

ANNEX 8

PROGRESS REPORT OF SEAFDEC/UNEP/GEF PROJECT ON “ESTABLISHMENT AND OPERATION OF A REGIONAL SYSTEM OF FISHERIES *REFUGIA* IN THE SOUTH CHINA SEA AND GULF OF THAILAND” (2017-2018)

I. INTRODUCTION

This Progress Report summarizes all the progress of works implemented by relevant partners and the SEAFDEC/Project Coordinating Unit during a period of 2016-2018 under the SEAFDEC/UNEP/GEF Project on the “Establishment and Operation of a Regional System of Fisheries *Refugia* in the South China Sea and Gulf of Thailand” during a period from 2016-2018. Based on 3 Regular meetings: 1) Inception Workshop held at Jasmine City Hotel, Bangkok Thailand on 1st-3rd November 2016; 2) 1st Meeting of the Regional Scientific and Technical Committee (RSTC1) convened at Centara Chuan Talay Resort & Villas, Trat Province, Thailand on 11th-13th September 2018 and 2) the 1st Meeting of the Project Steering Committee held at Jasmine City Hotel, Bangkok, Thailand on 4-5 December 2018, the following summary of work includes 1) signed letter of agreement by relevant partners/countries to implement the national project; 2) Agreed TORs for establishment of the Regional and National Institutions; 3) Regional activities; 4) Selecting and establishment of the Fisheries *Refugia* Sites by Cambodia, Malaysia, Philippines, and Thailand; and 5) Advancing the application of the fisheries *refugia* concept in the Gulf of Thailand.

II. PROGRESS OF WORKS

1. SIGNED LETTER OF AGREEMENT FOR NATIONAL PROJECT IMPLEMENTATION

After the Inception Workshop held in November 2016 with aims to enhance the understanding and effectiveness of the relevant fisheries officers who are nominated as a national focal points and scientific and technical focal point from 6 relevant countries on the project implementation, in 2017 there were 4 countries signed letter of agreement (LOA) namely: Cambodia (in January 2017); Philippines (in March 2017); Thailand (in March 2017); and Malaysia (in June 2017). The remaining 2 relevant countries namely Indonesia and Viet Nam are still pending till now due to emerging government policy change such as receiving Grants from the project, and policy on country collaboration with other donors, etc. However, all regional activities conducted since the project started till present, SEAFDEC/PCU invited those 6 relevant countries to participate for updating the countries situation. The follow-up and progress of submission for the LOA by remaining two countries could be summarized as follows:

- a) **Indonesia:** There are two main issues related to the LOA between SEAFDEC and National Lead Agency in Indonesia: 1) any SEAFDEC activities conducted in collaboration with Indonesian National Agency on Fisheries required the MOU between SEAFDEC and National Lead Agency. However, since Indonesia is a SEAFDEC Member Country, one SEAFDEC Council, therefore do not support that SEAFDEC have to make MOU with Indonesia since April 2018. This matter is also linked to the Implementation on establishment of fisheries *refugia* by Indonesia that in case the overall MOU between SEAFDEC and Indonesia is signed, the implementation of Fisheries *Refugia* by Indonesia will be covered. 2) Issues on Co-finance particularly for in-kind and cash co-finance is one of the key issues for decision maker on countries contribution to the project. However, SEAFDEC/PCU have explained to the responsible person(s) for better understanding on both term-definitions under the frame of country commitment to the project. SEAFDEC/PCU also invited 3 representatives from MMAF/Indonesia to attend the 1st Project Steering Committee held on 4-5 December 2019 in Bangkok, Thailand where the agreed DSA rate for calculation of the in-kind Co-finance was discussed as well as the Co-finance report from other 4 countries were shown as examples for Indonesian representatives. The discussion with Indonesia on the LOA was made again at the 51th SEAFDEC Council Meeting held in Surabaya, Indonesia on 18-20

March 2019 where Indonesia commit to process on submission of the signed LOA to SEAFDEC by mid of May 2019. At present SEAFDEC/PCU keep communicates to Responsible Agency in Indonesia for the said LOA for further action. And SEAFDEC PCU prepare the advance budget for Country implementation as soon as received the submission of LOA from Indonesia.

- b) **Viet Nam:** There are long communication with a National Focal Point on submission of the Letter of Agreement since after inception workshop in 2016. The SEAFDEC/PCU have visited Viet Nam for discussion on this matter in 2017 and follow-up with e-mail, but it is still pending. In 2018, a National Focal Point suggested SEAFDEC/PCU to change from LOA to the Letter of Intent (LOI) in which the PCU have revised and drafted the LOI before submission to NFP/Viet Nam in mid of August 2018 for further consideration and in-country coordination. The drafted LOI was discussed again in early of 2019, and Viet Nam led by D-Fish as a National Lead Agency agreed the LOI signed by SEAFDEC and D-Fish in April 2019. In this connection, SEAFDEC PCU received the submission of LOI from Viet Nam on 5 May 2019.

2. IMPLEMENTATION AND SELECTION OF FISHERIES *REFUGIA* SITES

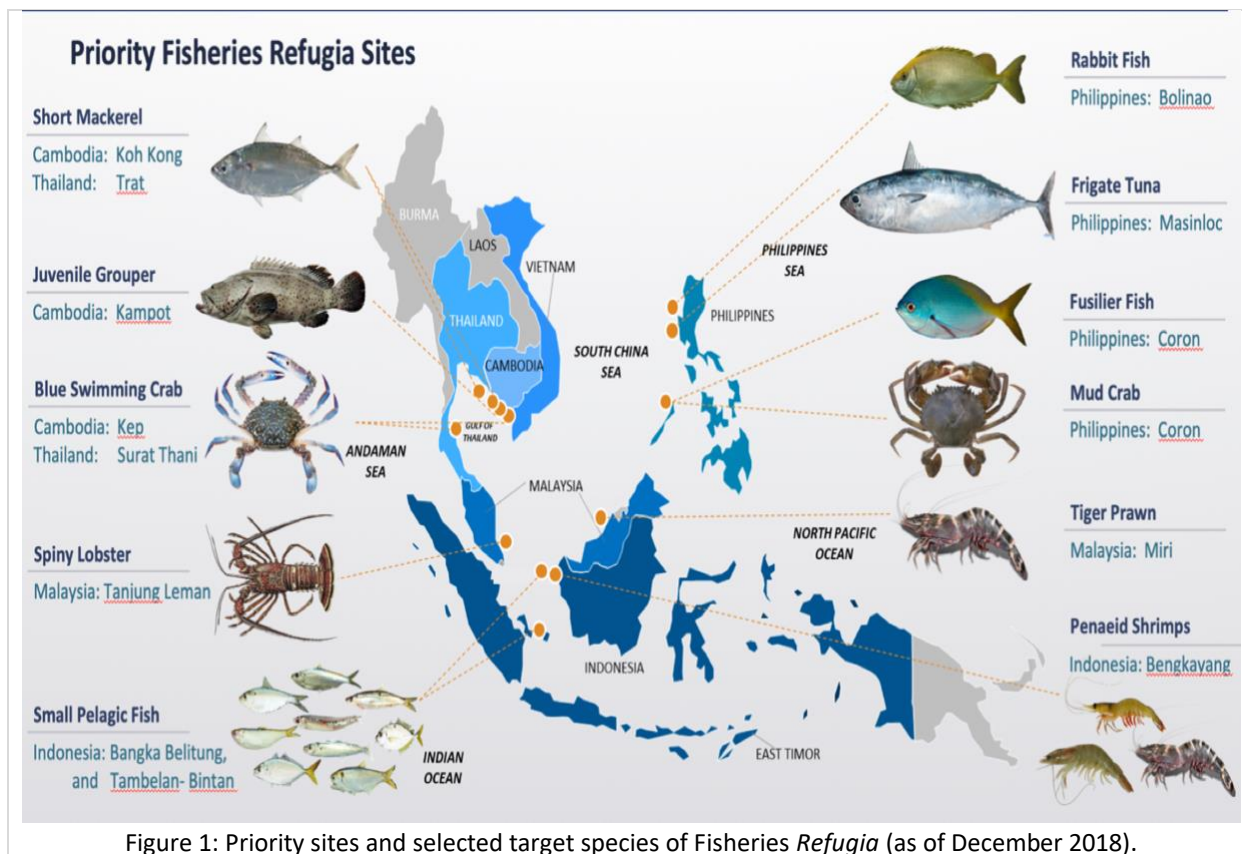
A. Establishment of Fisheries *Refugia* Sites by 4 Relevant Countries

Figure 1 shows the priority sites and selected target species of fisheries *refugia* in 5 countries as below explanation. To date, a total of ten priority fisheries *refugia* sites have been identified (see details from the Map) and implemented in four countries as follows:

- a) **Cambodia**, there are 3 priority fisheries *refugia* sites as follows:
- i. Kep Province: for blue swimming crab (*Portunus pelagicus*) *refugia* at relevant habitats areas such as coral, mangrove and seagrass bed off Kep coastal area;
 - ii. Kampot Province: for juvenile grouper (*Epinephelus spp.*) *refugia* in the seagrass bed. This is a new priority site to replace Preah Sihanouk Province for juvenile grouper *refugia* in the coral reef area of Koh Rong Archipelago where the local government reserved as a conservation area in 2018; and
 - iii. Koh Kong Province: for short mackerel (*Rastrelliger brachysoma*) *refugia* that is identified as a transboundary species with Trat Province of Thailand;
- b) **Malaysia**, there are 2 priority fisheries *refugia* sites as follows:
- i. Tanjung Leman, Johor: for spiny lobsters (*Panulirus polyphagus* as a main species) and other *Panulirus spp.* such as *P. versicolor*, *P. ornatus*, *P. homarus* and *P. longipes*) *refugia*; and
 - ii. Miri, Sarawak: for tiger prawn (*Penaeus monodon*) *refugia*
- c) **Philippines**, there are 3 priority fisheries *refugia* sites as follows:
- i. Bolinao, Pangasinan: for Rabbitfish (*Siganus spp.*) *refugia* in seagrass bed off Bolinao;
 - ii. Masinloc, Zambales - for juveniles of Frigate tuna (*Auxis thazard*) *refugia*; and
 - iii. Coron, Palawan: for fusilier fish *refugia* in coral reef area, and mud crab *refugia* in mangrove area.
- d) **Thailand**, there are 2 priority fisheries *refugia* sites as follows:
- i. Trat Province: for short mackerel (*Rastrelliger brachysoma*) as a transboundary species with Koh Kong Province of Cambodia; and
 - ii. Surat Thani Province: for blue swimming crab (*Portunus pelagicus*) *refugia*. This is a new priority site to replace short mackerel in Samui Archipelago where the Fisheries Department established a *refugia* under the national management policy for short mackerel since 2017 as one of the follow-up activities under the UNEP/GEF/SCS Phase I, by this reason a new *refugia* site for blue swimming crab is agreed at the National Fisheries *Refugia* Committee.

In addition, there are 3 tentative priority fisheries *refugia* sites proposed by Indonesia during the Inception Workshop in November 2016 and reiterated at the 1st Regional Scientific and Technical Committee Meeting in September 2018: two priority sites are at Bangka Belitung and Tambelan Bintan for the small pelagic fishes; another one is at Benkayang in west coast of Borneo for penaeid shrimps. The target species for those three priority sites will be discussed again after Indonesia start the project implementation.

