vietnam. The destructive and/or unsustainable fishing gear and practices in the SEA was reported as follow:

Push netting and inshore trawl fishing cause habitat impacts and selectivity issues. Catches in these gear types from inshore waters are largely composed of juveniles, and at high fishing effort levels are thought to contribute to growth over-fishing in South China Sea basin. Such a situation hinders fisheries management

[1] Vo, S.T., Pernetta, J.C., Paterson, C.J., 2013. Status and trends in coastal habitats of the South China Sea. Ocean and Coastal Management 85, 152-162.

efforts which largely focus on development of sustainable livelihoods and is a key threat in inshore where push nets are used extensively over seagrass beds to take juveniles of the economically important species.

Digging and gleaning of seagrass beds and mangrove forests is an area of concern at a majority of the priority *refugia* sites in the South China Sea. Growing demand for seafood in local markets has resulted in a marked increase over recent years in the number of people digging for sipunculid worms, gastropods, and crustaceans in the seagrass beds, leading to damage of seagrass plants, de-stabilisation of sediments (and subsequent erosion), and the over-exploitation of benthic organisms. Intensive digging and grazing in some mangrove areas is considered to be contributing to the occurrence of dwarf, low-density mangrove stands at several sites due to disturbance of mangrove roots and seedlings.

Blast fishing, poisons, and unselective fishing gears/practices are well-known and documented threats to fisheries and habitats in nearly all areas of the South China Sea. These fishing practices often result in mortalities of a wide range of size-classes of target and non-target species, contributing to both growth and recruitment over fishing. The effects of blasting on the physical structure of coral communities is of particular concern, and the occurrence of blast fishing "craters" on heavily blasted reefs has a major impact on coral reef associated fish assemblages. Non-selective fishing gears, such as trammel nets, are utilised in most fished coral reef areas along the South China Sea coast. The use of unselective fishing gear and practice/method, such as luring light purse seine in Thailand[2] and large scale lift net with light in Indonesia[3], has been identified that those are an environmental-unfriendly fishing practice due to catching of immature stock, high rate of by-catch and discard. Those unselective fishing activities are causing problem of declining of fisheries resources. The growing need to minimise the impacts of such practices on critical habitats necessitates the development of best practices in the management of these problems.

III. Fisheries component of Strategic Action Programme for the South China Sea

Taking into accounts above concerns,-this project entitled "*Establishment and Operation of a Regional System of Fisheries* Refugia *in the South China Sea and Gulf of Thailand*" has been developed to meet this need via implementation of the fisheries component of the Strategic Action Programme for the South China Sea. The development of the fisheries component of the South China Sea SAP recognised that the achievement of the SAP targets depends on successful national management of fisheries *refugia*. In support of this, priority national level actions for SAP implementation where identified as: (1) the designation and operational management of priority fisheries *refugia* sites; (2) development of the enabling environments for fisheries *refugia* management at national and provincial levels, including policy reforms and enhancement of the science and information base for *refugia* management; (3) capacity development through improved information management and dissemination; and (4) strengthened national coordination for fisheries *refugia* management. Therefore, the project entitled "*Establishment and Operation of a Regional System of Fisheries* Refugia *in the South China Sea and Gulf of Thailand*" was developed by comprise of the following 4 project components as follow;

Component 1. Identification and management of fisheries and critical habitat linkages at priority fisheries *refugia* in the South China Sea and Gulf of Thailand

Component 2. Improving the management of critical habitats for fish stocks of transboundary significance via national and regional actions to strengthen the enabling environment and knowledge-base for fisheries *refugia* management in the South China Sea and Gulf of Thailand Which including 9 sub components.

Component 3. Information Management and Dissemination in support of national and regional-level implementation of the fisheries *refugia* concept in the South China Sea and Gulf of Thailand

[2] Piyachoke and team, 2012. Anchovy Fisheries in the Gulf of Thailand, Technical Paper of Department of Fisheries Thailand, 18, 56 p.
[3] Ogunola, O. S., Onada, O. A., 2016. Fishing with Light: Ecological Consequences for Coastal Habitats. International Journal of Fisheries and Aquatic Studies 2016, 4(2), 474-483.

Component 4 National and regional cooperation and coordination for integrated fish stock and critical habitat management in the South China Sea and Gulf of Thailand

Focusing to Component 2, the objective of this component is focuses on strengthening the enabling environment for the formal designation and operational management of *refugia*. Additionally, the component will lead to considerable stress reduction. Specifically, the demonstrations of best practice fishing methods and practices aimed at addressing key threats to fish stock and critical habitat linkages, and the adoption of supporting laws, will result in a 20% increase in vessels applying improved gear/techniques to safeguard fish stock and critical habitat linkages at priority sites. This component has identified one important of national level activities is Targeted *demonstration activities* which stated in the component 2.9. This Activities will support, guide and building up the National Fisheries Departments in establishing coastal fisheries management systems in priority fisheries *refugia* including create a trial approaches to reducing the effects of trawl and push net fishing on seagrass habitat, as well as to test the use of fishing gear and practices that reduce the capture of juveniles, pre-recruits and fish in spawning condition.

