



**REGIONAL ACTION PLAN  
FOR  
MANAGEMENT OF TRANSBOUNDARY SPECIES:  
INDO-PACIFIC MACKEREL IN THE GULF OF THAILAND SUB-REGION<sup>1</sup>**

SEAFDEC

**I. INTRODUCTION**

Mackerels (Family Scombridae) particularly the Indo-Pacific mackerel also known as short mackerel (*Rastrelliger brachysoma*) are the most economically important small pelagic fishes in the Southeast Asian region contributing about 38% to the small pelagic fisheries production or 11% to the total capture fisheries production in 2010. Comparing among Mackerels group, *Rastrelliger* spp., in 2016 the *R. brachysoma* contributed with 78% among total catch of Mackerels with the value of 1,492 USD/MT, which decreased from 2015. (SEAFDEC, 2016: SEAFDEC Fishery Statistical Bulletin of Southeast Asia 2016).

On the region's total production of Indo-pacific mackerel, mainly reported by Indonesia, posted as the major contributor, the highest catch of mackerels was recorded in 2016 was at 283,106 metric tons (SEAFDEC, 2016), followed by Philippines contributed 35,518 MT from the Pacific and West Central Ocean. The total catch production of Indo-pacific mackerel, Thailand reported in 2012, amount of 194,845 MT and decreased in 2016, which amount of 81,017 MT. Similar to Philippines also found the declining of catch (SEAFDEC, 2016).

The Gulf of Thailand Sub-region (GoT) is also one of the important ecosystem for Indo-pacific mackerel where the peak highest catch by purse seine and falling net was in 1996 at 328,955 MT while the lowest catch had 3 peaks, in 1999, 2005 and 2010 at 289,285 MT, 283,984 MT and 259,354.56 MT, respectively that never reached 300,000 MT as recorded in 1996 (SEAFDEC, 2016)

In general, Indo-pacific mackerel are caught by various types of fishing gears in the GoT and the three major types recorded in 2008 are purse seines (45%), driftnets (31%), trawls (18%) and others (6%). The landings show declining trends indicating that the mackerel stocks in the South China Sea and GoT are already overexploited. For instance, in 2016, Thailand reported the catch production of Indo-pacific mackerel by 3 main fishing gears, purse seine (3,008 MT), trap (691.6 MT) and trawl (630.3). (SEAFDEC, 2016).

**II. STOCK STATUS OF *R. BRACHYSOMA***

Indo-pacific mackerel is low price but contain of high protein fish, so that it is popular for consumption in the Southeast Asia countries such as Cambodia, Indonesia, Thailand, Malaysia and etc. However, recently canned mackerel is bloom in the region to replace the sardine in which its production decreased. By this reason, Indo-pacific mackerel was recently found declining of the catches have been revealed due to overfishing and unregulated fishing operations in many countries, that become a great concern by Southeast Asia countries.

Number of fish species that includes mackerels among other species was reported in the overexploitation in the Gulf of Thailand (Puthy, 2007). In his study by using the Schaefer and Fox models

<sup>1</sup> The results from Technical Consultative Meeting on Drafting of the Regional Action Plan for Management of Transboundary Species Indo-Pacific Mackerel in the Gulf of Thailand Sub-region, 12-13 September 2019, Thailand

indicate that the mackerel fish stocks are both biologically and economically overexploited and there are opportunities to increase the rents from the mackerel stocks in the EEZ by reducing effort and allowing the stocks to increase in size.

While Thailand also reported that it is overexploitation during the past years and the changing of population patterns of Indo-pacific mackerel, maybe also due to environment impact, found that the changes of phytoplankton affected the distribution of fish larvae and due to the water current and temperature (SEAFDEC, 2017).

