The Seventh Meeting of the Scientific Working Group on Neritic Tunas Stock Assessment in the Southeast Asian Waters

SEAFDEC/MFRDMD, Kuala Terengganu, Malaysia

23rd- 24th August 2022

Southeast Asian Fisheries Development Center

Marine Fishery Resources Development and Management Department

PREPARATION AND DISTRIBUTION OF THIS DOCUMENT

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ABBREVIATION

AMAF	ASEAN Ministerial Meeting on Agriculture and Forestry
AMS	ASEAN Member State
AR	Artificial reef
ASEAN	Association of Southeast Asian Nations
ASPIC	A Stock-Production Model Incorporating Covariates
ASWGFi	Southeast Asia Sectoral Working Group on Fisheries
BoB	Bay of Bengal
CMSY	Monte Carlo method
CPUE	Catch Per Unit Effort
DOF	Department of Fisheries
ECPM	East coast of Peninsular Malaysia
EU	European Union
FAO	Food and Agriculture Organization
FiSAT	Fish Stock Assessment Tools
FMP	Fisheries Management Plan
GEF	Global Environment Fund
GoT	Gulf of Thailand
JTF	Japanese Trust Fund
mt	Metric ton
mtDNA	Mitochondrial Deoxyribonucleic Acid
nm	Nautical miles
RIMF	Research Institute of Marine Fisheries
RPOA	Regional Plan of Action
S-SOM	Southeast Asian Senior Officials Meeting
SOP	Standard Operating Procedure
SWG	Scientific Working Group
TAC	Total Allowable Catch
ToR	Term of Reference
WCPM	West coast of Peninsular Malaysia

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The Seventh Meeting of the Scientific Working Group on Neritic Tunas Stock Assessment in the Southeast Asian Waters
23rd- 24th August 2022
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I. INTRODUCTION AND OPENING OF THE MEETING

1. The Seventh Meeting of the Scientific Working Group (SWG) on Neritic Tunas Stock Assessment in the Southeast Asian Waters was organized by SEAFDEC/MFRDMD via Google Meet webinar on 23rd - 24th August 2022. The meeting was attended by the representatives from Brunei, Cambodia, Malaysia, Myanmar, Philippines, Thailand, and Viet Nam; as well as resource persons from Japan and Thailand; the representatives from SEAFDEC Secretariat and SEAFDEC/TD; the Chief, Deputy Chief, and Officials from SEAFDEC/MFRDMD. The list of participants appears in **Annex 1**.

2. The meeting was officiated by the Chief of SEAFDEC/MFRDMD, *Mr Abdul Haris Hilmi Ahmad Arshad*. He welcomed all the participants to the Seventh Meeting of the SWG-Neritic Tunas Stock Assessment in Southeast Asian Waters. He iterated the aims of this meeting, i) to share the report of the practical "Workshop on Seerfish in Malaysian Waters using ASPIC in Collaboration with DOF Malaysia". ii) to share the stock status of seerfish of all ASEAN Member States (AMSs), and iii) to discuss future work plans of activities. *Mr Abdul Haris* Hilmi anticipated that by the end of the meeting, the stock status of seerfish in all AMSs would be updated, and recommendations for the future work plan of operations for SWG-Neritic Tunas in the Southeast Asian region would be presented. He extended his gratitude to the Japanese Trust Fund (JTF) for supporting this project and the Deputy Chief of SEAFDEC/MFRDMD for his efforts in preparation for this meeting. The opening address appears in **Annex 2**.

II. ADOPTION OF AGENDA

3. The agenda was presented to the meeting and the resource person, *Dr Tsutomu Nishida*, recommended a 15-minute discussion following each AMS presentation in order to better comprehend the information presented. *Mr Abdul Haris Hilmi* accepted the suggestion, and the meeting agenda was adopted with a slight change. The meeting agenda appears in **Annex 3**.

III. PROGRESS ON STOCK AND RISK ASSESSMENTS OF NERITIC TUNA AND TUNA-LIKE SPECIES

4. Project leader, *Mr Mohammad Faisal Md Saleh*, presented the findings of the most recent internal workshop, "Workshop on Seerfish Using ASPIC in Collaboration with DOF Malaysia", held in December 2021. His presentation appears in **Annex 4**.

5. *Dr Nishida* applauds *Mr Mohammad Faisal* for his excellent presentation. He offered improvements to the prior internal workshop through his presentation, which is included in **Annex 5**.

6. Another resource person, *Dr Supapong Pattarapongpan*, fully agreed with *Dr Nishida*'s suggestion to update stock information and status in the Southeast Asian region at

least once every two (2) to three (3) years. *Dr Pattarapongpan* also requested that the results and evaluations of stock and risk assessments for tuna and tuna-like species be included in the future so scientists and the general public alike may understand the stock status in the region.

7. Finally, *Dr Pattarapongpan* agreed with *Dr Nishida*'s recommendation to organize future capacity building on data evaluation and catch per unit effort (CPUE) standardization since it is critical in stock assessments.

IV. CLARIFICATION OF THE STOCK STRUCTURE FOR ONE NERITIC TUNA SPECIES IN THE SOUTHEAST ASIAN REGION.

8. Senior Research Officer, *Ms Wahidah Mohd Arshaad*, presented the "Clarification of the Stock Structure for One Neritic Tuna Species in the Southeast Asian Region". The primary objective of this study is to utilize the mitochondrial deoxyribonucleic acid (mtDNA) D-loop marker to determine the genetic diversity and population structure of *E. affinis* in the Southeast Asian region. Her presentation appears in **Annex 6**.

9. Earlier studies in the Southeast Asian region using various genetic markers revealed that the stock status of other neritic tuna, *Thunnus tonggol* is panmixia, or a single population stock, implying that the stock should be handled collectively.

10. This study utilized mtDNA D-loop because of its capacity to assess intraspecific genetic variation. Six hundred and ten samples were collected from 13 locations around the Southeast Asia area, representing the Andaman Sea, South China Sea, and Sulu Sulawesi Sea, with 100 samples deposited at the Research Institute of Marine Fisheries (RIMF) Indonesia and yet to be evaluated. Meanwhile, 430 samples were successfully tested, and the results revealed 97% genetic similarity among the *E. affinis* population in this region.

11. A total of 275 haplotypes were developed; the high haplotype diversity and low nucleotide diversity imply a recent population increase in a large population. In addition, Maximum Likelihood Analysis found no discernible pattern of separation between *E. affinis* populations. Moreover, genetic distance within and between *E. affinis* populations has been determined to be minimal to nonexistent. This suggests that the *E. affinis* population throughout Southeast Asia originated from a single stock.

12. *Dr Nishida* expressed concern over the management efficiency if the widely dispersed species were to be managed as a single stock due to the involvement of several AMSs with differing laws and legislations. *Dr Pattarapongpan* advised that, in order to strengthen cooperation in the management of single-stock species, other biological factors, such as migratory patterns, gonads, *etc*., may be studied.

13. The Policy and Program Coordinator for SEAFDEC Secretariat, *Dr Worawit Wanchana*, announced future endeavours by the SEAFDEC partnership project include the Food and Agriculture Organization (FAO)- Global Environment Fund (GEF)-SEAFDEC project in the Bay of Bengal (BoB), Gulf of Thailand (GoT), and Sulu-Sulawesi (SS) Southeast Asia, which consists of a comprehensive, collaborative management strategy for transboundary species in the Southeast Asian region.

14. In addition, he highlighted that the technical finding on the stock structure and stock assessment analysis presented at this meeting would become the guidelines in subregional forums and will be considered in the management of certain transboundary species.

15. The representative of Indonesia, *Dr Tegoeh Noegrobo*, inquired about the status of samples from Indonesian, to which *Ms Wahidah* said that the Indonesian focal point would analyze 100 samples obtained in Banda Acheh and Pemangkat after the funds from MFRDMD for this project was received.

16. The representative of Philippines, *Ms Grace Lopez*, recommended including reproductive biology characteristics in the study. *Ms Wahidah* outlined the limits associated with including reproductive biology characteristics, which will necessitate additional expenditures and technical knowledge due to the expansive scope of the study.

V. PROGRESS ON THE LIFE-HISTORY STUDY FOR *E. affinis*

17. Research Officer, *Ms Annie Nunis Billy*, presented the "Progress on the Life-History Study for *E. affinis*". She highlighted that the age study might be utilized for population research, stock enhancement, and management measures. Her findings indicate that the average age of *E. affinis* throughout the east coast of Peninsular Malaysia (ECPM) from January 2020 to July 2021 is four years.

18. According to the results of the preliminary study conducted in 2020, she hypothesized that the spawning season for *E. affinis* along the ECPM occurs between April and June, with gonad maturity ranging from stages three to four. Meanwhile, the stock-recruitment may occur between July and October, as more juveniles were caught during this timeframe. Her presentation appears in **Annex 7**.

19. *Dr Nishida* noted that the SWG-Neritic Tunas gathers a wide array of biological data. He highly suggests that the data be incorporated into the stock assessment since the life-history study contains essential and valuable data for *E. affinis*.

20. *Ms Annie* also indicated that a study on the life cycle of *E. affinis* along the west coast of Peninsular Malaysia (WCPM) is now underway. It is hoped that the outcome of the study will provide additional information, along with genetic findings, on whether the *E. affinis* population in Peninsular Malaysia is recognized as a single stock or as distinct stock, as well as the most effective management framework.

21. *Dr Pattarapongpan* noted that the results of the life history study are insightful and enlightening for comprehending *E. affinis*'s life history. In addition, he strongly advised that the data from ECPM be integrated with the data from WCPM to conduct stock assessment and management. He also requested the data on *E. affinis*'s growth rate and $L\infty$.

22. *Dr Pattarapongpan* stated that the data might be utilized to support and corroborate the stock status of *E. affinis*. It may also be used to determine the migration pattern of *E. affinis*. He hopes the effort might be extended to WCPM.

VI. PRESENTATION ON CURRENT STOCK STATUS OF SEERFISH IN AMSs FOR THE LAST 20 YEARS

- Brunei Darussalam

23. The representative of Brunei Darussalam, *Mr Muhammad Azizi Mahali*, presented the "Stock Status of Seerfish in Brunei Darussalam". His presentation appears in **Annex 8**. In recent years, an upward trend may be seen for the CPUE value in Brunei Darussalam. *Mr Muhammad Azizi* stated that the waters of Brunei Darussalam are divided into four zones: Zone 1, Zone 2, Zone 3, and Zone 4. The majority of fishing activity takes place in Zones 1 and 2.

