Establishment and Operation of a Regional System of Fisheries *Refugia* in the South China Sea and Gulf of Thailand

REPORT

THE FIRST MEETING OF THAILAND'S NATIONAL SCIENTIFIC AND TECHNICAL COMMITTEE

BANGKOK, THAILAND
17 DECEMBER 2018

Prepared by
DEPARTMENT OF FISHERIES
THAILAND

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
TRAINING DEPARTMENT

Southeast Asian Fisheries Development Center | **United Nations Environment** | **Global Environment Facility**

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REPORT OF THE MEETING

I. INTRODUCTION

1) The first meeting of Thailand's National Scientific and Technical Committee of the Project entitled "Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand" was organized by the Department of Fisheries and held at Marine Fisheries Research and Development Division on 17th December 2018 at 10.00 am-16.30 pm. Ms. Praulai Nootmorn, Senior Expert in Marine Fisheries, and Thailand's National Focal Point, acted for the chairperson in her absence. Meeting agenda and list of participants are shown in Annex 1 and 2, respectively. The meeting minutes are as follows:

II. REPORT OF THE CHAIRPERSON

2) Ms. Praulai Nootmorn, Senior Expert in Marine Fisheries, and Thailand's National Focal Point, informed the meeting that the chairperson, Dr. Amonrat Sermwatanakul, could not chair the meeting due to her urgent official business, and assigned Ms. Praulai to act for her as the chairperson.
3) Ms. Praulai noted that signing of the Letter of Agreement (LOA) between the Department of Fisheries (DOF) and Southeast Asian Fisheries Development Center (SEAFDEC) was done in 2017 and the project had been implemented onwards. Proposed project sites were the coastal areas of Trat Province and Samui Island, Surat Thani Province, with Indo-Pacific mackerel be their priority species. The priority species in Surat Thani Province had later been changed to blue swimming crab due to the reason that Thailand had enough measures for Indo-Pacific management in that area. Project sites and their priority species, including work plan and expenditure reports had been already reported in the 1st and 2nd meeting of National Fisheries Refugia Committee (NFRC). The resolution of those meetings was that project sites and priority species was to be based on their area-based technical information under consideration of National Scientific and Technical Committee.

III. DISCUSSION ISSUES

A. Notification of the Department of Fisheries No. 1130/2561 Re: Appointment of Thailand's National Scientific and Technical Committee dated 27th November 2018

4) Mr. Kumpon Loychuen, Director of the Eastern Gulf Fisheries Research and Development Center (Rayong), as a committee and secretary, presented to the meeting the membership and TOR of Thailand's National Scientific and Technical Committee which were included in the "Notification of the Department of Fisheries No. 1130/2561 Re: Appointment of Thailand's National Scientific and Technical Committee dated 27th November 2018", as shown in Annex 3

B. Overview of Background of the Project: Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand

5) Ms. Ratana Munprasit, former Senior Expert in Area-Based Fisheries, as a Fisheries Refugia Project Staff of DOF, presented to the meeting an overview of Fisheries Refugia Project, including background, rationale, concept, participating countries, goal and objectives, regional project sites and priority species, and project management framework. The presentations are shown in Annex 4.
6) Ms. Praulai Nootmorn added information that there were 4 countries already signed LOA, namely Cambodia, Malaysia, Philippines, and Thailand.

7) Mr. Kumpon Loychuen asked about the frequency of NFRC meeting. Ms. Ratana noted that the meeting should be twice a year as indicated in the Project Document, nevertheless it could be more frequent if necessary.
8) Dr. Supawat Kan-atireklap, Director of the Marine and Coastal Resources Research and Development Center, the Eastern Gulf of Thailand, Department of Marine and Coastal Resources, commented that the Fisheries Refugia Project should be proposed to be one of the Sustainable Development Goal 14 (SDGs14) of Thailand in order to make the Project more beneficially. Ms. Ratana noted that it was highly possible to do that. Mr. Weerasak Yingyuad, Technical Coordinator of the Fisheries Refugia Project, added that the Project was also aimed to support SDG14.

C. Progress of the Project Implementation

9) Ms. Ratana Munprasit presented to the meeting the overall progress of the preceding project implementation up until present, both regionally and nationally. Objectives and results of each survey/meeting/workshop were also notified. Digital files of the reports of each significant national activity could be obtained via barcode system provided. The presentations are shown in Annex 5.

D. Technical Information of Fisheries, Fisheries Resources, and Ecosystem in Trat and Surat Thani Provinces

10) Ms. Ratana Munprasit presented to the meeting the studies of biology and fishing grounds of Indo-Pacific mackerel in Trat Province. The presence of small and adult Indo-Pacific mackerel throughout small-scale and commercial fishing grounds of Trat Province, their matured size, and stomach content were shown. She also presented marine fisheries status and small-scale blue swimming crab fisheries in Surat Thani Province. The presentations are shown in Annex 6 and 7.
11) Mr. Kumpon Loychuen presented to the meeting the monthly distribution of larvae and adult Indo-Pacific mackerel in their fishing ground in Trat Province during the year 2017-2018. The highest abundance of larvae and fully matured fish was found in January-February. He also showed the meeting the chlorophyll distribution along the coastal area of Trat Province in 2017. The presentations are shown in Annex 6.
12) Asst. Prof. Dr. Amonsak Sawusdee, Head of the School of Natural Resources and Environmental Technology Program, Walailak University, presented to the meeting the activities of Fishery Improvement Program (FIP) in Surat Thani province, including fisheries, biology, and catch of blue swimming crab, as well as ecosystem, hydrodynamics and environmental parameters in Surat Thani Province. The presentations are shown in Annex 7.
13) Ms. Varatip Buakaew, Head of Natural Resources Department, GISTDA, suggested that there were some data from satellite with MODIS system which would be useful for the Project implementation, such as chlorophyll and temperature. She also asked about the dissemination of the Project information. Mr. Weerasak Yingyuad noted that the Project information had been propagated via website and facebook. Ms. Ratana Munprasit added that each country had to provide the report of Project implementation, which would be distributed nationally and regionally.

IV. MATTERS FOR CONSIDERATION

A. Project Site and Priority Fisheries Species in Trat Province

14) **Mr. Kumpon Loychuen** proposed to the meeting for consideration the Fisheries Refugia site in Trat Province. It was the fishing ground, both small-scale and commercial, of Indo-Pacific mackerel throughout Trat Province covering the area of 5,809.82 km^2 (Figure 1). He also

proposed Indo-Pacific mackerel to be priority fisheries species with its critical period in January-April, referenced by the technical information previously presented.

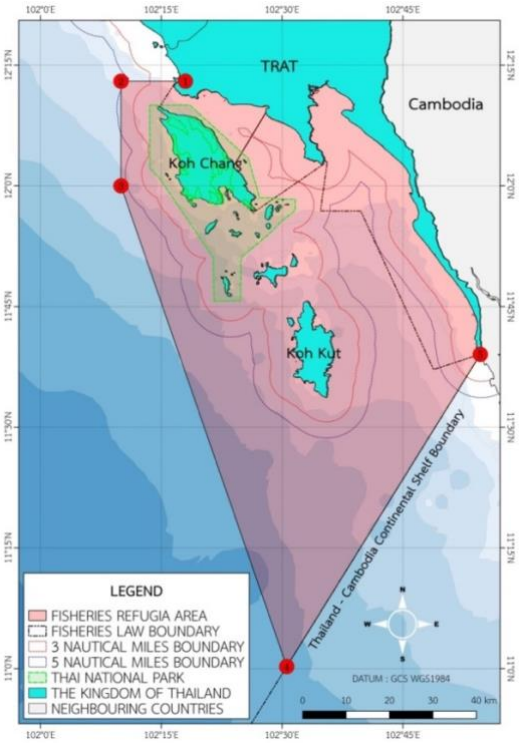

Figure 1 Initial proposed Fisheries Refugia site in Trat Province:

1	12°13′0″N 102°18′0″E
2	12°13′0″N 102°10′0″E
3	12°0′0″N 102°10′0″E
4	11°0′15.7″N 102°30′35.36″E
5	11°39′3.38″N 102°54′38.18″E

15) Members of the meeting were invited to discuss on the Fisheries Refugia site and priority species in Trat Province, based on the proposed map and presented technical information.
16) Mr. Amnuay Kongprom, Director of the Southern Gulf Fisheries Research and Development Center (Songkhla), Department of Fisheries, agreed on the proposed site and species. Nevertheless, he showed his concern about one of the Project key performance index which was 50% decrease of fishing effort in critical period, whereas it must be 100% prohibited in spawning period as defined in "the Royal Ordinance on Fisheries B.E. 2558, 2560 (2015, 2017) of Thailand"
17) Ms. Praulai Nootmorn noted that the proposed site was just the area for Project study, not the actual Fisheries Refugia site. She also mentioned that additional data on the effect of the catch of juvenile and matured Indo-Pacific mackerel were needed.
18) Ms. Ratana Munprasit commented that technical clarification for the Fisheries Refugia boundary was needed.
19) Mr. Weerasak Yingyuad, Technical Coordinator of the Fisheries Refugia Project, and Technical Officer, SEAFDEC, commented that conceptual framework of Fisheries Refugia for Indo-Pacific mackerel in Trat Province might be consistent with the existing management scheme in the central part of the Gulf of Thailand. He also suggested that additional data collection of mature fish in the area was needed.

20) Dr. Supawat Kan-atireklap commented that there should be obvious rationale for the selected species. He agreed on the site, but had a concern on the Project-site boundary line at Thai-Cambodian border which may cause territorial problem.
21) Mr. Weerasak Yingyuad responded to Dr. Supawat that Indo-Pacific mackerel had been selected as priority species based on the needs of stakeholders in the previous Stakeholder Consultation Meeting in Trat Province; it was also based on the presented technical information in this meeting.
22) Ms. Praulai Nootmorn commented that, due to territorial problem, the boundary line of proposed site at Thai-Cambodian border should be shifted a little further from the border line.
23) Meeting Resolution: Indo-Pacific mackerel would be priority species in Trat Province. Proposed Fisheries Refugia site would be adjusted by a little shift of the boundary line at Thai-Cambodian border, as shown in figure 2.

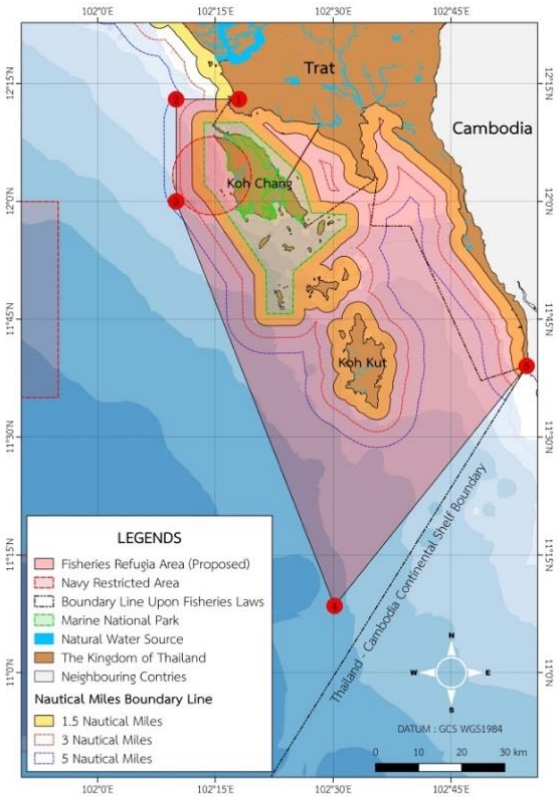

Figure 2 Proposed Fisheries Refugia site in Trat Province

B. Project Site and Priority Fisheries Species in Surat Thani Province

24) Ms. Ratana Munprasit proposed to the meeting for consideration the fisheries refugia site in Surat Thani Province. It was the coastal area of Surat Thani Province including Samui, Phangan, and Ang Thong Islands covering the area of 4,975.99 km^2 (Figure 3). She also proposed blue swimming crab to be priority fisheries species, referenced by the technical information previously presented.
25) Members of the meeting were invited to discuss on the Fisheries Refugia site and priority species in Surat Thani Province, based on the proposed map and presented technical information

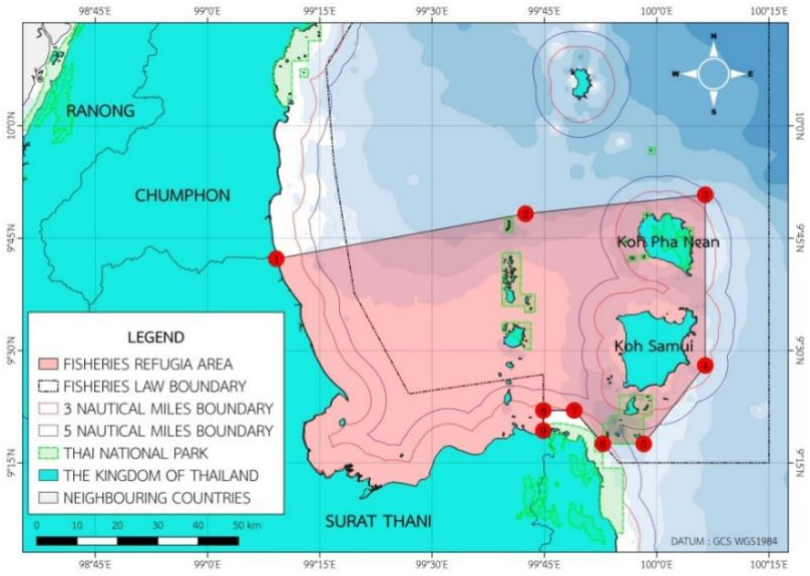

Figure 3 Initial proposed Fisheries Refugia site in Surat Thani Province:

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

26) Asst. Prof. Dr. Amonsak Sawusdee commented that Project site for management of blue swimming crab resource should be specific on their nursery ground. He further noted that information under ongoing blue swimming crab Fishery Improvement Project (FIP) in Surat Thani Province would indicate their spawning ground as well as the peak of their spawning season.
27) Ms. Praulai Nootmorn noted that blue swimming crab was the important economic marine species in Thailand; and Ban Don Bay in Surat Thani Province was their significant habitat and fishing ground, in which the concrete management was needed. She commented that study of catch and fisheries from their small-scale fishing gears, i.e. crab gill net and crab trap should be conducted via the information from fishing log book. She noted that the integration of FIP and Fisheries Project could make the most advantage in the area.
28) Mr. Weerasak Yingyuad noted that data required for blue swimming crab management, such as spawning period, nursing period, threat, fisheries, environment etc., could be obtained using budget from Fisheries Refugia Project.
29) Mr. Weerachai Phetsut, Instructor of Science Program in Fisheries, Maejo University at Chumphon, noted that: from the studies, migration of blue swimming crab for spawning was affected by environmental factors especially salinity and temperature.
30) Mr. Kumpon Loychuen commented that the area of Project site might be scoped to be within the nursery ground of the crab.
31) Ms.Tipamat Upanoi, Director of the Marine and Coastal Resources Research and Development Center, the Central Gulf of Thailand, Department of Marine and Coastal Resources, informed the meeting about the information from the Department of Marine and Coastal Resources that: juveniles of blue swimming crab were found mainly in seagrass bed, followed by mangrove, in the average length of 10 cm. The significant seagrass beds in Surat Thani Province were found in the joint area of Surat Thani-Chumphon Provinces as well as the area in the districts of Leam Pho, Phum Reang, Chaiya, and Tha Chang.
32) Ms. Ratana Munprasit expressed an opinion that the area around Samui and Phangan Islands should be excluded from the Project site due to insufficient data of blue swimming crab

resource and fisheries. She also noted that the site should be scoped within Ban Don Bay for convenience of Project implementation.

33) Asst. Prof. Dr. Amonsak Sawusdee, proposed the idea that boundary of the site should extend from Ban Don Bay upward to Tha Chana district, closed to Chumphon Province.
34) Mr. Amnuay Kongprom noted that mature stage of the crab should also be considered as a critical period due to the fact that the matured crabs were frequently found in the catch of blue swimming crab fisheries.
35) Ms. Tipamat Upanoi agreed to consider on matured crab. She suggested that the boundary of Project site should not be scoped within Ban Don Bay, but should extend rightward to reach the protected area of Mu Koh Ang Thong National Marine Park, as to fully cover the habitat of matured crab.
36) Ms. Ratana Munprasit responded to the mentioned opinions that: for Project implementation, it had to clearly identify the critical period in the life cycle of priority species, because the management schemes were different for each life cycle stage. She also noted that: it did not matter how big the area was, but it had to be identified as specific area of significance to the critical stage of its priority species; and community-based management measure had to be applied in such the area.
37) Mr. Weerasak Yingyuad added that: due to the limitation of time and budget, the Project could not reach the goal for overall life cycle of the target species, thus the most significant critical stage should be selected for the success of the Project. In his opinion, the area in Ban Don Bay could be the Project site for blue swimming crab management; however, migratory route of the blue swimming crab population in the area should be studied.
38) Dr. Supawat Kan-atireklap noted that the management measure for a single stage of life cycle might not reach the aim of conservation. In case of blue swimming crab, overfishing of matured crab could affect the volume of their larvae which was the target of Project implementation. He suggested to choose the best procedure even if more time was consumed.
39) Meeting Resolution: Blue swimming crab would be the priority species in Surat Thani Province. Proposed Fisheries Refugia site would be the coastal area from shoreline of Surat Thani Province straight rightward closing to the protected area of Mu Koh Ang Thong National Marine Park, as shown in figure 4.

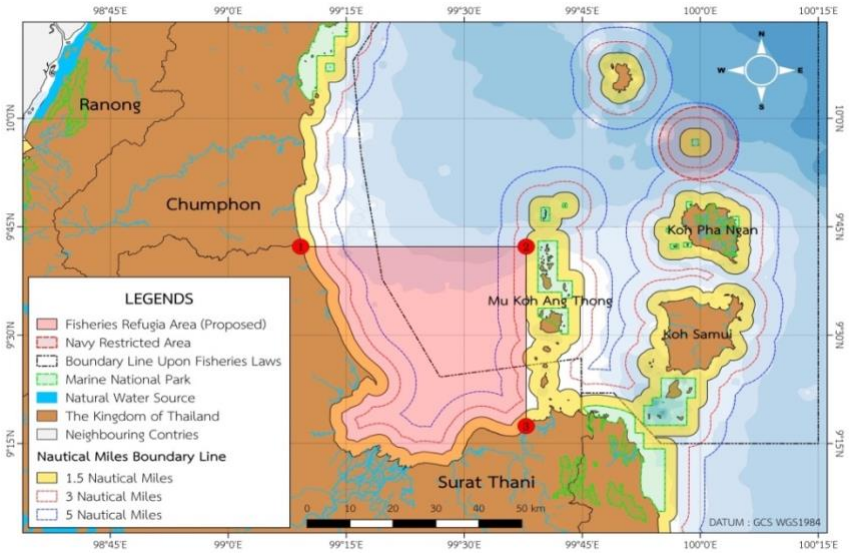

Figure 4 Proposed Fisheries Refugia site in Surat Thani Province

V. ANY OTHER BUSINESS. (None)

ANNEX 1

AGENDA

The First Meeting
of National Scientific and Technical Committee

17th December 2018

Department of Fisheries, Bangkok, Thailand

Agenda 1 Report of the Chairperson

Agenda 2 Matters of Report

2.1. Notification of the Department of Fisheries No. 1130/2561 Re: Appointment of Thailand's National Scientific and Technical Committee dated 27th November 2018
2.2. Overview of background of the project: Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand
2.3. Progress of project implementation
2.4. Technical information of fisheries, fisheries resources, and ecosystem in Trat and Surat Thani Provinces

Agenda 3 Matters for Consideration

3.1. Project site and priority fisheries species in Trat Province
3.2. Project Site and Priority Fisheries Species in Surat Thani Province

Agenda 4 Any Other Business

ANNEX 2

LIST OF PARTICIPANTS

Thailand's National Scientific and Technical Committee

1. Ms. Praulai Nootmorn	Senior Expert in Marine Fisheries, Department of Fisheries (Thailand's National Focal Point)	Committee
2. Mr. Amnuay Kongprom	Director of the Southern Gulf Fisheries Research and Development Center (Songkhla), Department of Fisheries	Committee
3. Mr. Supawat Kan-atireklap, Ph.D.	Director of the Marine and Coastal Resources Research and Development Center, the Eastern Gulf of Thailand, Department of Marine and Coastal Resources	Committee
4. Ms. Tipamat Upanoi	Director of the Marine and Coastal Resources Research and Development Center, the Central Gulf of Thailand, Department of Marine and Coastal Resources	Committee
5. Asst. Prof. Amonsak Sawusdee, Ph.D. (Mr.)	Head of the School of Natural Resources and Environmental Technology Program, Walailak University	Committee
6. Mr. Weerachai Phetsut	Instructor of Science Program in Fisheries, Maejo University at Chumphon	Committee
7. Ms. Varatip Buakaew	Head of Natural Resources Department, GISTDA (represented Director of Geo-Informatics Applications and Service Office)	Committee
8. Mr. Taweekiet Amornpiyakrit, Ph.D.	Senior Program Officer, Southeast Asian Fisheries Development Center	Committee
9. Mr. Kumpon Loychuen	Director of the Eastern Gulf Fisheries Research and Development Center (Rayong), Department of Fisheries	Committee and Secretary
10. Mr. Udom Khrueniam	Head of the Fishing Ground Development and Rehabilitation Unit, Eastern Gulf Fisheries Research and Development Center (Rayong), Department of Fisheries	Committee and Assistant Secretary

Observers

1. Ms. Ratana Munprasit	Fisheries Refugia Project Staff, Department of Fisheries
2. Ms. Pannalak Srithong	Fisheries Refugia Project Staff, Department of Fisheries
3. Ms. Jutima Jangjaiboon	Fisheries Refugia Project Staff, Department of Fisheries
4. Ms. Chanokporn Muenchamnan	Fisheries Refugia Project Staff, Department of Fisheries
5. Mr. Weerasak Yingyuad	Technical Officer, SEAFDEC

ANNEX 3

(Unofficial Translation)

Notification of the Department of Fisheries
No. 1130/2561
Re: Appointment of Thailand's National Scientific and Technical Committee

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The Department of Fisheries has have a cooperation for implementation of the project entitled "Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand" funded by Global Environmental Facility (GEF), which aim to improve management system of fisheries and critical marine habitats linkages in the South China Sea and Gulf of Thailand as well as promote sustainability of fisheries and fishing communities in the region. There are 6 countries participating in the Project, namely The Kingdom of Cambodia, Republic of Indonesia, Malaysia, Republic of the Philippines, The Socialist Republic of Vietnam, and The Kingdom of Thailand.

