



Linking the Science and Management Interface for Sustainable Use of Short Mackerel in the Gulf of Thailand

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I. INTRODUCTION

Early effort by the Government to manage the coastal resources generally involved decision-making at high levels and rarely involved participation of the communities as well as the science-based approaches. Consequently, strategies failed to minimize degradation of coastal resources and to improve the condition of those living in poverty. From these lessons, empowering of coastal communities to enable them to manage their own resources is gradually recognized by the government. Linking the science-based information to fisheries management for sustainable use is also needed. This paper provides some baseline and scientific information on one of the considered major fisheries resources in the coastal areas of Gulf of Thailand, the short mackerel. Base on the

Short mackerel, *Rastrelliger brachysoma*, an epi-pelagic fish, is considered an important fishery resource of the Gulf of Thailand. In 2009, the population of Short mackerel dramatically decreased as compared with previous years (2005- 2008) (Department of Fisheries, 2009). The distributions of short mackerel are influenced by environmental factors such as monsoon season and current movements (MFRDMD, 2010). Short mackerel in the Gulf of Thailand is potentially exposed to a large number of pollutants, especially heavy metals (e.g., cadmium, iron, mercury, and lead) and petroleum hydrocarbons in sediment and water, which potentially play a role in the diminishing fish populations (Cheevaporn & Menasveta, 2003; Wattayakorn, 2012).



II. REQUIRED SCIENCE-BASED INFORMATION

The realistic approach to the sustainable utilization of fisheries resources is to integrate all knowledges not only on science but also local based information as well as applying the baseline information and ocean forecasting system that affects to the fisheries resources of short mackerel. Developing of any area-based approach fisheries management measures for short mackerel, therefore it is needed to understand the key important issues as follows:

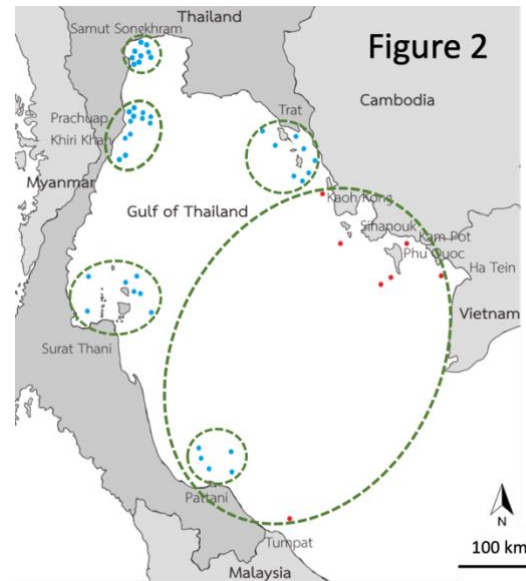
A. Life cycle history

In the Gulf of Thailand, particularly the west and north coast, the Life cycle of the Indo-Pacific mackerel in the Gulf of Thailand (Boonprakob, 1974) were discovered as shown in Fig. 1. This spatially and geographically defined of spawning grounds, nursery grounds and their migration route are very important information for the management. However, lack of life cycle history in the eastern part of the Gulf of Thailand, in the coastal areas of Cambodia and South Viet Nam induce

the low effectiveness of fisheries management for short mackerel by those countries.