In Indonesia waters, the over-exploitation of the pelagic fishery resources, including Indo-pacific mackerel has been highlighted in Jawa Sea and other Indonesian waters, however the recent population dynamic by Zamroni, A.& Ernawati, T. (2019), short mackerels in Northern Coast Java of Indonesia water has fully exploitation and recruitment process has not been disturbed, ever though not yet reach to the heavily exploitation stage, the suggestion was made to reduce fishing effort and control fishing permits such as number of units, size of fishing fleet, fishing gear dimensions, and fishing technology pressure. Due to few information of the few biological information on Indo-pacific mackerel, genetic diversity study of Indo-pacific mackerel was conducted includes in the Java Island (Indaryanto *et al.* 2015),

Meanwhile, the declining of Indo-pacific mackerel has been reported by media on the changes of environmental condition, in terms of changes in water quality and its critical habitats modification and loss, has been documented in several countries. It is interesting that such information on biological, environment factors, migration patterns impacts to the distribution of this species.

### **III. ISSUES, KNOWLEDGE GAPS AND CHALLENGES**

Based on the reviews and countries inputs to SEAFDEC questionnaires received at last September 2019 from 6 countries namely Cambodia, Indonesia, Malaysia, Philippine, Thailand and Viet Nam, the following issues, knowledge gaps and challenges for sustainable utilization of Indo-pacific mackerel are summarized as:

#### **3.1) Data and Information**

- Insufficient landing data, biological data collection for population and abundance study
- Study on migratory route, spawning ground
- Regular monitor data collection on capture production
- Identify Spawning grounds and seasons

#### **3.2) Understanding the Status of Fish Stock**

- DNA study
- Stock status of *R brachysoma* (distribution and abundance)
- Population dynamics (Growth parameters, mortalities and relationship to other regional stock)
- Actual effort to exploit the resources
- stock assessment for transboundary species
- Stock structure
- Trans-boundary distributions
- Multi-fishing gears to harvest

#### **3.3) Management Responses**

- Fisheries Management Plan
- Review on existing and effectiveness of regulations
- develop co-management schemes/arrangements
- transboundary management mechanism/plan
- Effects/Loss to IUU fishing
- database- software

- Traceability system using electronic logbook
- support the Sustainable management concept, Co-management, and EAFM

### 3.4) Awareness Building

- Educate people and student in fisheries communities
- Distribute brochures or any media to promote of fisheries management
- Raise awareness of both small-scale fishers and commercial fishers
- Sharing of the findings to both policy management level and fishermen
- develop consultation among researchers, managers and stakeholders (EAFM)
- to support the Sustainable management concept, Co-management, and EAFM

### 3.5) Strengthen Regional Cooperation

- Standardized data collection for regional stock assessment
- Data sharing
- Lack of management body
- Develop the transboundary management mechanism/plan

### 3.6) Study the Environment Impact

- Temporary disappear of short mackerel in the Gulf of Thailand
- impact of climate change to fish migration route

### 3.7) Enhance Capacity Building

- Inadequate knowledge on research works as follows:
  - Species identification of small size (juvenile) and larval fishes
  - otolith (to know age of fish)
  - Data collection at landing sites: catch and biological data
  - Data analysis
  - Stock Assessment and modeling for stock assessment
- Fishing gear technology

## IV. REQUIRED REGIONAL COOPERATION FOR TRANSBOUNDARY SPECIES

Since 1953, Thailand undertook several management actions of Indo-pacific mackerel stock. For management of Indo-pacific mackerel, throughout 1953-2015, Thailand conducted several studies and delivered total of 13 notification of the relating to closures of fishing area in the Gulf of Thailand with the objective of conserving the spawning and nursery stages of aquatic resources (Saikliang 2016). Thailand scaled up the knowledge on migration pattern within the EEZ's in the GoT, and up to present, Thailand still continue their efforts for the effective fisheries management for Indo-pacific mackerel.