For Viet Nam, there are 2-3 tentative priority sites of fisheries *refugia*, the details on target selecting species will be consulted with the local stakeholders before finalization, and this is why the PCU look forward that D-Fish/Viet Nam will start the project implementation as soon as possible.



B. National Level Activities during 2017-18

Table 1 shows the summary of the national activities under the project component 1 to 4 during 2017-2018. In general, all countries have established the institutions namely National *Refugia* Committee, National Scientific and Technical Committee and Site-based Management Boards to support the implementation at national activities. Through the stakeholder consultations, many key results are developed as follows: 1) the community-based *refugia* management are adopted, and under implementation at the priority fisheries *refugia* site; 2) the Agreement among stakeholders on establishment of fisheries *refugia*, key threats to *refugia* sites, and priority management interventions; 3) the networks of implementation teams/ management boards and community-based fisheries and habitat management volunteers for *refugia* management has were established at priority *refugia* sites; 4) literatures reviews, baselines surveys and development of fisheries and habitat data collection program to characterize priority *refugia* sites; and 5) Community capacity programmes at priority fisheries *refugia* sites have been developed.

In addition, the following activities are implementing by countries: 1) analysis of the scientific-based management to support the development of management measures and drafting the demarcating boundaries at each *refugia*; 2) participatory activities to monitor fish habitats within *refugia*, collect lost and abandoned fishing gear, and develop responsible fishing practices at the community level.

The details activities at each country are summarized as follows:

1) CAMBODIA

Fisheries *Refugia* project in Cambodia has started since June 2017, there are three selected fisheries *refugia* off Kep, Kampot and Koh Kong Provinces where these three sites are rich of biodiversity, spawning habitats of fish species and critical habitats. The locations of the selected *refugia* is shown in Figure 2. Leading by Mr. Vibol Ouk as a project national focal point under the Fisheries Administration, the management and

coordination institutions (see Figure 3) to support the implementation of national fisheries *refugia* activities have been established.

Table 1: Summary of the national activities under the project component 1 to 4 during 2017-2018

Activity Description	Cambodia		Malaysia		Philippines		Thailand		
	2017	2018	2017	2018	2017	2018	2017	2018	
Component 1: Identification and management of fisheries and critical habitat linkages at fisheries refugia sites in each country									
1.1	Developing fisheries and coastal habitat information and data collection programmes	✓	✓		✓	✓	✓	✓	✓
1.2	Facilitating agreement among stakeholder on the boundary of fisheries <i>refugia</i>	✓	✓		✓		✓		✓
1.3	Developing Community-Based Management Plans for Fisheries <i>refugia</i> sites		✓		✓		✓		✓
1.4	Establishing operational management for Fisheries <i>refugia</i> sites		✓						✓
1.5	Strengthening civil society and community organization participation in the management of fisheries <i>refugia</i> sites								
Activity Description	Cambodia		Malaysia		Philippines		Thailand		
	2017	2018	2017	2018	2017	2018	2017	2018	
COMPONENT 2: Improving the management of critical habitats for fish stocks of transboundary significance via national actions to strengthen the enabling environment and knowledge-base for fisheries refugia management in each country									
2.1	Enhancing policy guidance for improved management of the effects of fishing on critical habitats					✓			✓
2.2	Defining the policy and legal basis for formal designation and establishment of fisheries refugia in each country		✓						✓
2.3	Development of national guidelines on the establishment and operation of fisheries refugia								✓
2.4	Reforming national policy, legal and planning frameworks for demarcating boundaries and managing refugia								
2.5	Enhancing access to information relating to status and trends in fish stocks and their habitats in each country waters of the SCS				✓		✓		✓
2.6	Improving national-level management and sharing of information and data on fish early life history in each country waters of the SCS				✓		✓		✓
2.7	Enhancing access to information relating to the locations and status of coastal habitats and management areas in each country waters of the SCS								✓
2.8	Strengthening the information base for the planning, monitoring and evaluation of management at priority fisheries refugia sites						✓		✓
Activity Description	Cambodia		Malaysia		Philippines		Thailand		
	2017	2018	2017	2018	2017	2018	2017	2018	
COMPONENT 3: Information Management and Dissemination in support of national-level implementation of the fisheries refugia concept in each country									
3.1	Enhancing national uptake of best practices in integrating fisheries management and biodiversity conservation				✓		✓		✓
3.2	Improving community acceptance of area based approaches to marine management				✓		✓	✓	✓
3.3	Knowledge generated and experiences from establishing and operating fisheries refugia captured and shared nationally, regionally, and globally						✓		✓
Activity Description	Cambodia		Malaysia		Philippines		Thailand		
	2017	2018	2017	2018	2017	2018	2017	2018	
COMPONENT 4: National coordination for integrated fish stock and critical habitat management in each country									
4.1	Strengthened cross-sectoral coordination in the establishment and operation of fisheries refugia in each country		✓		✓	✓	✓	✓	✓
4.2	Harnessing national scientific and technical expertise and knowledge to inform policy, legal and institutional reforms for fisheries refugia		✓		✓	✓	✓	✓	✓
4.3	Catalyzing local community action via establishment and operation of site-based management boards at priority refugia sites		✓		✓	✓	✓	✓	✓



Figure 2: Fisheries refugia sites in Cambodia

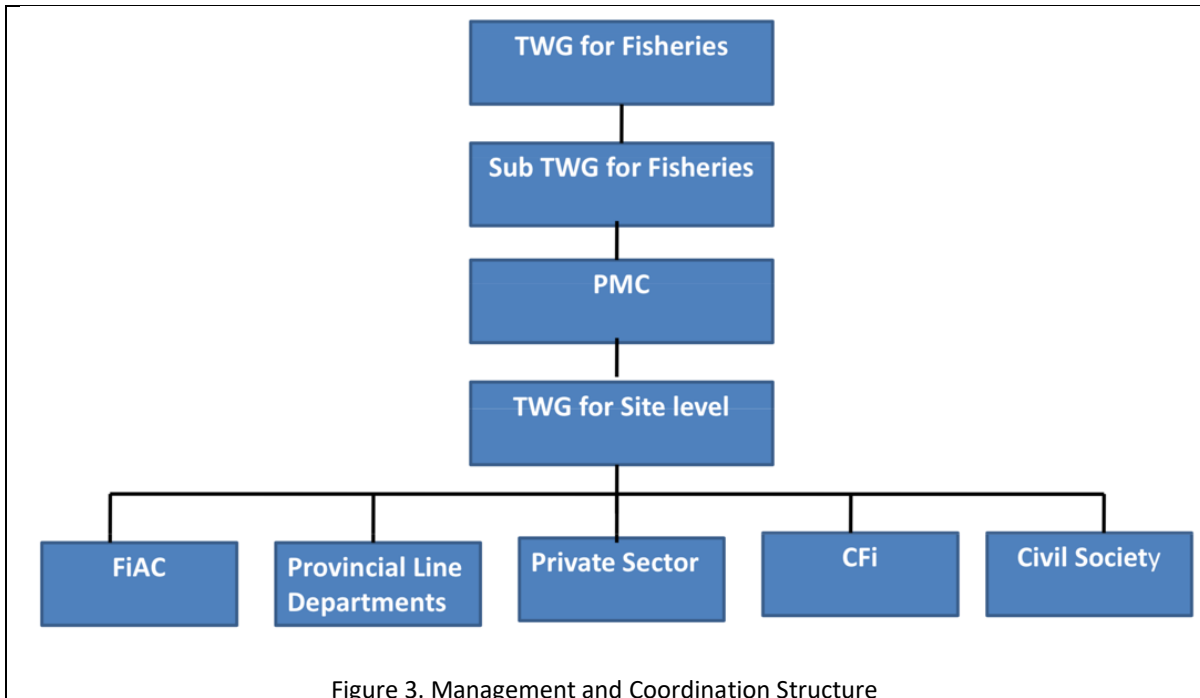


Figure 3. Management and Coordination Structure

• Stakeholders Consultation Meeting and Working Group Meetings

Several consultations with local communities and other stakeholders have been conducted focusing on site selection including species, capacity building to local government and stakeholders on establishment

of fisheries *refugia* as appeared in **Figure 4**. In addition, discussion on mapping of *refugia* site and issuing the MFMA (Marine Fisheries Management Area) proclamation by the MAFF's Minister (see figure 5).



Meeting and consultation with PDoA and FiAC in Kampot



Meeting and consultation with Deputy Governor of Kampot



Meeting and consultation with community fisheries and FiAC in Kampot



Meeting and consultation with FiAC in Koh Kong



Meeting with TWG chaired by Deputy Governor of Kep



Taking Photos together for TWG meeting chaired by the Governor of Kep



Meeting with TWG chaired by the Governor of Kep



Meeting with TWG chaired by the Governor of Kep

Figure 4. Stakeholder Consultations at sites level and Technical Working Group Meetings



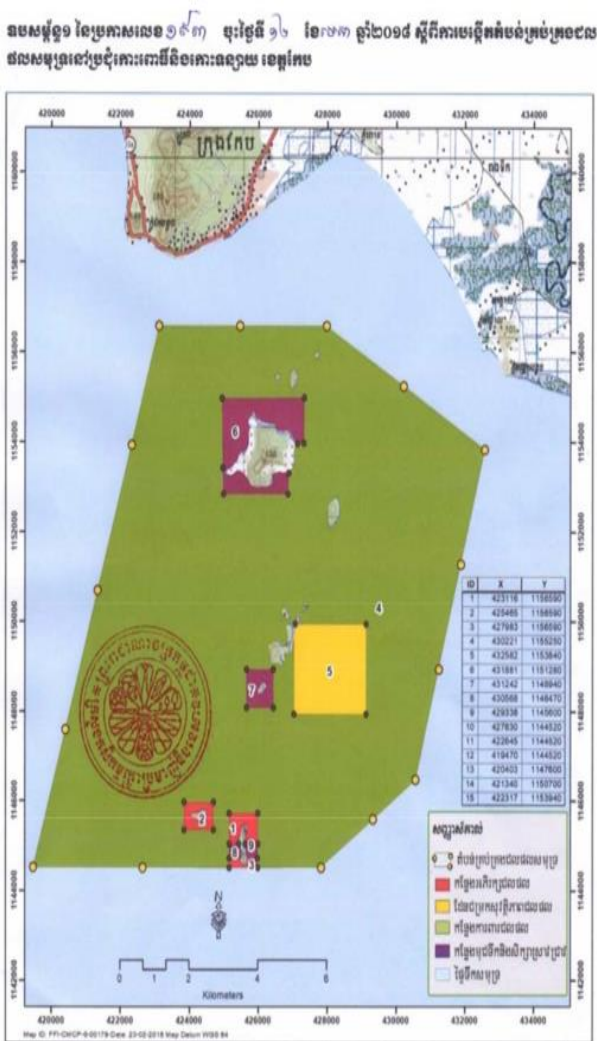
Meeting with FiA's TWG on draft proclamation of MFMA in FiA meeting room



Meeting with FIA's TWG on draft proclamation of MFMA in FIA meeting room

Figure 5. Meetings with FiA's TWG on Drafting Proclamation of the MFMA

For instance, the 1st Technical Working Group (TWG) Meeting on Management Plan Preparation for Marine Fisheries Management Area (MFMA) including Blue Swimming Crab Fisheries *Refugia* in Koh Po was organized by Fisheries Administration (FiA) of Cambodia collaborating with Kep Administration and Kep Fisheries Administration Cantonment on 16th to 17th November 2018. The meeting was conducted at Palm House Boutique in Kep province, participating 33 people from Fisheries Administration, Departments of Environment, Tourism, Public Works and Transports, and Agriculture, Forestry, and Fisheries, District Administration, Provincial Administration, Local Authorities, Provincial Police, Provincial Military Police, Water Boundary Police, Community Fisheries, and NGOs. The meeting noted that according to the MAFF's proclamation on the creation and management of Marine Fisheries Management Area in Koh Po and Koh Tonsay in Kep, Kep Administration and Fisheries Administration has agreed to create two management mechanism such as 1) Provincial Management Committee of Marine Fisheries Management Area and 2) Technical Working Group for Marine Fisheries Management Area in Kep. The objectives of the meeting are focusing on a) the announcement of composition and roles of TWG; b) the dissemination of the proclamation on the creation and management of MFMA in Kep; c) reviewing and discussion of 5 years- management plan for MFMA in Kep; and d) discussion on the next plan for MFMA in Kep. In this connection, the National Focal Point for Cambodia announced the MAFF's proclamation on the creation and management of MFMA in Koh Po and Koh Tonsay in Kep. The proclamation consists of 11 Articles stating about the target, objectives, extent, the definition of each area, responsibilities, zoning, banning, fund source, and provision.