Whereas the committees, indicated by names, in the previous Notification, No. 340/2560, have changed their positions in their responsible offices, and as the resolution of Thailand's National Fisheries Refugia Committee Meeting on 10th October 2018 at the Department of Fisheries, Bangkok, therefore, the Notification of the Department of Fisheries No. 340/2560 Re: an Appointment of Thailand's National Fisheries Refugia Committee and Thailand's National Scientific and Technical Committee, dated 5th April 2017 shall be repealed. Thus, Thailand's National Scientific and Technical Committee shall be appointed comprising the following members:

1. Senior Expert in Fisheries Management, Department of Fisheries	Chairman
2. Director of Marine Fisheries Research and Development Division, Department of Fisheries	Vice Chairman
3. Ms. Praulai Nootmorn, Senior Expert in Marine Fisheries, Department of Fisheries (Thailand's National Focal Point)	Committee
4. Special Expert in the Research of Resources and Environment in Marine and Coastal Ecosystem, Department of Marine and Coastal Resources	Committee
5. Director of the Central Gulf Fisheries Research and Development Center (Chumphon), Department of Fisheries	Committee
6. Director of the Southern Gulf Fisheries Research and Development Center (Songkhla), Department of Fisheries	Committee
7. Director of the Marine and Coastal Resources Research and Development Center the Eastern Gulf of Thailand, Department of Marine and Coastal Resources	Committee
8. Director of the Marine and Coastal Resources Research and Development Center the Central Gulf of Thailand, Department of Marine and Coastal Resources	Committee
9. Ms. Penchan Laongmanee, Lecturer of the Faculty of Marine Technology, Burapha University, Chanthaburi Campus	Committee
10. Asst. Prof. Dr. Amonsak Sawusdee, Head of the Natural Resources and Environmental Technology Program, Walailak University	Committee
11. Director of Geo-informatics Applications and Service Office, Geo-Informatics and Space Technology Development Agency (Public Organization)	Committee

12. . Mr. Weerachai Phetsut, Instructor of Science Program in Fisheries, Maejo University at Chumphon	Committee
13. Technical Officer from Southeast Asian Fisheries Development Center	Committee
14. Director of the Eastern Gulf Fisheries Research and Development Center (Rayong), Department of Fisheries	Committee and Secretary
15. Mr. Udom Khrueniam, Technical Officer of the Eastern Gulf Fisheries Research and Development Center (Rayong), Department of Fisheries	Committee and Assistant Secretary
16. Mr. Jirawut Kampirote, Technical Officer of the Central Gulf Fisheries Research and Development Center (Chumphon), Department of Fisheries	Committee and Assistant Secretary

Terms of Reference of Thailand's National Scientific and Technical Committee are:

1. Support data, evaluation, review, co-ordination, and advice, from a scientific and technical perspective, for the implementation of the Project entitled "Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand" in Thailand;
2. Provide the Thailand's National Fisheries Refugia Committee with technical guidance and suggestions;
3. Review technical information and progress reports from Site-Based Fisheries Refugia Management Boards regarding the purpose of the Project;
4. Facilitate co-operation with relevant organizations to enhance the comprehensive and accurate technical information for managing fisheries refugia; and
5. Take the other necessary technical actions for the effectiveness of Project implementation in Thailand.

This Notification shall be effective from now on.

Notified on 27th November B.E. 2561 (2018)

Signed Adisorn Promthep

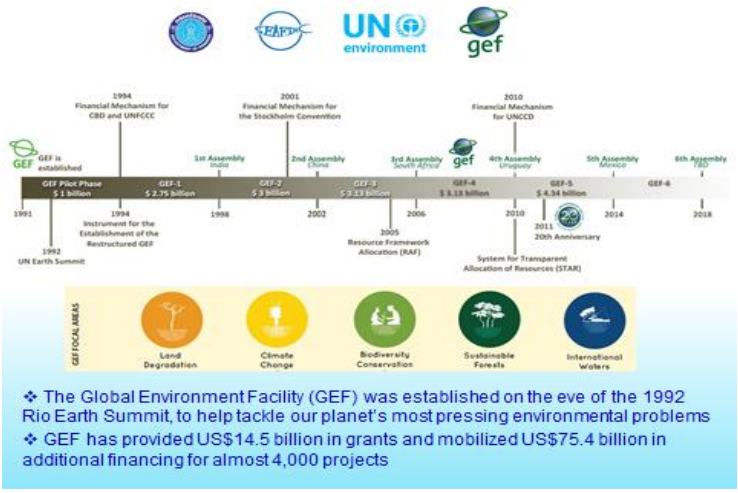
(Mr. Adisorn Promthep)

Director-General of the Department of Fisheries

ANNEX 4

OVERVIEW OF BACKGROUND OF THE PROJECT: ESTABLISHMENT AND OPERATION OF A REGIONAL SYSTEM OF FISHERIES REFUGIA IN THE SOUTH CHINA SEA AND GULF OF THAILAND

Overview
of
Fisheries Refugia
Project



- The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit, to help tackle our planet's most pressing environmental problems
- GEF has provided US$14.5 billion in grants and mobilized US$75.4 billion in additional financing for almost 4,000 projects

Review of Information Collated by the South China Sea Project on Links Between Fish Life-Cycle and Critical Habitats

- National Reports on Fisheries
- National Reports on Coral Reefs, Seagrass, Wetlands, Mangroves
- 142 Habitat Site Characterisations
- Habitat Demonstration Site Documents
- The South China Sea Meta-Database

ESTABLISHMENT AND OPERATION OF A REGIONAL SYSTEM OF FISHERIES *REFUGIA* IN THE SOUTH CHINA SEA AND GULF OF THAILAND

Participating Countries:

- Cambodia
- Indonesia
- Malaysia
- Philippines
- Thailand
- Viet Nam

Fisheries of the South China Sea

Fish stocks critically important for food security, income, and foreign exchange

↓

Fish production from SCS ≈ 10% of global production

↓

Most fish stocks fully-fished or over-fished

↓

Future landings will decline unless total effort reduced

↓

Difficult to reduce effort – high community dependence

Role of Fisheries Habitats in Sustaining Fisheries

SCS habitats play a critical role in sustaining fish stocks, food supply, and incomes


Mangroves


Coral Reefs


Seagrass


Wetlands

↕

Habitats are refuges for fish during critical stages of their life-cycles - e.g., as larvae, when spawning, and feeding

INTERNAL INFORMATION SESSION ON THE SEAFDEC/UNEP/GEF FISHERIES *REFUGIA* PROJECT


Ocean & Coastal Management

Status and trends in coastal habitats of the South China Sea

- Located at centre of the Indo-west Pacific biogeographic province (global & local significance)
- 11% of the world's total mangrove is found along the margins of the South China Sea (SCS)
- ~930,000 ha of coral reef in coastal waters of the SCS
- ~78,000 hectares seagrass (~1/3 of the 60 known seagrass species)
- Significant basin-wide and intra-country variation in the richness and extent of habitat building species
- Degradation and loss of habitats is a result of a multitude of persistent and emerging threats

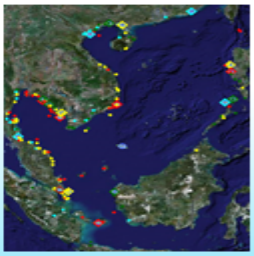
Loss of Fisheries Habitats of the South China Sea

Continued decline in the total area of habitats has raised serious concerns for sustainability of fisheries

Estimated Decadal Rates of Habitat Loss:

- Seagrass – 30%
- Mangroves – 16%
- Coral Reefs – 16%

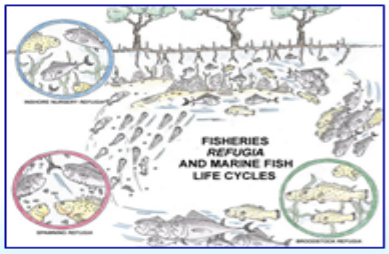
- **Fishing is a key factor in the continued loss of marine habitats and biodiversity in the South China Sea**



Development of the Fisheries *Refugia* Concept

Fisheries *Refugia*:

- Specific areas of significance to the life-cycle of fish species
- Should be defined in space and time
- Should NOT be no-take zones
- Serve to safeguard spawning aggregations, nursery grounds, and migration routes



Fisheries *Refugia* are "*Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical phases of their life-cycle, for their sustainable use.*"

Goal & Objectives

Longer-term goals of the fisheries refugia initiative: :
This project focus on **transformational change in how the fisheries and environment sectors work together**
Aim to contribute to:

- improved integration of habitat and biodiversity conservation considerations in the management of fisheries in the South China Sea and Gulf of Thailand
- improved national management of the threats to fish stock and critical habitat linkages within fisheries *refugia*; and,

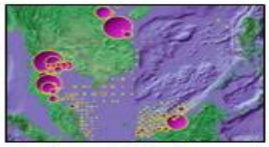
enhanced uptake of good practice in integrating fisheries management and biodiversity conservation in the design and implementation of regional and national fisheries management systems

The Specific Objectives:
"*to operate and expand the network of fisheries refugia in the South China Sea and Gulf of Thailand for the improved management of fisheries and critical marine habitats linkages*

Stakeholder Consultations on *Refugia* Concept

Intergovernmental Guidelines on *Refugia*

Technical Workshops on Mapping Known *Refugia*



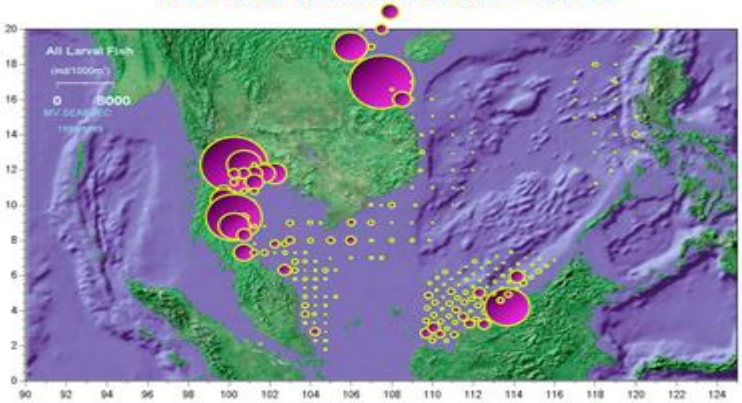
Review of Fish Egg and Larvae Data for *Refugia* Identification

Development of a Fisheries *Refugia* Information Portal

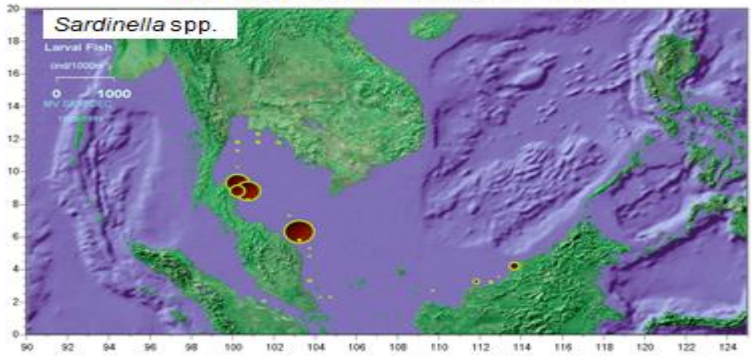
Conduct of Regional Training Events on *Refugia* Science and Management

Conduct of Country Consultations on the Identification and Establishment of Fisheries *Refugia* Sites

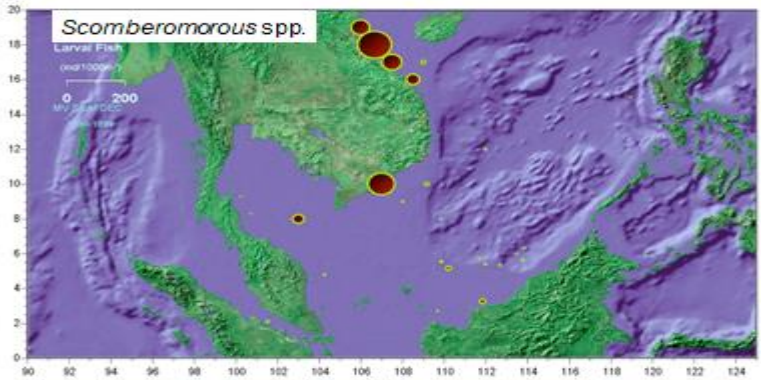
Review of Information Collected by SEAFDEC on Larval Fish Distribution and Abundance



Review of Information Collected by SEAFDEC on Larval Fish Distribution and Abundance



Review of Information Collected by SEAFDEC on Larval Fish Distribution and Abundance

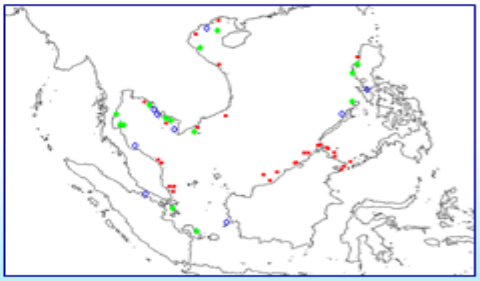


Identification of Fisheries *Refugia* Sites

52 known spawning and nursery areas identified

Site Information Collated:

- Site name
- Geographic location
- Species utilising the site (spawning/nursery)
- Time of year used

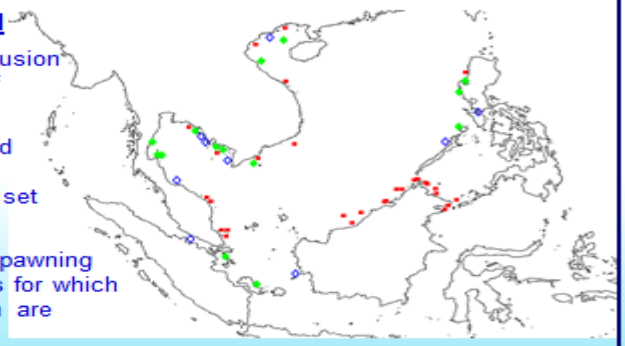


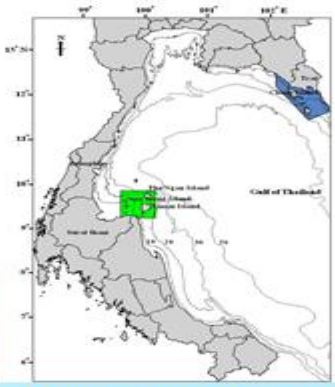
General need for more detailed information about species usage of sites to develop management measures

Identification of Fisheries *Refugia* Sites

Sites Identified

- 14 sites for inclusion in initial system of *refugia* (green)
- 9 sites accorded high priority for action once initial set established (blue)
- Additional 29 spawning and nursery areas for which further information are required (red)





Initially proposed Fisheries Refugia sites in Thailand

Global Environment Facility (GEF)

United Nations Environment Programme (UN Environment)
GEF Agency

Southeast Asian Fisheries Development Center (SEAFDEC)
Executing Partner

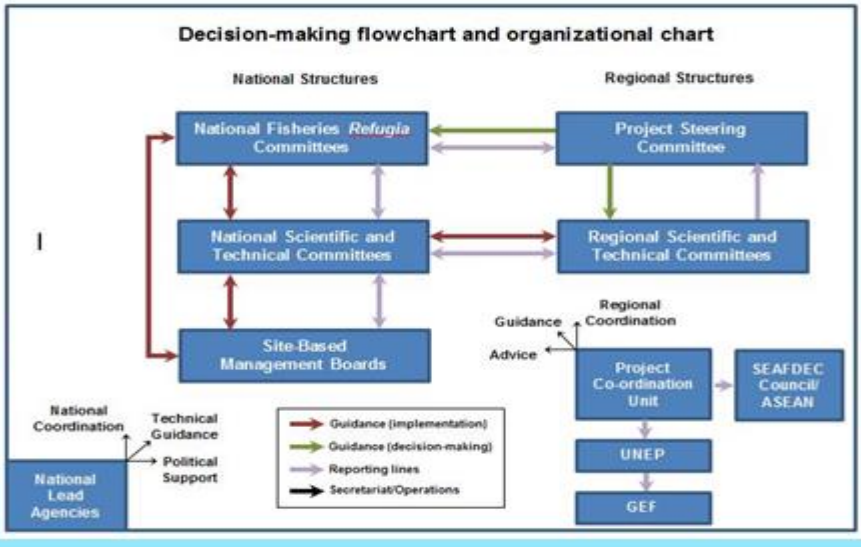
Department of Fisheries
Executing Partner

Development of a Regional System of Fisheries *Refugia*

Regional Actions
- Regional information and data management for *refugia* system
- Targeted demonstration activities
- Capacity development
- Supporting regional fisheries management
- Monitoring and evaluation

National Actions
- Enhancing national coordination
- Strengthening the enabling environment
- Building the national and site-level science and information base
- Planning operational management of *refugia*

Local Actions
- Establish local management boards
- Delineate *refugia* boundaries/formal designation of sites
- Identify fisheries management problems/solutions for *refugia* sites
- Establish regulations and monitoring



ANNEX 5

PROGRESS OF THE PROJECT IMPLEMENTATION

Regional Main Activities

2010: Project Identification Form (PIF) proposed

2013: Project approved

- Overall budget from GEF	3,000,000	US$
- Budget allocated for Thailand	248,000	US$
- Thailand co-finance	913,688	US$
Co-finance in kind	783,888	US$
Co-finance in cash	129,800	US$

2014, Jan: Regional Initiation Workshop for the Preparatory Phase of the SEAFDEC/UNEP/GEF/Project (in Thailand)

2014, Feb: Institutional Stakeholder Consutation Workshops (in each participating country)

Regional Main Activities

2014, May: Regional Validation Workshop for the Preparatory Phase of the SEAFDEC/UNEP/GEF/Project (in Indonesia)

2016, Nov: Regional Inception Workshop for the project: Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand (in Thailand)

2018, Sep: The First Regional Scientific and Technical Committee Meeting (in Thailand)

2018, Dec: The First Meeting of the Project Steering Committee

Thailand Main Activities

2017, Mar 31st: Letter of Agreement (LOA) between SEAFDEC and DOF signed

2017, Apr 5th: "Thailand's National Fisheries Refugia Committee" and Thailand's National Scientific and Technical Committee appointed

2017, Jun 21st: Budget transferred to DOF (39,210 US$)

2017, Jul: Kick off the Project implementation in Thailand

2017, Jul
Stakeholder Initiation Meeting at Samui Island, Surat Thani Province

- To survey for initial baseline data of small scale fisheries and fishermen in Samui Island

SEAFDEC/UNEP/GEF/Thailand/01
STAKEHOLDER INITIATION MEETING AT KOH SAMUI
ON 19-20 JULY 2017 IN SURAT THANI PROVINCE

2017, Aug
Stakeholder Initiation Meeting at Trat Province

- To introduce the Fisheries Refugia Project to the stakeholders from both public and private sectors
- To seek for the opinion of suitable key species and project site in the area
  - Indo-Pacific mackerel
  - Fourfinger threadfin (Pla Ku Rao)
  - White pomfret
  - Initially agreed for Chong Chang to be the Fisheries Refugia site
- To seek for the nomination of Site-Based Management Board

2017, Sep
Stakeholder Consultation Meeting at Trat Province

- To inform to the stakeholders from both public and private sectors the Notification of the Department of Fisheries on the Appointment of National Fisheries Refugia Committee and National Scientific and Technical Committee
- To consider the membership of Site-Based Management Board in Trat Province

2017, Sep
Stakeholder Consultation Meeting at Surat Thani Province

- To introduce the Fisheries Refugia Project to the stakeholders from both public and private sectors
- To inform to the stakeholder from both public and private sectors the Notification of the Department of Fisheries on the Appointment of National Fisheries Refugia Committee and National Scientific and Technical Committee
- To consider the membership of Site-Based Management Board in Surat Thani Province

2018, Feb
Stakeholder Consultation Workshop in Trat Province

- To introduce the Fisheries Refugia Project to the fishermen, local stakeholders, NGOs, and relevant public organizations
- To overview the marine fisheries resources and fisheries in Trat Province
- To discuss on the following items
  - Programs/projects/activities related to marine resource sustainable development in Trat Province
  - Priority fisheries and threats to the life cycles of important species
  - Stakeholder analysis
  - Collation of baseline information and data related to fish life cycles and criticle habitat linkage
  - Planning of socio-economic survey in fisheries refugia site
  - Communication and media

SEAFDEC/UNEP/GEF/Thailand/05
Stakeholder Consultation Workshop
Trat Province, Thailand, 27-28 February 2018

2018, Feb
Stakeholder Consultation Workshop in Trat Province

- To introduce the Fisheries Refugia Project to the fishermen, local stakeholders, NGOs, and relevant public organizations
- To overview the marine fisheries resources and fisheries in Trat Province
- To discuss on the following items
  - Programs/projects/activities related to marine resource sustainable development in Trat Province
  - Priority fisheries and threats to the life cycles of important species
  - Stakeholder analysis
  - Collation of baseline information and data related to fish life cycles and criticle habitat linkage
  - Planning of socio-economic survey in fisheries refugia site
  - Communication and media

SEAFDEC/UNEP/GEF/Thailand/05
Stakeholder Consultation Workshop
Trat Province, Thailand, 27-28 February 2018

2018, Feb
Stakeholder Consultation Workshop in Trat Province (cont.)