Although the migration patterns of Indo-pacific mackerel was known within the Thailand's EEZ in Gulf of Thailand sub-region for almost 30 years ago, but recently the results of genetic analysis for Indo-pacific mackerel using individual assignment and mixed-stock analysis, shows that the contradictory migratory behavior of short mackerel among fishery stocks at the inner and eastern Gulf of Thailand. (Kongseng, *et al*, 2020). Additionally, the population from Pattani maybe migrates across eastern Gulf of Thailand (southern part of Viet Nam and Cambodia waters). These results indicate that the best approaches for sustainable management of transboundary species such as Indo-pacific mackerel are the joint management cooperation among relevant countries whose harvested the species at region or sub-regional levels.

## V. PROVISIONS OF THE REGIONAL ACTION PLAN FOR MANAGEMENT OF TRANSBOUNDARY INDO-PACIFIC MACKEREL

A wide range of the international instruments relate to the ASEAN-SEAFDEC the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020, key instrument includes the 1982 United Nations Convention on the Law of the Sea (UNCLOS), United Nations Fish Stock Agreement (UNFSA), UN Sustainable Development Goal (SDG) 14. These are aims to conserve and manage of fisheries resources to combat illegal fishing for sustainably use of seas and marine resources, which also look at the environment, economic and social well-being. Importantly, the ASEAN-SEAFDEC Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region (2001,2011), addressed the importance to implement effective fisheries management through ecosystems approach by integrating habitat and fisheries resources and increasing social and economic benefit to all stakeholders and knowledge/science-based development and management of fisheries management.

In realizing the importance of the cooperative efforts of the countries, SEAFDEC with the funding support from the government of Sweden through the SEAFDEC-Sweden Project and the SEAFDEC/UNEP/GEF Project on Establishment and Operation of a Regional System of Fisheries *Refugia* in the South China Sea and Gulf of Thailand (Fisheries *Refugia*) therefore facilitated countries to develop the Regional Action Plan (RAP) for Management of Indo-pacific mackerel. The RAP contains:

Section 1: Introduction,

Section 2: Stock Status of Indo-pacific mackerel,

Section 3: Issues, Knowledge Gaps and Challenges,

Section 4: Required Regional Cooperation for Management of Transboundary Species,

Section 5: Provisions of the RAP including goal, outcomes, objectives and actions.

The provisions of RAP comprise of 5 dimensions: 1) Governance; 2) Social; 3) Economic, 4) Ecosystem; and 5) Climate Change. The provisions are aligned with the Ecosystem Approach to Fisheries Management concept (EAFM).

This RAP for Management of Indo-pacific mackerel is meant to serve as a foundational document, of a non-legally binding nature, that identifies practices and processes to support implementation of the ASEAN-SEAFDEC Resolution among the country in the GoT Sub-region. It marks an evolutionary step towards a concerted regional approach to supporting countries in their efforts to manage transboundary fish stock.

### 5.1 THE GOAL OF REGIONAL ACTION PLAN

This RAP is intended to serve as guide for the countries in implementing the actions to achieve ***“Sustainable Indo-Pacific mackerel fisheries in the Gulf of Thailand sub-region through science-based management for shared benefit to other ASEAN Member States by 2030”***

### 5.2 OUTCOMES

- i. Healthy of Indo-pacific mackerel resources through the implementation of fishery management plan
- ii. The template for the development of management plan applicable to other sub-regions
- iii. Accurate and comprehensive information for Indo-Pacific mackerel

### 5.3 ACTIONS

## A) GOVERNANCE DIMENSION

**Overall Objective:** Regional/sub regional fisheries management mechanism are in place building upon from national regulation and management scheme

### Specific Objectives

- A1. Fisheries Management Mechanism developed and approved (including fisheries management plan and arrangement, the effective of regulation)
- A2.... Data management system are enhanced and considered regional/sub-regional standardization data management system in place
- A3. Standard for assessing fishing effort large, medium and small-scale fishery agreed
- A4. Understandings on national law and management schemes within the sub-regional are communicated and applied
- A5. Impact of unregulated and unreported fishing assessed
- A6. Catch documentation system applied as a tool to improve traceability of the short mackerel fishery