24. *Dr Nishida* noticed that the CPUE numbers provided were derived from trawl and purse seine operations. As a result, while assessing stocks in the future, it is critical to consider the CPUE value from Brunei Darussalam. This increase in CPUE value is crucial for the 2018-2022 stock assessment as the more CPUE trends are accounted for, the more precise the stock assessment in the region.

25. According to him, it is said that the seerfish population in the western half of the Pacific Ocean originates from the same population. As a result, the stock status of nations such as Brunei Darussalam, Indonesia, Malaysia, and the Philippines should be easily comparable. If the CPUE trends in these nations are similar, this is excellent news since it indicates that the seerfish in the waters surrounding Southeast Asia are from the same stock.

26. *Dr Pattarapongpan* was seeking clarification after observing the increasing catch of *Scomberomorus* spp. *Mr Mohd Azizi* explained that it is presumed to be the shift in policy since Brunei Darussalam recently introduced fishing operations in Zone 3. Additionally, he proposed additional indicators to assess the CPUE trend in Brunei Darussalam. In terms of management perspective, a single indicator is insufficient.

27. Research Officer, *Mr Muhammad Amirullah Al-Amin Ayob*, inquired on i) the efficiency of the artificial reefs (ARs) programme in Brunei Darussalam, particularly in enhancing fish stocks, ii) the location of ARs, and iii) the contribution of ARs to increase Brunei Darussalam's fish population. *Mr Mohd Azizi* stated that the surveys were conducted at the ARs following their deployment to determine the development in terms of biodiversity, including the presence of migrating fish, coral production, and other marine species. The primary objective of ARs is to increase fish populations in Brunei waters by providing fish habitats. ARs are typically deployed in marine park areas where fishing is prohibited, which can serve as marine habitat protection. The other goal is to establish new breeding and fishing grounds, and this initiative can shift the fishing pressure in other places.

- Cambodia

28. The representative of Cambodia, *Mr Suy Serywath*, explained that there is currently no systematic effort in Cambodia to record or monitor seerfish. This meeting is a fantastic opportunity to obtain ideas, suggestions, and information from other ASEAN Member States (AMSs). Approximately two to three tons of seerfish are caught in Cambodian waters.

Nevertheless, since COVID-19, the catch of seerfish has been significantly reduced. Stormy weather makes it challenging to capture these fish in Cambodian waters, and it is thought that seerfish migrate to different regions to avoid storms.

29. Cambodia's primary focus is generally on the total catch rather than by species. Since last year, the European Union (EU) has financed an initiative to monitor landing catches at specific landing locations, and species-specific monitoring could have been conducted for seerfish. Therefore, in the future, researchers will be able to examine the data and information on the seerfish stock status.

30. *Dr Nishida* remarked that the FAO statistics do not include any catch data that can be considered for evaluation but that the EU project may generate more precise data on catch and trend in the near future, despite the modest amount of catch on seerfish.

- Indonesia

31. *Dr Tegoeh* presented the "Stock Status of Indonesia Seerfish Fisheries". He began by presenting a brief overview of the various vessels employed in harvesting seerfish. Traditional wooden boats are utilized by most of Indonesia's fishers, and gillnets and purse seines are the most popular fishing gear. Smaller vessels frequently fish in close proximity, fewer than 12nm, whereas larger vessels fish beyond 12nm. According to the stock status assessment, *Scomberomorus commerson* has a moderate fishing mortality rate, whereas *S. guttatus* has a high fishing mortality rate. Additionally, he highlighted that Indonesia had developed a Fisheries Management Plan (FMP) in order to manage fisheries resources more sustainably. He concluded his presentation by summarising fisheries issues, as well as conclusions and recommendations. His presentation appears in **Annex 9**.

32. *Dr Nishida* has requested information on the number of purse seine and gillnet fishing vessels from 2000-2016, as well as detailed fishing efforts to estimate stock status accurately. *Dr Tegoeh* responded that data are available for the number of registered boats in Indonesia but not for actively operated boats or the fishing gear sets employed by each vessel. *Dr Nishida* stated that to estimate the fishing effort and CPUE accurately, it is preferable to have information for actively operated boats rather than the number of registered boats, as well as the number of fishing gear sets for each vessel.

33. *Dr Nishida* inquires further about the method employed to determine the growth equation and natural mortality (M). *Dr Tegoeh* explained that M was estimated using Fish Stock Assessment Tools (FiSAT) and Length Base Analysis, while the growth equation was estimated using ASPIC. He stated that Indonesia is already well aware of the incomplete data for the number of active fishing fleets, particularly for seerfish, to determine fishing efforts for CPUE estimation. In this regard, a new data recording system was implemented by supplying active fishing fleets with physical and digital logbooks to record their catch and effort.

34. *Dr Pattarapongpan* noted that the growth for *S. commerson* and *S. guttatus* have distinctive characteristics. The two species differ in size but have a slow growth rate. He explained that generally speaking, smaller species within the same genus and environmental variables grow more quickly than larger species. However, in Indonesia's case, even though *S. commerson* is bigger than *S. guttatus*, their growth rates are nearly identical. In addition, he advises that Indonesia may employ alternative approaches, such as FiSAT, otolith study, or the

R-package TropFishR, for the growth parameter equation. The R-package TropFishR contains additional statistical methods for analyzing data on the growth parameter equation.

- Malaysia

35. The representative of Malaysia, *Mr Sallehudin Jamon*, presented "The Stock Status of *S. commerson* and *S. gutattus* in Malaysian waters". His presentation appears in **Annex 10.**

36. *Dr Nishida* commended *Mr Sallehudin* for his involvement as a resource person in the prior internal workshop by MFRDMD. In addition, he mentioned that the previous internal workshop had limitations due to the fact that only catch data from Malaysia was utilized. Data from the Andaman Sea and the South China Sea are necessary to evaluate the status of seerfish stocks in the Southeast Asian region. He noted that the Monte Carlo method (CMSY) analysis only interpreted catch data, whereas the ASPIC analysis interpreted both catch and effort data. Therefore, he believes the ASPIC analysis has more accurate results than the CMSY analysis. However, CMSY analysis can be utilized if the data quality is poor. He indicated there is no cause for concern if the catch data has a more extended time series than the effort data since at least more than ten years of data is required to produce reliable analysis output. However, as a gentle reminder, standardization of the nominal catch and effort data is necessary before running the analysis.

37. *Mr Sallehudin* clarified that the CMSY analysis only interprets the catch data. Still, if the same catch data is utilized in ASPIC analysis with the addition of effort data, the outcome will be nearly identical. This is based on his previous analysis of landing data for other species. However, there were some discrepancies in both analyses for seerfish, despite the fact that he applied the same catch data.

38. *Dr Pattarapongpan* commented that if the data quality for CMSY analysis is satisfactory, the outcome will be identical to that of other analyses employing the same catch data. However, since seerfish is not a target species for Southeast Asia fisheries, the data may not be as reliable as for other neritic tuna species, which may result in a disparity between the results of the ASPIC and CMSY analyses. In this instance, the ASPIC analysis result is more reliable because catch and effort data were interpreted. If the quality of seerfish data improves in the future, it may be possible to compare the results of ASPIC and CMSY analyses.

39. *Mr Sallehudin* responded that CMSY analysis is commonly utilized by Japanese and Chinese researchers to evaluate stock status. Regarding the CMSY analysis and its interpretation, a large number of references and journals are available. Consequently, he suggested that SEAFDEC can continue introducing CMSY analysis to AMSs through capacity building.

40. *Dr Pattarapongpan* indicated that CMSY analysis might be utilized as a model for future assessments, but the data quality is the primary concern. He proposed prioritizing training on data validation and adopting the advanced form of data validation in terms of capacity building. If it is successful, the CMSY analysis can support the outcome of ASPIC.

41. *Dr Nishida* was in opposition to *Dr Pattarapongpan*. He proposed continuing to utilize ASPIC rather than the CMSY analysis, as the CMSY analysis is only employed when the data quality is inadequate. In addition, it is preferable to compare the stock assessment derived from ASPIC with those of the other biological assessment models.

42. *Mr Sallehudin* concurred with *Dr Nishida* as well. Since most references indicate that CMSY analysis was utilized for poor data quality, AMSs should continue to utilize ASPIC analysis since AMSs have effort data that can generate more reliable results.

- Myanmar

43. The representative of Myanmar, *Mr Soe Win*, presented the "Current Stock Status of Seerfish in Myanmar". Presently, there are four fishing grounds along Myanmar's coastal area where fishing vessels are permitted to fish in one or two adjacent fishing grounds. Myanmar also has a closed season, which means that fishers can only operate during particular times of the year, depending on the type of fishing gear they deploy. Bio-economic modelling of mackerel caught using gillnet and landed at Yangon jetty between 2008 and 2019 revealed a grim scenario of 66.6% decline in the catch (including *S. commerson*, *S. guttatus*, *S. koreanus etc*.). This prompted the Myanmar government to implement a 14% reduction in fishing efforts. His presentation appears in **Annex 11.**

44. *Dr Nishida* expressed gratitude to *Mr Soe Win* for his presentation. According to him, 1400 tonnes is a sizable amount of fish caught in the Indian Ocean. As a result, he proposed that the total catch could be included in future assessments of the seerfish stock status. In addition, he clarified that the seerfish is a pelagic species that inhabit the waters of Malaysia, Myanmar, and Thailand. Consequently, it is crucial that these nations perform their separate responsibilities in ensuring the viability of the current seerfish stock. These approaches are more achievable than Myanmar's attempts to reduce its catch effort by 14%.

- Philippines

45. *Ms Lopez* presented the "Seerfish of the Philippines". In her presentation, she stated that from 2012 to 2021, *S. commerson* accounted for 97% of all seerfish landings, whereas *S. guttatus* represented just 3%. She mentioned that Region 6 (located in the Central Visayas area of the country) had the highest total seerfish landings, with 854 mt. As seerfish is a bycatch of commercial fishing operations in the Philippines, it is often captured by purse seine, hook-and-line, or drift gillnet. In addition, the figures from the Philippines Statistical Authority indicate the total output of seerfish regardless of species, and the metadata system does not account for the fishing effort. Due to sporadic landings, she also noted that no biological assessment had been undertaken on seerfish. Her presentation appears in **Annex 12.**

- Thailand

46. The representative of Thailand, *Dr Pavarot Noranarttragoon*, presented the "Seerfish Fisheries in Thailand". *Dr Noranarttragoon* noted that 95% of the seerfish captured in Thailand comprises narrow-barred Spanish mackerel (*S. commerson*) and Indo-Pacific king mackerel (*S. guttatus*). Furthermore, 80% of all seerfish captures originate from the Gulf of Thailand. At the same time, 74% of the catch was caught by commercial purse seine and trawl fleets, whereas handline and longline are the major gears employed by the artisanal fleet. His presentation appears in **Annex 13.**

47. So far, no study has been conducted on biological parameters and stock assessment of seerfish in Thai waters. In the Thai fisheries management policy, seerfish resources are governed under the pelagic fish group, which is confined to annual allowable quotas and fishing effort restrictions. Due to the complexity of multi-species and multi-gear fisheries in Thai

waters, comprehensive fishing information on seerfish fisheries necessitates substantial cost and effort, as well as the expertise necessary for scientific studies on biological parameters.