SEAFDEC/UNEP/GEF/Thailand/05
Stakeholder Consultation Workshop
Trat Province, Thailand, 27-28 February 2018

2018, Feb
Stakeholder Consultation Workshop in Trat Province (cont.)

Result of the workshop

- Programs/projects/activities related to marine resource sustainable development in Trat Province were provided
- Influence and interest of each stakeholder were analyzed
- Priority species were proposed as follows:
  - **Blue swimming crab**
  - **Mantis shrimp**
  - **Indo-Pacific mackerel**
  - **Banana shrimp**
  - **Indian squid**
  - **Bigfin reef squid**
  - **Horseshoe crab**

SEAFDEC/UNEP/GEF/Thailand/05
Stakeholder Consultation Workshop
Trat Province, Thailand, 27-28 February 2018

2018, Apr
Stakeholder Consultation Workshop in Samui Island, Surat Thani Province

- To introduce the Fisheries Refugia Project to the fishermen, local stakeholders, NGOs, and relevant public organizations
- To overview the marine fisheries resources and fisheries in Samui Island
- To discuss on the following items
  - Programs/projects/activities related to marine resource sustainable development in Samui Island
  - Priority fisheries and threats to the life cycles of important species
  - Stakeholder analysis
  - Collation of baseline information and data related to fish life cycles and criticle habitat linkage
  - Planning of socio-economic survey in fisheries refugia site
  - Communication and media

SEAFDEC/UNEP/GEF/Thailand/06
Stakeholder Consultation Workshop
Samui Island, Surat Thani Province, Thailand, 25-26 April 2018

2018, Feb
Stakeholder Consultation Workshop in Samui Island (cont.)






SEAFDEC/UNEP/GEF/Thailand/06
Stakeholder Consultation Workshop
Samui Island, Surat Thani Province, Thailand, 25-26 April 2018

2018, Feb
Stakeholder Consultation Workshop in Samui Island (cont.)

Result of the workshop

- Programs/projects/activities related to marine resource sustainable development in Samui Island were provided
- Influence and interest of each stakeholder were analyzed
- Priority species were proposed as follows:
  - **Blue swimming crab**
  - **Shrimp**
  - **Indo-Pacific mackerel**
  - **Giant sea catfish (Pla Riew Kiew)**
  - **Talang queenfish (Pla Sara)**
  - **Barracuda (Pla Sark)**
  - **Spanish mackerel**
  - **White pomfret**
  - **Sea turtle, Dolphin, Giant clam, Sea cucumber**

SEAFDEC/UNEP/GEF/Thailand/06
Stakeholder Consultation Workshop
Samui Island, Surat Thani Province, Thailand, 25-26 April 2018

2018, Aug
The First Meetings of NFRC and NSTC in Bangkok

- To overview background of Fisheries Refugia Project to the National Fisheries Refugia Committee, and the National Scientific and Technical Committee
- To introduce to the Committees the memberships of "National Fisheries Refugia Committee", "National Scientific and Technical Committee", and "Site-Based Management Boards"
- To report to the Committees the following items:
  - Work plan and budget
  - Preliminary implementation
  - Priority fisheries species
  - Baseline information to be collected

SEAFDEC/UNEP/GEF/Thailand/07
The First Meetings of Thailand National Fisheries Refugia Committee and Thailand Scientific and Technical Committee 22 August 2018, Bangkok, Thailand

2018, Aug
The First Meetings of NFRC and NSTC in Bangkok (cont.)

Resolution of the meeting

- Intensive scientific and technical information are to be well-prepared under National Scientific and Technical Committee consultation for accurate-defined areas prior to the next proceeding
- The committee members are to be defined by their positions unless any members' names are necessary. Lists of members and TORs of all the Committees are to be amended and proposed to the next meeting for consideration
- Priority/target species are to be considered and defined via National Scientific and Technical Committee consultation on the basis of area-based scientific information
- Data collection is to be scoped on the basis of Project objectives and work plan which would be the key factors for Project achievement

SEAFDEC/UNEP/GEF/Thailand/07
The First Meetings of Thailand National Fisheries Refugia Committee and Thailand Scientific and Technical Committee 22 August 2018, Bangkok, Thailand

2018, Oct
Consultation Meeting for Project Implementation at DOF

- To prepare some inputs for the 2nd National Fisheries Refugia Committee (NFRC) meeting including:
  - Priority species and actual sites for Project implementation
  - Memberships and terms of reference (TOR) of Project committees
  - Meeting allowances and travel expenses for committee members

SEAFDEC/UNEP/GEF/Thailand/08
Consultation Meeting of the Project Implementation
5th October 2018, Bangkok, Thailand

2018, Oct
Consultation Meeting for Project Implementation at DOF (cont.)

Resolution of the meeting

- Priority species and Project sites
  - Trat Province:
    - Priority species: Indo-Pacific mackerel
    - Project site: Trat Bay to Thai-Cambodia border at Khlong Yai District
  - Surat Thani Province
    - Priority species: Blue swimming crab
    - Project site: Ban Don Bay

SEAFDEC/UNEP/GEF/Thailand/08
Consultation Meeting of the Project Implementation
5th October 2018, Bangkok, Thailand

2018, Oct
Consultation Meeting for Project Implementation at DOF (cont.)

Resolution of the meeting (cont.)

- NFRC is chaired by Director General of the Department of Fisheries and composes of the senior executive representatives from the following organization:
  - Department of Fisheries
  - Department of Marine and Coastal Resources
  - Kasetsart University
  - GISTDA
- NSTC is chaired by Senior Expert in Fisheries Management of the Department of Fisheries and composes of the of senior technical representatives from the following organization:
  - Department of Fisheries
  - Department of Marine and Coastal Resources
  - Kasetsart U., Burapha U., Walailak U.

SEAFDEC/UNEP/GEF/Thailand/08
Consultation Meeting of the Project Implementation
5th October 2018, Bangkok, Thailand

2018, Oct
The Second Meetings of NFRC in Bangkok

- To propose **Indo-Pacific mackerel** to be the priority species in Trat Province and **blue swimming crab** to be the priority species in Surat Thani Province
- To propose the revised memberships and TORs of NFRC and NSTC for consideration
- To propose quarterly progress report, expenditure report, costed work plan, and cash advance request for approval

SEAFDEC/UNEP/GEF/Thailand/09
The Second Meetings of Thailand National Fisheries Refugia Committee
10th October 2018, Bangkok, Thailand

2018, Oct
The Second Meetings of NFRC in Bangkok (cont.)

Resolution of the meeting

- Priority fisheries species and project sites are to be considered and defined by National Scientific and Technical Committee
- 1) Senior Expert in Resources and Environmental Research in Marine and Coastal Ecosystem, Department of Marine and Coastal Resources, and 2) representative from Project Coordinating Unit, are to be added as the members of **National Fisheries Refugia Committee**
- 1) Senior Expert in Resources and Environmental Research in Marine and Coastal Ecosystem, Department of Marine and Coastal Resources, 2) Lecturer from Mae Joe University, Chumphon Campus, 3) Representative from GISTDA, and 4) Researcher from SEAFDEC are to be added as the members of **National Scientific and Technical Committee**
- quarterly progress report, expenditure report, costed work plan, and cash advance request are approved

SEAFDEC/UNEP/GEF/Thailand/09
The Second Meetings of Thailand National Fisheries Refugia Committee
10th October 2018, Bangkok, Thailand

2018, Nov
Consultation Meeting for Project Implementation at DOF

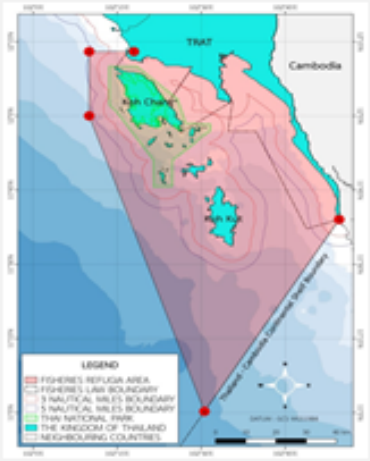
- to discuss on technical information available for defining priority species and fisheries refugia sites in Trat and Surat Thani Provinces

SEAFDEC/UNEP/GEF/Thailand/10
Consultation Meeting of the Project Implementation
13rd November 2018, Bangkok, Thailand

2018, Nov
Consultation Meeting for Project Implementation at DOF (cont.)

Resolution of the meeting

- Priority species and Project site in Trat Province:



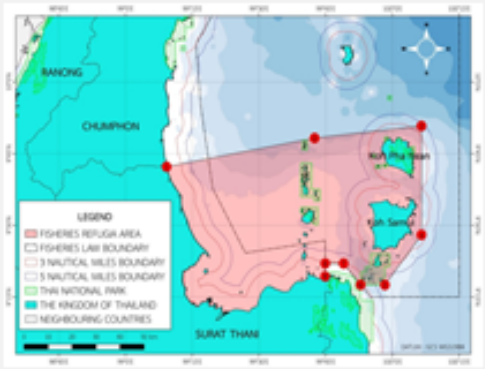
- Priority species: Indo-Pacific mackerel

- Project site: the coastal area of Trat Province, including Chang and Kud Islands

2018, Nov
Consultation Meeting for Project Implementation at DOF (cont.)

Resolution of the meeting

- Priority species and Project site in Surat Thani Province:
  - Priority species: Blue swimming crab



- Project site:
  coastal area of Surat Thani Province, including Samui and Pha Ngan Islands

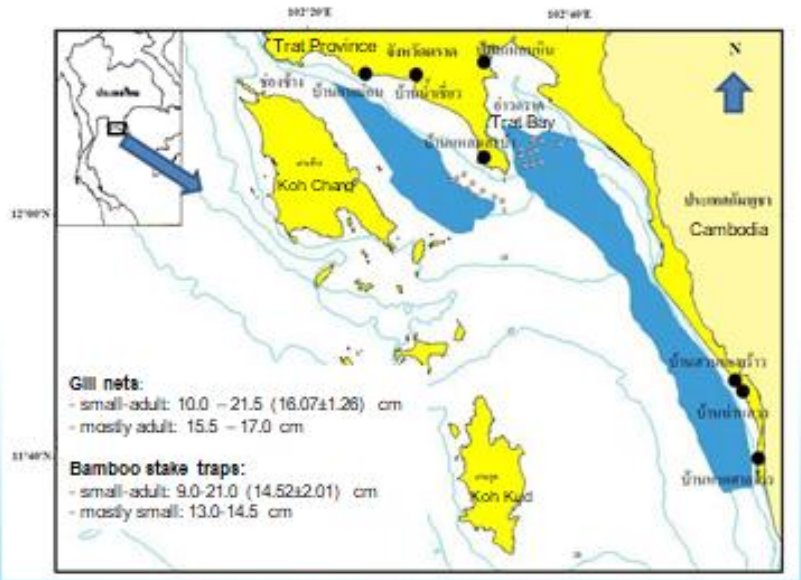
SEAFDEC/UNEP/GEF/Thailand/10
Consultation Meeting of the Project Implementation
13rd November 2018, Bangkok, Thailand

ANNEX 6

TECHNICAL INFORMATION OF INDO-PACIFIC MACKEREL RESOURCE AND FISHERIES IN TRAT PROVINCE

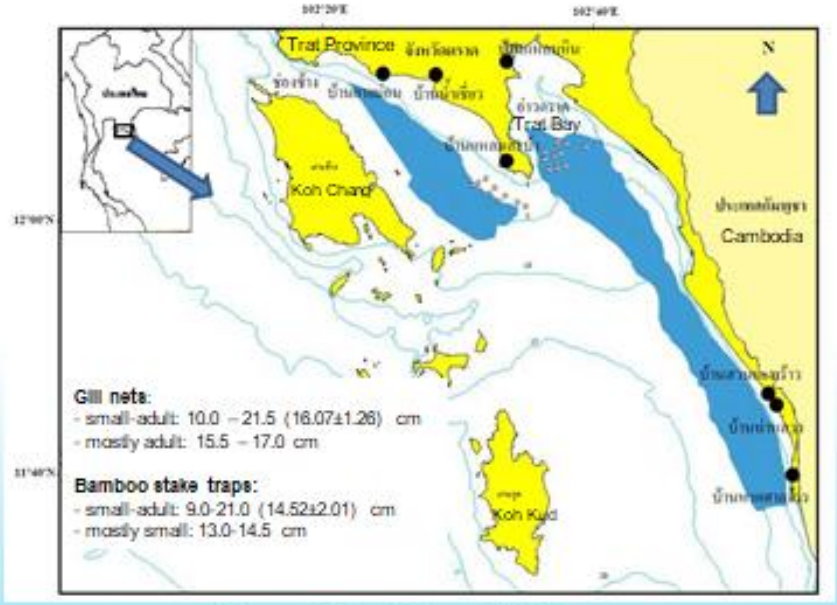
Some Information of Indo–Pacific Mackerel Resources & Fisheries in Trat Province

Indo–Pacific Mackerel from small-scale fisheries in Trat Province in 2007– 2008



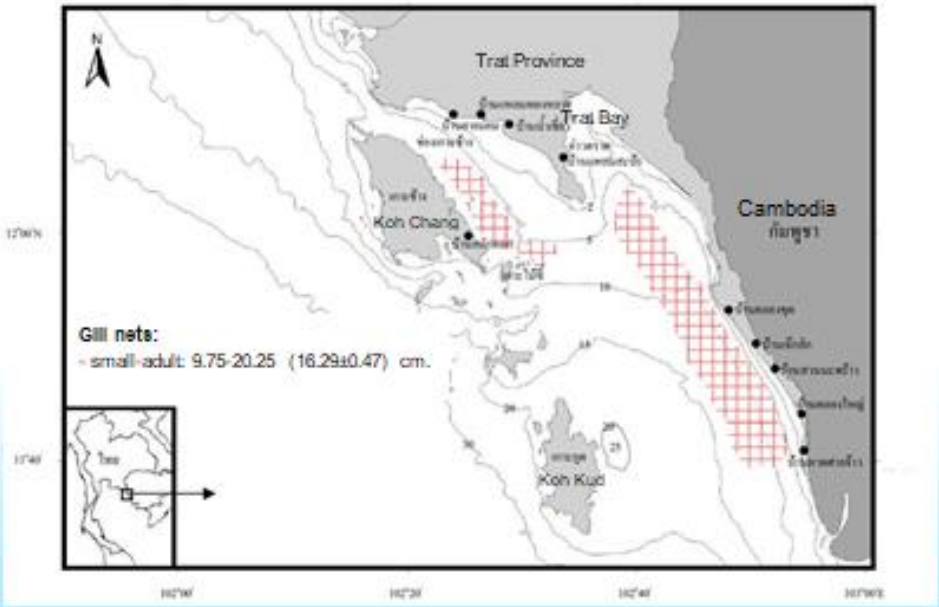
Source: Siri and Srikum (2012)

Indo–Pacific Mackerel from small-scale fisheries in Trat Province in 2007– 2008



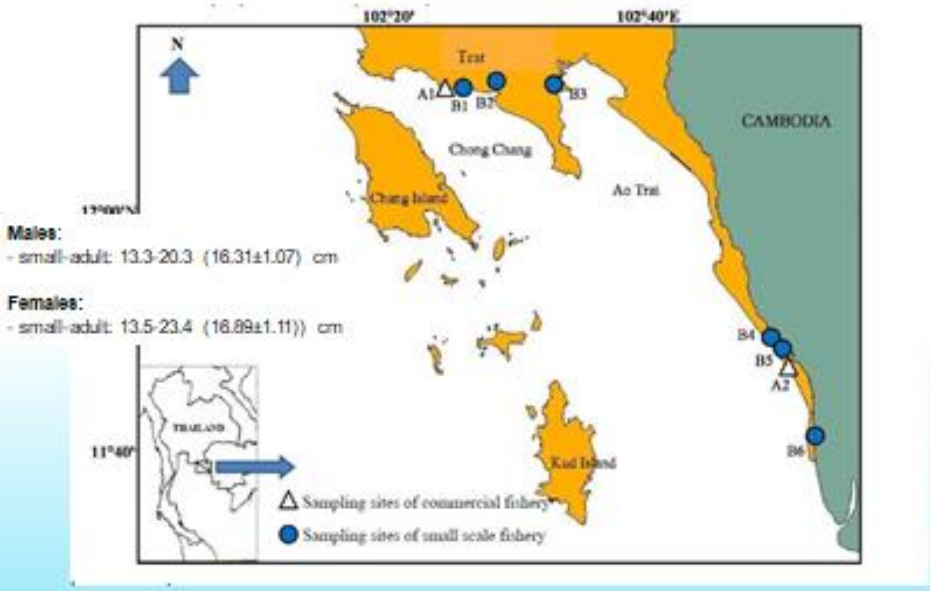
Source: Siri and Srikum (2012)

Indo-Pacific mackerel from gill nets in Trat Province in 2009



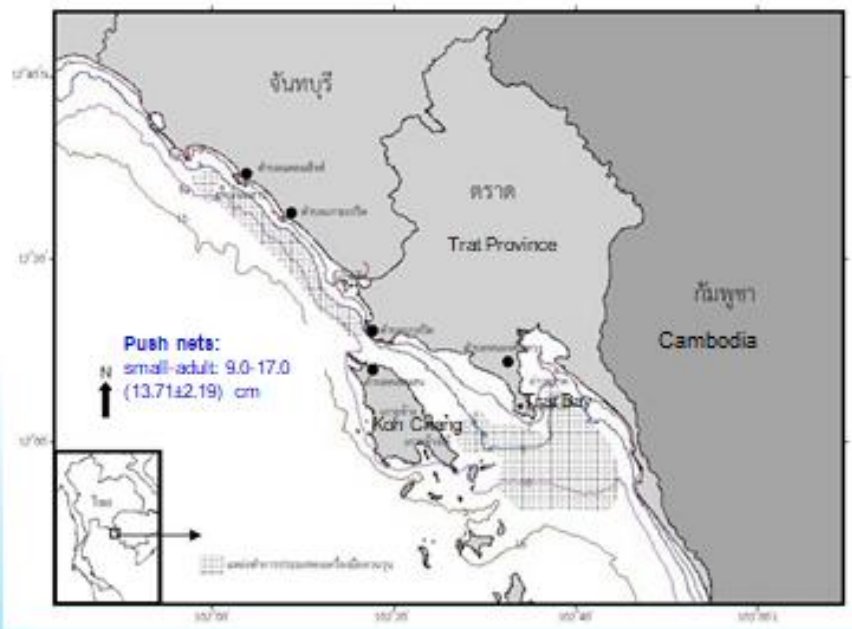
Source: Suksumran, Siri, and Tunvilai (2009)

Indo–Pacific Mackerel from small-scale and commercial fisheries in Trat Province in 2009



Source: Khrueniam, Charoensombat, Yangphonkhan, and Munprasit (2009)

Indo-Pacific mackerel from push nets in Trat Province in 2010



Source: Suksumran and Thongsila (2015)

References:

Khrueniam, U. and Chareonsombat, B. 2012. Maturation of Indo-Pacific mackerel (*Rastrelliger brchysoma* (Bleeker, 1851)) along the coast of Trat Province. Technical paper No. 9/2012. Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives. 16 pp.