Knowledge Gaps/Issues	Actions	Ref.	Responsibility
Insufficient catch and landing data	Develop the SOP/technical guidance for data collection (including catch data, biological data)	A2	SEAFDEC University Government agency
	To further develop catch documentation	A2	Fishery research institute
	Harmonization/standardized on data collection and develop database system	A2	
Insufficient biological data collection	Conduct capacity building program for data collection to enumerator and scientist, researchers	A3	SEAFDEC University Government agency
	Conduct time series data collection with standardized method	A3	Fishery research institute
Fishing effort (include commercial and small scale)	Link to the catch documentation include commercial and small-scale fishery (as available)	A4	Government and Private sector
	Regular monitor data collection on fishing effort capture production (include commercial and small scale)	A4	
Fisheries Management Mechanism (including fisheries management plan and arrangement, the effective of regulation)	Develop fisheries management plan for short mackerel at national and sub-regional level	A1	SEAFDEC University Government agency Fishery research institute All stakeholder (fishers, others)
	Establish regional cooperation on monitoring, control and surveillance	A1	Existing national MCS partners/network
	Raise awareness of both small-scale fishers and commercial-scale fishers <ul style="list-style-type: none"> <li>○ Policy and regulations</li> <li>○ Management measures</li> <li>○ Sustainable utilization</li> </ul>	A1	SEAFDEC University Government agency Fishery research institute

	○ Involvement the participation, considering gender sensitivity		All stakeholder
	Promote stakeholder consultation among researchers, managers and stakeholders using EAFM	A1	SEAFDEC University Government agency Fishery research institute All stakeholder International organizations (FAO, NOAA, etc)
	Conduct habitat rehabilitation and stock enhancement programs	A1	SEAFDEC University Government agency Fishery research institute All stakeholder
Understanding national law and regulations	Comparative review of national law and regulations	A5	Government and resource person
	Disseminate knowledge and information on the conservation and management of Indo-pacific mackerel to fisheries communities and students	A5	Government Other stakeholders
Flexibility of regulation to respond to science advise	Encourage periodic evaluation of policy and regulation	A1	Government
Management schemes/arrangements including transboundary aspects.	Develop management schemes/arrangements at sub-regional area including transboundary aspects	A1	SEAFDEC University Government agency
	Support establishment of regional cooperation/management mechanism (non-legal binding and scientific advisory committee)	A1	Fishery research institute All stakeholders
Illegal, Unregulated and Unreported Fishing	Assessing the impact of Illegal, Unregulated and Unreported Fishing	A6	Government and resource person
	Strengthen the Monitoring, Control and Surveillance network against the illegal fishing (none legal binding)	A6	Inter-agencies coordination
Traceability system for fish and fishery product (using electronic logbook, etc)	Develop the catch documentation that suitable for traceability system e.g. electronic logbook, etc	A6	Government and resource person

## B) SOCIAL DIMENSION

**Overall Objective:** Social responsibility and involvement in fisheries management achieved

### Specific Objectives

- B1. Understanding the social condition of people involving in fishery at local and national level.
- B2. Increase participation and involvement of stakeholder in various level.
- B3. Resolve conflict on land and resource use
- B4. Build awareness and capacity in all level

Knowledge Gaps/Issues	Actions	Ref.	Responsibility
Social and economic at local and national level	Conduct a baseline survey based on available information on social and economic at local and national level (S)	B1	Government University
Traditional fishing (indigenous knowledge and social responsibility)	Improve and disseminate the best practice to other (indigenous people)	B1	Government
People engagement in fishery activity (include small scale fishery and large scale/commercial fishery, processing)	Conduct stakeholder analysis for understanding the important and influence of stakeholder in various level	B2	Government University
People engagement in policy making (fisherfolk organization, academy, private sector,	Promote Public Private Partnership	B2	Government
	Promote multi stakeholder engagement in policy making	B2	Government and relevant stakeholder
Social structure (community small scale and large scale, gender, migrant labor, and fisher)	Encourage gender equality based on understanding of social structure in community	B2	Government and relevant stakeholder
Conflict on land and resource use	Promote stakeholder consultation	B3	Government and relevant stakeholder
	Promote marine spatial planning and coastal zone management	B3	Government Resource person Relevant stakeholder
Awareness	Distribute brochures or any media (e.g. digital media) to promote fisheries management and regulations  Capacity building and experts exchange  Fishing gear technology for eco-friendly (Reduce bycatch, cost and expenditures)	B4	SEAFDEC Government Relevant stakeholder

