



The 2nd Regional Scientific and Technical Committee Meeting for 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

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Thansur Sokha Hotel, Kampot Province (Fisheries *Refugia* Site), Cambodia.

BIOLOGICAL STUDY OF SHORT MACKEREL IN KOH KONG, CAMBODIA

I. INTRODUCTION

Short mackerel (*Rastrelliger brachysoma*) is a pelagic fish that tolerates slightly reduced salinities in estuarine habitats and occurs in areas where surface temperatures range between 20 and 30° C. This marine fish species found disperse along the coast throughout the major part of the Central Indo-West Pacific region, including Viet Nam, Cambodia, Thailand, Myanmar, Malaysia, Indonesia, Papua New Guinea, Philippines, Solomon Islands and Fiji. Considering the decreasing number of the wild population of Short mackerel, mainly due to the overfishing and the deterioration of the environment. The major source of this fish has been only from the capture fishery, which is not enough to meet for consumer demand. Therefore, incorporate strategies that aim to work towards better management of fisheries and marine habitats are needed to complement the management measures for sustainable fisheries.

II. REQUIRED SCIENCE-BASED INFORMATION FOR MANAGEMENT



Figure 1: the migration patterns of short mackerel in the Gulf of Thailand by DOF.

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 migration patterns of short mackerel were discovered by the Department of Fisheries of Thailand (see Figure. 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 Thailand.

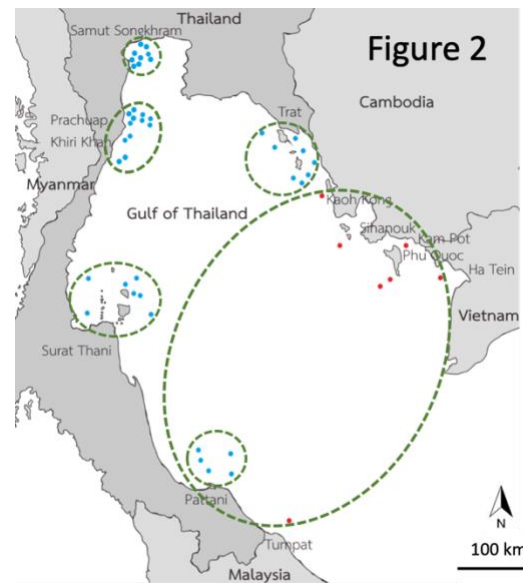
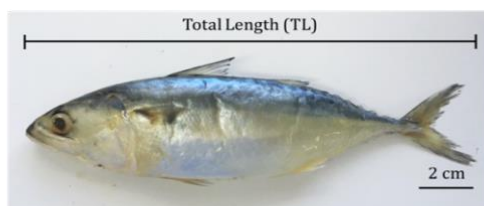
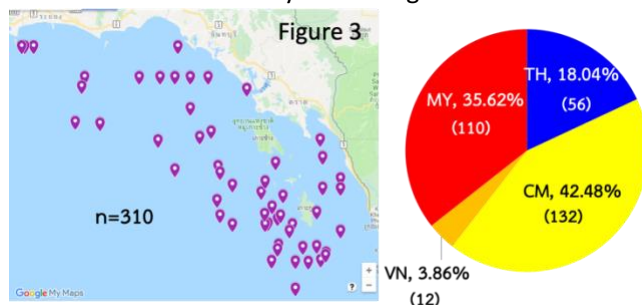


Figure 2: Map indicating sampling localities and population differentiation of Short mackerel in the Gulf of Thailand.



n=310; mean TL_±SD = 16.65 ± 1.38 cm

Figure 3: the contributions of the Short mackerel populations in the Gulf of Thailand by DOF according to the origin by countries in year 2014.

It is therefore needed to understand the overall genetic diversity of short mackerel in the Gulf of 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 Pattani (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. Environment Parameters

The oceanography and biogeochemical characteristics determine the abundance, growth, survival, and recruitment of marine resources and significantly influence the magnitude of fisheries in the sea. A study on Indo-Pacific Mackerel (Short Mackerel) Resource in Relation to Sea Surface Environment in The