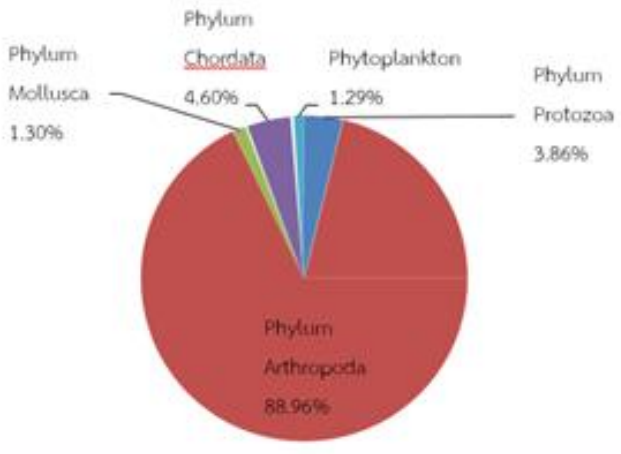
Khrueniam, U., Chareonsombat, B., Yangphonkhan, B., and Munprasit, R. 2013. Some biology of Indo-Pacific mackerel (*Rastrelliger brchysoma* (Bleeker, 1851)) and Indian mackerel (*R. kanagurta* (Cuvier, 1816)) in Trat Province, 2009. Technical paper No. 3/2012. Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives. 17 pp.

Siri, J. and Srikum, T. 2012. Indo-Pacific mackerel resource from small scale fisheries in Trat Province. Technical paper No. 22/2012. Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives. 24 pp.

Suksumran, N., Siri, J., and Tunvilai, R. 2013. Important small-scale fisheries around Trat Province in 2009. Extension paper No. 2/2013. Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives. 27 pp.

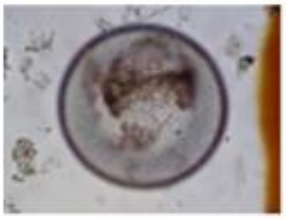
Suksumran, N. and Thongsila, K. 2015. Push net fisheries in the eastern gulf of Thailand. Technical paper No. 11/2015. Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives. 29 pp.

Stomach Content Analysis of Indo-Pacific Mackerel in the Inner Gulf of Thailand



Source: Saikliang, Pinputtasin, Chamason, and Kaewmun (in print)

Phytoplankton



Coscinodiscus radiatus

Cyclotella sp.

Thalassiosira sp.

Thalassionema frauenfeldii

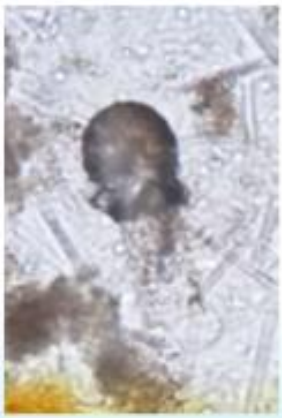
Thalassionema nitzschioides

Source: Saikliang, Pinputtasin, Chamason, and Kaewmun (in print)

Zooplankton

Unidentified Copepods 2

Euterpina sp.

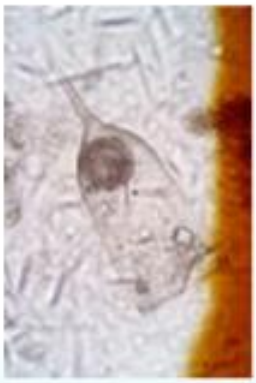


Codonellopsis ostenfeldii

Source: Saikliang, Pinputtasin, Chamason, and Kaewmun (in print)

Zooplankton

Rhabdonella spiralis



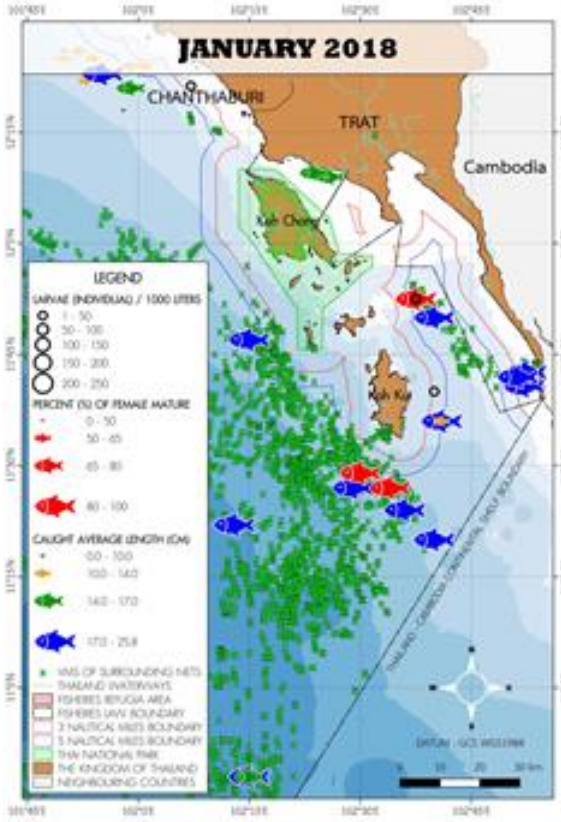
Favella panamensis

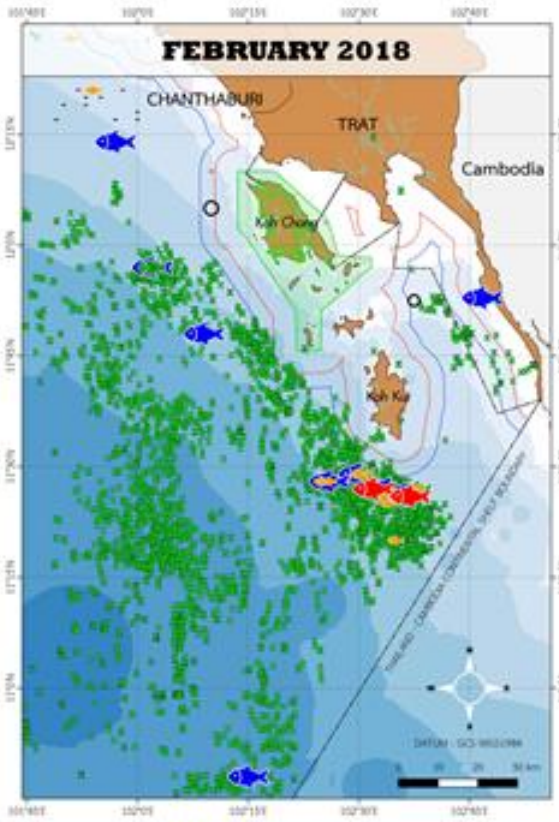
Corycaeus sp.

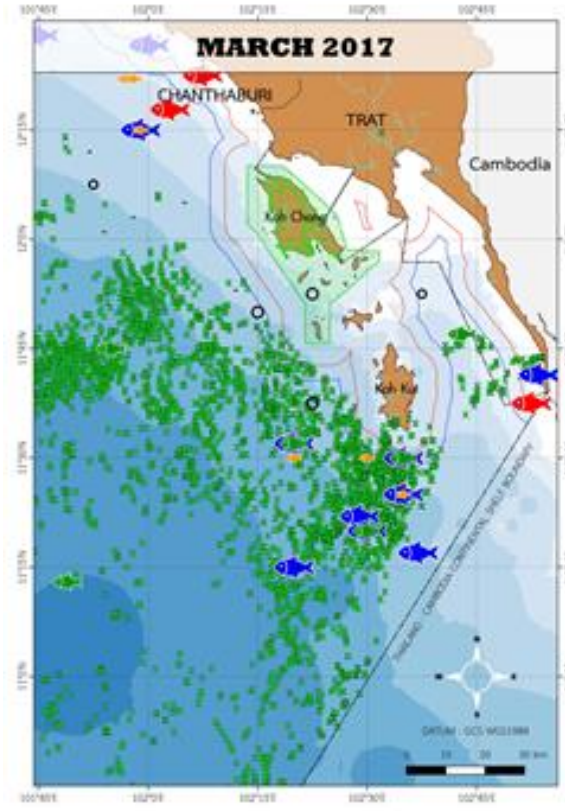
Source: Saikliang, Pinputtasin, Chamason, and Kaewmun (in print)

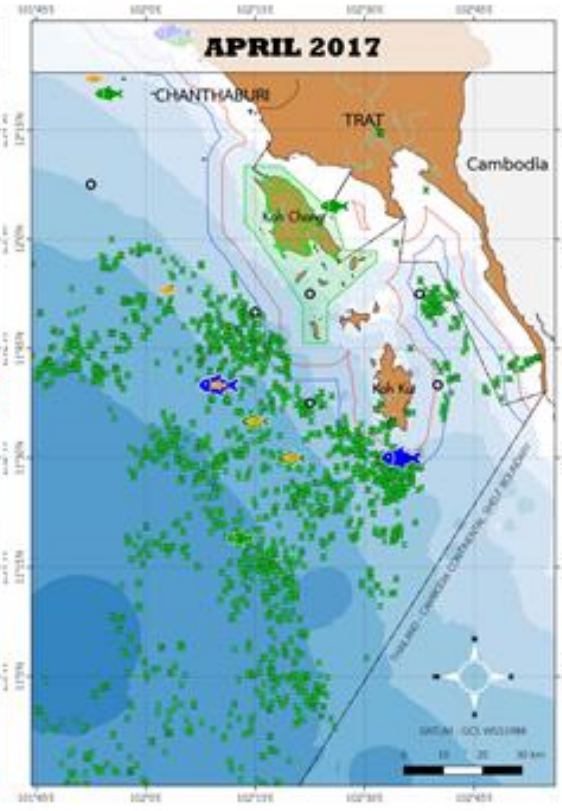
Fish

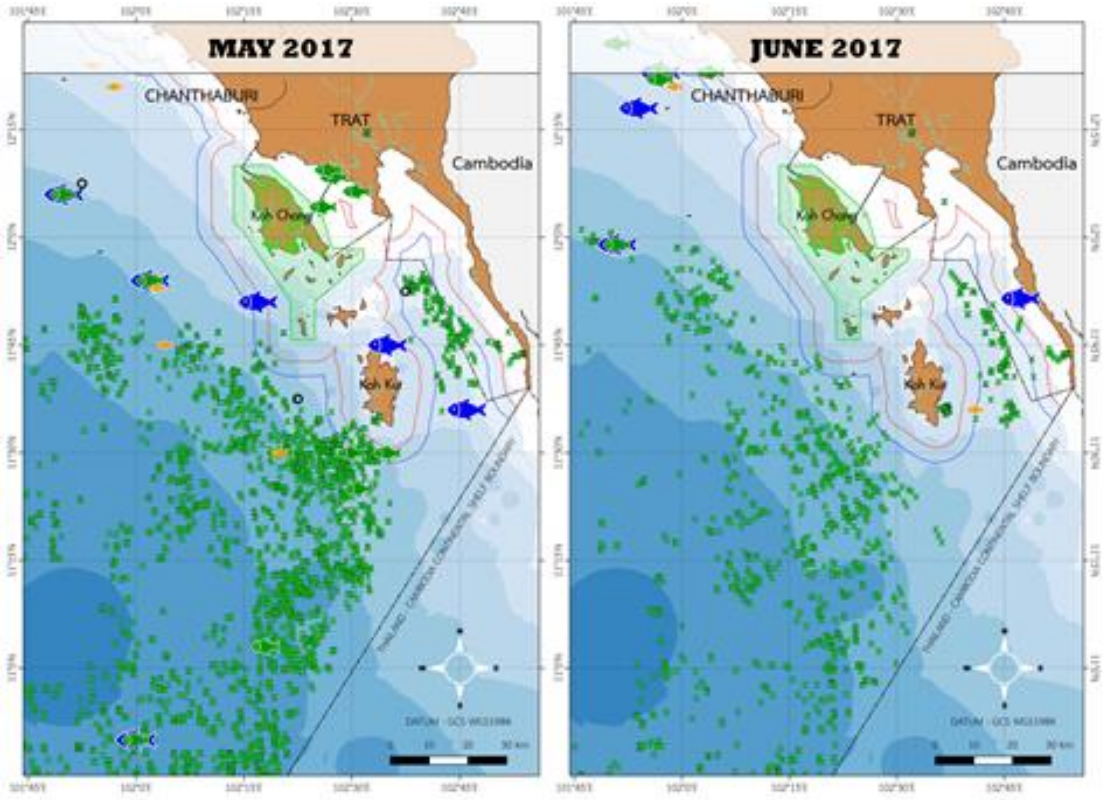
Source: Saikliang, Pinputtasin, Chamason, and Kaewmun (in print)