## C) ECONOMIC DIMENSION

**Overall Objective:** Equal distribution of economic benefit, economic return and employment opportunities

**Specific Objectives:**

- C1. Ensure the national government and private sector commitment for long-term funding and support.
- C2. Understanding the structure and ownership of asset within fishing industry (large, medium and small scale).
- C3. Maximized economic benefit return for management response and reduced unequal distribution.

Knowledge Gaps/Issues	Actions	Ref.	Responsibility
Funding	To ensure the national government commitment for long-term funding and support	C1	Government Private sector Funding agency/donor
	Explore various potential donor	C1	
	Promote capital access through micro finance scheme	C1	
	Promote corporate social responsibility	C1	
Structure and ownership of asset within the fishing industry (large and small scale)	Review structure and ownership of asset within the fishing industry (large, medium and small scale) for management responses	C2	Government Resource person
Benefit and economic return and unequal distribution	Assess benefit and economic return throughout the value chain	C3	Government Resource person
Increase of cost (fuel and other inputs)	To ensure the fuel and other input exist for local fishermen	C3	Government
Fisheries employment revenue	To create the alternative work	C3	Government Private Sector Relevant stakeholder
	Require the contract among people engage in fishing	C3	

## D) ECOSYSTEM DIMENSION

**Overall Objective:** Maintain healthy ecosystem for the wellbeing of short mackerel resources

**Specific Objectives**

- D1. Understand current status and improve the knowledge of short mackerel resources for scientific based management
- D2. Understand various habitats of short mackerel throughout its life cycle

Knowledge Gaps/Issues	Actions	Ref.	Responsibility
Migratory route	Update, further define and confirm the migratory route at national, sub-regional or regional area	D2	Fisheries Agencies, National Research Institutions, Regional Institutions
	Conduct tagging program, e-DNA, DNA	D1	Fisheries Agencies, Research Institutions
Spawning and nursery grounds (including dispersion and distribution of fish larvae)	Conduct comprehensive larvae survey (e.g ichthyoplankton)	D1	Fisheries Agencies, Research Institutions
	Study on critical habitats	D2	Fisheries Agencies, Research Institutions,
Seasonal changes	Conduct comprehensive larvae survey (e.g ichthyoplankton)	D1	Fisheries Agencies, Research Institutions, SEAFDEC
	Conduct reproductive biology study	D1	Fisheries Agencies, Research Institutions, SEAFDEC
Physical and chemical oceanographic conditions and ocean circulation	Conduct oceanography survey	D2	Fisheries Agencies, Research Institutions, SEAFDEC
	Develop oceanographic modelling	D2	Fisheries Agencies, Research Institutions, IOC/WESTPAC
	Conduct satellite imagery (GIS, remote sensing) analysis	D2	Fisheries Agencies, Research Institutions
Stock structure	Conduct DNA study, otolith, tagging, etc.	D1	Fisheries Agencies, Research Institutions, SEAFDEC
Stock status at national and regional of <i>R. brachysoma</i> (distribution and abundance)	Conduct stock assessment at national, sub-regional or regional level	D1	Fisheries Agencies, Research Institutions, SEAFDEC