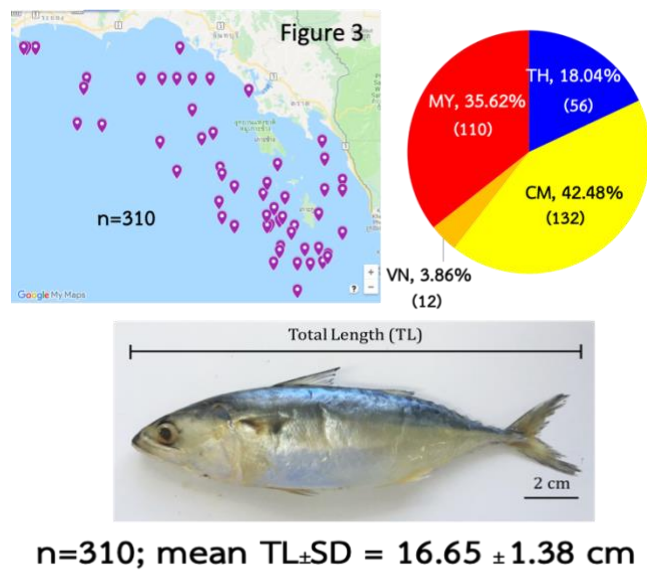
B. Fishery Biological Consideration

As living populations or communities, aquatic living resources are capable of on-going renewal through the processes of growth in size and mass of individuals and additions to the population or community through reproduction (leading to what in fisheries is often called 'recruitment'). In a population at equilibrium, the additive processes of growth and reproduction on average equal the loss process of total mortality. For sustainable fisheries on short mackerel, it is required a total population is maintained above a certain abundance or biomass, but also that the age structure of the population is maintained in a state in which it is able to maintain the level of reproduction, and hence recruitment, necessary to replenish the losses through mortality.



But in fact, due to the declining of short mackerel stock due to fishing over a long period on selected portions of a stock, for example large individuals or individuals spawning at a specific time or locality within a wider spawning season or range, can reduce the frequency of the particular genetic characteristics giving rise to that feature or behavior.

This has the effect of reducing the overall genetic diversity of the stock in principle. With reduced genetic diversity, the production potential of the population can be adversely affected, and it may also become less resilient to environmental variability and change. It is therefore needed to understand the overall genetic diversity of short mackerel in the Gulf of the Thailand. By these reasons, SEAFDEC supported by the Sweden Government conducted the survey in collaboration with coastal countries in the Gulf of Thailand namely Cambodia, Malaysia, Thailand and Viet Nam (SEAFDEC, 2018). The results of genetic analysis of 436 short mackerel samples from the coastal areas as shown in Figure 2 indicate that: 1) Population



differentiation is found in the Gulf of Thailand; 2) Thailand populations are genetically different to each other in moderate level; 3) Cambodia, Vietnam, Malaysia and Pattnati (Thailand) populations are genetically different to each other in low level.

In addition, make use these genetic results focused in the Trat province where located nearby Cambodia border as shown in Figure 3, indicates that the short mackerel harvested off Trat province consisted of 42.48% from Cambodia, 35.63% from Malaysia and 3.86% from Viet Nam, while only 18% from Thai waters.

C. Ocean forecasting system

Taking in to consideration that distributions of short mackerel are influenced by environmental factors such as monsoon season and current movements as well as potentially exposed to the pollutants, especially heavy metals and petroleum hydrocarbons in sediment and water, therefore the ocean data and forecasting system is an important tool to support in monitoring its affects to aquatic marine animal. Regarding this, it is necessary to acknowledge to the SEAGOOS project under the IOC/WESTPAC that developed the ocean modelling to understand the flow of current, sea temperature, wave, wind, and salinity (SEAFDEC, 2019). This information is useful to facilitate the effectiveness. It is expected in very near future the improved modelling will include more higher resolution of the image as well as include runoff of nutrients, pollutants, etc.

III. LINKING THE SCIENCE AND MANAGEMENT

Integration of overall information as above mentioned to management of short mackerel in the Gulf of Thailand is aligned with the regional initiatives through the GEF Funded, UNEP implemented and SEAFDEC executed project on “Establishment and Operation of a Regional Fisheries Refugia in the South China Sea and Gulf of Thailand” which is one of the component under the implementation of the Strategic Action Programme for the South China Sea.

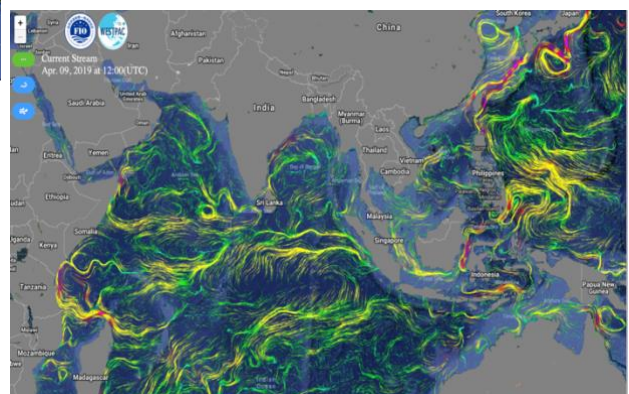
Area-based approaches to fisheries management in the western Gulf of Thailand have applied over the last decade to safeguard spawning stock and larvae of the short mackerel. The measures designed against the backdrop of high fishing pressure and increasing demand for the region’s seafood products (see refugia areas A and B depicted in Figure 5) have enabled resource managers, scientists, fisherfolk and communities to develop experience working together in safeguarding critical fish stock and life-cycle linkages.