48. To improve knowledge of seerfishes and prepare for future stock assessments in the region, Thailand suggests establishing regional collaboration on data collection and, at the same time, developing a standard operating procedure (SOP) for data collection. *Dr Nishida* suggested that the protocol for data collection for seerfish should be comparable to the SOP for data collection of neritic tunas.

- Viet Nam

49. The representative of Viet Nam, *Mr Nguyen Viet Nghia*, presented the "Stock Status of Seerfish in Vietnam". He began his presentation by outlining the three fishing management zones in Viet Nam: coastal, nearshore, and offshore. He added that there is a five-year management cycle for fishing zones, during which the limit for fishing licences and catches is updated. Overall, Viet Nam aims to determine the total allowable catch (TAC) and undertake a stock assessment every five years. Then, he described the neritic tuna present in Vietnamese waters, including frigate tuna, bullet tuna, kawakawa, stripped bonito, and longtail tuna. Simultaneously, *Mr Nguyen* stated that no data collecting on seerfish had been conducted in Viet Nam thus far. He ended his presentation by highlighting the primary concerns and challenges faced in Viet Nam, namely, very poor time series data gathering. His presentation appears in **Annex 14**.

VII. GENERAL DISCUSSION AND WAY FORWARD

50. *Dr Nishida* shared his insights and proposed future initiatives for the project. In his presentation, he addressed the technological and logistical challenges that AMSs must consider. This technical problem discusses the stock assessment method employed, ASPIC. On the other hand, the logistical difficulties encompassed capacity building for this project. His presentation appears in **Annex 15.**

VIII. CLOSING OF THE MEETING

51. The Deputy Chief of SEAFDEC/MFRDMD, *Dr Masahito Hirota*, thanked all AMSs for their active engagement. He explained that due to the ongoing COVID-19 pandemic, SEAFDEC/MFRDMD has decided to organize the meeting via video conference. *Dr Hirota* mentioned that The JTF VI Phase II project, "Fisheries Management Strategies for Pelagic Fish Resources in the Southeast Asian Region," supports SWG-Neritic Tunas activities and is halfway through the five-year road map. He is hopeful that the members will be able to work closely and consistently together to provide scientific recommendations for sustainable management of pelagic resources in this region. His closing remarks appear in **Annex 16**.

Annex 1

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Annex 2

OPENING ADDRESS

Mr Abd Haris Hilmi Ahmad Arshad
Chief of SEAFDEC/MFRDMD

The Seventh Meeting of the Scientific Working Group on Neritic Tunas Stock Assessment in the Southeast Asian Waters

SEAFDEC/MFRDMD, Kuala Terengganu, Malaysia
23 August 2022

بسم الله الرحمن الرحيم

السلام عليكم ورحمة الله وبركاته

Very good morning

Representatives from Brunei Darussalam

Representatives from Cambodia

Representatives from Indonesia

Representatives from Malaysia

Representatives from Myanmar

Representatives from Philippines

Representatives from Thailand

Representatives from Viet Nam

Representatives from SEAFDEC Secretariat

Representatives from SEAFDEC/TD

Our Resource Person Dr Tsutomu Nishida & Dr Supapong Pattarapongpan

All observers

All officers from SEAFDEC/MFRDMD

First, I welcome you to the Seventh Meeting of the SWG- Neritic Tunas Stock Assessment in the Southeast Asian Waters organized by SEAFDEC/MFRDMD.

Recognizing the importance of neritic tuna fisheries in Southeast Asian waters, regional or sub-regional cooperation is needed to promote the sustainable utilization of neritic tuna. The Regional Plan of Action on Sustainable Utilization of Neritic Tunas in the Southeast Asian waters (RPOA-Neritic Tunas) was finalized by all AMSs. It was endorsed by the 47th Meeting of the SEAFDEC Council in April 2015 and the 23rd Meeting of the Southeast Asia Sectoral Working Group on Fisheries (ASWGFi). The Regional Plan of Action (RPOA)-Neritic tuna

was also supported by the Southeast Asian Senior Officials Meeting (S-SOM) during the 36th ASEAN Ministerial Meeting on Agriculture and Forestry (AMAF) in late 2015.

The meeting of the SWG-Neritic Tunas was conducted yearly, and the first meeting was held in collaboration with the DOF Malaysia in 2014. The meeting reviewed the status and trends of neritic tuna fisheries in the Southeast Asian region, especially the stock status of the longtail tuna resources, and the drafting of the Term of Reference (ToR) for a long-term establishment of the regional working group in which the Member Countries agreed to support its implementation after ending of the project.

A Series of meetings were conducted between 2015-2019; the 2nd was held in Viet Nam in 2015, the 3rd in Thailand in 2016, the 4th in Malaysia in 2017 and the 5th Meeting in Thailand in 2019. Three objectives of the Seventh Meeting of SWG- Neritic Tunas Stock Assessment in the Southeast Asian Waters this year are:

- To share the report of the practical "Workshop on Seerfish in Malaysian Waters using ASPIC in Collaboration with DOF Malaysia".
- To share the stock status of seerfish of all AMSs countries.
- To discuss future work plans of activities.

By the end of this meeting, it is expected that;

1. The Practical "Workshop on Seerfish in Malaysian Waters using ASPIC in Collaboration with DOF Malaysia" report is a general reference for AMSs.
2. The stock status of seerfish in all AMSs countries was updated.
3. Recommendation on the future work plan of activities for SWG-Neritic Tunas in the Southeast Asian Region.

Finally, I would like to record my appreciation and congratulation to all MFRDMD staff, especially Deputy Chief Dr Masahito Hirota, Mr Mohammad Faisal and Ms Mazalina, as well as Dr Worawit Wanchana from SEAFDEC Secretariat and Ms Suwanee Sayan from SEAFDEC/TD, resource person Dr Supapong Pattarapongpan for making this meeting a reality. We also appreciate the expertise and services provided by Dr Tom Nishida and Dr Supapong Pattarapongpan in the past and hope to work again with them in future. I officially open the Seventh Meeting of the SWG - Neritic Tunas Stock Assessment in the Southeast Asian Waters.

Thank you.

PROVISIONAL AGENDA AND TIMETABLE (MALAYSIAN TIME) *Moderator: Special Departmental Coordinator of* SEAFDEC */MFRDMD*	
Day 1 **(23 August 2022)**	
Agenda 1: Opening of the Meeting	
1000-1015	Opening Address *By Chief of* SEAFDEC */MFRDMD*
Chairperson: Chief of SEAFDEC */MFRDMD*	
Agenda 2: Adoption of Agenda	
1015-1030	Introduction and Adoption of the Agenda *By Deputy Chief of* SEAFDEC */MFRDMD*
1030-1045	Tea break
Agenda 3: Progress on Stock and Risk Assessments of Neritic Tuna and Tuna-Like Species	
1045-1100	Result on Workshop on Seerfish in Malaysian Waters using ASPIC in Collaboration with DOF Malaysia *By Mr. Mohammad Faisal Md Saleh from* SEAFDEC */MFRDMD*
Agenda 4: Results on the Population Study of *Thunnus tonggol* in the Southeast Asian Region	
1100-1115	Results on the Population Study of *Thunnus tonggol* in the Southeast Asian Region *By Ms. Wahidah Mohd Arshaad from* SEAFDEC */MFRDMD*
Agenda 5: Progress on the Life-History Study for *Euthynnus affinis*	
1115-1130	Progress on the Life Historical Study of *Euthynnus affinis* *By Ms. Annie Nunis Billy from* SEAFDEC/*MFRDMD*
Day 2 **(24 August 2022)**	
Agenda 6: Presentation on Stock status of seerfish in AMSs for the last 20 years	
1000-1015	Brunei Darussalam
1015-1030	Cambodia
1030-1045	Tea Break
1045-1100	Indonesia
1100-1115	Malaysia
1115-1130	Myanmar
1130-1145	Philippines
1145-1200	Thailand
1200-1215	Viet Nam
Agenda 7: General Discussion and Way Forward	
1215-1245	Future Planning for Meeting and Workshop, Funding and Activities *Moderator: Chief of* SEAFDEC/*MFRDMD*
Agenda 8: Closing of Meeting	
1245-1300	*Closing Remarks by Deputy Chief of* SEAFDEC */MFRDMD*

The 7th Meeting of the SWG-Neritic Tunas in the SEA
23rd & 24th August 2022
SEAFDEC/MFRDMD Kuala Terengganu, Terengganu

Result on Workshop on Seerfish in Malaysian Waters using ASPIC in Collaboration with DOF Malaysia

By:
Mr. Mohammad Faisal Md Saleh
Mr. Mohamad Syahidan Azmi

SEAFDEC/MFRDMD
Kuala Terengganu

Implementation of SWG-Neritic Tunas Meetings

The series of the Scientific Working Group for Neritic Tunas in the Southeast Asian Waters (SWG-Neritic Tunas) Meetings:

- 1st SWG - 18-20 Nov 2014, Shah Alam, Malaysia: a) TOR and Mechanism of SWG endorsed by ASEAN, b) Work plan for Stock Assessment of Neritic Tunas.
- 2nd SWG - 15-17 June 2015, Hai Phong, Viet Nam: a) SOP for Data Collection, b) SOP for Genetic Study and Sampling in the Region.
- 3rd SWG - 27-29 June 2016, Chonburi, Thailand: a) Stock & Risk Assessments for LOT & KAW (2014), b) Genetic Samplings and Study for LOT & KAW.
- 4th SWG - 7-9 Nov 2017, Kuala Lumpur, Malaysia: a) Review the Stock and Population of Seer Fish, b) Preliminary results of Genetic Study for LOT.
- 5th SWG - 9-11 Jan 2019, Bangkok, Thailand: a) Stock & Risk Assessments for Spanish and King Mackerel, b) Results of Genetic Study for LOT.
- 6th SWG - 2 Dec 2020, online by SEAFDEC/MFRDMD: a) Introduce the revised TOR for SWG-Neritic Tunas, b) Results from a series of workshops, c) Disoussions and Recommendation on future plan of SWG activities.
- 7th SWG - 23-24 Aug 2022, online by SEAFDEC/MFRDMD: a) Share the result from Seer Fish workshop, b) Share the status of seer fish in AMSs, c) Disoussion and Recommendation on the future plan of SWG activates.