IV. Supports to fishing gear modification and fishing practice improvement for sustainable fisheries resource utilization

In year 2017-2018, The national lead agency of fisheries from participating country were organized a series of multi-stakeholder consultation at the local site including Kep province, Kampot province and Koh Kong province in Cambodia, Trat province and Surat Thani in Thailand, Bolinao, Mazinloc and Coron in Philippine, Kuala Baram and Tanjung Leman in Malaysia. The multi-stakeholder consultation at the local site was aimed to compiling the information, suggestion and issue on the coastal habitat from all local resource users. One part of the consultations was focus on the threat to fish life-cycle from fisheries base on the experiences from all stakeholders through casual chain analysis methodology. The results of the threat to fish life-cycle from the multi-stakeholder consultation were shown in Table 1.

To supporting the achievement of component 2, The demonstrations of best practice fishing methods and practices including test the use of fishing gear and practices to addressing key threats from fisheries will implementing at priority refugia sites. The site level management board will be establishing a coastal fisheries management system including create a trial approaches to reducing the effects of threat to coastal habitat and fisheries resources. Many options of fisheries management including fishing management were guide in the FAO technical guidelines for responsible fisheries No. 4 Suppl. 2 (FAO, 2003)[4]. The summarized of the option to manage the fishing was shown in the Table 2.

The Southeast Asian Fisheries Development Center(SEAFDEC) have long-time experience through implementing various project concerning the improvement of fishing gear and practice for sustainable coastal fisheries management in Southeast Asia country for example; 1. Juvenile and Trash Excluders Devices (JTEDs) to reduce capture of juvenile and small fish in Trawl fisheries, 2. Turtle Excluders Devices(TEDs) to release a sea turtle which incidental catch by trawl fishing, 3. Circle Hook(C-Hook) to prevent captures a sea turtle by longline fishing, 4. Voluntary approach on releasing the gravid blue swimming crab which catch by gillnet and trap fisheries, 5. Crab Bank project, 6. Assess the impacts of enlarging the trawl cod end *mesh size* from 2.5 cm - 4 cm, 5. Nursery/Spawning ground protection by various kinds of tools, and etc.

In this connection, the PCU in collaboration with the SEAFDEC/Training Department proposes to work on fishing gear modification and fishing practice improvement to support a Establishment of fisheries refugia at country levels. Workplans and selected country will be discussed during the RSTC2.

[4] FAO Fisheries Department. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries. No. 4, Suppl. 2. Rome, FAO. 2003. 112 p.

Table 1. The result matrix of the causal chain analysis from multi-stakeholder consultation workshop at the fisheries *refugia* site in Cambodia, Thailand, Philippine and Malaysia.

Country	Site Name	Target Species	Stage of life-cycle	Threat	Immediate Cause	Root Cause	Management Action
Cambodia	Kep	Blue swimming crab	Juvenile	• Loss of habitat (i.e. sea grass • Illegal fishing • Habitat destruction • Over fishing	• Use of unsustainable fishing gear/practice (i.e. Small Mesh elongated collapsible trap) • Destructive fishing gear • Purse seine net trawlers	• High market demand • High price • Unsustainable fishing gear using • Destructive fishing gear	• Strengthening fisheries law enforcement • Fisheries law extension • Establishment of conservation area • Creating crab bank • Alternative livelihood provision
		Blue swimming crab	Spawning (December to January)	• Destruction of spawning habitat • Loss of seagrass • Over fishing	• Illegal fishing • Trawlers with small mesh size net • Use of inappropriate fishing gear • Small Mesh elongated collapsible trap • Purse seine trawlers • Unsustainable fishing gears	• Effort fishing to catch more fish • High price • High market demand	• Conservation area development • Strengthening law enforcement • Fisheries law extension • Creation of conservation area • Strengthening patrolling and monitoring
	Kampot	Grouper (*Epinephelus spp.*)	Adult	• Declining fish • Habitat destruction	• Mouse tailed trap	• High demand • High price in market	• Strengthening law enforcement