	Share data, information and findings from scientific research to relevant stakeholders	D1	Fisheries Agencies, Research Institutions, SEAFDEC
	Standardized data collection for regional stock assessment	D1	Fisheries Agencies, Research Institutions, SEAFDEC
	Develop modeling for stock assessment	D1	Fisheries Agencies, Research Institutions, SEAFDEC, FAO
Species Identification	Provide capacity building on species identification of small size (juvenile) and larval fishes	D1	Fisheries Agencies, Research Institutions, SEAFDEC
Status and Trends	Investigate the trend of short mackerel catch at national, sub-regional levels	D1	Fisheries Agencies, Research Institutions, SEAFDEC
Population dynamics (Growth parameters, mortalities etc.	Conduct survey on fisheries biology	D1	Fisheries Agencies, Research Institutions
Impact of fishing effort on stock structure (Multi-fishing gears to harvest)	Conduct study on impact of fishing effort on stock structure (Multi-fishing gears to harvest) to improve the fishery management	D1	Fisheries Agencies, Research Institutions, SEAFDEC
	Enhance Fishing gear technology for eco-friendly (Reduce bycatch, cost and expenditures)	D2	Fisheries Agencies, Research Institutions, SEAFDEC
Stock assessment and distributions for transboundary species	Enhance the cooperation for information sharing among the bordering countries	D1	Fisheries Agencies, SEAFDEC
Capacity building and experts exchange	Training, workshop, conference and experts exchange	D1,2	Fisheries Agencies, Research Institutions, SEAFDEC, FAO, UNEP-GEF

## E) CLIMATE CHANGE

**Overall Objective: Adaptive management based on understanding the impact of climate change and disaster**

**Specific Objectives:**

- E1. adaptive management measures **in place** in response to the impact of climate change and disaster to short mackerel fisheries and habitats
- E2. mitigation and precautionary measures **adopted** to compensate the effects of climate change

Knowledge Gaps/Issues	Actions	Ref.	Responsibility
Impact of climate change to fish migration route	Assess the impact of climate change/disaster/anthropogenic activities to fish migration route, habitat and behavior	E1	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO
	Study effect of environmental changes on the migratory pattern and spawning patterns based on climate change	E1	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO
	Share information from the findings of scientific research to both fisheries managers and fishers	E2	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO
Sensitivity of species on critical habitats and environment impact to ecosystem (pollution, climate change, etc)	Conduct study on sensitivity of species on environment change (pollution, climate change, etc) to support the management response	E1	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO
	Study on the critical habitats (spawning and grounds)	E1	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO
	Study effect of environmental changes on the migratory pattern and spawning patterns	E1	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO

	Data sharing (assign focal person to share information)	E1	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO
Capacity building and experts exchange	Training, workshop, conference and experts exchange on CC impacts	E1 E2	Fisheries and Environmental Agencies, Research Institutions, SEAFDEC, UNEP-GEF, UNDP, FAO

#### REFERENCES:

1. SEAFDEC (2016), Fishery Statistical Bulletin of Southeast Asia
2. Em Puty (2008)
3. SEAFDEC (2017), Report of the Experts Group Meeting on Stock Status and Geographical Distribution of Anchovy, Indo-Pacific mackerel and Blue Swimming Crab (AIB), in the Gulf of Thailand, Bangkok, Thailand, 22-23 September 2016, Southeast Asian Fisheries Development Center. 69 pp.
4. Zamroni, A.& Ernawati, T. (2019). Population Dynamic and Spawning Potential of Short Mackerel (*Rastrelliger brachysoma* Bleeker, 1851) in the Northern Coast of Java. 1-9. <http://ejournal-balitbang.kkp.go.id/index.php.ifrj>
5. Indaryanto et al. 2015. Genetic variation of short body mackerel, *Rastrelliger brachysoma* of Java Island, Indonesia based on mtDNA control region sequences AACL Bioflux, 2015, Volume 8, Issue 5. <http://www.bioflux.com.ro/aac1>
6. Kongseng, S., Phoonsawat, R.s Swatdipong, A., (2020), Individual assignment and mixed-stock analysis of Short mackerel (*Rastrelliger brachysoma*) in the Inner and Eastern Gulf of Thailand: Contrast migratory behavior among the fishery stocks. Fish. Res. 221, 1-9. <https://doi.org/10.1016/j.fishres.2019.105372>
- 7.