Implementation of Workshop

- The practical workshop is one of the major activities in the SEAFDEC neritic tunas project.
- ASPIC - Stock and risk assessments as recommended by neritic tuna Scientific Working Group (SWG) since 2015.
- 4 regional workshop and an internal workshop had been organized from 2016 until 2021 mainly on 2 species of neritic tuna (*T.tonggol* & *E.affinis*) and 2 species of tuna-like species (*S.commerson* & *S.guttatus*).
- Results of the workshop will be presented during the SWG-Neritic Tunas meeting.
- Results should be looked at caution, due to uncertainties in data, stock structure, CPUE standardization, factors not inorporated in ASPIC (age structure and biological factors) and environment factors.
- Result of workshops also can be used as a reference to the assessments of neritic tunas and tuna-like species stock status.

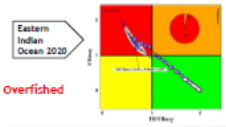
Implementation of Regional Workshop

The series of Regional Workshop of Stock and Risk Assessments on Neritic Tunas was organized:

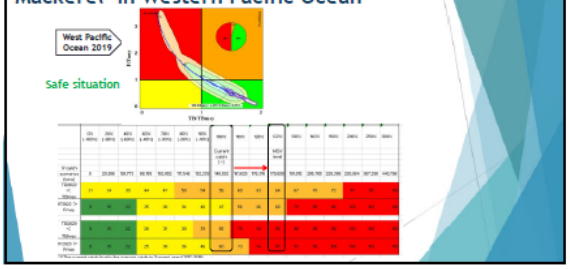
- 1st Regional Workshop (17-25 April 2016), SEAFDEC MFRDMD, Kuala Terengganu, Malaysia: Workshop on Stock Assessments on Kawakawa and Longtail Tuna Resources in SEA.
- 2nd Regional Workshop (7-9 November 2017), Kuala Lumpur, Malaysia: Advance Training Course on Risk Assessments of Kawakawa and Longtail Tuna in the SEA Waters.
- 3rd Regional Workshop (16-20 July 2018), SEAFDEC Training Department, Samut Prakan, Thailand: The Practical Workshop on Stock Assessments of Indo-Pacific King Mackerel and Narrow-barred Spanish Mackerel in the Southeast Asian Waters.
- 4th Regional Workshop – 10 to 15 Feb 2020, SEAFDEC Training Department, Samut Prakan, Thailand: The Practical Workshop on Tuna Stock and Risk Assessment for Longtail Tuna (*Thunnus tonggol*) and Kawakawa (*Euthynnus affinis*) in Southeast Asian Waters.
- Internal Workshop – 19 to 23 Dec 2021, Kuala Terengganu, Terengganu, Malaysia: Workshop on Seer Fish in Malaysia Waters using ASPIC in Collaboration with DOF Malaysia.

Data used for Regional Workshop	Data used for Internal Workshop
➢ Historical nominal catches - obtained from data coordinators from each AMs ➢ Published catch data - obtained from IOTC and FAO. ➢ The data used to build catch by species at two areas (Pacific Ocean side and Indian Ocean side) ➢ Preferred - catch data from IOTC (Indian Ocean side) and FAO (Pacific Ocean side) as they are based on the official data submitted by each government. ➢ Alternatives - data obtained from the data coordinators were used if FAO and IOTC catch data are missing.	➢ Due to Covid-19 pandemic in 2021, SEAFDEC/MFRDMD had organized internal practical workshop on stock assessments of tuna-like species with collaboration with DOF Malaysia. ➢ This collaboration involved the usage of Malaysia's CPUE data and resource person from DOF Malaysia. ➢ This workshop also utilized the catch data from AMSs extracted from FAO and IOTC. ➢ The results of this workshop can be shared with AMSs for reference.

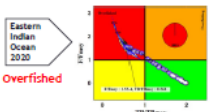
Stock Status of Narrow-barred Spanish Mackerel in Eastern Indian Ocean



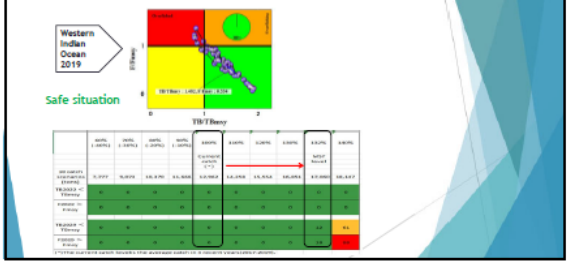
Stock Status of Narrow-barred Spanish Mackerel in Western Pacific Ocean



Stock Status of Indo-Pacific King Mackerel in Eastern Indian Ocean



Stock Status of Indo-Pacific King Mackerel in Western Pacific Ocean



Summary of Result of stock assessments and risk assessments (2021)

	Western Pacific Ocean		Eastern Indian Ocean	
	Scomberomorus	Scomberomorus	Scomberomorus	Scomberomorus
Stock status (Color in the KOBE plot)				
	45%	100%	98%	100%
MSY (tons)	179,600	17,868	45,310	13,878
Current catch level (tons) Average 3 years	146,950 (ave=2017-2019)	12,960 (ave=2017-2019)	41,399 (ave=2018-2020)	13,784 (ave=2018-2020)
Optimum catch level (need to update every years	102,852 (5 & 10 yr)	17,868 (5 & 10 yr)	37,305 (10yr)	9,649 (10 yr)
Reduction (-) or increase (+) from the current to optimum catch level	-30%	+32%	-10% (10yr)	-30% (10yr)

- Narrow-barred Spanish mackerel (Western Pacific Ocean): The current (179,600 tons) can be maintained or should be reduced to at least 30% from current catch to secure MSY levels for both TB and F in 50% probability of violating MSY level in three to ten years.
- Narrow-barred Spanish mackerel (Eastern Indian Ocean): The current catch (45,310 tons) should be reduced to at least 10% to secure MSY levels for both TB and F with a 50% probability if violating the MSY level in 10 years.
- Indo-Pacific king mackerel (Western Pacific Ocean): The current catch (12,960 tons) can be increased by 32% to the MSY level. Even increase to MSY level, the probabilities of violating MSY (TB and F) is less than 18% in three and ten years.
- Indo-Pacific king mackerel (Eastern Indian Ocean): The current catch (13,784 tons) should be reduced to at least 30% to secure MSY levels for both TB and F at a 50% probability of violating MSY level in ten years.

Constrain

- Uses of catch data from IOTC & FAO and effort data from Malaysia.
  - FAO - Indonesia, Philippines and Malaysia.
  - IOTC - Bangladesh, Indonesia, Malaysia and Thailand.
- The accuracy of the results due to only catch and effort data from Malaysia were used.
- Multi-gear for seer fish fisheries in the SEA region.
- Only participants from SEAFDEC/MFRDMD and Malaysia SWG-Neritic tunas members (Ms. Effarina & Ms. Norazlin can attended the workshop due to inter-countries restriction.

Discussion

- Previous analysis conducted by SEAFDEC/TD utilized CPUE data from several member countries whereas recent discussion utilize only CPUE data from DOF Malaysia.
- Any comparison between those two results would be incomparable. The comparison of previous (2016) and current (2020) seer fish status stocks in both regions (Western Pacific Ocean and Eastern Indian Ocean) can be discussed if both use nominal CPUE from Malaysia in ASPIC analysis.

Comments
Suggestions
Seerfish SA+RA
(SE Asian water)
(2022)

Tom Nishida
Resource person

1st of ALL, Congratulations!

You achieved SA+RA by yourself
& independently !
It is great and A big applause !

This is the ultimate goal of the Capacity Building.
Self works without using experts and BIG budgets

3 comments

(1) Technical
(2) Editorial
(3) How to handle this report

(1) Technical comments
Last time (2018) vs. this time (2022)

- Stock structure
- Evaluation of Catch
- Evaluation of CPUE
- Evaluation of results (SA+RA)

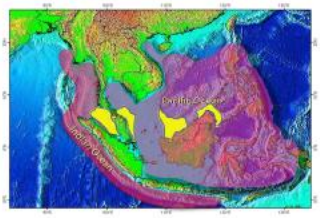
(1) Technical comments : Stock structure

2 stock structures (OK)
(Pacific & Indian)

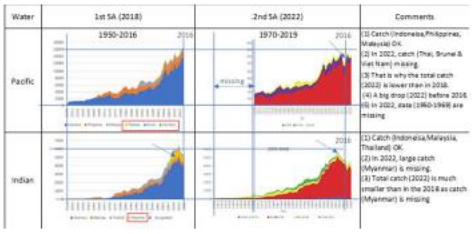
"Malaysian water"
or "SE Asian water"

Malaysian waters limited

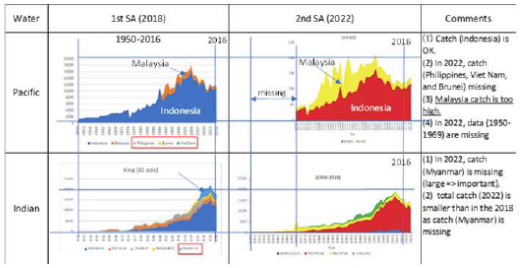
should be
the SE Asian water
consistently



(1) Technical comments : Evaluation of catch (Spanish mackerel)



(1) Technical comments : Evaluation of catch (King mackerel)



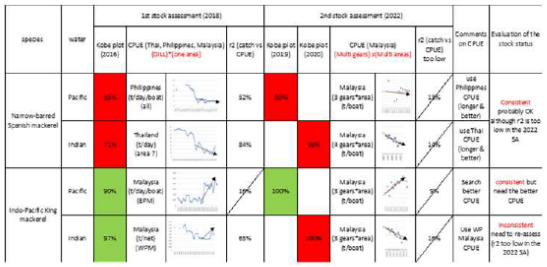
(1) Technical comments : Evaluation of CPUE
Last time (2018) vs. this time (2022)

The report (2022) indicates:
CPUE (2022) is not comparable to the last ones (2018)
as 2022 SA used only Malaysian CPUE.
(note) 2018 SA used multiple CPUE (Thai, Philippines & Malaysia)