As shown in **Figure 6**, It was clarified on zoning that Red color is Conservation Zone with the total size of 109ha (0.1% of total area); Yellow color is Fisheries *Refugia* Zone that is sea grass and blue swimming crab places and that zone must be banned for three months to ensure the stock of blue swimming crab and after that fishing permission will be made; Dark Green Color is Protection Zone with the big size and small scale fishing is permitted, the exception for bottom trawlers because the fisheries law states that that fishing gear is banned to fish in the water depth less than 20 meters; Pink Color is Eco-tourism Zone at sea bottom that is coral reef place with the permission for diving and sightseeing. He added that next time he will discuss with the head of TWG to propose Tourism Companies coming to visit there to contribute some money to supporting the activities of MFMA.

• **Other Activities**

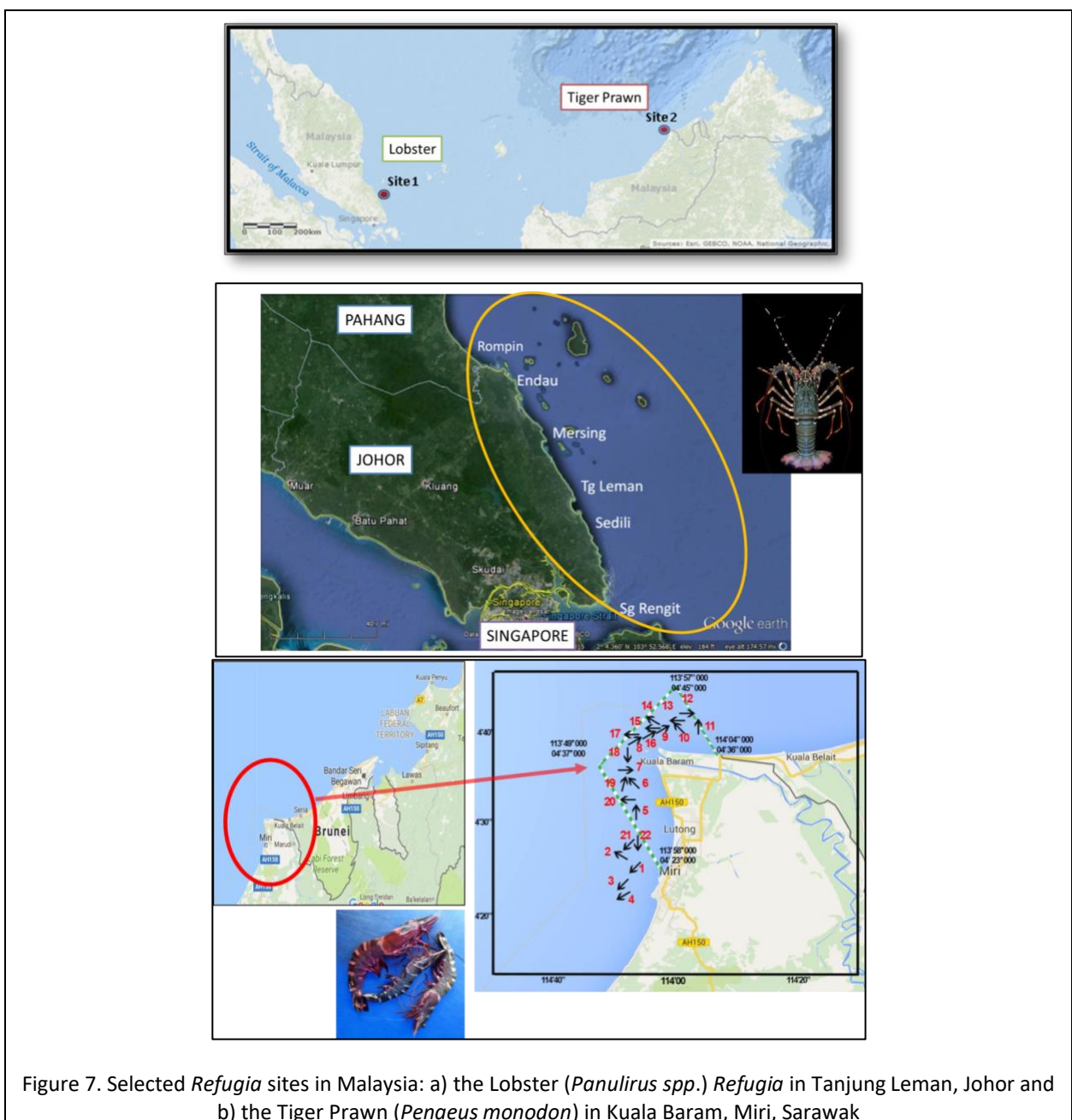
List of all activities since starting the project in 2017 till 4th Quarter of 2018 are shown in the <https://fisheries-refugia.org/cambodia-activities-report/89-refugia-country-activities/cambodia/141-cambodia-activities-in-2019> It is scheduled that the data collection at sites for baseline survey including science-based fisheries management will be conducted in the early of quarter 1 of 2019..

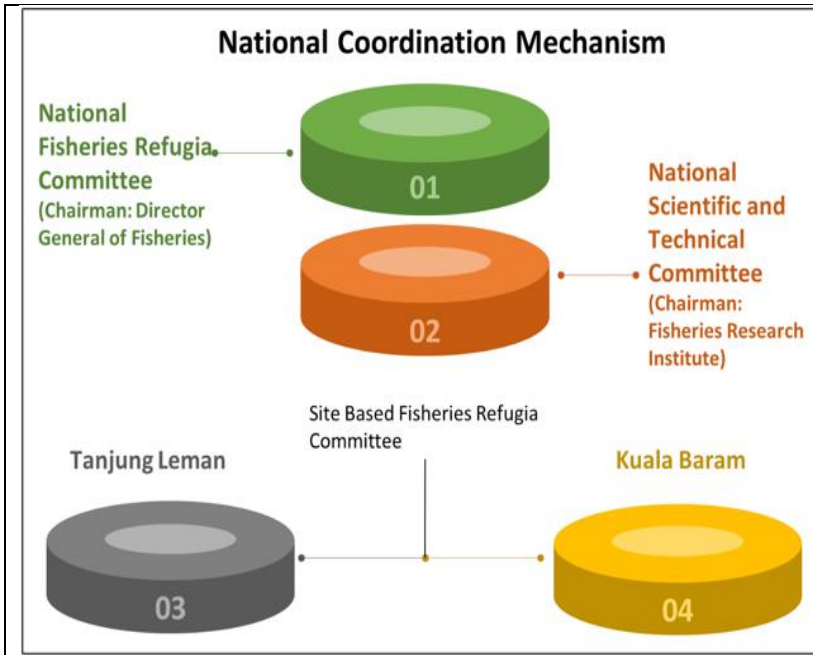
Figure 6. MFMA Map in Kep approved by MAFF's Ministers Including Fisheries *Refugia* Area for blue swimming crab

2) MALAYSIA

There are two proposed fishery *refugia* sites in Malaysia, namely the Lobster (*Panulirus spp.*) *Refugia* in Tanjung Leman, Johor and the Tiger Prawn (*Penaeus monodon*) in Kuala Baram, Miri, Sarawak (**Figure 7**). For the lobster *refugia* in Tanjung Leman, the actual site has not been determined yet as scientific data gathering is still on-going and the Department of Fisheries Malaysia will only announce the *refugia* area once the spawning site of the spiny lobster has been determined. The main fishing area for spiny lobsters spans from southern Pahang to the tip of east Johor (Sungai Rengit). Landing data of spiny lobsters caught by fishermen has been collected in some jetties such as Endau, Tanjung Leman and Sedili.

As for the tiger prawn *refugia*, the proposed site is located at the river mouth of Kuala Baram in Miri, Sarawak and the *refugia* area has been roughly determined by researchers studying the prawn population there. The proposed site for the tiger prawn *refugia* is located near a mangrove swamp with a river mouth and nearby the border of Brunei Darussalam. The offshore area sloop into deep water as characteristic of a continental sloop area.





The national coordination mechanism follows closely the suggested layout by the Regional *Refugia* Project Steering Committee where there are 3 levels of coordination, namely the National Fisheries *Refugia* Committee, the National Scientific and Technical Committee and two site-based Fisheries *Refugia* Committees at Tanjung Leman and Kuala Baram (Figure 8). The Chairman for the National Fisheries *Refugia* Committee is the Director General of Fisheries Malaysia while the Chairman for the National Scientific and Technical Committee is the Director of the Fisheries Research Institute (DOFM).

Figure 8. National Coordination Mechanism

The details of the stakeholder consultations, other meetings and activities since project started till the 4th Quarter of 2018 are listed as shown in the link: <https://fisheries-refugia.org/refugia-country-activities/refugia-malaysia>

A series of stakeholder consultations were conducted at the two *refugia* sites in Tanjung Leman, Johor and Kuala Baram, Sarawak. For the Lobster *Refugia*, stakeholder consultations were conducted at both Johor and Pahang states areas (see Figure 9).