					• Trawler with ball light		• Strengthening patrolling group • Strengthening cooperation with relevant stakeholders • Establishing fisheries refugia
		Grouper (*Epinephelus spp.*)	Fingerlings (October to December)	• Declining of fingerlings • Habitat destruction such as sea grass, coral reef, and mangrove forest	• Mosquito (Small) net fishing gear • Push net fishing with electric • Mouse tailed trap • Trawler with ball light • Hand Push net	• High Demand from cage culture • High price in market	• Strengthening law enforcement • Strengthening patrolling group • Strengthening cooperation with relevant stakeholders • Establishing fisheries *refugia* • Strengthening the extension to fish seed traders • Replanting flooded forest (Wetland)
	Koh Kong	Mackerel	Spawning (November to January at Koh Kapi, Prek 3& 2, Boeung Kachang, Koh Yor, and Koh Nou)	• Habitat loss • Over fishing	• Illegal fishing • Mackerel gill net with small mesh size • Light Luring fishing • Purse seine net and trawlers from neighbouring country	• High market demand in neighbouring country • Destructive fishing gears • Illegal fishing from outside area	• Establishment of fisheries refugia • Strengthening patrolling group to make MCS • Strengthening law enforcement • Extending fisheries law • Making co-operation with

					• Trawlers with small mesh size net from 2.5 to 3cm		relevant stakeholders • Strengthening transboundary-bilateral operation
Thailand	Trat	Indo-Pacific mackerel	Whole life cycle	• Over fishing • Destructive fishing gears (e.g. giant trawls)	• Illegal fishing • Invasion of foreign fishing • Fishing by foreigner workers • High market demand • Needs of small size for processing	• Increasing number of small-scale fishing boats altered from the commercial ones • Non-cooperation of some fishing group • Lacking in fisheries conservation awareness • Insufficiency of public authority • Overlapped functions of relevant public authorities	• Strengthening fisheries law enforcement • Creating conservation areas (restricted fishing gear) • Increasing awareness • Promoting participatory approach fisheries management • Empowering the communities on community base fisheries management • Promoting community regulations for fisheries management • Promoting fishing eco-tourism • Establishing aquatic animal banks

							• Rehabilitating and establishing fisheries habitat • Promoting mesh size restriction
	Surat Thani	Blue swimming crab	Whole life cycle	• Use of Unsustainable fishing gears • Over fishing	• Illegal fishing • Fishing of small-size crabs in seagrass bed • Small mesh-size nets	• Illegal fishing • High market demand • Lacking in fisheries conservation awareness • Low water quality • Climate change	• Strengthening fisheries law enforcement • Establishing crab bank • Creating conservation areas • Creating awareness
Philippine	Bolinao	Rabbit fish (*Siganus spp.)*	juveniles	• Over harvesting of juveniles	• high demand of fish paste	• Easy source of income for marginal fisherman	• Size regulation on the harvesting of Rabbit fish & provision of supplemental livelihood
	Mazinloc	Frigate tuna (*Auxis spp.*)	Pre-recruits / Juvenile	• Overfishing, use of fine mesh nets	• FADs fishing	• Due to high demand	• FAD Management plan, Mesh size regulation
	Colon	Fusilier fish		• Decreasing of fish • Loss of coral habitat	• Unsustainable fishing practice: • Use of cyanide in the live reef fish industry • Blast fishing		

					• Non-selective fishing gear and practices • Collection of corals as sinker • Solid waste pollution		
Malaysia	Kuala Baram, Sarawak	Tiger Prawn (*P. monodon*)	Juvenile	• deforestation			
			Pre-recruit	• Shrimp push net & bag net			
			Adult	• Trawl net			
			Spawning	• Trawl net			
	Tanjung Leman, Johor	Lobster (*Panulirus spp.*)					

Table 2. The matrix of the options to manage the fishing that summarized from the FAO technical guidelines for responsible fisheries volume 4 Suppl. 2. The Ecosystem Approach to Fisheries (FAO, 2003)

1. Technical measures	Gear modifications that improve selectivity	• Gear restriction • Mesh size restrictions • Fishing method control • Non-target species selectivity (TEDs, JTEDs, C-hook, etc)
	Other gear issues	• Environmental conditions (light level, temperature, current speed, etc). • Ghost fishing control
	Spatial and temporal controls on fishing	• Seasonal closure • Fisheries *Refugia* • MPA
	Control of the impact from fishing gear on habitats	• Prohibition of certain gear in some habitats (trawling in coral reef and seagrass areas) • Replace a high-impact fishing method with one with less impact on the bottom, e.g. trapping, longlining or gillnetting.
	Energy efficiency and pollution	• Reduce of CO2 emissions. • Energy optimization
2. Input (effort) and output (catch) control	Controlling overall fishing mortality	• Capacity limitation spatial/temporal • Access limitations • Effort limitation
	Catch controls	• By-catch controls (such as quotas)
3. Ecosystem manipulation	Habitat modifications	• Preventing habitat degradation • Prohibition of destructive fishing methods in ecologically sensitive habitats (such as seagrass beds); • Prohibition of intentional cleaning of the seafloor to facilitate fishing; and • Reduction of the intensity of fishing in some fishing grounds to ensure that non-target • Providing additional habitat
	Population manipulation	• Restocking and stock enhancement
4. Rights-based management approaches		• User rights • Effort rights • Catch rights • Effort management