↓

Yes.. but, this will be a very good opportunity
to see <u>how different CPUE produce difference SA results</u>

(1) Technical comments : Evaluation of CPUE (2018 vs 2022)



(1) Technical comments : Evaluation of CPUE

<u>Quality of CPUE</u> : r2 (Catch vs. CPUE)
Average 67%(2018) : much higher than 14% (2022) (@5 times)
except King mackerel (Pacific) (both are low level)

Why
2018➔ Best CPUE selected from many CPUE in 3 countries
2022➔ CPUE (low r2) selected only from Malaysia

<u>We need Capacity Building how to select the best CPUE (future)</u>

(1) Technical comments : Evaluation of CPUE

<u>Trends of CPUE (Spanish PO+IO and King PO)</u>
CPUE (2018 vs 2022) are similar : good news
Similar results (Stock status)
But the SA results (2018) more reliable (good Catch & CPUE quality)

CPUE (King mackerel, Indian Ocean)
Conflict (opposite) between 2018 vs. 2022: bad news
Both CPUE are NG (low r2)
We need to search better CPUE from 3 or more countries (future)

(1) Technical comments : Evaluation of CPUE (2022)

No description how to standardize nominal CPUE
0 catch analyses (log normal or 2 steps Delta log normal) ?
ANOVA & diagnostics (residual analyses & QQ plots) ?
not available

↓

Goodness of fitness of standardized CPUE unknown

↓

Uncertainties in results (SA & RA)

(2) Editorial comments (important ones)

- Eastern Indian Ocean (EIO) and Western Pacific Ocean (WPO) ➔ mislead
- Normally FAO and RFMO context ➔ large area as below:

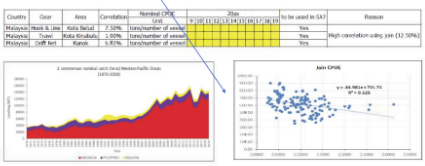
- Need a foot note: EIO & WPO in the SE Asian water then readers understand

(2) Editorial comments (important ones)

- Workshop on Seer Fish in Malaysian Waters ➔ SE Asian waters
- Seer fish ➔ normally seerfish (FAO, IOTC and others).
- Current level ➔ current catch levels (risk assessments)
- Species compositions (Fig 2 and Fig 3)
  - ➔ need the source of information
  - ➔ need to explain how species compositions are used.

(2) Editorial comments (important ones)

Need to include trends of standardized CPUE
(important & critical info. for readers)



(3) How to handle this document (for discussion)

(suggestion from a resource person) ➔ SW7 needs to discuss & decide.

Only one CPUE+ Quality CPUE (low)+ Fitness (unknown)
Catch (some countries) are missing.

⬇

Input (large uncertainties)

➔Results (SA & RA) (large Uncertainties)(likely not plausible)

⬇

It is excellent as exercise, but results should be handled as preliminary.

➔ Results should not be the SEAFDEC official view.

➔We need to re-assess using better catch & CPUE in the future.

(will discuss in Agenda 7: Future work)

Summary

Excellent job ! as all works done independently.
Good evidence that Capacity has been transferred well.
However there are some problems (Catch, CPUE and editorial).

⬇

Future

Need to supervised by a resource person or work together

⬇

To make sure the works can be done with less problems.

Introduction

- Kawakawa, *Euthynnus affinis*, is a small epipelagic tuna species that inhabit coastal marine realms where the water temperature ranges from 18 to 29°C (Collette & Naeun, 1983) – mostly familiar in tropical and subtropical climate of the Indo-Pacific region (Kumar *et al*., 2012).
- Kawakawa is among the most important fishing resources in this region.
- In Southeast Asia (SEA) region, Indonesia is the major landing for both Pacific (70%) and Indian (73%) Ocean, followed by Philippines, Thailand and Malaysia, respectively (MFRDMD, 2021).
- The stock status (from Kobe Plot) is in the green zone in 2018. However, the current catch (2016-2018) is still higher than the MSY level (MFRDMD, 2021).

- Long-term effect to fisheries industries may be resulted if the landing is not monitored regularly.
- Mitochondrial DNA (mtDNA) D-loop region has been utilised in this present studies due to its abilities to evaluates intraspecific genetic variation as well as population genetic (Kasim et al., 2020; Nabilsyafiq et al., 2019).
- Different molecular marker, like mtDNA (COI, Cytb, D-loop, ATPase) or nuclear DNA (microsatellite, SNP or RAPD, RFLP) were used in fisheries and aquaculture for efficient and sustainable resource management.
- These molecular markers has different mode of inheritance and were displaying the different amount of molecular information.

- A pilot study in Southeast Asia (5 areas in the Philippines & 1 area in Pangkor Island, Malaysia) indicated kawakawa is near "panmixia" or mixing in Southeast Asia (Santos *et al.* 2010).
- A single genetic stock of KAW identified along the Indian coast inferred analysis of mtDNA D-loop region (Kumar *et al.* 2012).

Objectives

- To identify the level of genetic diversity of Kawakawa, *Euthynnus affinis* in the Southeast Asian region.
- To identify the genetic structure of Kawakawa, *Euthynnus affinis* in the Southeast Asian region by using DNA mitochondrial control region (D-loop) markers.
- To share the result for management of these neritic tuna fisheries in the region.

DETAIL OF SAMPLES COLLECTED

Samples

NO.	COUNTRY	SAMPLING SITES	CODE	TOTAL NO OF SPECIMEN
1	Brunei	Muara	ABR	20
2	Cambodia	Sihanouk Ville	ASV	50
3	Malaysia	Kuala Perlis	AKP	59
4		Kota Kinabalu	AKK	50
5		Kuantan	AKT	57
6		Semporna	ASP	50
7	Myanmar	Yangon	AMY	50
8	Philipines	Palawan (Sulu Sea)	APS	39
9		Palawan (West Philipines Sea/South China Sea)	APC	26
10		Zamboanga (Sulu Sea)	APZ	59
11	Thailand	Ranong	ARG	50
12		Trat	ATR	50
13	Viet nam	Vung Tau	AVT	50
		TOTAL		610

+ 100 KAW samples from 2 locations (Banda Aceh & Pemangkat) were collected and stored by Research Institute for Marine Fisheries (RIMF), Indonesia.

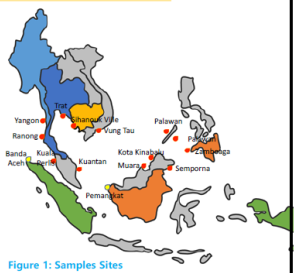
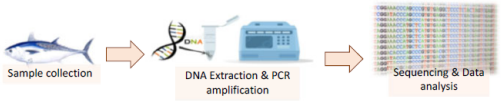


Figure 1: Samples Sites

Methodology



- A total of **610 samples** from **13 sampling locations** around Southeast Asian region (Figure. 1).
- Genomic DNA was extracted using the Qiagen DNeasy Blood & Tissue Kit.
- ***D-loop* region** (858 bp) were amplified using forward primer, **CB3R420** (5'CCC CTA ACT CCC AAA GCT AGG 3') and reverse primer, **12Sar430** (5' GCC TGC GGG GCT TTC TAG GGC C 3') (Willette *et al.* 2016) with the final volume 25µl.

Result

No.	Country	Sampling Sites	Code	Total no. of Samples	Total no. of Samples Sequences
1	Brunei	Muara	ABR	20	9
2	Cambodia	Sihanouk Ville	ASV	50	30
3	Malaysia	Kuala Perlis	AKP	59	54
4		Kota Kinabalu	AKK	50	40
5		Kuantan	AKT	57	40
6		Semporna	ASP	50	21
7	Myanmar	Yangon	AMY	50	39
8	Philippines	Palawan (Sulu Sea)	APS	39	31
9		Palawan (West Philippines Sea/South China Sea)	APC	26	26
10		Zamboanga (Sulu Sea)	APZ	59	42
11	Thailand	Ranong	ARG	50	38
12		Trat	ATR	50	36
13	Viet nam	Vung Tau	AVT	50	24
			TOTAL	610	430

Table 1: Genetic diversity indices calculated for *Euthynnus affinis* population based on mtDNA D-loop sequences.

Country	Pop	Genetic Diversity			
		N	H (S)	H	π
Brunei	ABR	9	8 (20)	0.9722	0.0058
Cambodia	ASV	36	30 (130)	0.9857	0.0166
Malaysia	AKP	54	43 (60)	0.9853	0.0059
	AKT	40	30 (43)	0.9705	0.0047
	AKK	40	37 (41)	0.9949	0.0049
	ASP	21	15 (26)	0.9524	0.0042
Myanmar	AMY	39	30 (40)	0.9703	0.0041
Thailand	ATR	38	15 (24)	0.8009	0.0036
	ARG	30	24 (37)	0.9770	0.0051
Philippines	APZ	42	37 (50)	0.9919	0.0055
	APS	31	28 (44)	0.9936	0.0063
	APC	26	23 (40)	0.9877	0.0055
Vietnam	AVT	24	21 (26)	0.9855	0.0046
Overall		430	275 (217)	-	-
Mean		-	-	0.9816	0.0061

Table 2: Pairwise F_{ST} estimates (below diagonal) and genetic distance (upper diagonal) of *E. affinis* inferred by mtDNA D-loop. (All significant P values were in blue font)

Pop	APZ	APS	APC	ABR	AKP	AKT	AKK	ASP	ASV	AVT	ATR	ARG	AMY
APZ	0	0.0059	0.0056	0.0056	0.0056	0.0053	0.0052	0.0049	0.0118	0.0052	0.0054	0.0054	0.0048
APS	-0.0025	0	0.0061	0.0060	0.0060	0.0058	0.0056	0.0054	0.0123	0.0056	0.0058	0.0058	0.0053
APC	0.0070	0.0223	0	0.0057	0.0056	0.0053	0.0054	0.0049	0.0119	0.0052	0.0055	0.0054	0.0048
ABR	-0.0122	-0.0054	-0.0098	0	0.0057	0.0054	0.0054	0.0050	0.0119	0.0052	0.0053	0.0053	0.0049
AKP	-0.0020	0.0055	-0.0030	-0.0171	0	0.0053	0.0053	0.0050	0.0119	0.0052	0.0054	0.0049	0.0054
AKT	0.0043	0.0253	0.0057	0.0108	0.0008	0	0.0050	0.0045	0.0115	0.0049	0.0052	0.0045	0.0051
AKK	0.0008	-0.0041	0.0182	0.0110	0.0020	0.0169	0	0.0046	0.0116	0.0049	0.0052	0.0045	0.0051
ASP	-0.0027	0.0120	-0.0165	-0.0042	-0.0108	-0.0108	0.0002	0	0.0112	0.0045	0.0047	0.0047	0.0041
ASV	0.0214	0.0279	0.0123	-0.0300	0.0267	0.0172	0.0295	0.0068	0	0.0115	0.0117	0.0116	0.0111
AVT	0.0161	0.0244	0.0044	0.0133	0.0098	0.0239	0.0310	0.0031	0.0168	0	0.0046	0.0049	0.0044
ATR	0.1536	0.1511	0.1634	0.1551	0.1396	0.1857	0.1763	0.1743	0.0852	0.1051	0	0.0051	0.0047
ARG	0.0052	0.0172	-0.0036	-0.0207	-0.0004	0.0014	0.0125	-0.0108	0.0179	0.0075	0.1543	0	0.0046
AMY	-0.0029	0.0190	-0.0050	-0.0032	-0.0052	0.0001	0.0055	-0.0151	0.0217	0.0191	0.1811	-0.0041	0