Figure 9. Stakeholders consultation meetings at the sites level and some event received good coverage from the local newspapers

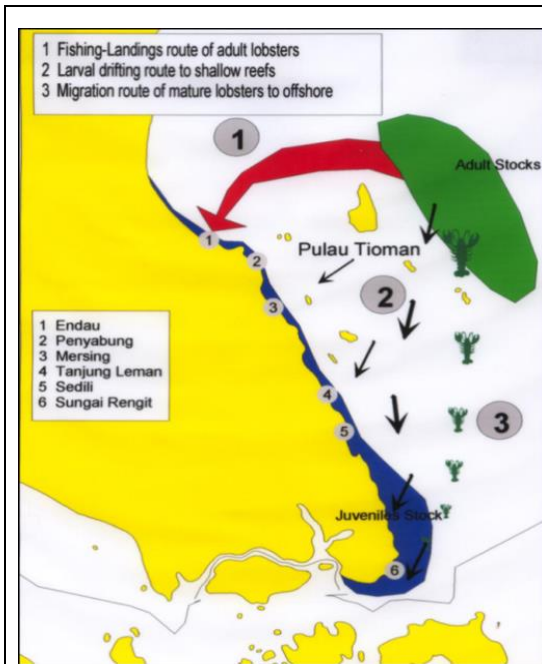
- **Establishment of the Fisheries *Refugia* Information Center, Tanjung Leman**



Figure 10. *Refugia* Information Center at Tanjung Leman

- **Scientific Studies: Lobster *Refugia* in Tanjung Leman, Johor**

The scientific studies to support the formation of the Lobster *Refugia* in Tanjung Leman, Johor focused mainly on four main activities which were the collection of lobster landing data from jetties, lobster eggs and maturation observation from the landing jetties, lobster resource and larvae surveys in the fishing ground at East Johor. The lobster fishery in Southern Pahang-East Johor is represented by three main gears namely lobster traps, drift nets (with the mesh size of 4-5 inches) and bottom trawlers. The scientific studies will cover all types of spiny lobsters available in the area (*Panulirus polyphagus*, *P. versicolor*, *P. ornatus*, *P. homarus* and *P. longipes*) and includes the slipper lobster (*Thenus orientalis*) fishery as well. However, more focus is given to *P. polyphagus* or mud spiny lobster since it is the main spiny lobster species caught in the area. Thus, the subsequent formation of lobster *refugia* in the area will be based on the biology and life cycle of the *P. polyphagus* lobster.



There were past studies concerning the life cycle of *P. polyphagus* in the East Johor area (refer to Alias et al., 2000) but the migration route has not been clearly identified yet. Records from elsewhere indicated that the spiny lobster will undertake a mass migration to their spawning ground before releasing their eggs into deeper sea (Figure 11).

To examine the life cycle of spiny lobsters, the Fisheries Research Institute of the Department of Fisheries has conducted a lobster resource and larvae survey in the East Johor waters from the 21st to 25th August 2017. The survey was funded using National Fund and samplings were carried out using KK Senangin II vessel. The resource survey objectives are to collect the egg bearing adult lobsters and the abundant distribution of the lobsters for mapping out.

Figure 11. Spiny lobster migration pattern in East Johor area (Taken from Alias et al., 2000)

Scientific Studies: Tiger Prawn *Refugia* in Kuala Baram, Sarawak

The scientific studies to support the formation of the Tiger Prawn *Refugia* in Kuala Baram, Miri, Sarawak focused mainly on three main activities which were tiger prawn (*Penaeus monodon*) landing data collection, maturation stage observation and identification of nursery areas for juvenile prawn in the Baram River area. Kuala Baram is located at the mouth of the Baram River in Miri and has a sizeable mangrove habitat essential for the tiger prawn life cycle. The scientific study for this year focus mainly on the juvenile stage tiger prawn resources and sampling were conducted periodically using rented fishermen boat and gear.

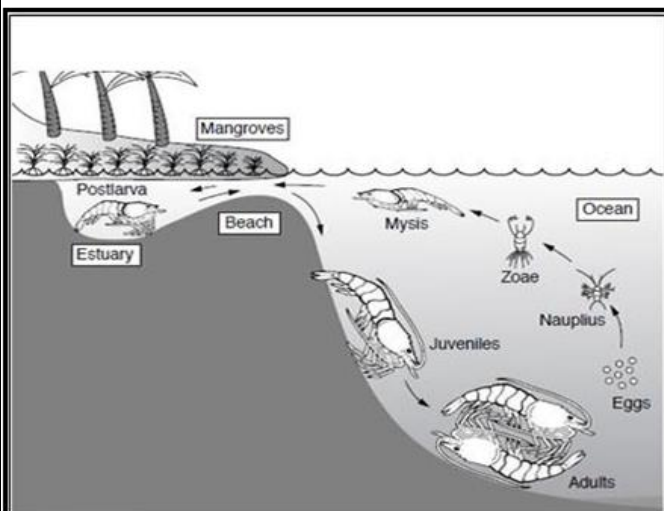


Figure 12. life cycle of the tiger prawn

The adult tiger prawn copulates and spawn in the deep water off Kuala Baram before the larvae make its way back to the mangrove habitat and post larvae and juveniles (Figure 12). During the life cycle of the tiger prawn, there are various threats that may affect the population and the formation of a tiger prawn *refugia* will greatly aid in the preservation of the prawn stock (Box 1).

The studies concerning the biology and resource assessment of tiger prawn in Kuala Baram have been conducted since 1998 mainly by Fisheries Research Institute Bintawa and can be used in the formation of the Tiger Prawn *Refugia* in Kuala Baram (refer to papers by Hadil and Faazaz, 1998; Hadil and Gambang, 2001; Hadil, 2004; Hadil, 2012).

Box 1.

The life history phase, known habitat and possible threat analysis for the tiger prawn in Kuala Baram, Sarawak

Life history phase	Known habitat/ critical area	Threat
Early-life history	Ocean water up to 130m (muddy/sandy/rocky)	Filtering, predator (whale, manta-ray)
Juvenile	Seagrass/ mangrove/ estuary	deforestation
Pre-recruit	Seagrass – salty water (25-30ppt)	Shrimp push net & bag net
Adult	Deepwater (20-50m)	Trawl net
Spawning	Oceanic water	Trawl net

- **Socio-economic Surveys**

The baseline socio-economic surveys of fishing covering eight fishing areas in Pahang-Johor and four areas in Miri were carried out in between March-August 2018 and within 2016 by local University in Sarawak, respectively. The results from a total of 138 respondents took part in eight fishing areas of Pahang-Johor survey showed that 88.19% of respondents agreed with the establishment of *refugia* as proposed by DoF, 85.29% of respondents agreed not to conduct fishing operation of lobster during its breeding season after the establishment of *refugia* and a further 97.06% of respondents agreed that the Department of Fisheries should discuss with the fishers and fishers' community regarding the proposal of the establishment of lobster *refugia* in the beginning.

3) PHILIPPINES

List of all activities from 2017 till 4th Quarter of 2018 is shown in the link : <https://fisheries-refugia.org/refugia-country-activities/refugia-philippines>

- **Reviewed works on selected 3 Fisheries *Refugia* Sites**

Figure 13. Map of the Philippines with emphasis to the 3 target Fisheries *Refugia* Sites, the detailed information of each site is as follows: 1) Bolinao is a first class municipality in the province of Pangasinan, Philippines. Based on the census of 2015, it has a population of 82,084 (Census Population 2015) and has land area of 23,320 hectares. Municipality of Bolinao, is located along the northwest coast of Luzon, Philippines, and one of seventeen towns bordering the Lingayen Gulf. Bolinao is bordered by West Philippine Sea (South China Sea) on the north and west; and on the east by the Caquiputan Channel, which also divides the municipality from the island municipality of Anda, Pangasinan; and on the south by the municipality of Bani, Pangasinan. (McManus et al 2007). Bureau of Fisheries and Aquatic Resources (BFAR) data showed that there are 4,941 and a total of 1,424 fisherfolks and boat registered respectively (Table 2). Major gears operating in the area are purse seine, hook and line, multiple hook and line, single line and scoop net among others; 2) Masinloc is a first class municipality in the province of Zambales. According to the 2015 census, it has a population of 47,719 people. Masinloc is a coastal town situated between the Zambales mountain in the east and West Philippine Sea (South China Sea) on the west and it is politically divided into 13 barangays. The town is divided into two parts by the Masinloc River. The barangays of Bani, Taltal and Balaganon are industrial sites and situated in the northern part while the other barangays except the island of San Salvador are situated on the southern part. BFAR data recorded a total of 3,927 and 301 registered fisherfolks and boats respectively (Table 2). Major gears operating in the area are purse seine, drift gill net, hook and line, gill net among others; and 3) Coron is a first class municipality in the province of Palawan, comprising the eastern half of Busuanga Island, all of Coron Island and about 50 other minor islets stretching as far as Tara Island in the northeast and Canipo Island in the south. All these islands are part of the Calamian Archipelago in Northern Palawan that separates the West Philippine Sea (South China Sea) from the Sulu Sea. Coron is administratively divided in to

23 barangays. According to the 2015 census, it has a population of 51,803 people and a land area of 689.1 km². Coron Island is the third-largest island in the Calamian Islands in northern Palawan. Currently tourism is the top industry in Coron and is a location of beaches, dive sites, and other natural tourist spots.

BFAR data documented a total of 3897 and 599 registered fisherfolks and boats respectively (Table 2). Major gears operating in the area are bagnet, hook and line, multiple hook and line, spear gun and bottom gill net among others.

Project Site	BOAT Registration (BoatR)	Fisherfolk Registration (FishR)
Bolinao, Pangasinan	1424	4941
Masinloc, Zambales	301	3927
Coron, Palawan	599	3897

Source: BFAR Table 2, 2017 Data of registered boats and fisherfolks.

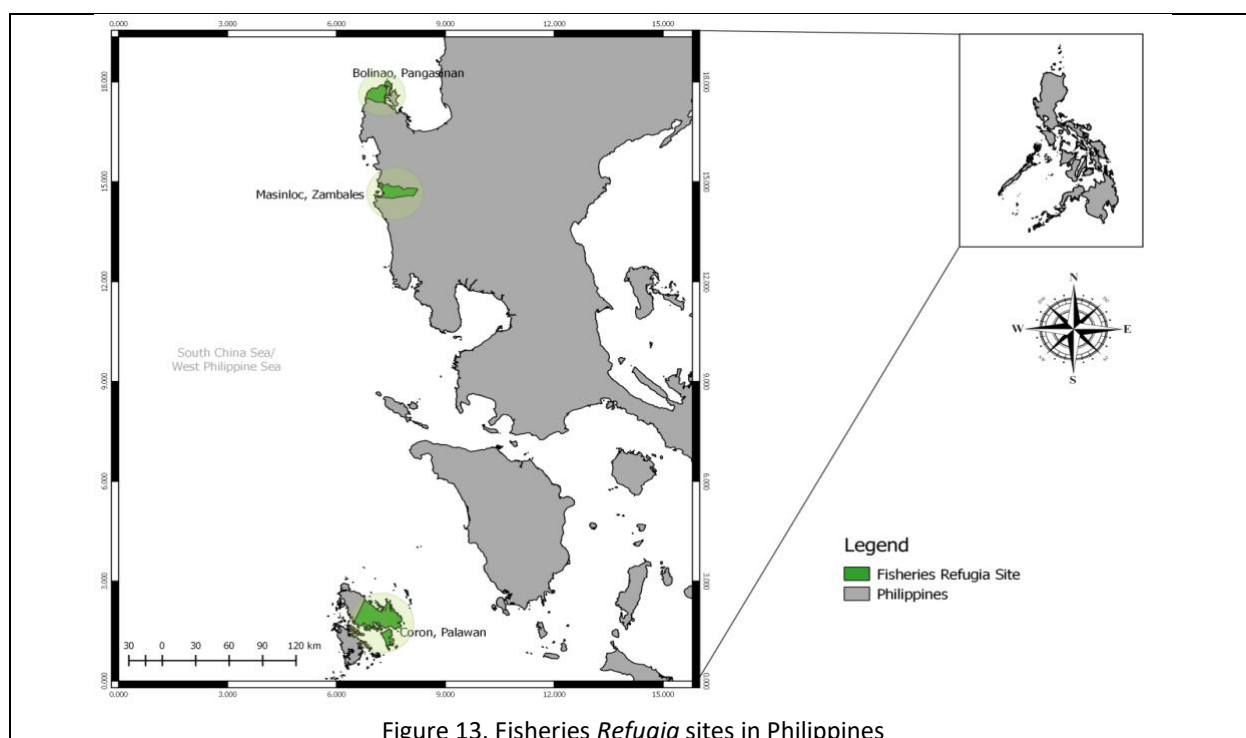


Figure 13. Fisheries *Refugia* sites in Philippines

- **Baseline Fisheries Data Collection**

During the 1st and 2nd quarter of 2017, various baseline data were collected in 3 target Fisheries *Refugia* sites e.g. number of fisherfolks and boat registered (table 1), fish catch data by species, gears and area. We also gathered data on number of Marine Protected Area (MPA) and Fish Sanctuary (FS) in the Fisheries *Refugia* sites, numbers of fisheries related ordinances/laws and number of peoples/fisherfolks organization among others.