JANUARY 2018
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut
LEGEND

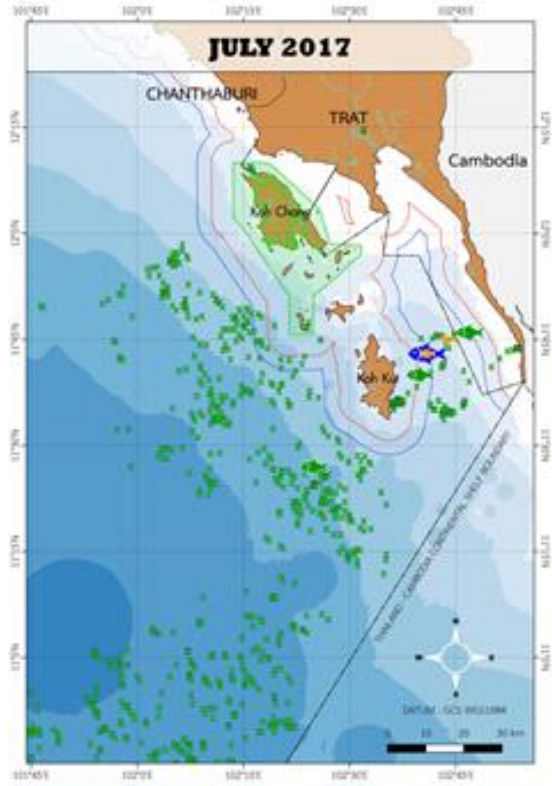

FEBRUARY 2018
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut

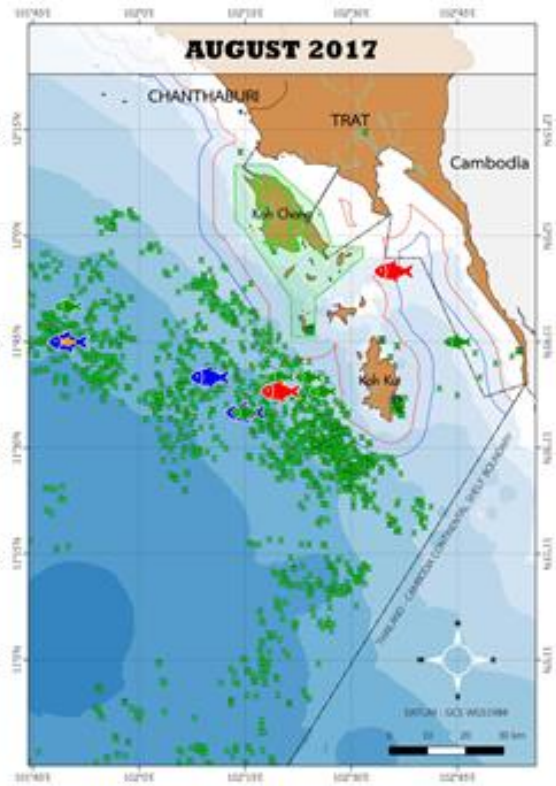

MARCH 2017
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut

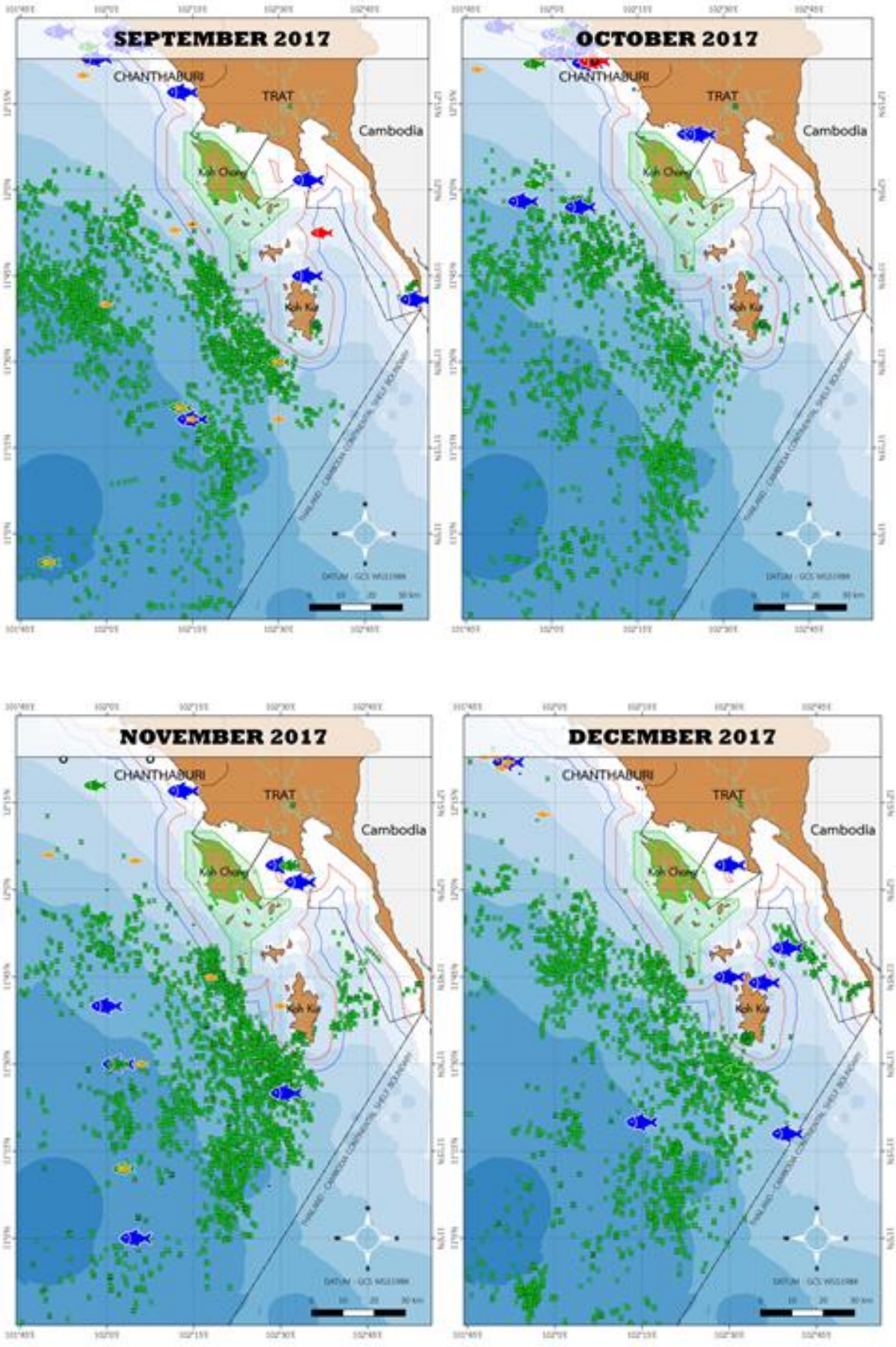

APRIL 2017
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut


MAY 2017
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut

JUNE 2017
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut


JULY 2017
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut


AUGUST 2017
CHANTHABURI
TRAT
Cambodia
Koh Chang
Koh Kut


SEPTEMBER 2017
OCTOBER 2017
NOVEMBER 2017
DECEMBER 2017
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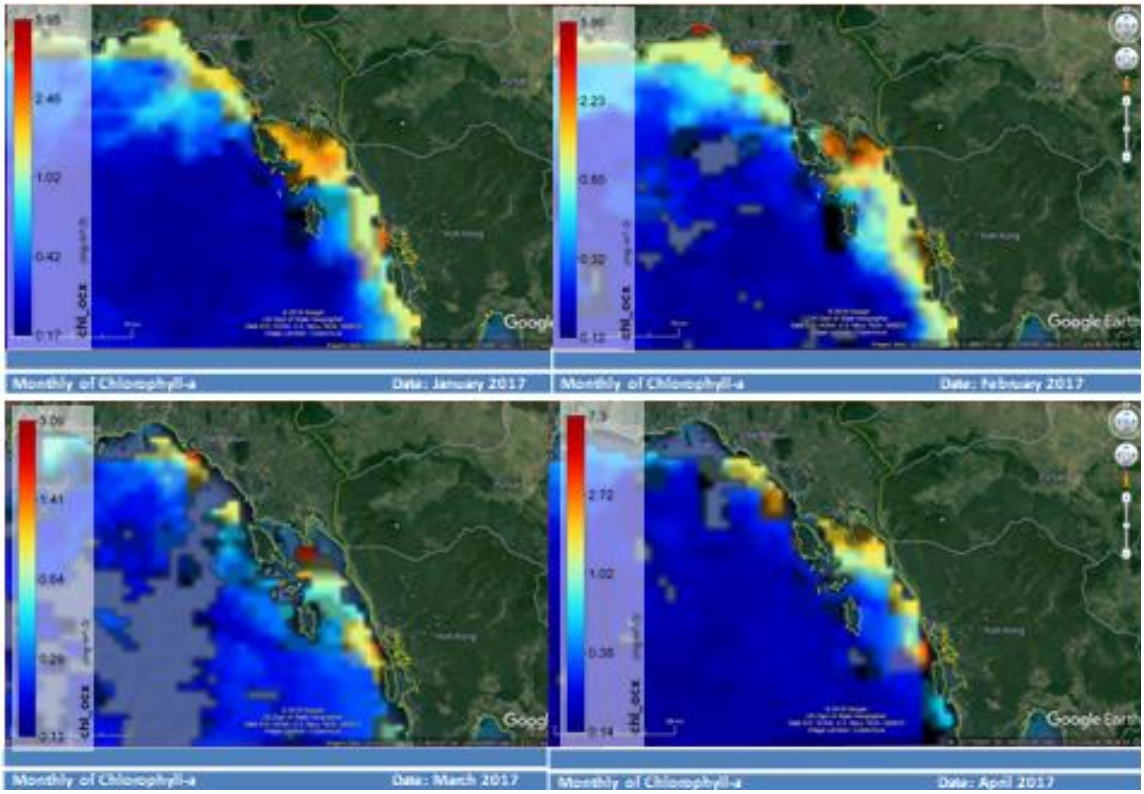
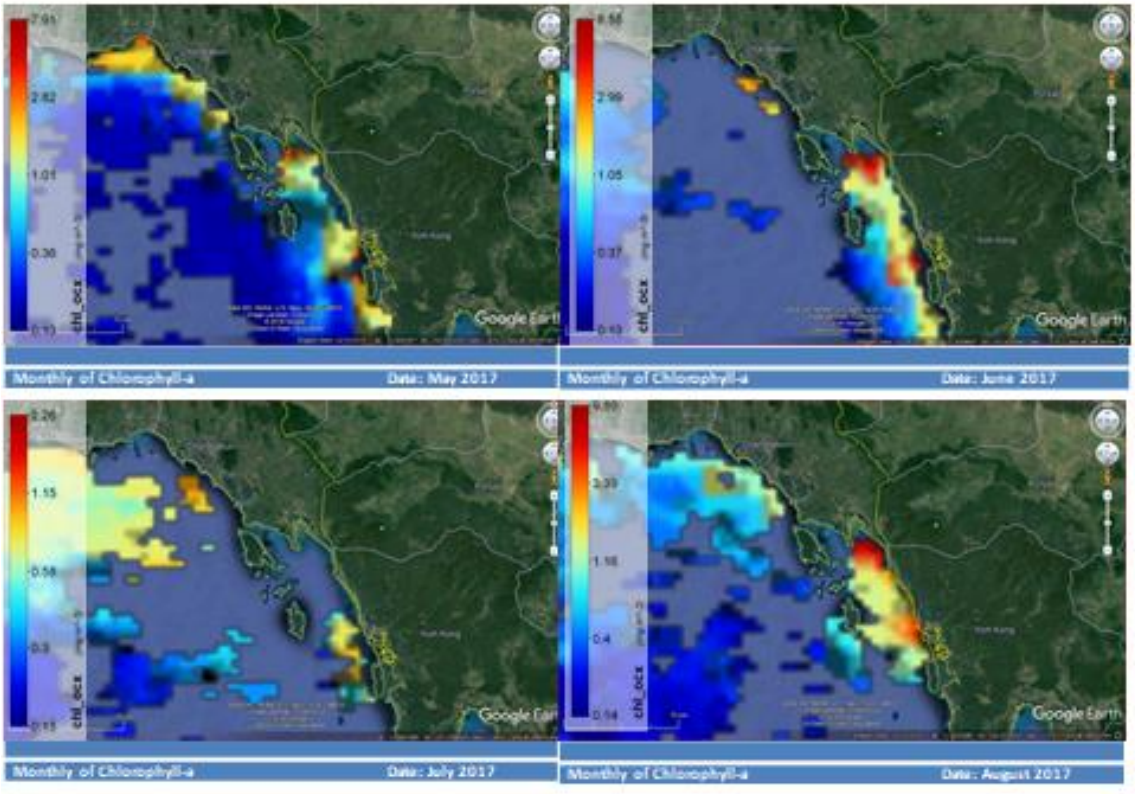
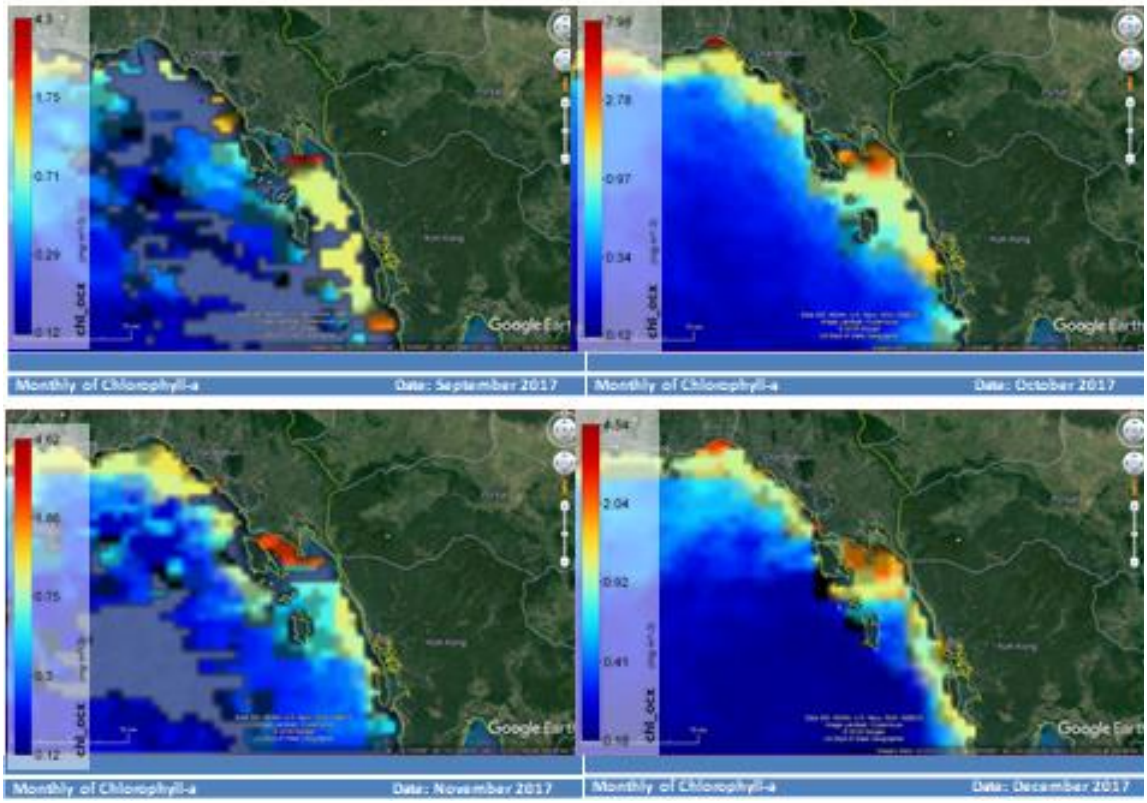
TRAT
Cambodia
Koh Chang
Koh Kut

ปริมาณคลอโรฟิลเอ






Monthly of Chlorophyll-a
Date: September 2017
Monthly of Chlorophyll-a
Date: October 2017
Monthly of Chlorophyll-a
Date: November 2017
Monthly of Chlorophyll-a
Date: December 2017

ANNEX 7

TECHNICAL INFORMATION OF BLUE SWIMMING CRAB RESOURCE, FISHERIES, AND ENVIRONMENT IN SURAT THAINI PROVINCE

Some Information of Blue Swimming Crab Resources, Fisheries, and Ecosystem in Surat Thani Province

General Information of Surat Thani Province

- Located at the east of the southern part of Thailand covering the area of the sea and islands in the Gulf of Thailand
- Area: 12,892 km^2
- Coastline: 156 km
- Islands: Koh Samui, Koh Pha-ngan, Koh Tao, and Mu Koh Ang Thong
- Living earned: agriculture, fisheries, vending, hotel and tourism

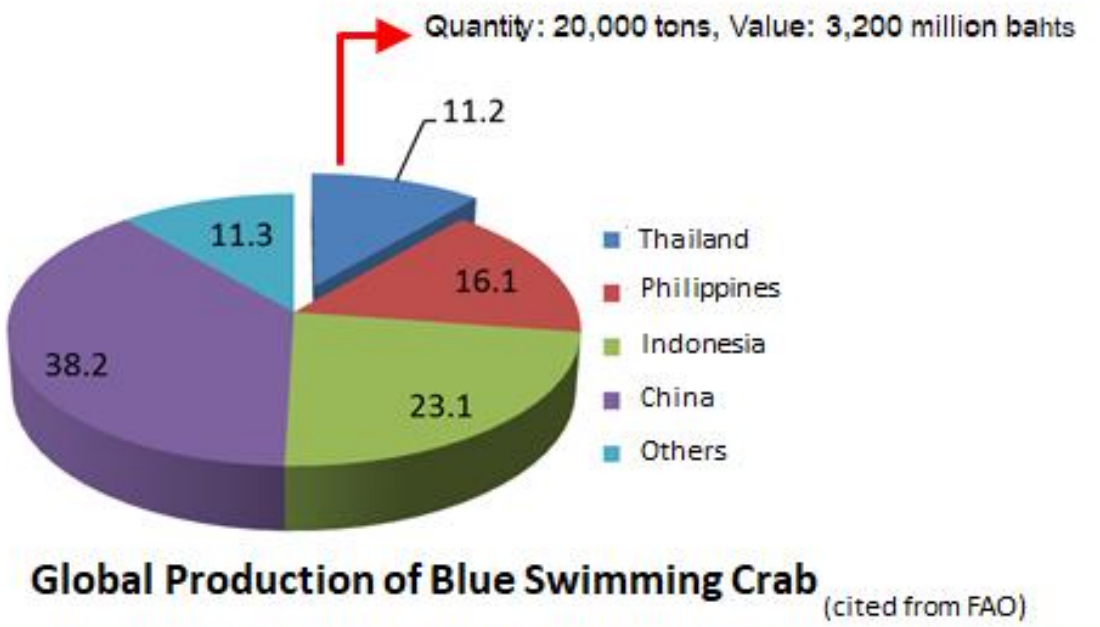
Blue Swimming Crab

Scientific Name: *Portunus pelagicus*, Linnaeus (1758)

Common Name: Blue Swimming Crab

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

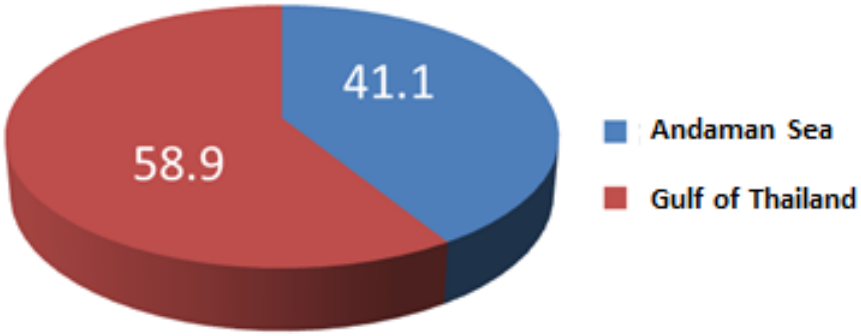
Production of Blue Swimming Crab



Global Production of Blue Swimming Crab (cited from FAO)

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Production of Blue Swimming Crab in Thailand

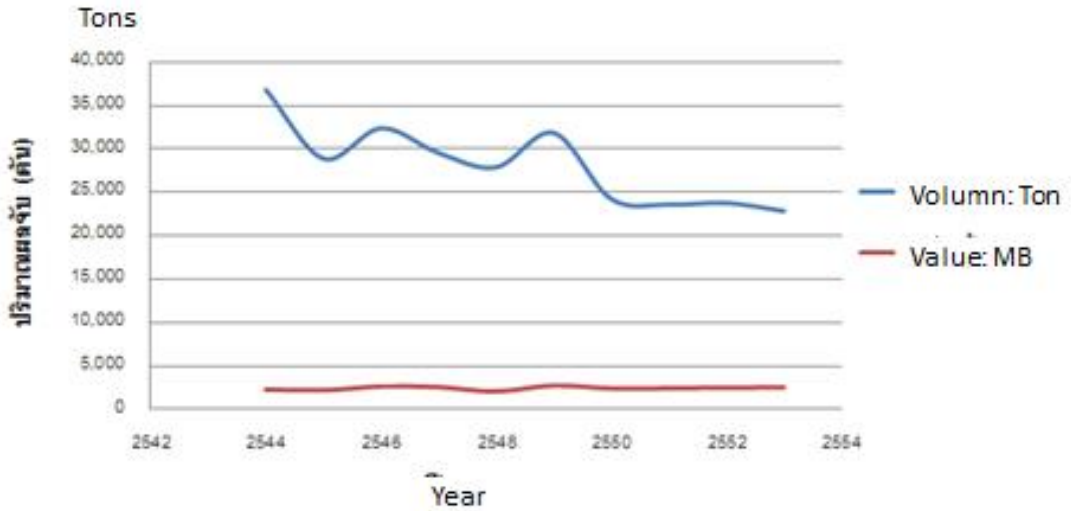


Production Ratio of Blue Swimming Crab in the Gulf of Thailand and Andaman Sea

(cited from FAO)

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Production of Blue Swimming Crab in Thailand During 2001-2010)



ภาพแสดงสภาวะผลจับปูม้าในประเทศไทยระหว่างปี พ.ศ. 2544-2553

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Fishing Gear for Blue Swimming Crab

Gill Net

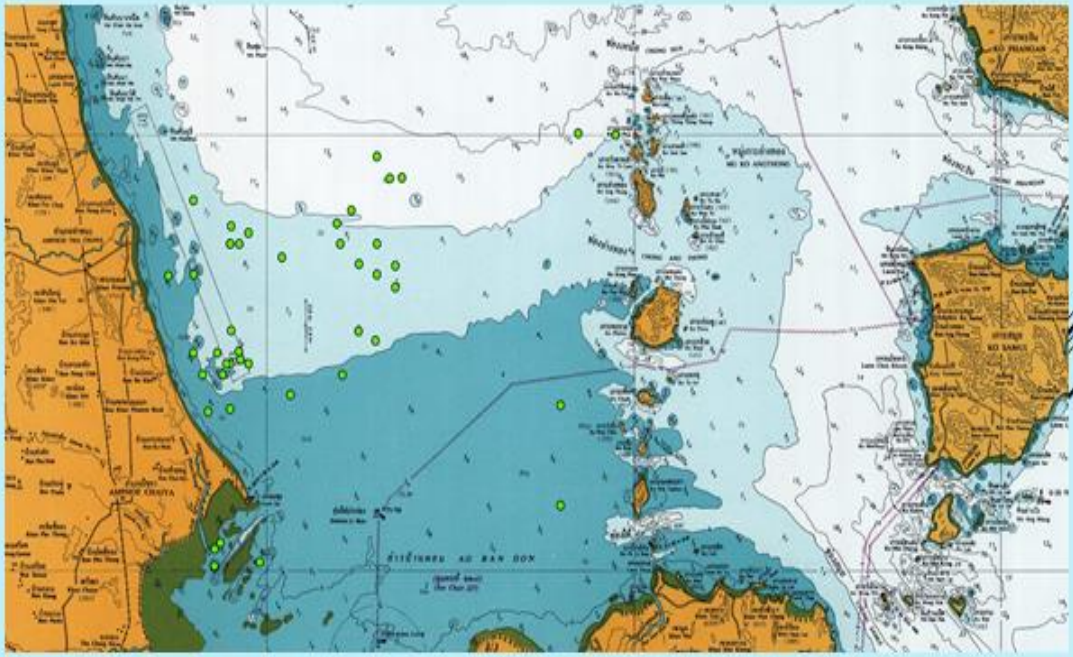
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Fishing Gear for Blue Swimming Crab

Collapsible Crab Trap

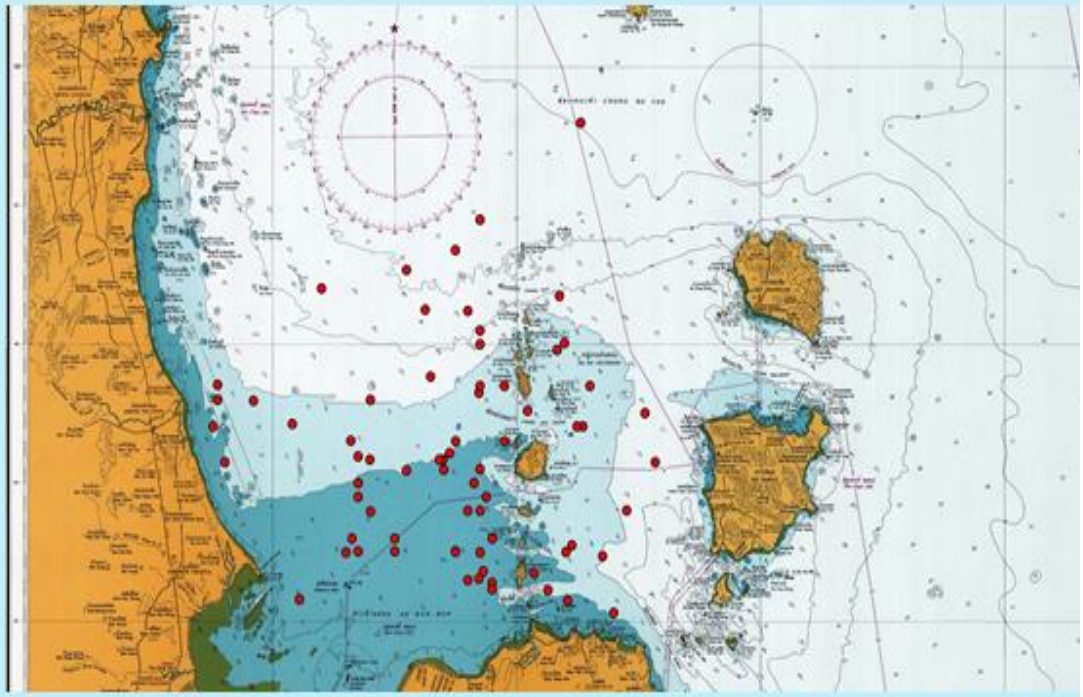
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Fishing Ground of Crab Gill Net Fisheries



Source: Middle Gulf Fisheries Research and Development Center (Chumphon)

Fishing Ground of Crab Trap Fisheries



Source: Middle Gulf Fisheries Research and Development Center (Chumphon)