Results of Analysis of Molecular Variance (AMOVA) to determine genetic variance in mtDNA D-loop. (d.f. = degree of freedom)

Source of variation	d.f	Sum of squares	Variance components	% of total variance	Fixation index	P-value
Among population	12	71.54	0.0926 Va	3.07	0.0307	0
Within population	417	1220.27	2.9263 Vb	96.93		
Total	429	1291.81	3.0189	100		

Summary

- Out of 610 samples, only 430 was successfully sequenced for mtDNA *D-loop*, which generated 275 haplotypes.
- **High haplotypes diversity** coupled with **low nucleotide diversity** (Table 1) indicates a large population size that has undergone recent population expansion (Chen *et al.*, 2015, Kasim *et al.*, 2020).
- The **phylogenetic analysis** using maximum likelihood (ML) tree method displayed **no obvious separation pattern** for all populations.
- Correspondingly, pairwise genetic comparisons (F_{ST}) showed **low and non-significant value** between all populations except for twelve significant pairwise involving ATR. In addition, **genetic distance** within and among population **were very low** (Table 2).
- AMOVA analysis also revealed **high contribution within population**
- These result strongly suggest that the *Euthynnus affinis* population in Southeast Asian region were panmictic with shallow genetic structure due to high gene flow (Kunal et *al.*, 2014; Kasim *et al.*, 2020).
- ATR population showed significant genetic structure from the rest based on F_{ST} however, all other analyses suggested genetic homogeneity with other *E. affinis* population in the Southeast Asian region.

Conclusion

> Based on the available information, due to lacks the population structure suggested by the mtDNA D-loop, it is possible to treat the *Euthynnus affinis* population in Southeast Asian region as a **single stock unit** for management purposes

- THANK YOU -

7 SWG on Neritic Tunas Stock Assessment in the Southeast Asian Waters,
23-24 August 2022

Wahidah Mohd Arshaad

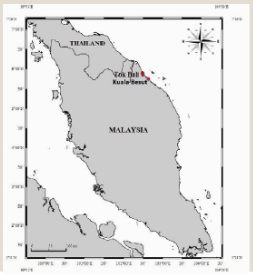
Progress on the Life History Study for *Euthynnus affinis* in the East Coast of Peninsular Malaysia

IQWURGXFWLRQ

Euthynnus affinis (Photo: Collette & Nauen, 1983)

- SEAFDEC/MFRDMD is currently conducting a study to determine the age of kawakawa at the time of fishing mortality. The study is under the project "Fish Management Strategies for Pelagic Fish Resources in the Southeast Asian Region" implemented from 2020 to 2024 supported by the Japanese Trust Fund VI Phase II. The findings of this study could aid the population research and stock management of *E. affinis* to enhance the development of fisheries management measures such as the regulation of fishing gear.
- The hard part analysis was employed in this study which is the most precise and dependable technique to determine the growth parameters of fish by examining the hard component of its body (*e.g.* otolith) (Morales-Nin, 1992). The development of otolith is proportional to the size of fish and typically follows an allometric rise in dimensions when measuring the age of a fish.

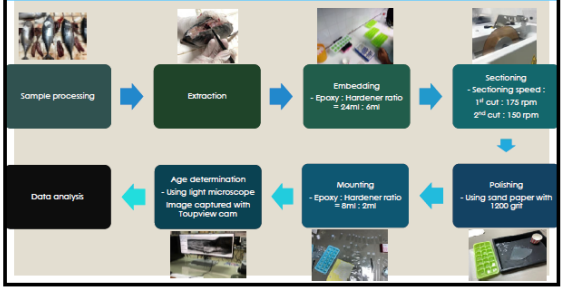
VDPSOLQJ#DR FDWLRQ



- LKIM Tok Bali, Kelantan
- LKIM Kuala Besut, Terengganu

Both sampling location has the same fishing area (Terengganu Waters, Pahang Water and Johor Waters)

PHWKRGRORJ\

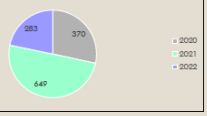


- From 2020 – 2022, a total of 1,302 samples of *Euthynnus affinis* has been collected. 360 samples has been successfully analysed from January 2020 – July 2021. Lab work and sample collection is still on going.

n (number of samples collected) = **1,302**

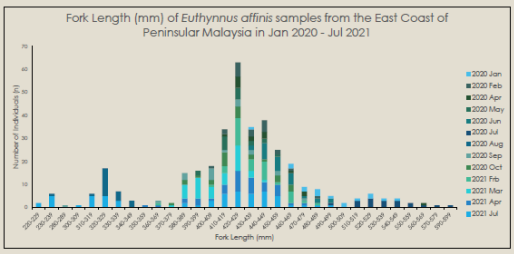
n (number of samples analysed) = **360**

Total Sample Collected of *Euthynnus affinis* in the East Coast of Peninsular Malaysia in Jan 2020 - Aug 2022



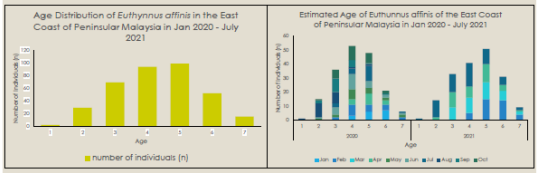
Analysed sample of *Euthynnus affinis* in the East Coast of Peninsular Malaysia in Jan 2020 - July 2021

Fork Length (mm) of *Euthynnus affinis* samples from the East Coast of Peninsular Malaysia in Jan 2020 - Jul 2021



Average fork length = 423.1 mm

As for January 2020 until July 2021, 360 samples has been analysed. 27.5 % (99 individuals) of total samples analysed are 5 years old. The rest of the samples are still in progress to be analysed.



Average age (Jan 2020 – Jul 2021) = 4 years

UHIHUHQ FHV

- Collette, B. B., & Nauen, C. E. (1983). *Scombrids of the world: An annotated and illustrated catalogue of tunas, mackerels, bonitos, and related species known to date*. Food and Agriculture Organization of the United Nations.
- Morales-Nin, B. (1992). Determination of Growth in Bony Fishes from Otolith Microstructure. FAO Fisheries Technical Paper. No. 322. Rome.

جابتن فرايكن
DEPARTMENT OF FISHERIES
MINISTRY OF PRIMARY RESOURCES AND TOURISM · BRUNEI DARUSSALAM

Country Report: Stock Status of Seer Fish in Brunei Darussalam

Overview

- The narrow-barred Spanish mackerel, Scomberomorus commerson and the Indo-Pacific king mackerel, Scomberomorus guttatus are migrating species that are commonly found in Indo-West Pacific region and they commonly inhabit the nearshore waters of less than 100 m depth.
- Both species are commonly caught by different gear types such as bottom trawl, hook and lines and purse seine, by commercial fisheries.

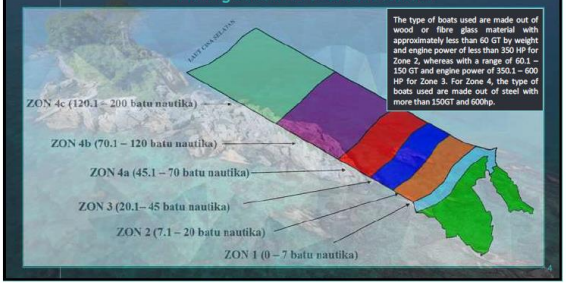
2

Economical Value

	Name	Price/kg
1	Narrow-barred Spanish Mackerel (Scomberomorus commerson)	BND 14
2	Indo-Pacific King Mackerel (Scomberomorus guttatus)	BND 8

3

Fishing zone in Brunei Darussalam



The type of boats used are made out of wood or fibre glass material with approximately less than 60 GT by weight and engine power of less than 350 HP for Zone 2, whereas with a range of 60.1 – 150 GT and engine power of 350.1 – 600 HP for Zone 3. For Zone 4, the type of boats used are made out of steel with more than 150GT and 600hp.

4

Trends 2002-2021: Scomberomorus commerson

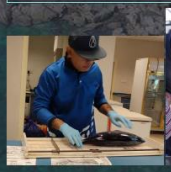
5

Trends 2002-2021: Scomberomorus guttatus

6

Stock Assessment: Euthynnus affinis (2018 – 2022)

Data Collected:
- Landing
- CPUE
- Efforts
- Length & Weight
- Gonad Maturity



7

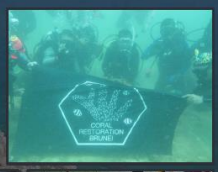
Capture Fisheries Management – Management of fisheri resources under the Fisheries Order 2009

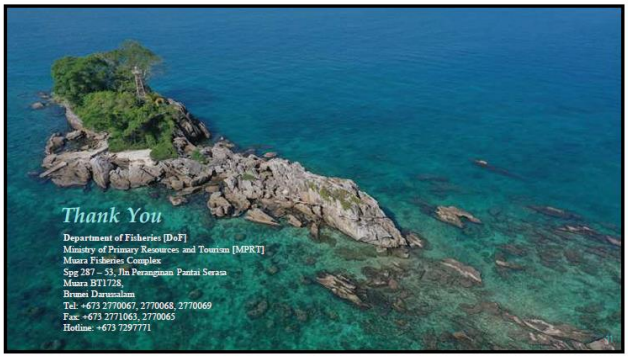
WAY FORWARD

❑ Capacity building on stock assessment:
- Improve sampling technique, identification/categorization of species, increasing no. of samples/target species
- Improve technical capabilities to perform stock assessment analysis (R, FiSAT, etc)
- Building stock assessment database to maintain up to date monitoring of trends and status

❑ Management of fisheries activities:
- Increase surveillance to combat IUU and encroachment into MPA
- Promote protection and management of marine habitat and creation of new fishing ground through artificial reef programs

9





Overview

The narrow-barred Spanish mackerel, *Scomberomorus commerson* and the Indo-Pacific king mackerel, *Scomberomorus guttatus* are migrating species that are commonly found in Indo-West Pacific region and they commonly inhabit the nearshore waters of less than 100 m depth. Both species are commonly caught by different gear types such as bottom trawl, hook and lines and purse seine, by commercial fisheries.