Data on landed catch in Masinloc was obtained from BFAR Regional Office no. 3, these data were collected by the National Stock Assessment Program in the area.

- **Hiring and Training of Fisheries enumerator at 3 Fisheries *Refugia* Sites**

The National Fisheries Research and Development Institute (NFRDI) hired 2 enumerators per Fisheries *Refugia* site to collect actual data on landed catch at various fish landing sites. The training for enumerators in Masinloc, Zambales and Coron, Palawan was held on site, while the enumerators of Bolinao, Pangasinan were asked to come to NFRDI office for training. Training lectures include how to compute total catch (by species, area and type of gear), how to calculate catch and effort (by area and type of gear) how to measure length-frequencies, biological data (e.g. maturity stages, length/weight relationship) and in determination of fishing gear and fishing operation among others. A quarterly monitoring of the enumerators data collections were

made by the NFRDI Project Team to ensure the proper data collection in the fish landing area. Data Collected by the enumerators were submitted to NFRDI monthly and encoded to the NSAP Database System.



Actual fish landing at Binabalian Island during the monitoring of sampling activities in Bolinao, Pangasinan



Actual fisheries data collection of Technical Enumerators at Poblacion, Coron, Palawan



Actual fisheries data collection of Technical Enumerators at Masinloc, Zambales

- **Stakeholder consultation meeting at Fisheries *Refugia* sites.**

- a) Bolinao, Pangasinan

The stakeholder meeting was held at El Pescador Resort Hotel & Participated in by 25 participants from different agencies/LGUs of Bolinao. The group presented the initial list of agencies for the Fisheries *Refugia* Site Management Committee (RSTC) that has been agreed initially during the previous Inception Workshop of *Refugia* Project. The participants revised the membership of RSMC. The group discussed the list of members and agreed on how the RFMC can be put into a Executive Order to be signed by the Municipal Mayor. The group finally agreed that an executive order will be used for the RFMC. During the meeting we also presented the provisional terms of reference of the FRMC for review of the Members.

After the presentation and review of Term of Reference for the *Refugia* Site Management Committee, we informed the participants that we will be sending letter to the different agencies listed in the membership of the Committee to nominate member as well as alternate member to be included in the Draft Executive Order to be reviewed and signed by the Municipal Mayor. We also informed them that a formal meeting will be conducted once the Executive Order was signed by the Mayor. On August 02, 2017, the *Refugia* Site Management Committee of Bolinao, Pangasinan was finally signed by Hon. Mayor Arnold D. Celeste.

- b) Coron, Palawan

The stakeholder consultation meeting in Coron, Palawan was held in Darayonan Lodge on June 27 to 29, 2017 and participated in by the representatives from LGU, BFAR-PFO, Philippines Coast Guard, Maritime Poilice, PCSD, Academe, & representative from fisherfolk. An opening program was conducted with a prayer followed by the singing of National Anthem. The welcome message was delivered by Mr. Rey Templonuevo, Officer-in-Charge of the Provincial Fisheries Office of Northern Palawan. After the welcome message, participants were requested to introduced themselves and followed by a Group Photo opportunity of participants attended the workshop. Mr. Valeriano Borja, the National Scientific & Technical Focal Point for the Fisheries *Refugia* in the Philippines, discussed the Rationale and Mechanics of the Meeting. He emphasized that questions, reactions, and even recommendations are welcomed after every presentation and even in the course of the presentations. Mr. Barut, the Technical Adviser to the Philippines of the Fisheries *Refugia* Project presented a brief overview and background of the fisheries *refugia* project. He also presented and explain the principles of Ecosystem Approach to fisheries. Mr. Barut further discussed the project goals and objectives of the Fisheries *Refugia*.

After the presentation of goals and objectives, a review on the existing data on fisheries in Coron, Palawan was presented and verified by the participants, a short workshop after the presentation was also conducted to update the existing information available. The data on the Calamianes known critical spawning & nursery areas was also presented. This data can be used as one of the reference in choosing fish species & in establishing fishes *refugia* in Coron.

A workshop ended on identification of target species and threats for the establishments of fisheries *refugia* was also conducted in the afternoon session, identification was group into three areas, mangrove, corals & seagrass.

- c) Masinloc, Zambales

So far no stakeholder consultation meeting was completed in Masinloc, Zambales due to some technical hitches during the project implementation on the 3rd and 4th quarters of 2017. Stakeholders consultation meeting will be accomplished this coming 4th quarter of 2018.



Photos taken during the Site Level Inception Meeting and Courtesy visit to Municipality of Bolinao, Pangasinan



Photos taken during the Site Level Inception Meeting and Courtesy visit to Municipality of Masinloc, Zambales



Photos taken during the Site Level Inception Meeting and Courtesy visit to Municipality of Coron, Palawan

- **Baseline Fisheries Data Collection**

During the 1st and 2nd quarter of 2017, various baseline data were collected in 3 target Fisheries *Refugia* sites e.g. number of fisherfolks and boat registered (table 2), fish catch data by species, gears and area. We also gathered data on number of Marine Protected Area (MPA) and Fish Sanctuary (FS) in the Fisheries *Refugia* sites, numbers of fisheries related ordinances/laws and number of peoples/fisherfolks organization among others.

Data on landed catch in masinloc was obtained from BFAR Regional Office no. 3, these data were collected by the National Stock Assessment Program in the area. It was observed that data collected on landed fish catch in Poblacion, Masinloc (Table 3) was mainly caught by Handline Fishing, *Thunnus albacares* dominated the total catch from 2012-2016 with a total landed catch of around 130 metric tons, followed by *Katsuwonus pelamis* with 64 metric tons, and 16.74 metric tons for *Coryphaena hippurus*. A total of 14 species

was observed during 2012-2016 and majority if the species observed was large pelagic. Data collected in Balogo Matalvis, Masinloc, Zambales was caught by Purse Seine fisheries. Landed catch of the purse seine was caught outside municipal waters. *Kasuwonus pelamis* and *Thunnus albacares* dominated the catch with 2732.16 MT and 2684.85 MT, respectively. Small Pelagic species were also observed to dominate the landed catch with 350.41 MT for *Decapterus macrosoma* and 143.87 metric tons for *Decapterus macarellus*. A total of 11 species was observed during 2012-2016 and majority if the species observed were large pelagic and small pelagic (Table 4).

Fisheries data was also collected in Bolinao, Pangasinan. 2016 data on landed catch per fishing gear (Table 5) was obtained from NSAP data of the BFAR Regional Office 1. There are 3 existing fisheries landing sites in Bolinao, Pangasinan were NSAP collects landed catch per fishing gear, it was observed that Purse seine fisheries obtained the highest total catch around 125.7 MT landed in Luciente, Bolinao, followed by Hook & Line fisheries in Arosan, Bolinao with 107.5 MT, and in Balingasay, Multiple hook & line with 24.7 metric tons, handline fisheries amounting 38.27 MT and scoop net fisheries with 6.4 metric tons. A total of 302.75 metric tons of fish was landed in Bolinao, Pangasinan in the year 2016.

Table 3. Species and catch in metric tons landed in Poblacion, Masinloc, Zambales from 2012-2016

List of species and catch (MT) landed in Poblacion , Masinloc (2012 – 2016)										
Landing site	Gear	ScientificName	2012	2013	2014	2015	2016	Grand Total		
Poblacion	Handline	<i>Abalistes stellaris</i>	0.13	0.49	0.93	1.94	0.87	4.37		
		<i>Auxis rochei</i>			0.94	4.37	1.48	6.79		
		<i>Auxis thazard</i>			3.21	2.43	1.98	7.62		
		<i>Coryphaena equiselis</i>					0.10	0.10		
		<i>Coryphaena hippurus</i>	2.70	3.25	3.96	3.45	3.37	16.74		
		<i>Decapterus macrosoma</i>	0.03		0.06			0.09		
		<i>Elagatis bipinnulata</i>	0.27	0.23	0.02			0.52		
		<i>Euthynnus affinis</i>			0.52	0.09		0.62		
		<i>Gempylus serpens</i>	0.06					0.06		
		<i>Kasuwonus pelamis</i>	9.49	10.28	13.53	16.42	14.40	64.11		
		<i>Scomberomorus commerson</i>			0.04		0.92	0.96		
		<i>Selar crumenophthalmus</i>	0.04					0.04		
		<i>Thunnus albacares</i>	26.16	27.60	29.91	24.39	22.70	130.77		
		<i>Thunnus obesus</i>	0.80	0.42	2.63	2.24	0.50	6.60		
		Grand Total			39.69	42.28	55.74	55.33	46.32	239.37

Table 4. Species and catch in metric tons landed in Balogo, Matalvis , Masinloc, Zambales from 2012-2016

List of species and catch (MT) landed in Balogo_ Matalvis , Masinloc (2012 – 2016)									
landing site	Gear	ScientificName	2012	2013	2014	2015	2016	Grand Total	
Balogo_ Matalvis	Purse seine	<i>Abalistes stellaris</i>		1.74		0.22		1.96	
		<i>Auxis rochei</i>			2.85	8.18	19.37	30.40	
		<i>Auxis thazard</i>		0.39	10.80	11.40	21.22	43.81	
		<i>Decapterus macarellus</i>				77.73	89.33	183.35	350.41
		<i>Decapterus macrosoma</i>	34.36	88.34	21.17			143.87	
		<i>Elagatis bipinnulata</i>			1.79			1.79	
		<i>Euthynnus affinis</i>	3.28	10.64	12.89	7.02	17.23	51.06	
		<i>Kasuwonus pelamis</i>	495.98	588.81	541.41	556.79	549.17	2,732.16	
		<i>Sarda orientalis</i>	0.64	2.56	0.42			3.62	
		<i>Thunnus albacares</i>	488.12	581.72	522.65	542.13	549.88	2,684.50	
		<i>Thunnus obesus</i>	15.28	24.02	6.94	4.19	2.30	52.74	
Grand Total			1,037.66	1,298.21	1,198.65	1,219.27	1,342.52	6,096.31	

Table 5. 2016 data on Catch per Fishing Gear recorded in Bolinao ,Pangasinan

Landing Center	Fishing Gear	Total
Luciente, Bolinao, Pangasinan	Purse Seine	125,745.00
Arosan, Bolinao, Pangasinan	Hook and Line	107,537.00
Balingasay, Bolinao, Pangasinan	Multiple Handline	24,744.65
	Single Handline	38,277.87
	Scoop Net	6,450.09
TOTAL		302,754.61