This has involved the application of targeted management measures aimed at significant reductions in fishing effort and use of inappropriate fishing gear and practices for 90 days in area A (15 Feb-15 May) and 30 days area B (16 May – 14 June) to safeguard fish in spawning condition and fish larvae, respectively (Saikliang, 2016). The large size of these management has been the source of some tension between



government and larger-scale operators, with discussions largely having focused on the need for area-based measures to reflect more fully the known migratory routes, ocean circulation patterns and primary production in the Gulf.

Accordingly, the fisheries refugia concept was recently applied to the establishment of nursery refugia in the upper Gulf of Thailand aimed at boosting year class strength of new recruits to the fishery. This has been achieved via application of targeted measures, combined with revised and strengthened regulations and



enforcement, in refugia area C (60 days from 15 Jun – 15 Aug) and refugia areas D (60 days from 1 Aug – 30 Sep) aimed at targeted and incidental capture of larval and juvenile fish. This staged and combined application of refugia areas in a northerly, clockwise direction from the western to the upper central Gulf to protect fish at critical life-cycle stages including spawning, larval, and juvenile to pre-recruit has shown to bring about significant improvements in landings and food security for small-scale operators

Department of Fisheries, Thailand reports an almost 10-fold increase in landings from 2,470 tons prior to the expansion of the network to 28,670 tons include the operational management of areas C and D. This success points to possible strengthened resilience of stocks of Indo-Pacific associated with the ongoing establishment and planned management of fisheries refugia sites for this species in the transboundary area of Trat, Thailand and Koh Kong, Cambodia which are located to the east of the present managed areas. Recent surveys show these areas to be critical areas for juvenile and young adult Indo-Pacific mackerel.

IV. CONCLUSIONS

Many countries in the coastal areas of the Gulf of Thailand effort to manage their fisheries resources and short mackerel, however individually works for development of their fisheries management maybe not enough to safe and ensure fish stock for sustainable utilization. As short mackerel is a shared fish stock, it is therefore required clear scientific information such as migration patterns, spawning areas, as well as genetic study of its population. Between Thailand and Cambodia particular in Trat Province of Thailand and Koh Kong Province of Cambodia, it is necessary to find on how migration of short mackerel in these transboundary areas. In addition, the short mackerel between Cambodia and Southern Viet Nam needed to be identified as well to support the management of their stock for sustainable utilization by those countries.

V. REFERENCES

- Boonprakob, U. 1974. Conclusion of Indo-Pacific mackerel's dynamic in the Gulf of Thailand for conservation on Indo-Pacific Mackerel. Technical Paper, Pelagic Fish Conservation Unit during 1967-1972 part 1. Survey and Research Division, Department of Fisheries; pp 203-231.
- Cheevaporn, V., & Menasveta, P. (2003). Water pollution and habitat degradation in the Gulf of Thailand. *Marine, Pollution Bulletin*, 47, 43–51.
- MFRDMD (2010) Ensuring the Sustainability of Small Pelagic Fishery in the Southeast Asian Region, SEAFDEC Newsletter Vol.33 No.3
- Pirochana Saikliang (2014). Development of Fisheries Refugia through Closed Seasons and Areas in the Gulf of Thailand, *J. Mar. Biol. Ass. India*, 56 (1), 70-76.
- SEAFDEC (2018). Sub-regional Initiatives on Transboundary Species Management in GoT: AIB-Species, in the Gulf of Thailand Technical Meeting on Management of Transboundary Species: Indo-Pacific Mackerel on 19-20 December 2018.
- SEAFDEC, 2019. Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand, Report of the Second Meeting of the Regional Scientific and Technical Committee (RSTC2) in Kampot Province, Cambodia on 21th – 23th May 2019. Southeast Asian Fisheries Development Center, Training Department, Samutprakarn, Thailand; 179 p.
- Wattayakorn, K. (2012). Petroleum pollution in the Gulf of Thailand: A historical review. *Estuarine and Coastal Marine Science*, 35, 234–245.

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