Fishing ground in Brunei Darussalam are divided into 4 major zones namely Zone 1, 2, 3 & 4 as illustrated in **Figure 1.** Commercial fisheries vessels operate in all zones, with exception of Zone 1 which have been under moratorium since 2008. Fisheries vessels specifications are limited by zones. The type of boats used are made out of wood or fibre glass material with approximately less than 60 GT by weight and engine power of less than 350 HP for Zone 2, whereas with a range of 60.1 – 150 GT and engine power of 350.1 – 600 HP for Zone 3. And lastly, for Zone 4 the type of boats used are made out of steel with a weight of more than 150 GT and engine power of more than 600 HP.

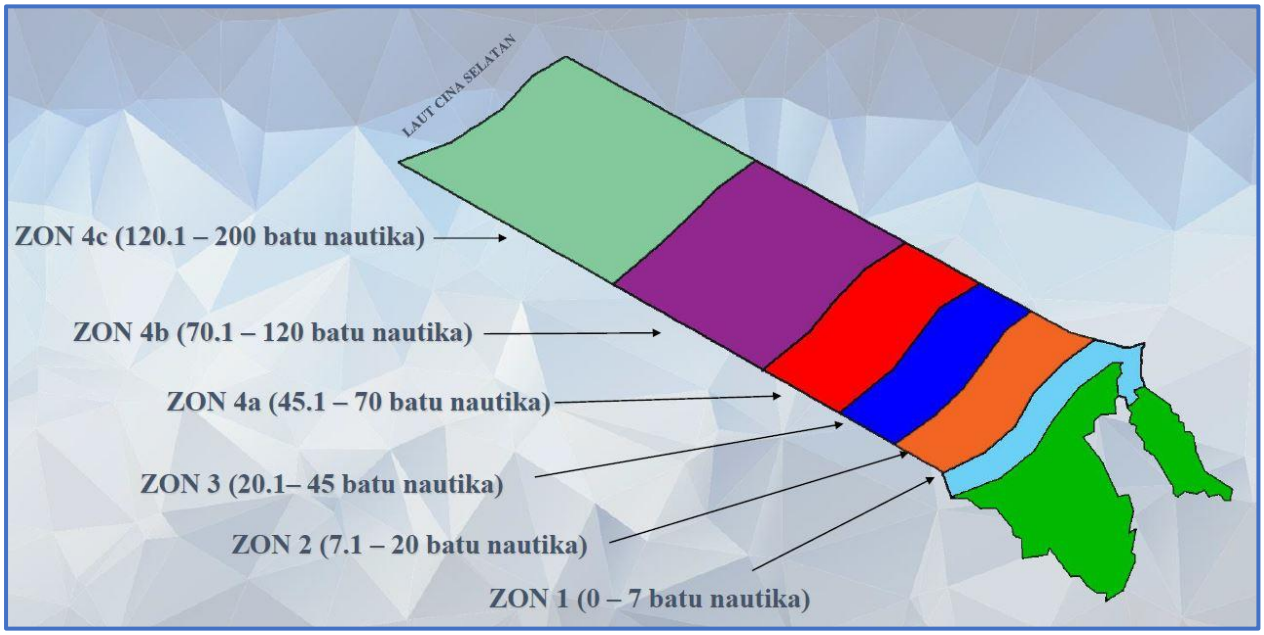


Figure 1 – Overview of fishing zonation in Brunei Darussalam

Most catches of *Scomberomorus commerson* and *Scomberomorus guttatus* are recorded from commercial captures in Zone 2 and Zone 3. From 2003 to 2022 (July), the annual yield for *Scomberomorus commerson* showed an average ranging from B$200,000 to B$400,000. The data for annual yield of this species can be seen at **Figure 2** below, showing 2013 and 2016 had the highest yield records. As for *Scomberomorus guttatus*, can be seen that an average of less than B$200,000 of annual yield. As of 2022 *Scomberomorus commerson* & *Scomberomorus guttatus* are valued at B$14 and B$8 respectively.

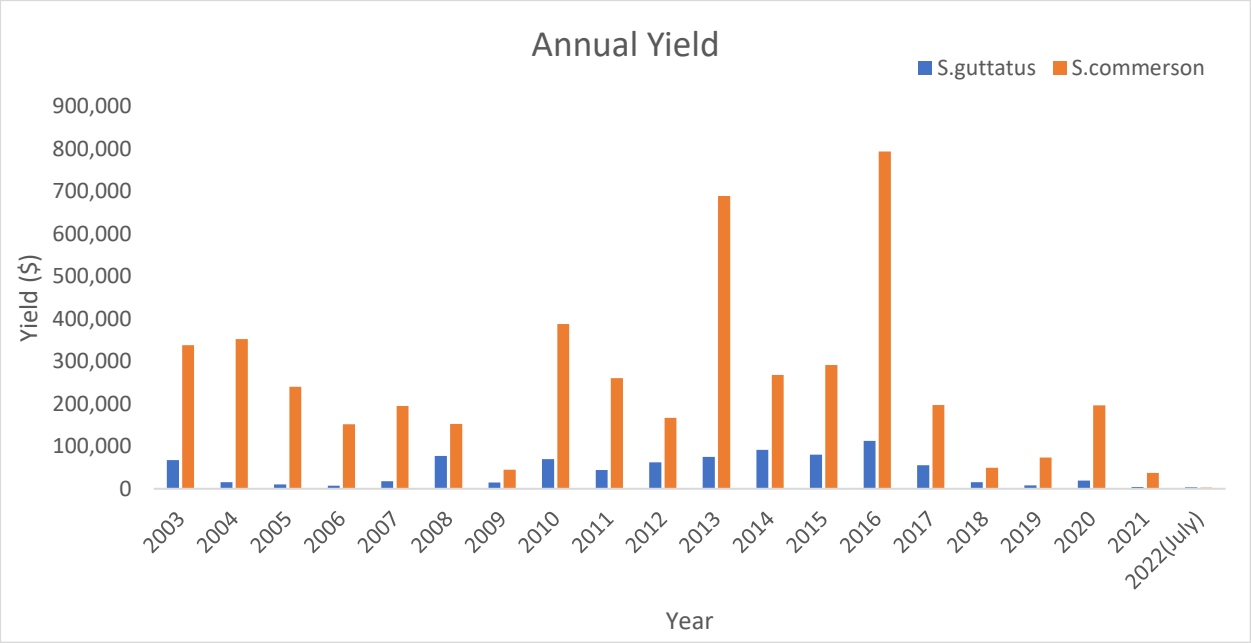
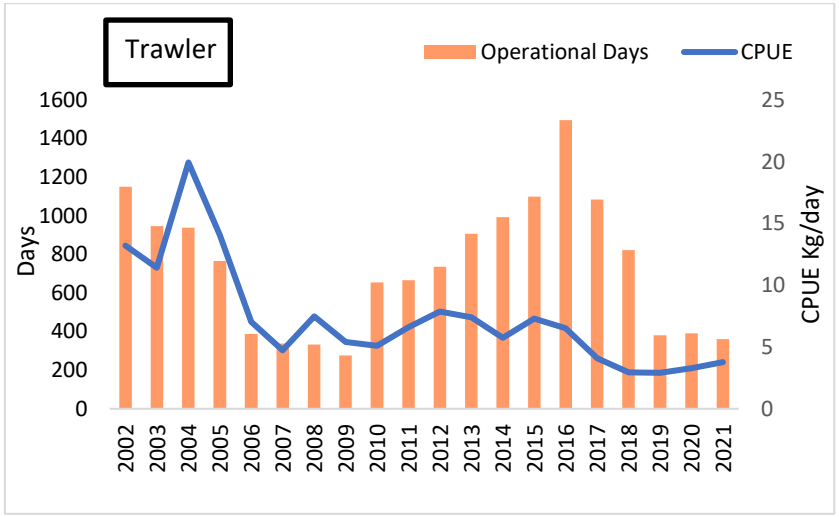
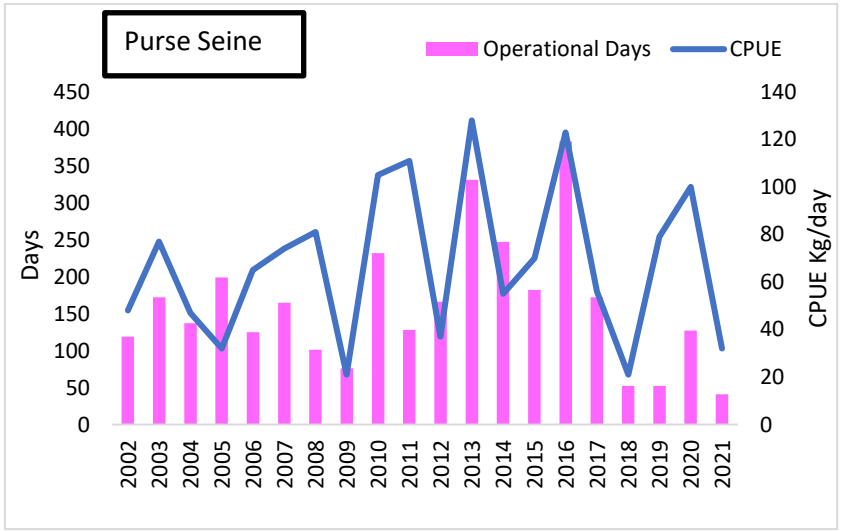


Figure 2 – Annual yield for *Scomberomorus commerson* and *Scomberomorus guttatus* from 2003 to 2022 (July)

Referring to **Figure 3**, as the year proceed from 2002 until 2021, a declining trend for the last five years can be seen for the CPUE of *Scomberomorus commerson* using trawler as fishing gear, whereas in comparison to using purse seine, the value for CPUE is relatively higher. Higher efforts (in terms of operational days) are also observed in the last 5 years. On average, for both trawler and purse seine, in 2016 showed the highest CPUE. As for *Scomberomorus guttatus*, for both trawler and purse seine showed decline in CPUE in Error! Reference source not found. below.