- Initial Survey on the Collection of fish eggs and larvae in 3 Fisheries *Refugia* site

Preliminary investigation on collection of ichthyoplankton at 3 *refugia* sites : Bolinao Bay, Masinloc Bay, and Coron Bay as shown Figure 14a,b c, respectively. were completed

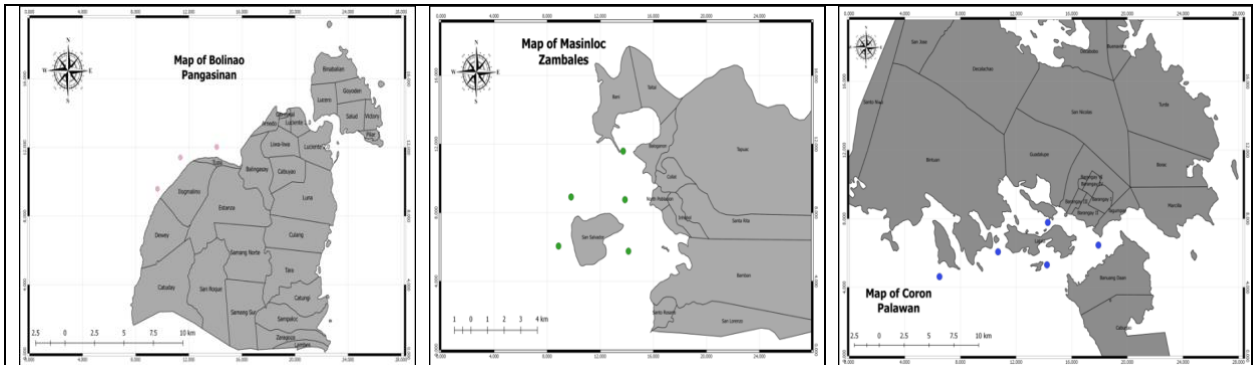


Figure 14 locations for fish eggs and larvae survey: a) Bolinao, b) Masinloc, and c) Coron

Of the three target *refugia* site, Coron Bay got the highest density being observed with 116 individual/100m³ for fish larvae and 140 individual/100m³ for fish eggs while Bolinao Bay got the least density observed with 17 individual/100m³ for fish larvae and 88 individual/100m³ for fish eggs. In terms of diversity, Masinloc Bay has the most numbers of families being identified with 22 families followed by Coron Bay with 19. Overall, Carangidae (jacks and pompanos) dominates the total composition of the three *refugia* sites with 34 individuals followed shortly by Lutjanidae (snappers) with 19 and Acanthuridae (surgeonfishes and unicornfishes) with 15.

- Aerial photograph in 3 fisheries *refugia* sites



Aerial photograph at Balingasay and Arosan fish landing site in Bolinao, Pangasinan



Aerial photograph at Matalvis fish port, Masinloc Zambales



Aerial photograph at Bintuan Landing Site and Poblacion, Coron, Palawan

• **Future activities in 2019 :**

Fisheries *Refugia* Stakeholders Consultation Workshop for 3 *Refugia* Sites, continue fisheries data collection on landed catch for 3 *refugia* sites, site monitoring for site level activities, Establishment of *Refugia* Site Management Board in Coron, Palawan & Masinloc, Zambales and continue ichthyoplankton survey for 3 *Refugia* Sites.

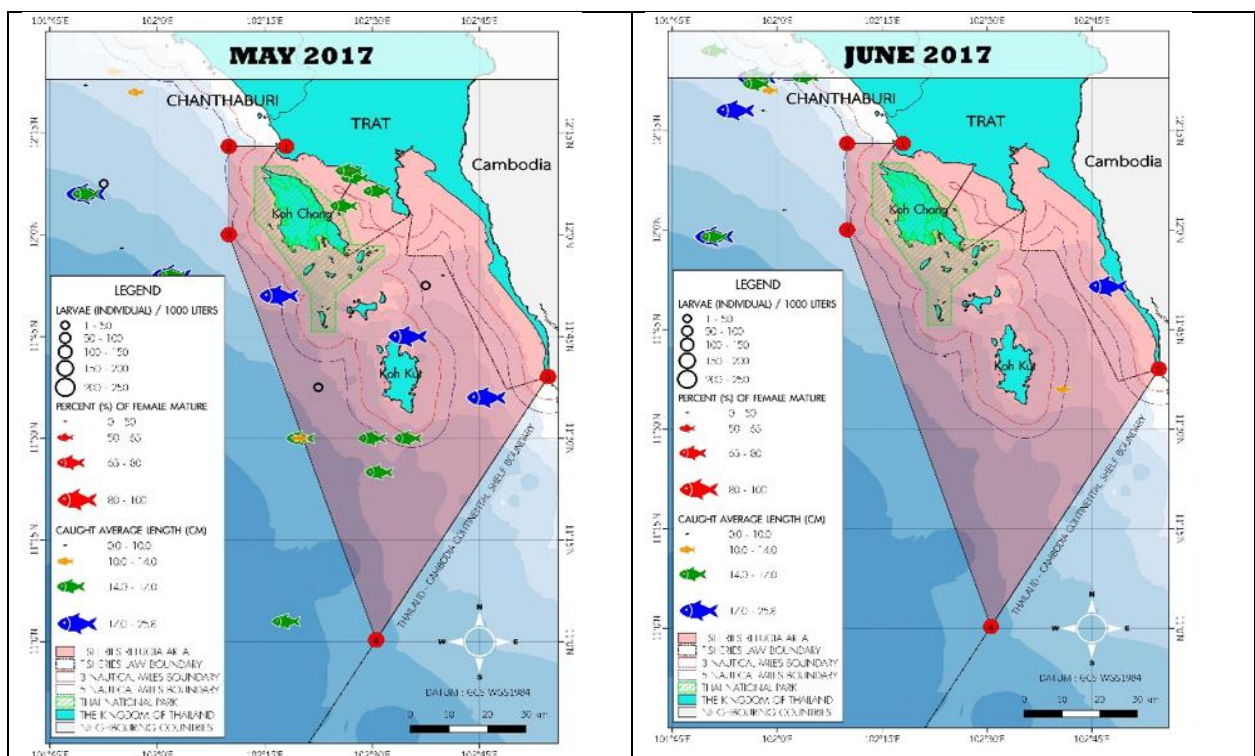
4) THAILAND

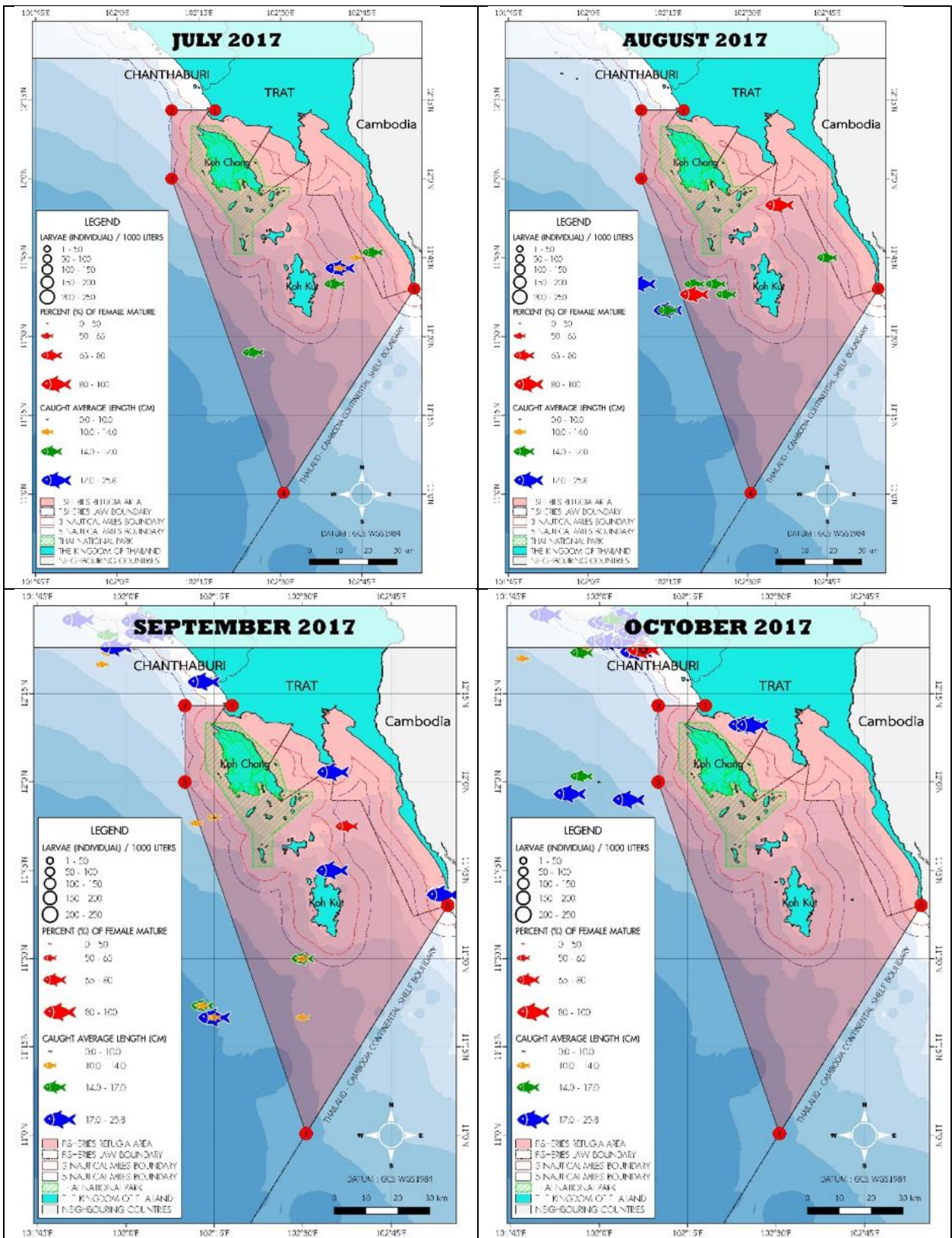
Following the guidance mentioned in the GEF adopted full project document, Thailand set up the required implementing committees in coordination with various institutions and relevant stakeholders namely a National Fisheries *Refugia* Committee (NFRC), a National Scientific and Technical Committee (NRSTC) and 2 Site-based Management Boards (SMB) at selected *Refugia* Sites in Trat and Surathani Provinces in 2017. The National Focal Point of the project was also nominated to coordinate and support the execution of Thailand's activities. Six (6) stakeholder consultations - consisting of key fisheries community people and members from the NSTC and SMB - were conducted between August 2017 and January 2019 (See list of activities via link: <https://fisheries-refugia.org/refugia-country-activities/refugia-thailand>). The results of those meeting clearly show that all relevant stakeholders understood the Fisheries *Refugia* Concept for sustainable utilization of the fisheries resources and provided support to implement the project at their selected sites for short mackerel (*Rastrelliger brachysoma*) in Trat Provinces, and blue swimming crab (*Portunus pelagicus*) in Surathani Province. In addition, from the consultations, the DOF/TH was able to compile the baseline information which is useful for further planning and development of management measures as well as for establishing other fisheries *refugia* for both species for future consideration by the community. To support the establishment of a fisheries *refugia* at both selected sites, the NFRC and NSTC meetings have been organized twice in 2018 and once in early of 2019, respectively.