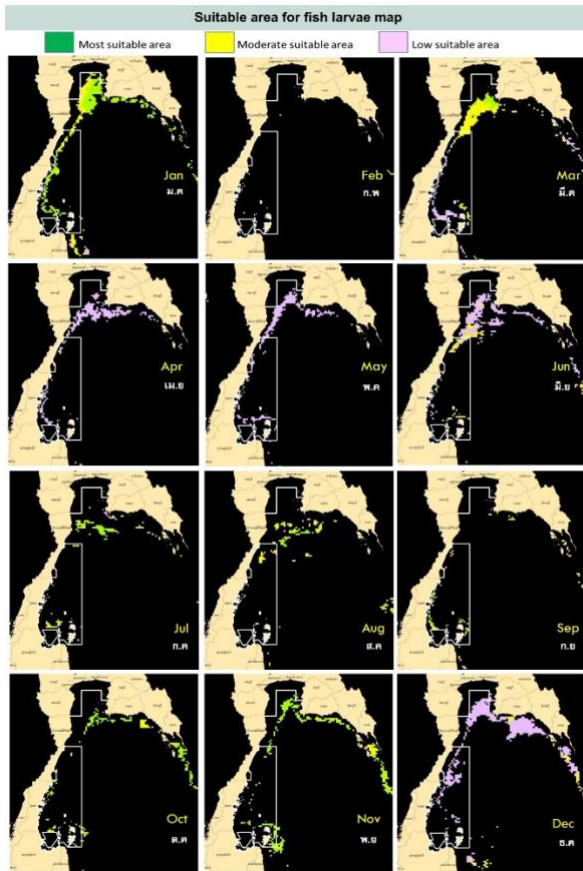


Figure 4: suitable area for fish larvae map generate by MODIS data in year 2015.

Gulf of Thailand had conducted. The study was aimed to investigate changes of Chlorophyll-a and sea surface temperature using satellite data along with a relationship between Short mackerel resource actual data from field survey sample and Chlorophyll-a and sea surface temperature. The study results indicated the relative between sea surface temperature, chlorophyll-a and planktons which fishes including Short mackerel's feed (confirmed by stomach content study) as shown in Figure 4 and Figure 5. The overall results revealed that environment in the sea have changed especially a rising in sea surface temperature which might be a reason for the period of peak sex organ development in Short mackerel had a bit shift from normal (Methee et al.,2017).

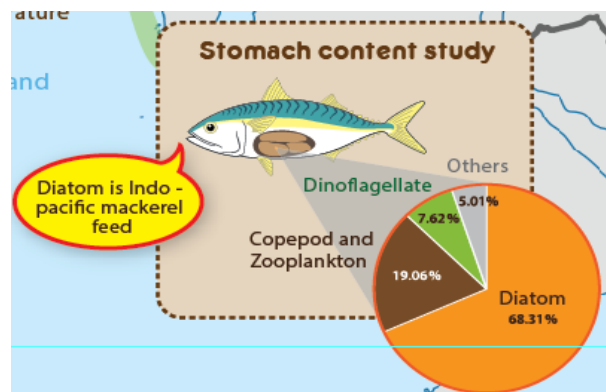


Figure 5: Stomach content of Short mackerel in Prachuap Khiri Khan Province, Thailand during 2013.

III. ENHANCING INFORMATION OF SHORT MACKEREL IN CAMBODIA

Thus, it was acknowledged that Short mackerel is common in Cambodian waters but there is limited knowledge as compared to that of the western part of the Gulf of Thailand on the migratory patterns, and where the most important spawning area of Short mackerel is, etc. However, it is expected that similar pattern exists for the eastern Gulf, even down to the waters of Vietnam. The pattern of migration during critical stages of the lifecycle needs to be studied with the scientific base. Here the aim is, through the establishment of refugia, to ensure the sustainable use of important fisheries resources during critical stages of their life cycle by specific management measures on their habitats. In connection with progressive results from the project implementation, The Project Coordinating Unit of the SEAFDDEC/UNEP/GEF Fisheries Refugia project (PCU) in cooperation with Fisheries Administration Cambodia (FiA) was conducted a Technical Training to officers from Fisheries Administration/Cambodia on Biological Studies of Short Mackerel (*Rastrelliger brachysoma*) during 11th to 15th February 2019. The specific subjects are focused on species identification, maturity stage identification, and methodology for larval and juvenile fish surveys in the coastal areas of Koh Kong Province, Cambodia. The information to be obtained from these studies is as follows:

- ❖ Biological data:
 - Monthly size composition of short mackerels
 - Length-weight relationship
 - Length at first maturity
 - Sex ratios
 - Spawning season determination from Gonadosomatic Index (GSI) and % of maturity
 - Stock unit/population structure using DNA analysis methods
- ❖ Larval and juvenile fish surveys:
 - Monthly larval and juvenile fish species and composition in coastal area of Koh Kong province
 - Phytoplankton, zooplankton, sea surface temperature and salinity, etc.
 - Etc.

IV. MANAGEMENT OF TRANSBOUNDARY SHORT MACKEREL SPECIES

The Project Coordinating Unit of the SEAFDDEC/UNEP/GEF project on Fisheries Refugia in collaboration with the National Lead Agency on Fisheries Refugia in Cambodia and Thailand will work together to understand more on the transboundary species, short mackerel. Furthermore, it is believed that based on the project implementation by both Cambodia and Thailand, the sub-regional cooperation for management of short mackerel refugia between Thai-Cambodia can be established by 2020. By this reason, the scientific data/information sharing among two countries for identification of fish refugia such as spawning ground, nursery ground and migratory route are required.

XX