Production of Blue Swimming Crab in Thailand

Size decreased

1987

Avg. Carapace length: 14 cm

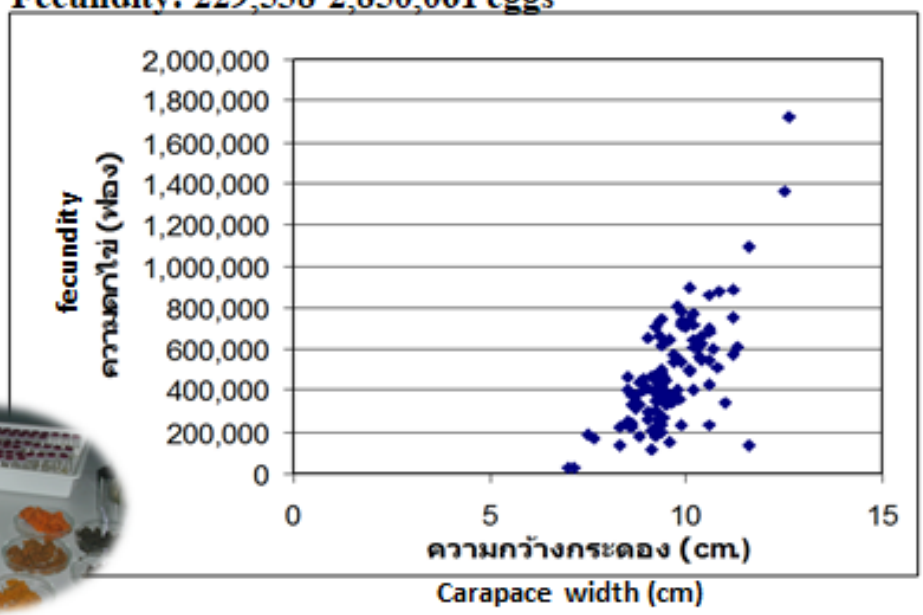
2007

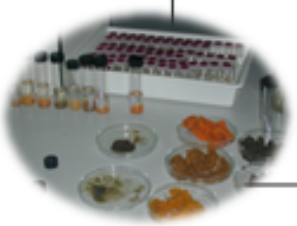
Avg. Carapace length: 8 cm

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Fecundity of Blue Swimming Crab

Fecundity: 229,538-2,850,061 eggs





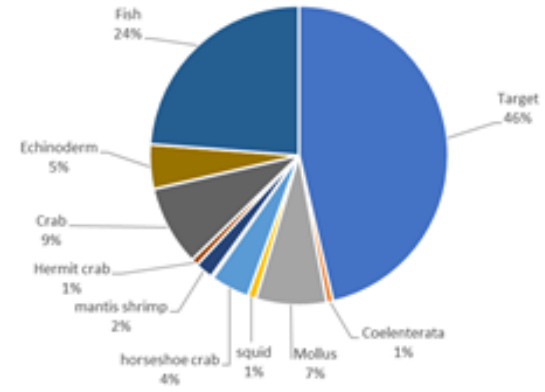
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

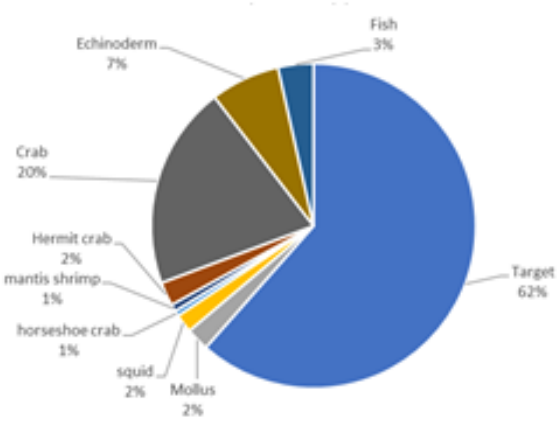
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Catch Composition by Weight

สัดส่วนองค์ประกอบชนิดเชิงน้ำหนักตัวจากเครื่องมืออวนและลอบ



Crab Gill Net



Crab Trap

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Landing Data

แบบบันทึกข้อมูลการประมงปูม้า

เพื่อประกอบการวางแผนพื้นฟูปูม้า บริเวณอ่าวบ้านดอน

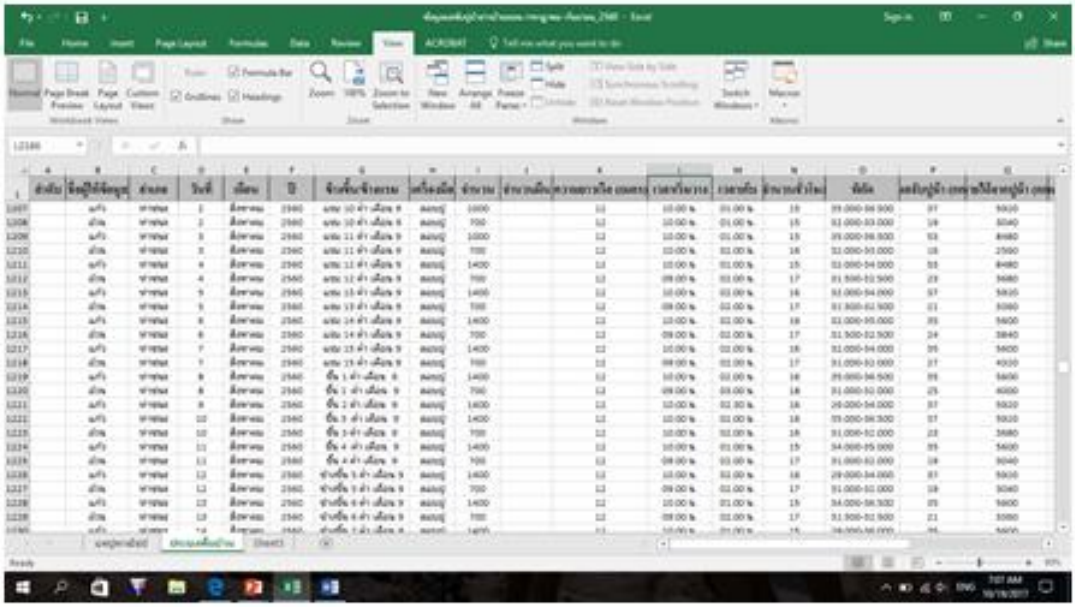
โดย ทีมนักวิจัย มหาวิทยาลัยวลัยลักษณ์ และคณะ

งานวิจัยที่ได้รับโจทย์พื้นที่ และชาวประมงมีส่วนร่วม

ร่วมแรงร่วมใจกันฟื้นฟูปูม้าอ่าวบ้านดอน

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

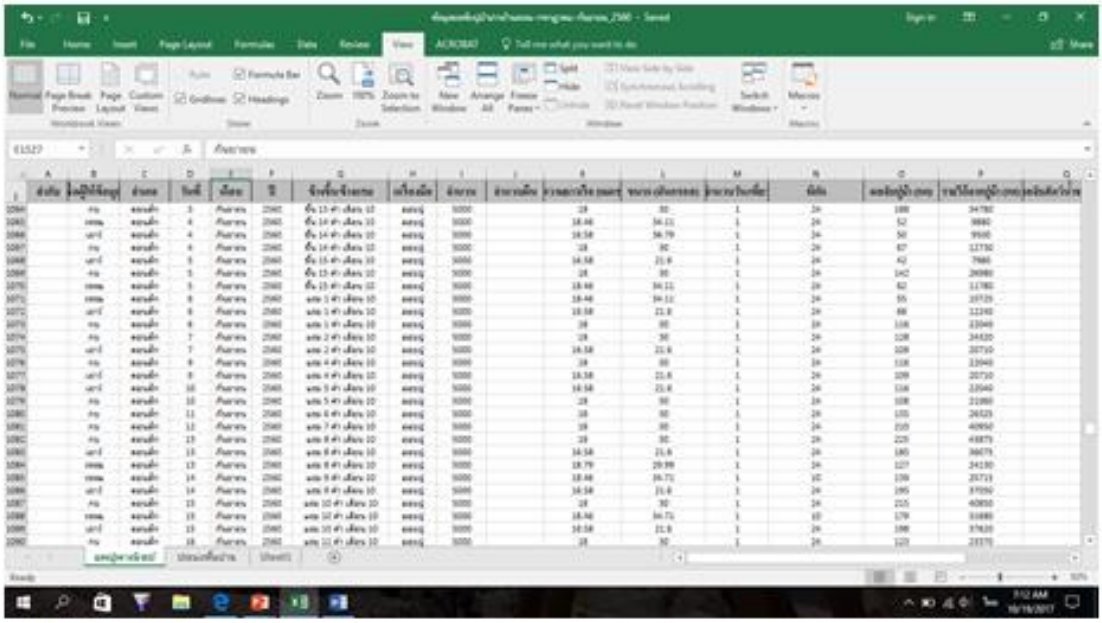
(Small Scale Landing)



2196 records

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Commercial Landing



1526 records

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Catch Composition (%) of Crab Gill Net Fisheries in Surat Thani Province in 2017

สัตว์น้ำ	ร้อยละองค์ประกอบสัตว์น้ำ									
	ก.พ. 60	มี.ค. 60	เม.ย. 60	พ.ค. 60	มิ.ย. 60	ก.ค. 60	ส.ค. 60	ก.ย. 60	ต.ค. 60	พ.ย. 60
กลุ่มกั้ง		0.25					0.64	1.68		
กลุ่มกุ้ง	0.59	0.07					0.10	0.13		
กลุ่มปลา	23.19	15.97		0.35		2.76	1.91	3.35		
กลุ่มปู										
- Portunus pelagicus	43.86	75.18	99.19	94.05	99.72	89.28	85.07	92.13	99.46	
- Charybdis feriatus	0.59	2.14	0.30	5.60		7.49				
- other crab		2.98	0.51		0.28		11.81	0.68	0.54	
กลุ่มหมึก						0.46	0.47	2.02		
กลุ่มหอย	2.08	3.41								
สัตว์น้ำอื่นๆ	29.69									
ผลรวม	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
อัตราการจับ (กก./ลาน 100 เมตร)	0.06	0.19	0.14	0.54	0.32	0.50	0.13	0.31	0.36	-

Source: Middle Gulf Fisheries Research and Development Center (Chumphon)

Catch Composition (%) of Crab Gill Net Fisheries in Surat Thani Province in 2018

สัตว์น้ำ	ร้อยละองค์ประกอบสัตว์น้ำ							
	ม.ค. 61	ก.พ. 61	มี.ค. 61	เม.ย. 61	พ.ค. 61	มิ.ย. 61	ก.ค. 61	ส.ค. 6
กลุ่มกั้ง	3.49	0.00	0.00	0.18	0.00	0.00	0.45	
กลุ่มกุ้ง	0.00	0.28	0.00	0.00	0.00	0.00	0.90	
กลุ่มปลา	36.51	4.30	0.00	0.00	0.00	0.00	11.96	
กลุ่มปู								
- Portunus pelagicus	53.81	92.15	97.94	98.14	98.40	98.67	84.81	9
- Charybdis feriatus	0.00	3.27	1.67	1.68	1.60	0.38	1.07	
- other crab	6.19	0.00	0.40	0.00	0.00	0.95	0.21	
กลุ่มหมึก	0.00	0.00	0.00	0.00	0.00	0.00	0.60	
กลุ่มหอย	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
สัตว์น้ำอื่นๆ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ผลรวม	100.00	100.00	100.00	100.00	100.00	100.00	100.00	1
อัตราการจับ (กก./ลาน 100 เมตร)	0.12	0.46	0.29	0.63	0.19	0.19	0.41	0.2

Source: Middle Gulf Fisheries Research and Development Center (Chumphon)

Catch Composition (%) of Crab Trap Fisheries in Surat Thani Province in 2017

สัตว์น้ำ	ร้อยละองค์ประกอบสัตว์น้ำ											
	ม.ค. 60	ก.พ. 60	มี.ค. 60	เม.ย. 60	พ.ค. 60	มิ.ย. 60	ก.ค. 60	ส.ค. 60	ก.ย. 60	ต.ค. 60	พ.ย. 60	ธ.ค. 60
กลุ่มกั้ง	0.00	0.83	0.00	0.00	0.28	0.00	0.00	0.00	4.06	0.00	0.00	0.70
กลุ่มปู												
Portunus pelagicus	93.00	87.73	62.86	84.16	91.19	73.84	94.89	100.00	79.90	90.13	91.35	77.96
Charybdis feriatus	6.42	9.84	25.16	15.68	8.50	4.90	3.88	0.00	4.85	0.01	1.38	7.30
other crab	0.58	0.99	11.98	0.16	0.02	21.25	0.00	0.00	11.19	9.86	7.27	13.68
กลุ่มหมึก	0.00	0.61	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.36
ผลรวม	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
อัตราการจับ (กก./ลอบ 10 ลูก)	0.145	0.190	0.285	0.162	0.450	0.233	0.256	0.361	0.263	0.284	0.239	0.198

Source: Middle Gulf Fisheries Research and Development Center (Chumphon)

Catch Composition (%) of Crab Trap Fisheries in Surat Thani Province in 2018

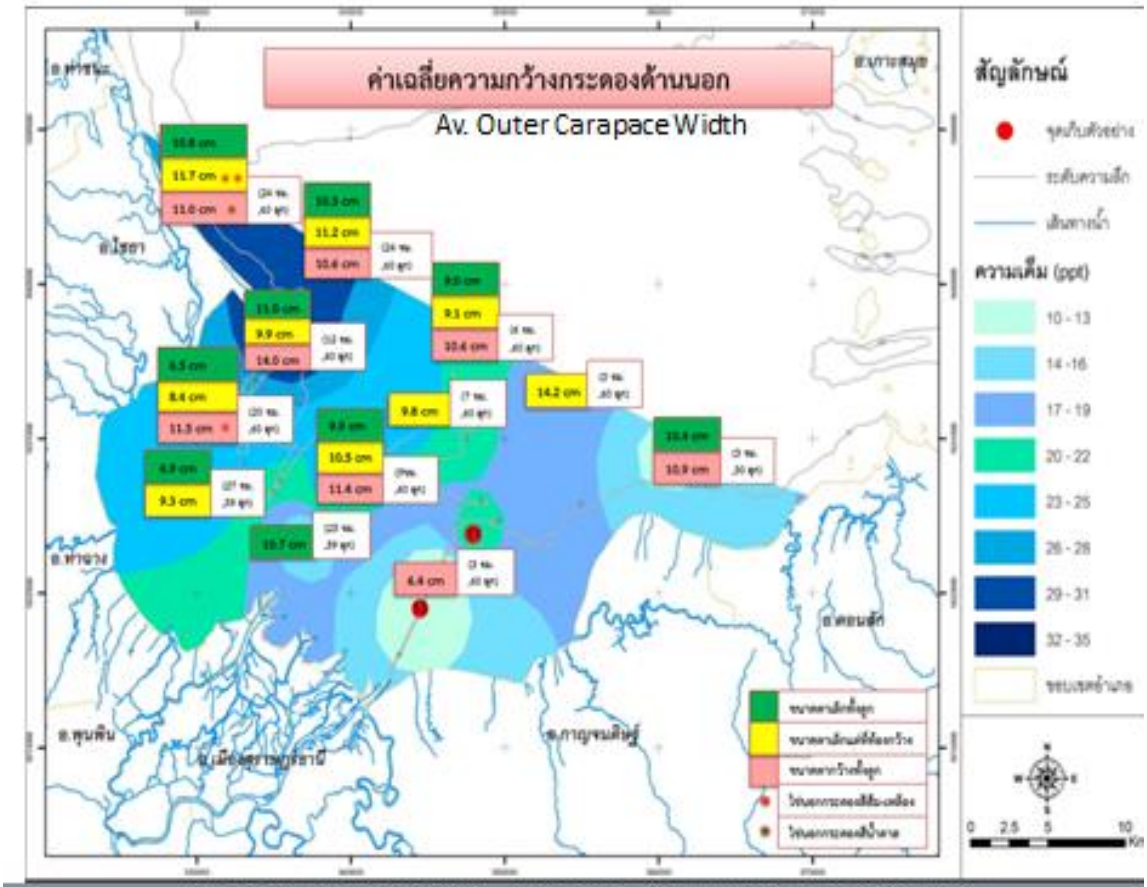
สัตว์น้ำ	ร้อยละองค์ประกอบสัตว์น้ำ							
	ม.ค. 61	ก.พ. 61	มี.ค. 61	เม.ย. 61	พ.ค. 61	มิ.ย. 61	ก.ค. 61	ส.ค. 61
กลุ่มกั้ง	0.00	0.83	0.00	0.00	0.28	0.00	0.00	0.00
กลุ่มปู								
Portunus pelagicus	93.00	87.73	62.86	84.16	91.19	73.84	94.89	100.00
Charybdis feriatus	6.42	9.84	25.16	15.68	8.50	4.90	3.88	0.00
other crab	0.58	0.99	11.98	0.16	0.02	21.25	0.00	0.00
กลุ่มหมึก	0.00	0.61	0.00	0.00	0.00	0.00	1.23	0.00
ผลรวม	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
อัตราการจับ (กก./ลอบ 10 ลูก)	0.130	0.104	0.144	0.127	0.172	0.263	0.219	0.242

Source: Middle Gulf Fisheries Research and Development Center (Chumphon)

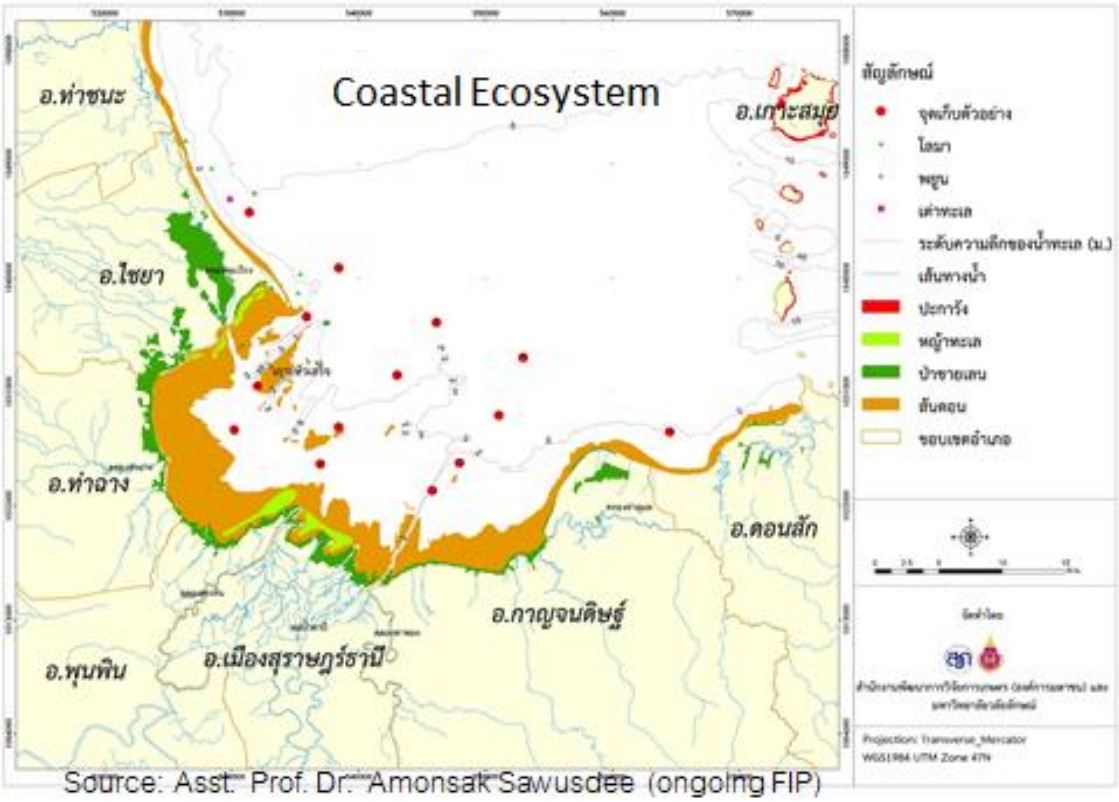
Catch Composition (%) of Trawl Fisheries in Surat Thani Province in 2017

สัตว์น้ำ	ร้อยละองค์ประกอบสัตว์น้ำ									
	ต.ค. 60	พ.ย. 60	ธ.ค. 60	ม.ค. 61	ก.พ. 61	มี.ค. 61	เม.ย. 61	พ.ค. 61	มิ.ย. 61	ก.ค.61
ปลาทรายแดง	0.09	9.76		0.08				0.07	3.04	0.03
ปลาปากคม	0.02					0.13		0.08	0.34	0.61
ปลาผิวน้ำอื่นๆ				0.09				0.21	0.12	0.15
ปลาหน้าดินอื่นๆ	35.41	14.70		14.41		27.59		11.54	20.94	18.43
ปูม้า	**25.57**	**8.13**		**13.72**		**13.96**		**45.07**	**10.86**	**13.96**
สัตว์น้ำอื่นๆ	38.91	67.41		71.70		58.32		43.03	64.70	66.82
รวม	100.00	100.00		100.00		100.00		100.00	100.00	100.00
อัตราการจับ (กก. /ชม)	**18.57**	**23.87**		**32.54**		**12.37**		**8.22**	**14.93**	**26.18**