- **Priority Species at selected *refugia* sites and reviews of existing data**

- a) Trat *Refugia* Site

The national Fisheries *Refugia* Committee agreed to propose Indo-Pacific mackerel or short mackerel (*Rastrelliger brachysoma*) as a priority species in Trat Province due to its economic importance in Thailand. In addition, it is the trans-boundary species of Thai-Cambodian waters. Recent supporting technical information of short mackerel including their size, maturity, larvae and juvenile distribution, stomach contents, and DNA are available for analysis. Distributions of sizes, maturities, and larvae of short mackerel in Trat Province during the year 2017-2018 were compiled and studied by Mr. Kumpon Loychuen, Director of the Eastern Gulf Fisheries Research and Development Center (Rayong) and concurrently is appointed as a National Scientific and Technical committee as shown in **Figure 15 and 16**.





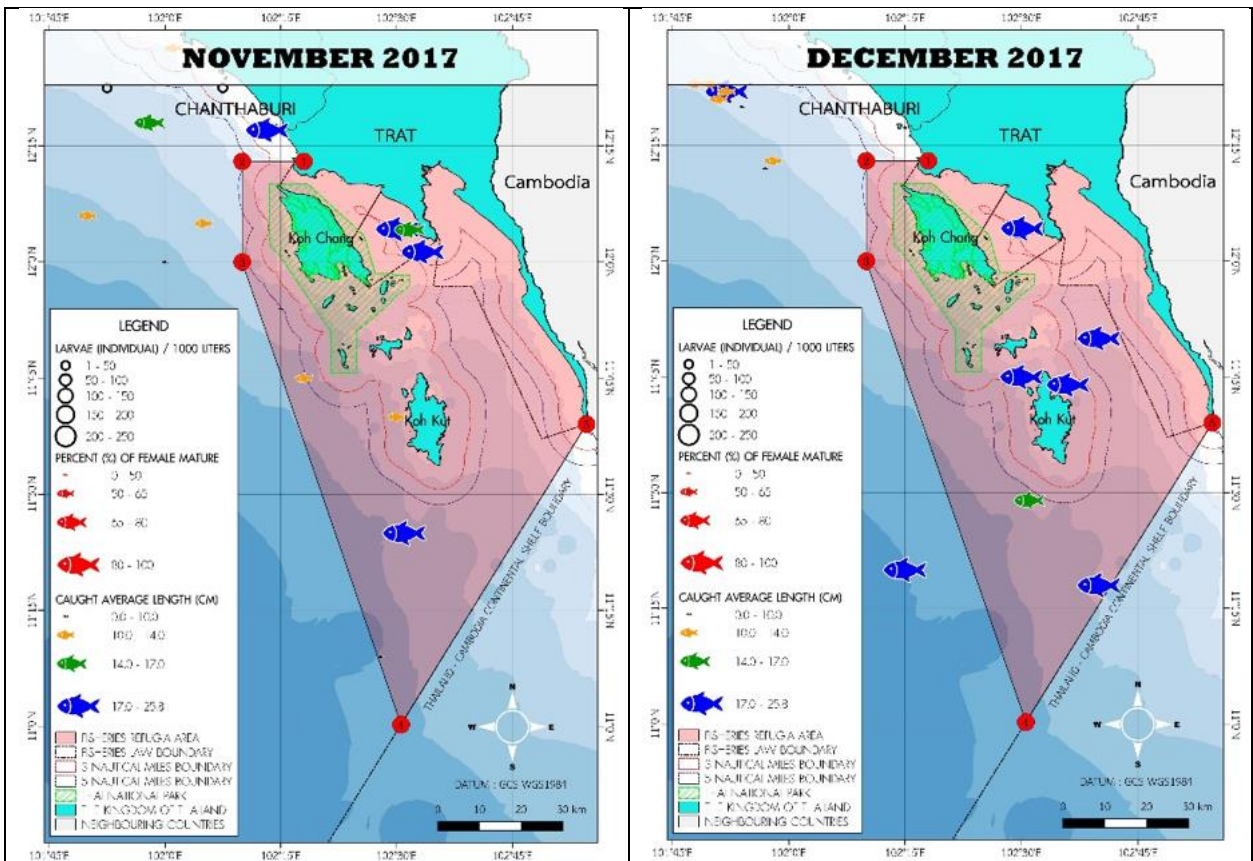


Figure 15. Distribution of larvae, mature females, and sizes short mackerel in Trat Province during Mar 2017 – April 2018 (source: Eastern Gulf Fisheries Research and Development Center (Rayong))

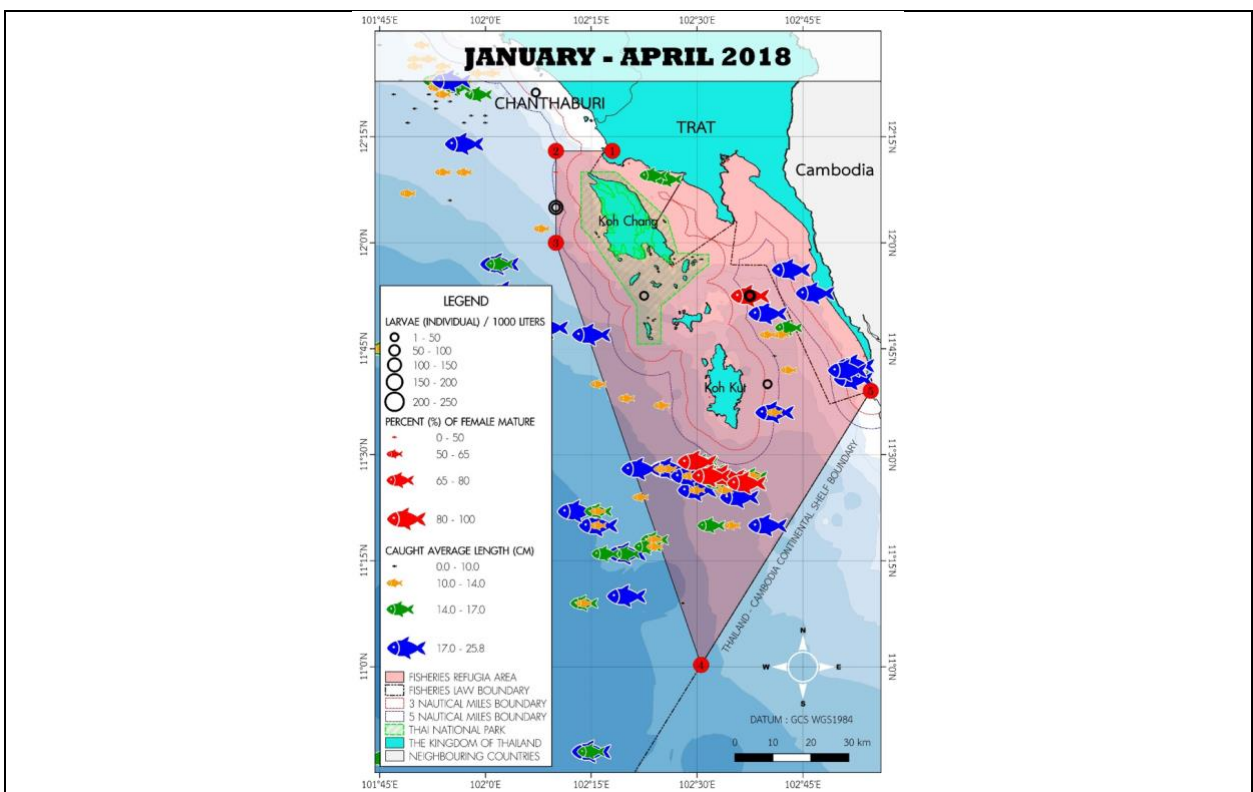
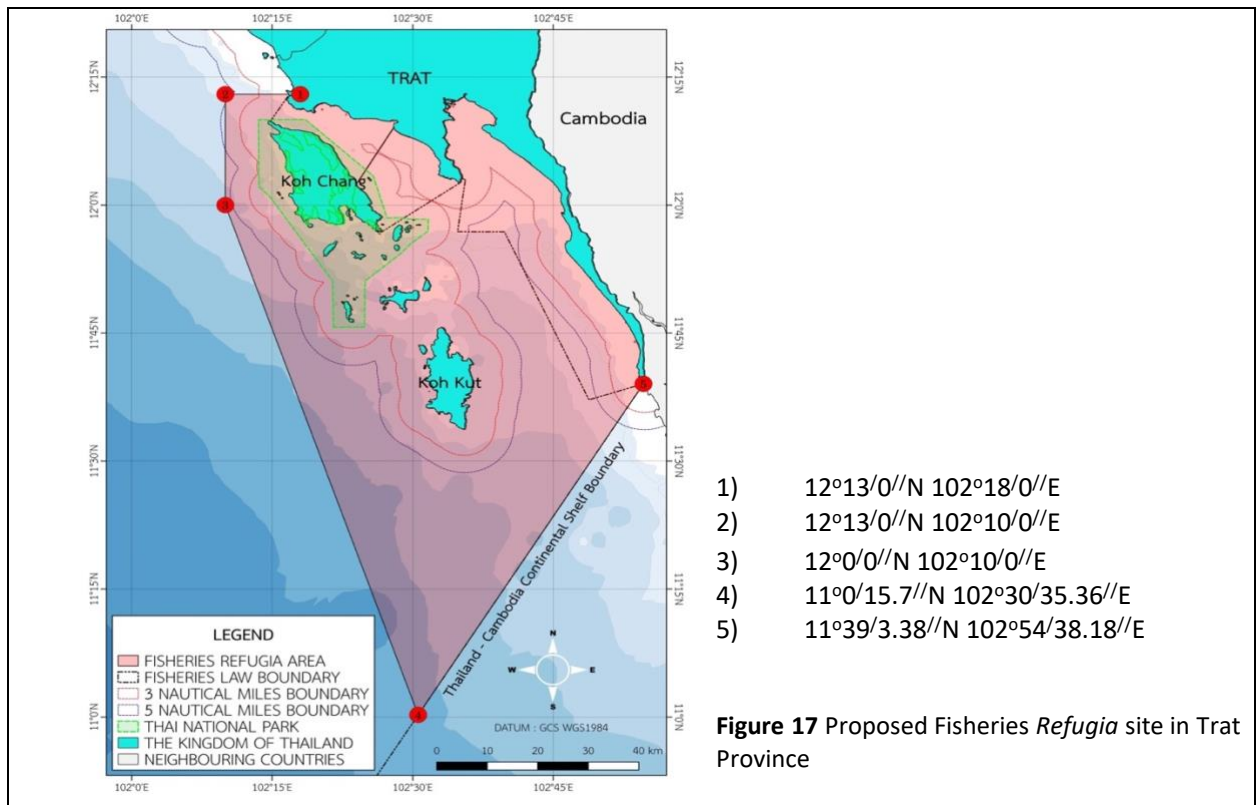


Figure 16. Distribution of larvae, mature females, and sizes of short mackerel in Trat Province during January – April 2018 (source: Eastern Gulf Fisheries Research and Development Center (Rayong))

From the study, mature Indo-Pacific mackerel and their larvae were found abundant in the waters off Trat Province during January-April. Fishing gears in the area were mainly commercial purse seine, anchovy purse seine, anchovy falling net, and short mackerel gill net.

It was concluded that Fisheries *Refugia* site was to be the area in which larvae and mature fish existed. The area was estimated at 5,809.82 km² with its boarder shown in Figure 17.



b) Surat Thani *Refugia* Site

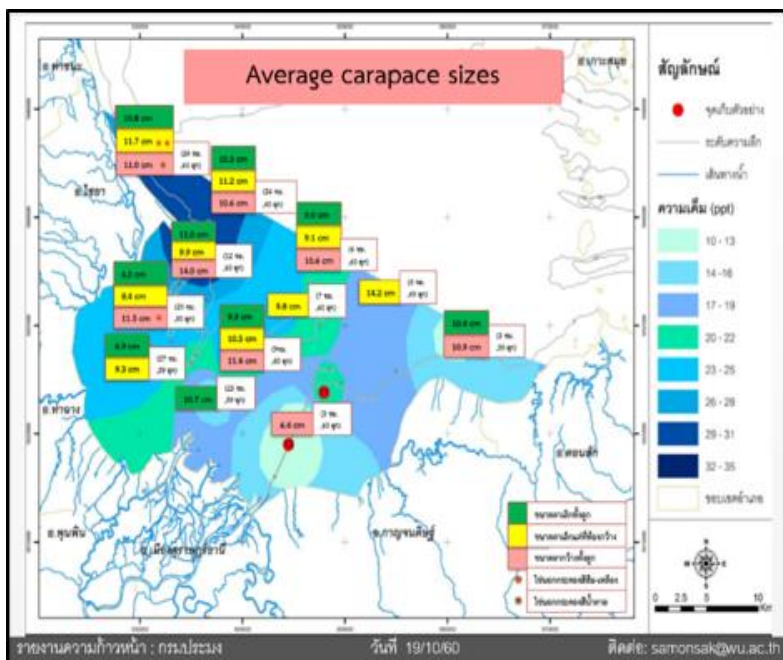


Figure 18. Average carapace sizes in relationship with salinity data.

The Committee agreed to propose blue swimming crab to be a priority species in Surat Thani Province due to its economic importance and needs of fishermen in the area. Moreover, blue swimming crab had been included in the Fishery Improvement Program (FIP) in Ao Ban Don, Surat Thani Province, resulted in the availability of its recent technical information (Figure 18). Establishment of Fisheries *Refugia* for blue swimming crab in Surat Thani Province would support the FIP national program to make the most advantage for marine ecosystem, fisheries, and fishermen in the area. It was hoped to be the best practice of fisheries management in the country.

Coastal ecosystem and activities of FIP in Surat Thani Province, including life cycle of blue swimming crab were prepared by Assist. Prof. Dr. Amonsak Sawusdee, Head of Resources and Environment Department, Walailak University. The meeting concluded that project site should be the whole coastal area of Surat Thani Province, in which Koh Samui and Koh Pha Ngan are included. Project site covered the area of 4,957.99 km² with its boarder shown in the Figure 19.

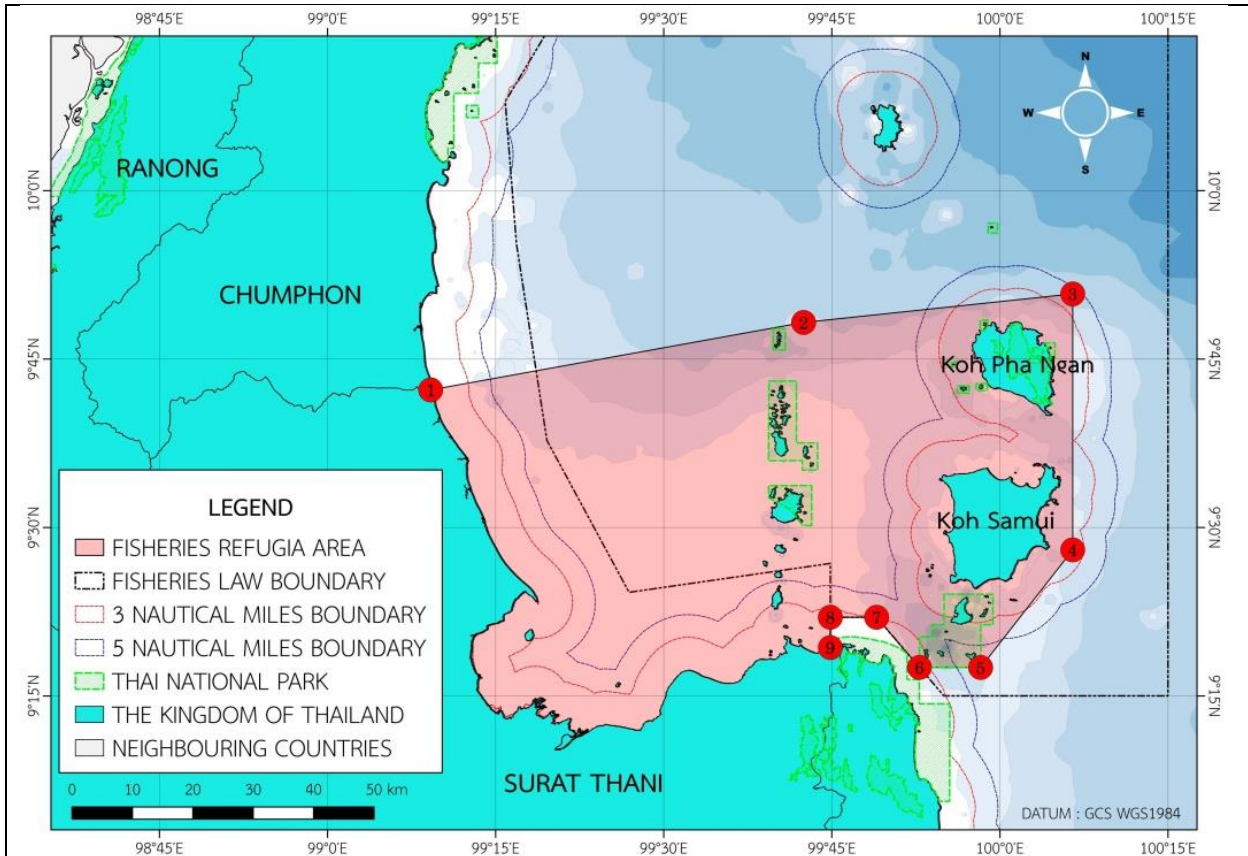


Figure 19 Proposed Fisheries *Refugia* site in Surat Thani Province

- 1) 9°42'15//N 99°09'12//E
- 2) 9°48'15.35//N 99°42'28.98//E
- 3) 9°50'48//N 100°6'30//E
- 4) 9°28'0//N 100°6'30//E
- 5) 9°17'31.58//N 99°58'16.96//E
- 6) 9°17'32.09//N 99°52'49.19//E
- 7) 9°22'0//N 99°49'0//E
- 8) 9°22'0//N 99°44'52//E
- 9) 9°19'18//N 99°44'52//E

- **Future Activities**

Currently, the DOF/TH is planning to conduct more survey for scientific data and information collection to identify the life cycle pattern of the target species as to identify the best management measures. Given that the short mackerel (or platoo in Thai) is one of the most economically important species in Thailand and considering its migration behavior in the coastal area off Thai and Cambodia waters, bilateral cooperation with Cambodia is therefore required as to support the establishment of a sub-regional *refugia*. This will be conducted by DOF/TH in 2019 and onward.

III. ADVANCING THE APPLICATION OF THE FISHERIES REFUGIA CONCEPT IN THE GULF OF THAILAND

Area-based approaches to fisheries management in the western Gulf of Thailand have applied over the last decade to safeguard spawning stock and larvae of the short Mackerel (*Rastrelliger brachysoma*). The measures designed against the backdrop of high fishing pressure and increasing demand for the region's seafood products (see *refugia* areas A and B depicted in Figure 20) have enabled resource managers, scientists, fisherfolk and communities to develop experience working together in safeguarding critical fish stock and life-cycle linkages.

This has involved the application of targeted management measures aimed at significant reductions in fishing effort and use of inappropriate fishing gear and practices for 90 days in area A (15 Feb-15 May) and 30 days area B (16 May – 14 June) to safeguard fish in spawning condition and fish larvae, respectively. The large size of these management has been the source of some tension between government and larger-scale operators, with discussions largely having focused on the need for area-based measures to reflect more fully the known migratory routes, ocean circulation patterns and primary production in the Gulf.



Accordingly, the fisheries *refugia* concept was recently applied to the establishment of nursery *refugia* in the upper Gulf of Thailand aimed at boosting year class strength of new recruits to the fishery. This has been achieved via application of targeted measures, combined with revised and strengthened regulations and enforcement, in *refugia* area C (60 days from 15 Jun – 15 Aug) and *refugia* areas D (60 days from 1 Aug – 30 Sep) aimed at targeted and incidental capture of larval and juvenile fish. This staged and combined application of *refugia* areas in a northerly, clockwise direction from the western to the upper central Gulf to protect fish at critical life-cycle stages including spawning, larval, and juvenile to pre-recruit has shown to bring about significant improvements in landings and food security for small-scale operators. Department of Fisheries, Thailand reports an almost 10-fold increase in landings from 2,470 tons prior to the expansion of the network to 28,670 include the operational management of areas C and D. This success points to possible strengthened resilience of stocks of Indo-Pacific associated with the ongoing establishment and planned management of fisheries *refugia* sites for this species in the transboundary area of

Trat, Thailand and Koh Kong, Cambodia which are located to the east of the present managed areas. Recent surveys show these areas to be critical areas for juvenile and young adult Indo-Pacific mackerel.

Figure 20. Distribution and relative abundance of fish larvae in the Gulf of Thailand derived from analysis of samples collected by SEAFDEC

Success breeds success in the Southeast Asian region, with the abovementioned achievements leading to senior officials of the Department of Fisheries, Thailand recently issuing directives to explore the application of the fisheries *refugia* approach in bringing about improved management of overexploited stocks of the longtail tuna (*Thunnus tonggol*). The latter represents a true example of the mainstreaming of the science

generated by GEF projects in the day-to-day operations of a national government in planning for sustainable fisheries in Southeast Asia.

IV. CONCLUSION

Based on the results from country's implementation for establishment of fisheries *refugia* at country level such that of stakeholder consultations, there are many threats facing at *refugia* site by fishing community in which impact to the marine ecosystems. One of the problems are declining of fish productions, destructive fishing gears, conflict of users, illegal fishing, invasion of foreign fishing vessels, etc. It is expected that the 2019 activities will be touched more on the public awareness and outreach programme to promote local social, economic and environmental benefits of fisheries *refugia* implemented at priority locations including the best practice approaches and measures for integrated fisheries and habitat management captured, documented and communicated nationally. In addition, measures for the fisheries sector's sustainable use of fish habitats and biodiversity, and based on site-level including the following tasks:

- National guidelines on the use of fisheries *refugia* in integrating fisheries and habitat developed and endorsed by heads of national government departments responsible for fisheries and the environment
- National policy, legal and planning frameworks for demarcating boundaries and managing *refugia* assessed and required reforms endorsed, including requirements for assessing socio-economic impacts of management measures and stakeholder consultation
- Establishment and population of an online national database of fish egg and larvae distribution and abundance
- National online Geographical Information System on fisheries and marine biodiversity featuring information on locations and management status of coastal habitats, fisheries *refugia*, MPAs, and critical habitats for threatened and endangered species

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