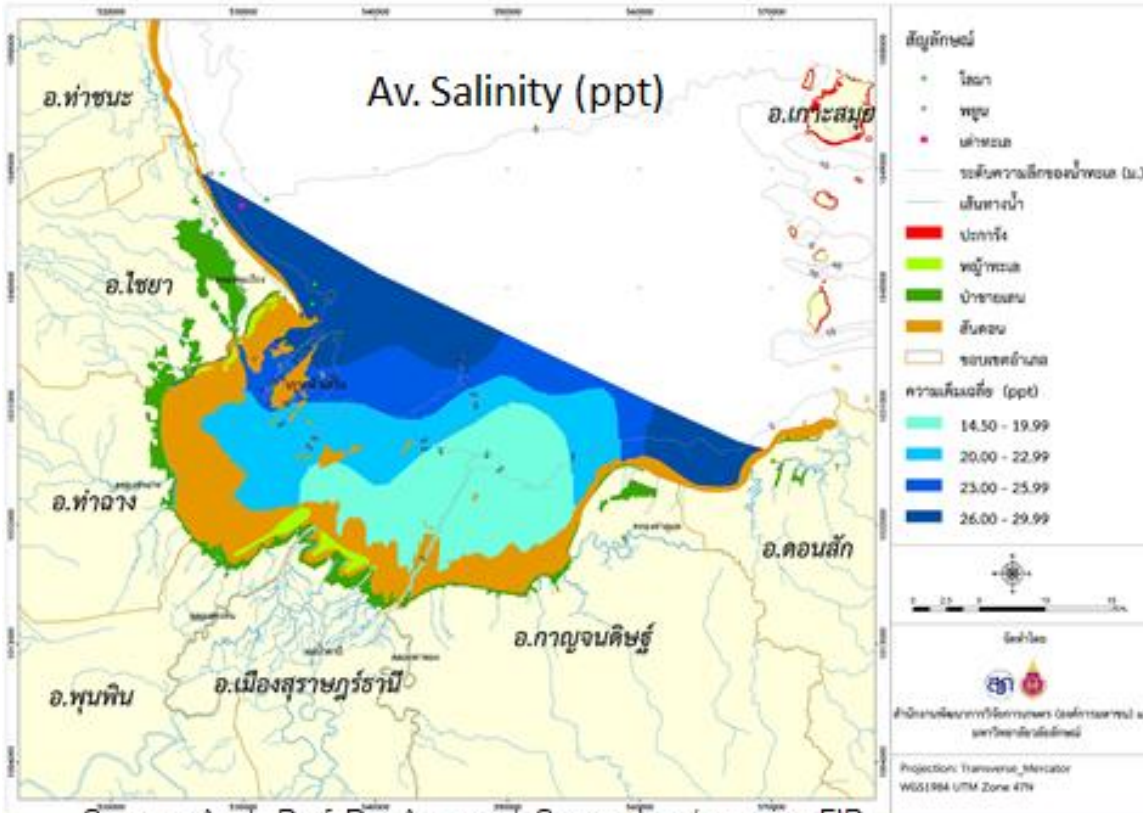
Source: Middle Gulf Fisheries Research and Development Center (Chumphon)



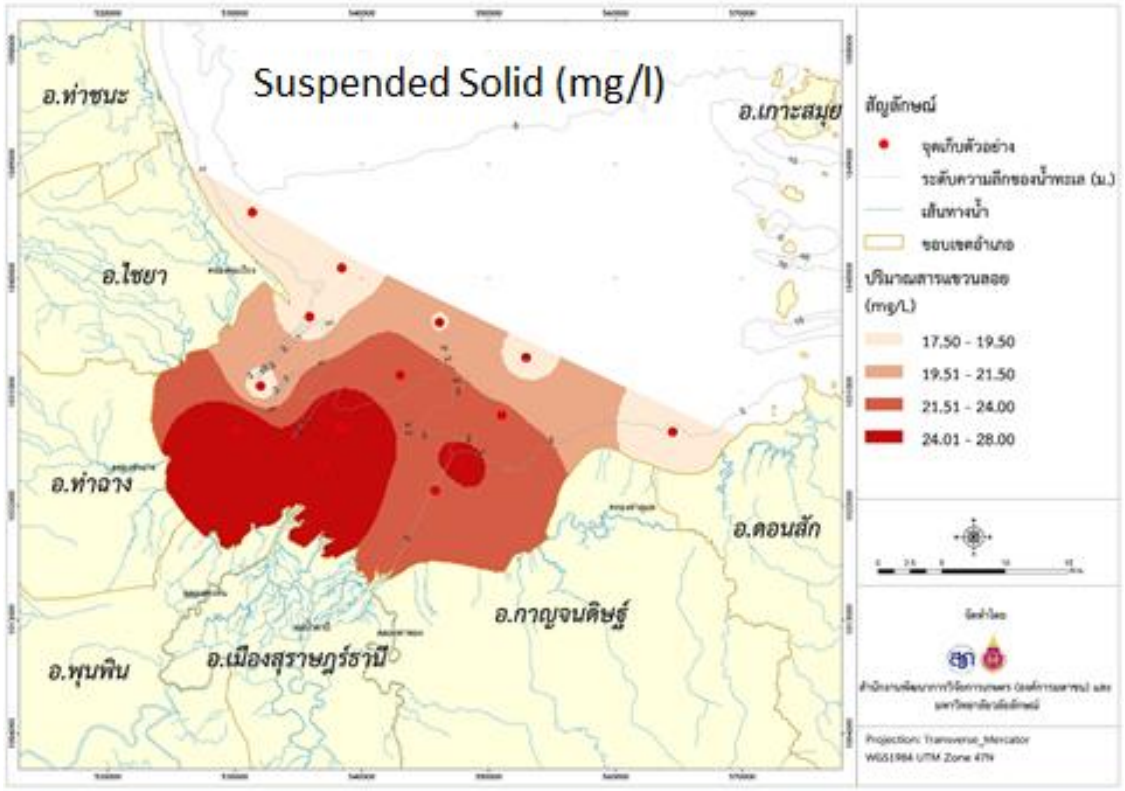
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



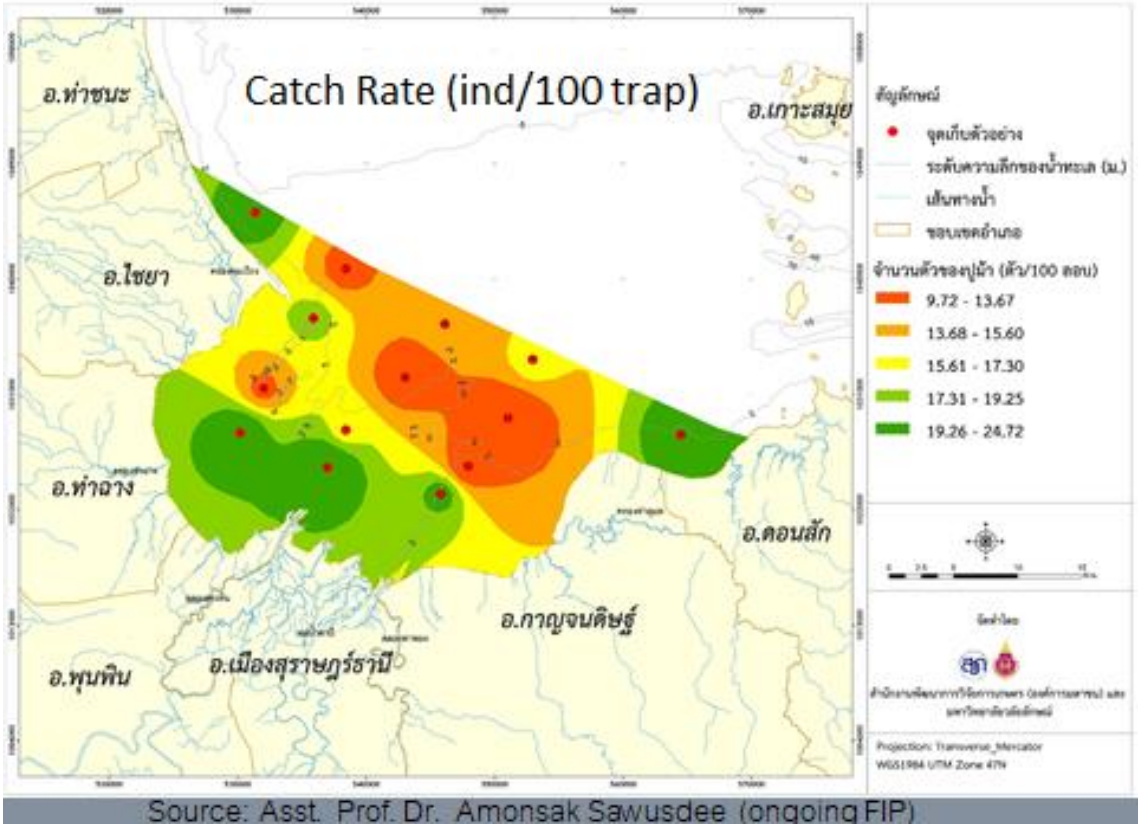
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



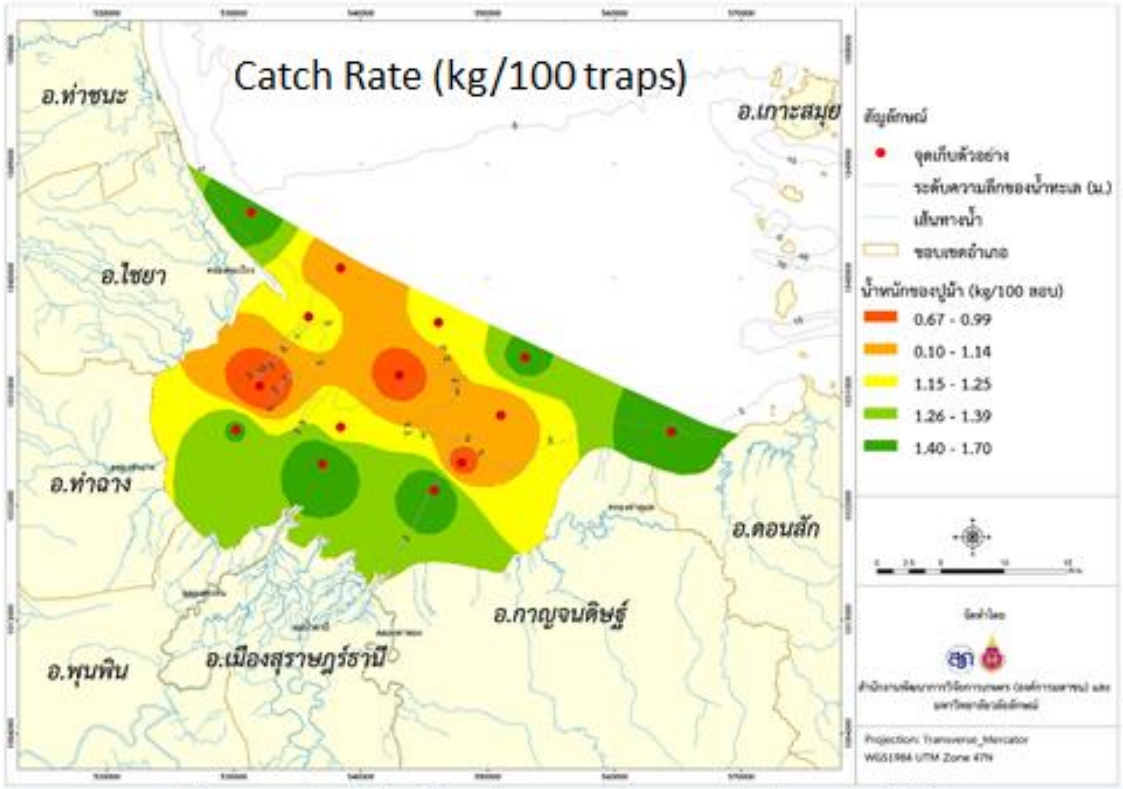
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



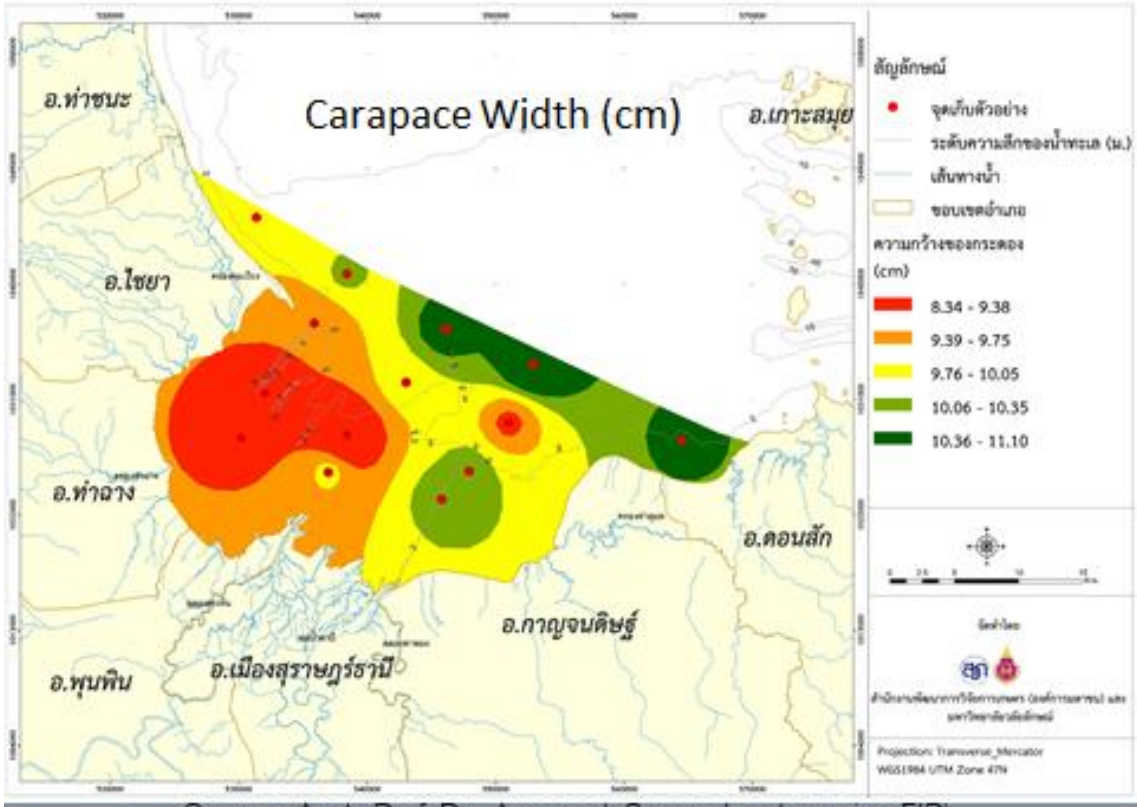
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



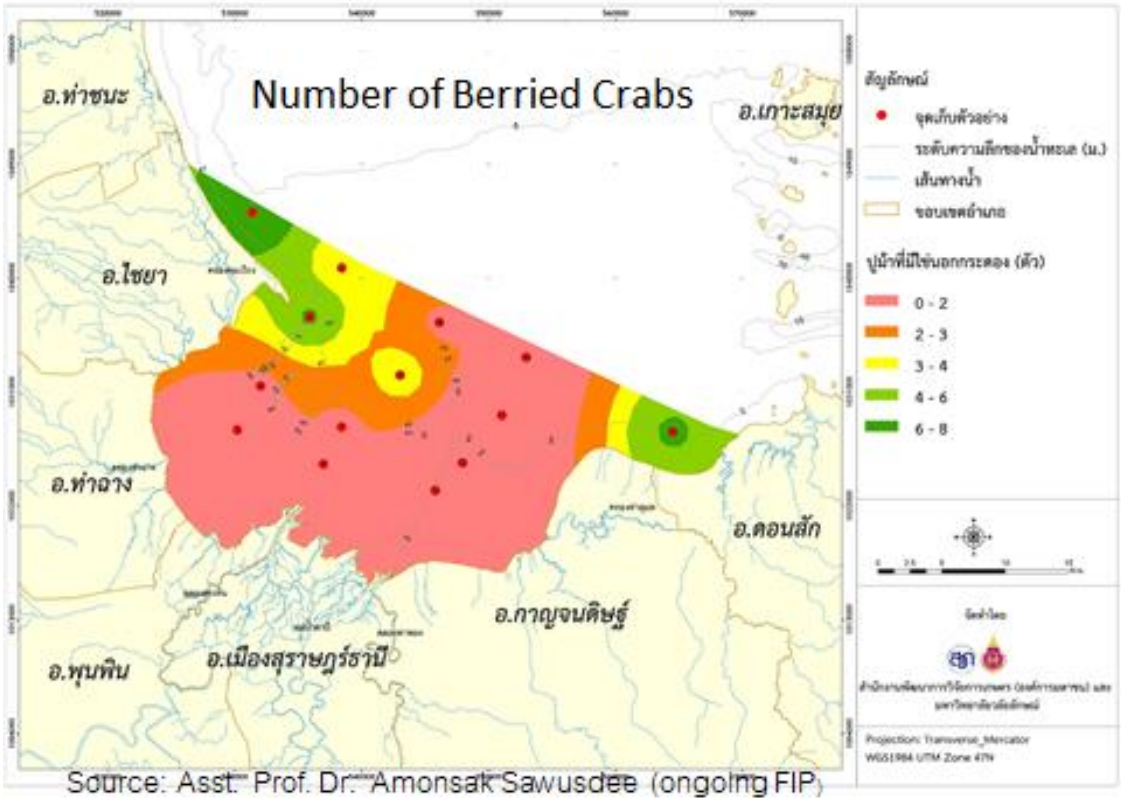
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



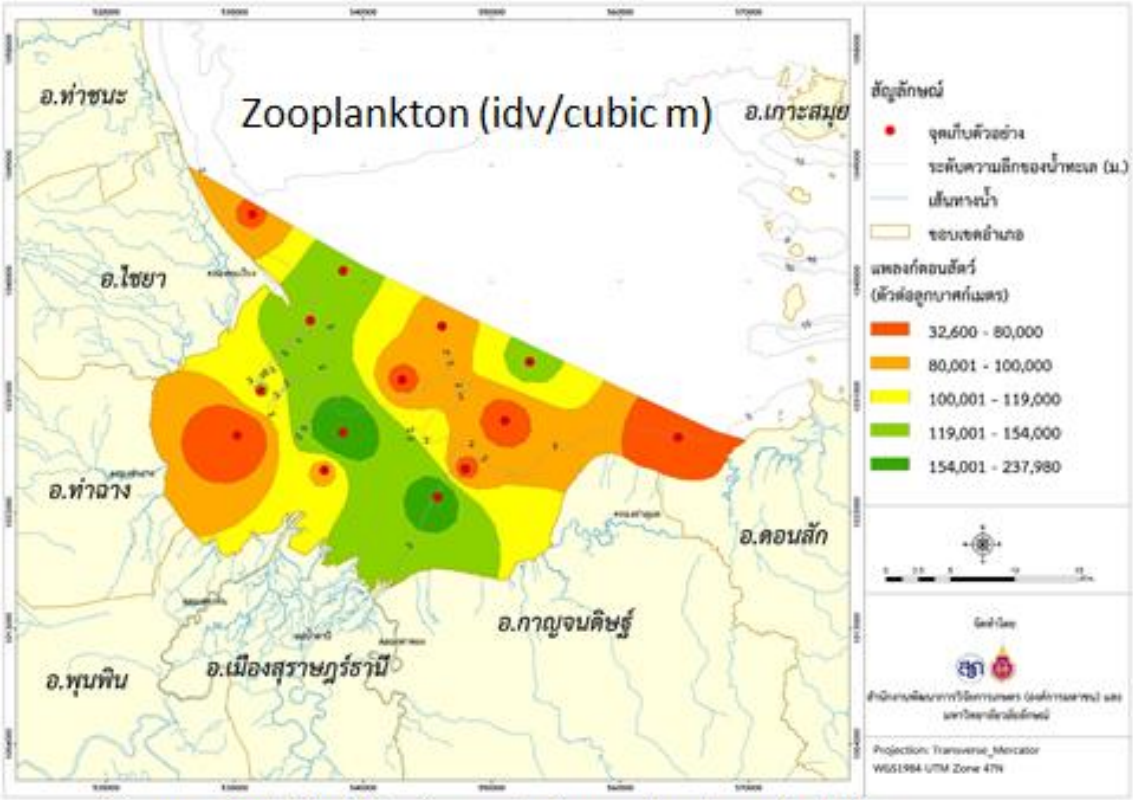
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

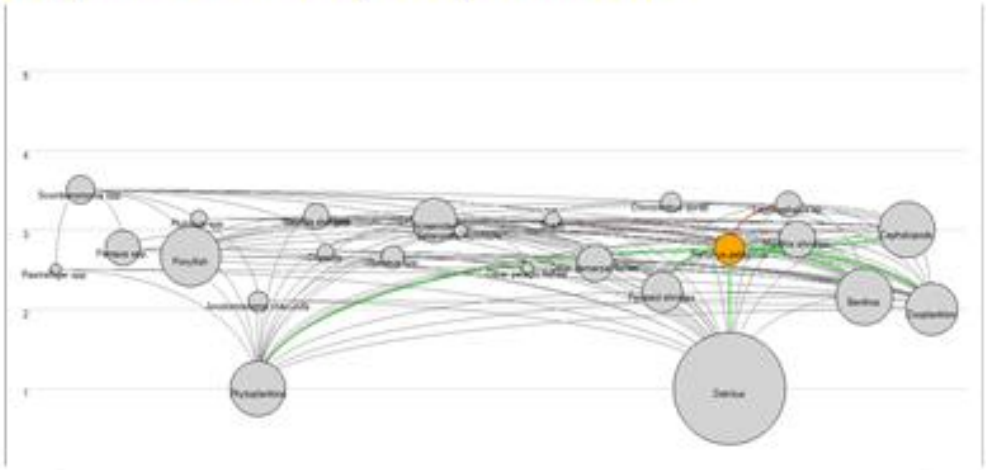


Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Flow-diagram of Ban Don Bay ecosystem in 2007



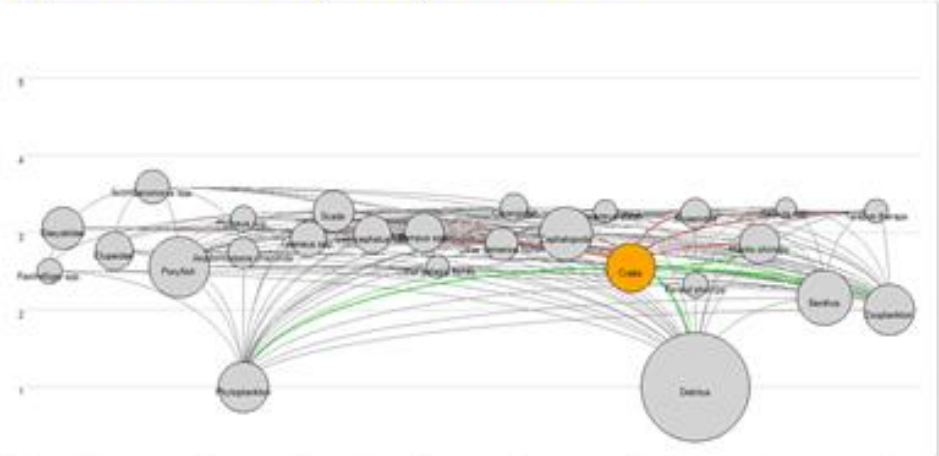
Transfer efficiency

Refresh | Options

Source \ Trophic level	II	III	IV	V	VI	VII	VIII
Producer	17.7	9.6	6.0	5.2	2.0	0.3	
Detritus	14.5	9.2	4.4	5.2	0.3		
All flows	17.2	9.5	5.8	5.2	1.8	0.3	
Proportion of total flow originating from detritus: 0.31							
Transfer efficiencies (calculated as geometric mean for TL II-IV)							
From primary producers: 10.1%							
From detritus: 8.3%							
Total: 9.8%							

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Flow-diagram of Ban Don Bay ecosystem in 2016

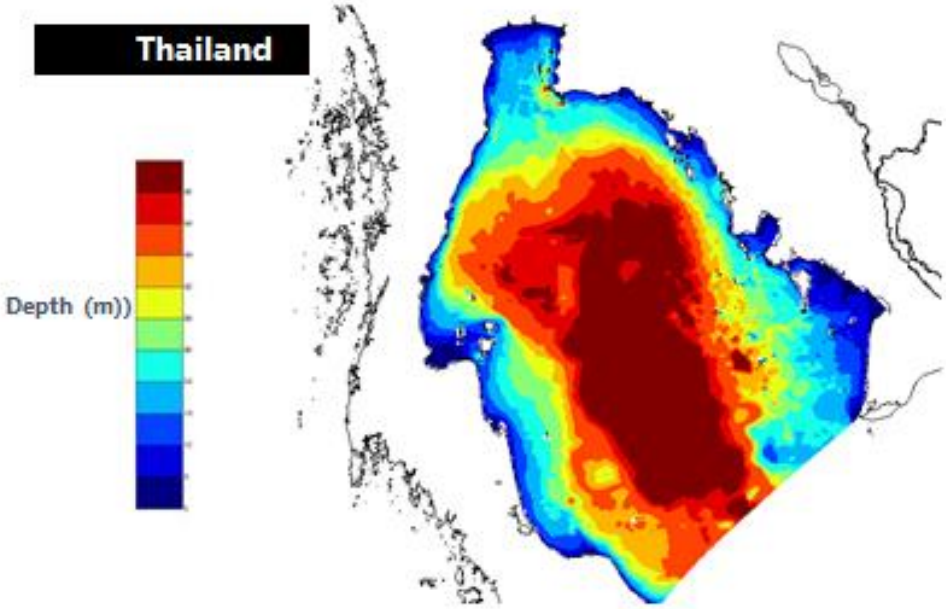


Transfer efficiency

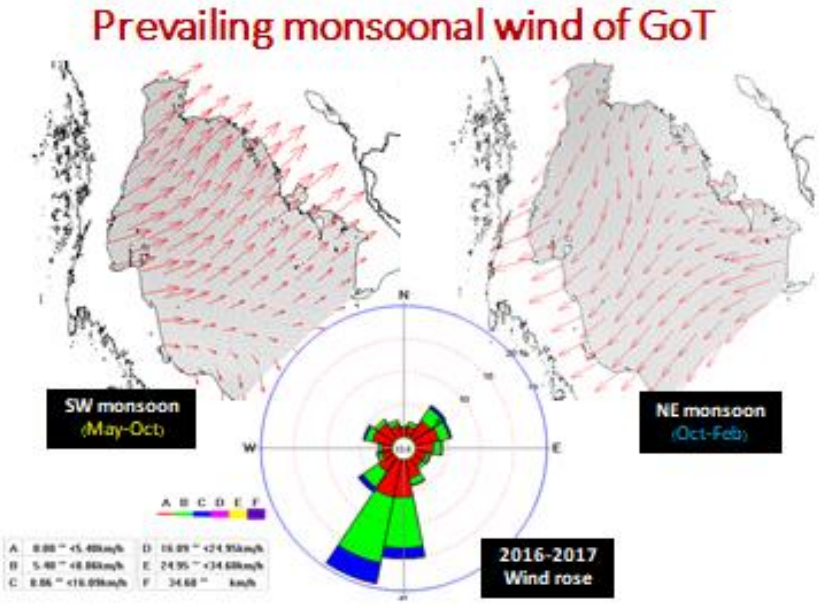
Refresh | Options

Source \ Trophic level	II	III	IV	V	VI	VII	VIII
Producer	19.8	12.4	6.1	3.8	2.6	2.2	
Detritus	13.2	10.6	5.9	3.7	2.6		
All flows	18.6	12.1	6.1	3.7	2.6	2.1	0.5
Proportion of total flow originating from detritus: 0.24							
Transfer efficiencies (calculated as geometric mean for TL II-IV)							
From primary producers: 11.4%							
From detritus: 5.4%							
Total: 11.1%							

Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

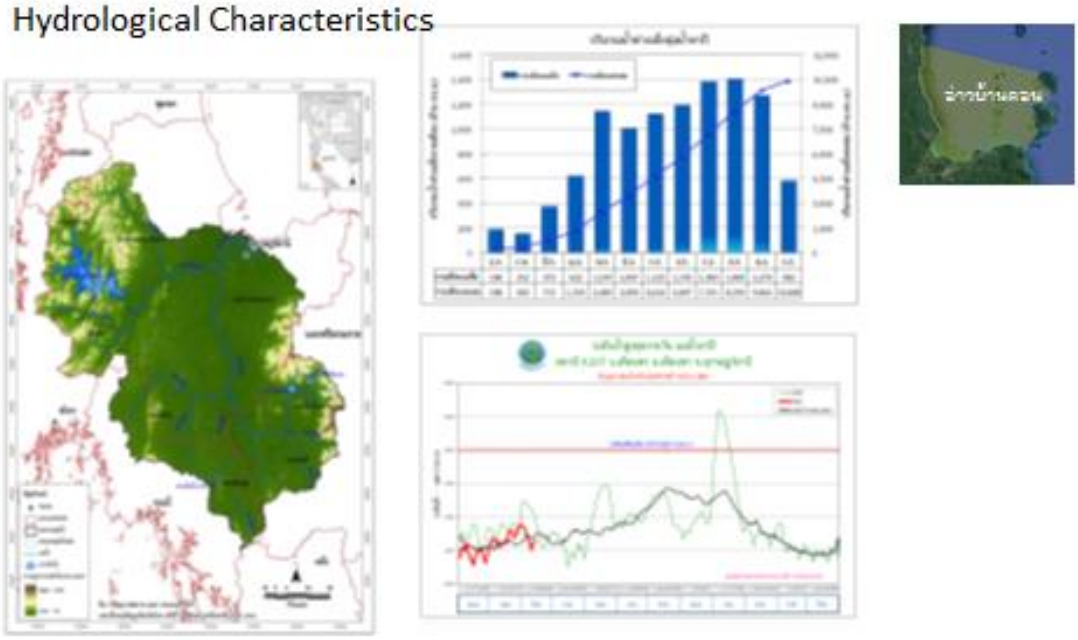


From Royal Thai Navy

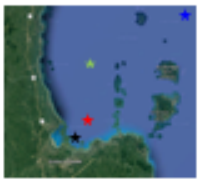


Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Hydrological Characteristics

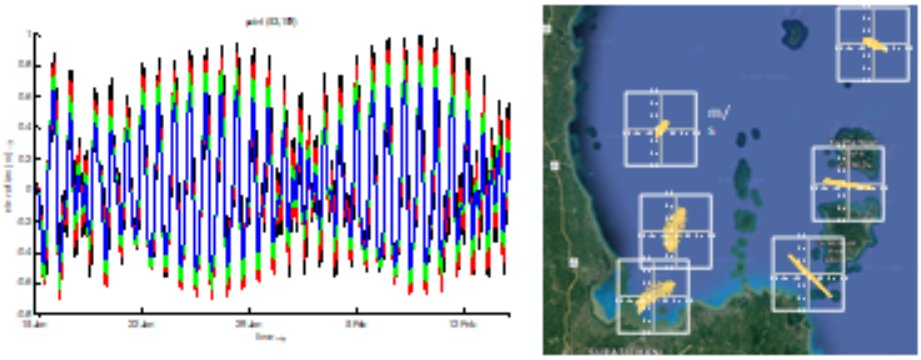


Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)



(Hydrodynamics)

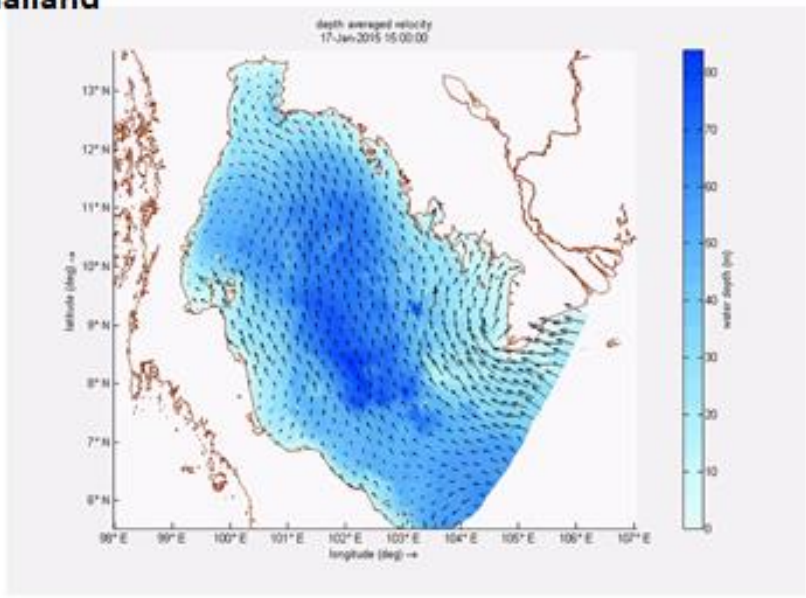
- พิสัยน้ำขึ้น-น้ำลง สูงสุด ประมาณ 1.6 m
- กระแสน้ำได้รับอิทธิพลการน้ำขึ้น-น้ำลง ลมมรสุมและแม่น้ำ
- พิสัยความเร็วกระแสน้ำ 0.3-0.6 m/s
- น่าจะเป็น Well mixed ที่บริเวณใกล้ปากแม่น้ำ และ Stratified water column ที่น้ำลึก



Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Hydrodynamics in the Gulf of Thailand

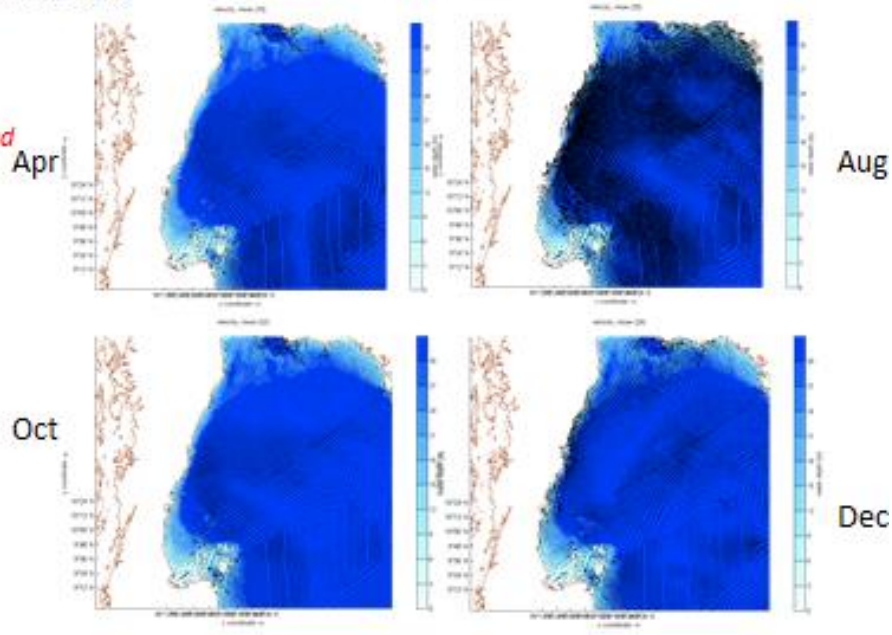
Current from tidal and wind



Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

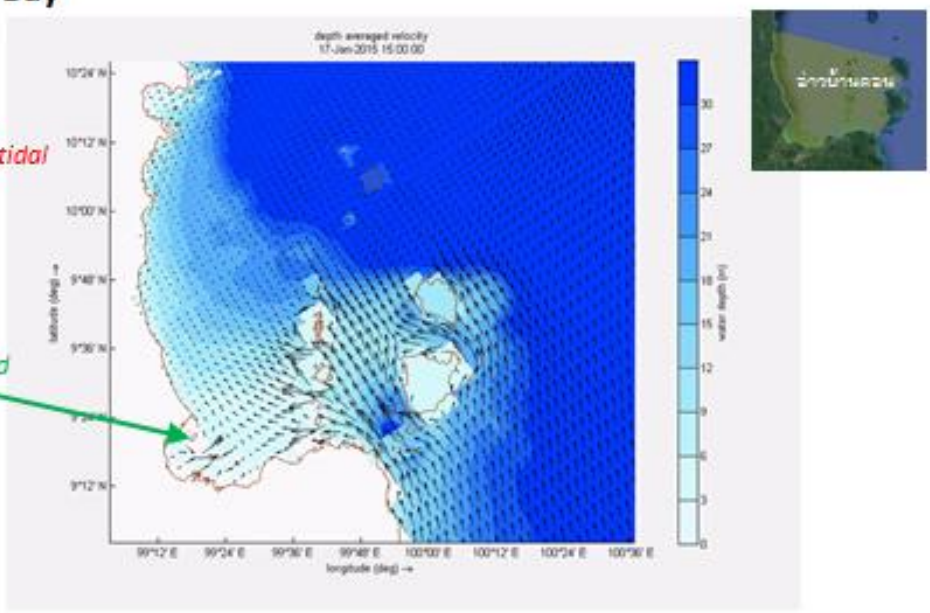
Hydrodynamics in the Gulf of Thailand

Water Flow affected by tidal and wind



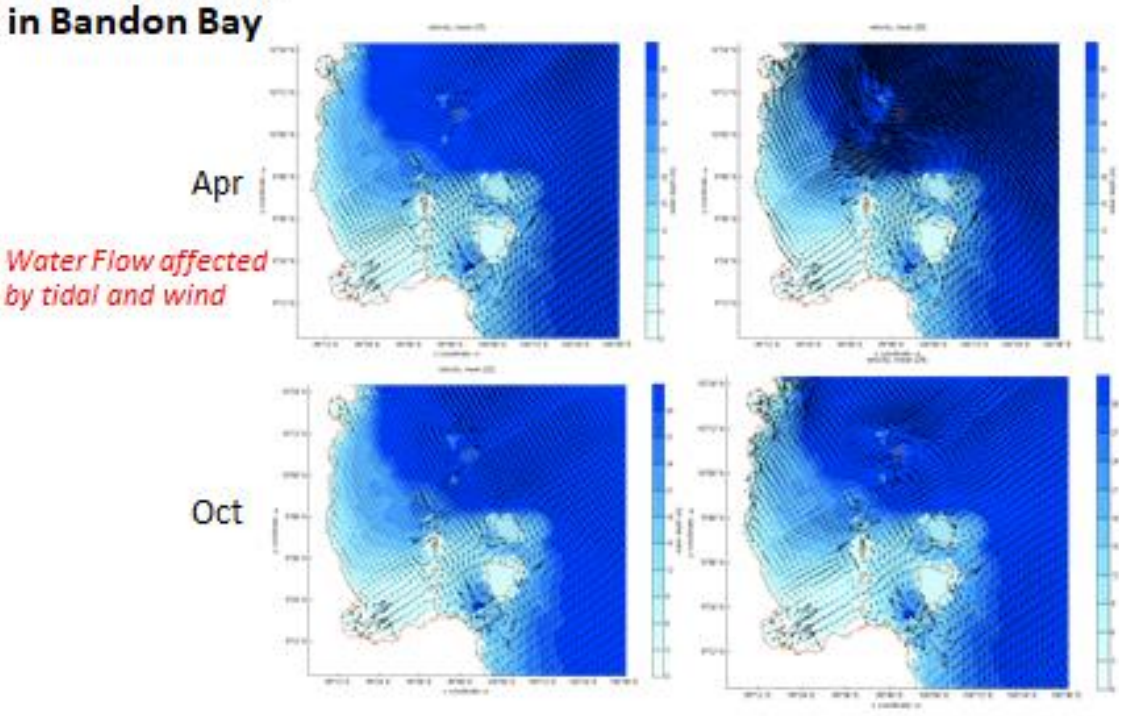
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Hydrodynamics in Bandon Bay



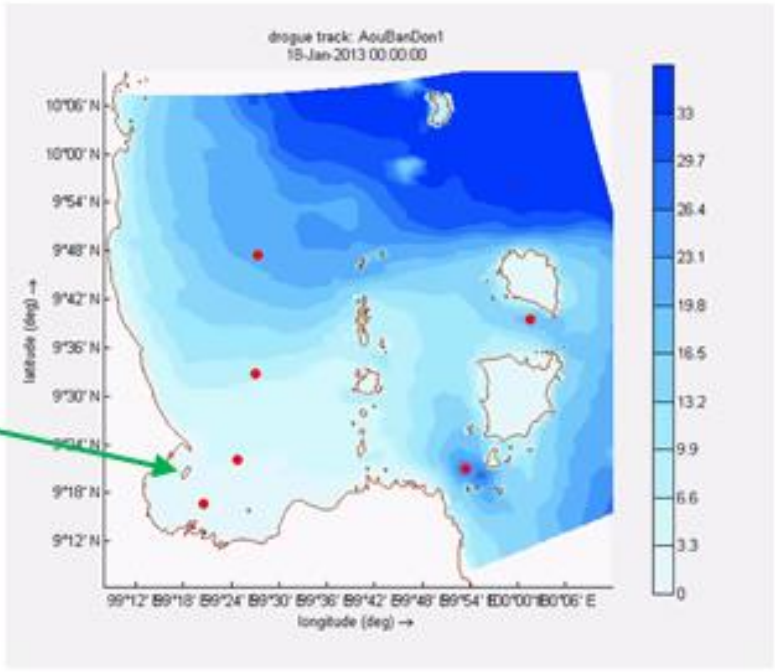
Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Hydrodynamics in Bandon Bay



Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

Experiment of buoy movement in Ban Don Bay



Source: Asst. Prof. Dr. Amonsak Sawusdee (ongoing FIP)

ANNEX 8

PICTURES OF THE MEETING