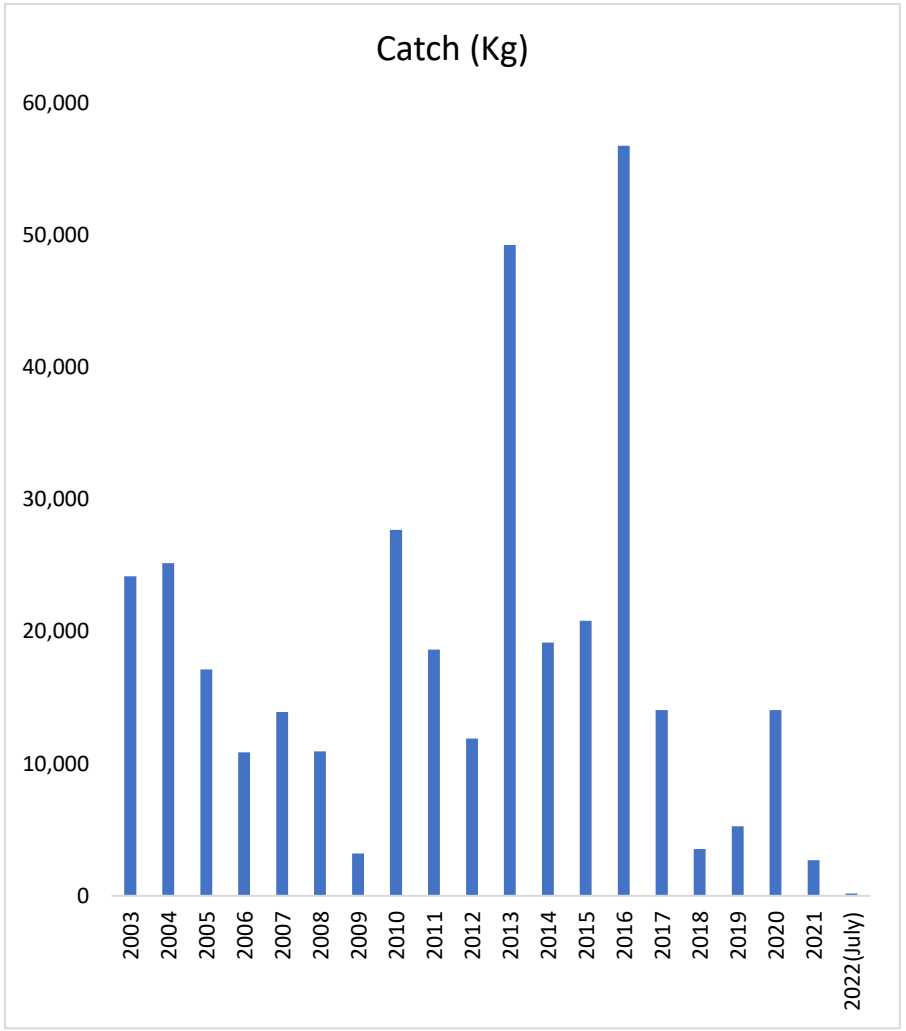
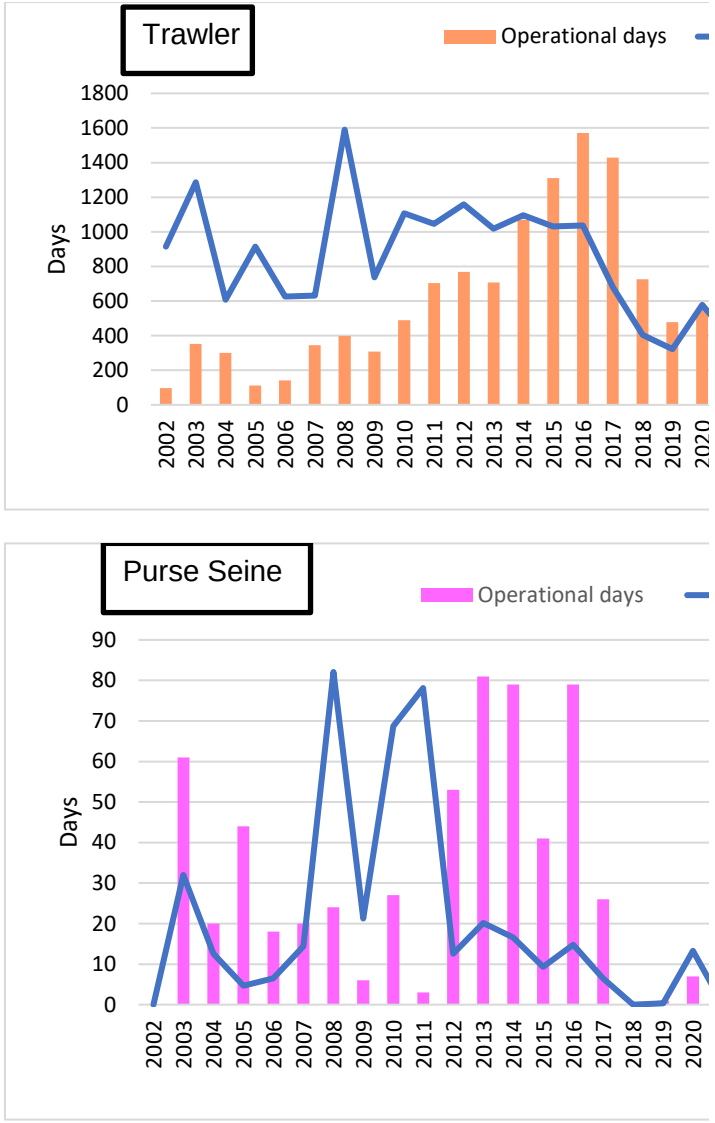


Figure 3 - Trends 2002-2021: *Scomberomorus commerson*



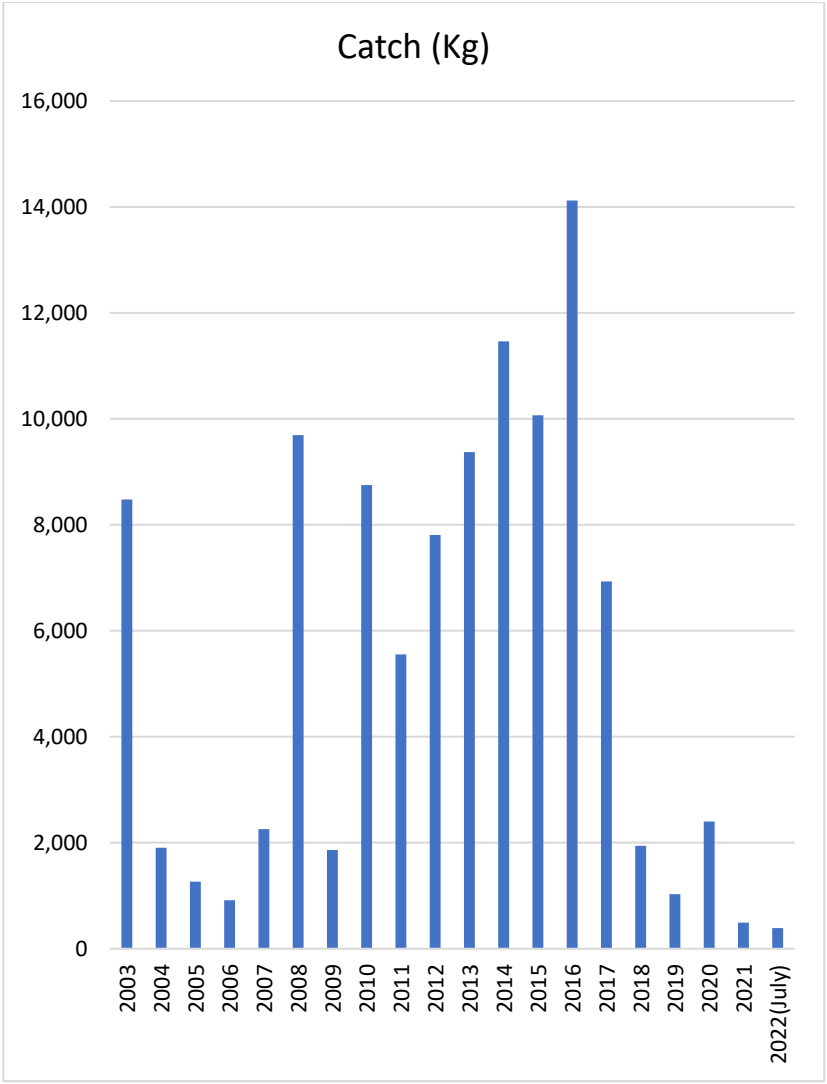


Figure 4 - Trends 2002-2021: *Scomberomorus guttatus*

Stock status of Indonesia seer fish fisheries

(*Scomberomorus commerson* and *Scomberomorus guttatus*)

Tegoeh Noegroho, Ignatius T Hargiyatno, Lilis Sadiyah, Fayakun Satria and Wudianto
Research Center for Fishery, National Research and Innovation Agency

7th Meeting of Scientific Working Group on Neritic Tunas Stock Assessment in the Southeast Asian Waters
23rd and 24th August 2022

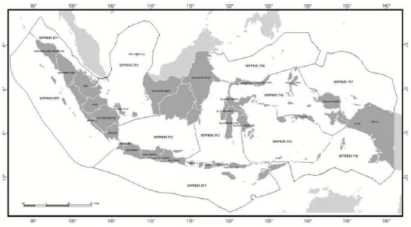
Fishing vessel and gear

Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred Spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

- Wooden boat
- Dominated by traditional fishing boat (<10 GT)
- Less large/industrial fishing (> 30 GT) → as by catch
- Main fishing gear: Gillnet and purse seine,
- sometimes cought by trolline and handline
- Gillnet < 10 GT → seerfish as target with 18% and 3 % catch comp.
- Gillnet > 20 GT → Targeted neritic tuna

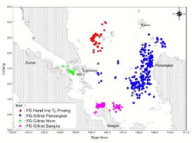
Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred Spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

Indonesia Fisheries Management Area



Fishing ground and season

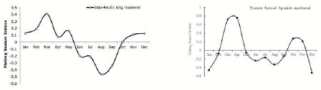
Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan



fishing grounds of the fishing gear that catches the seerfish at IFMA 711.

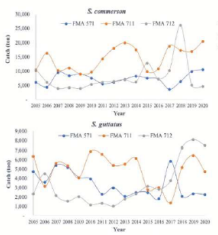
- Small vessel → near coast < 12 nmil
- Large vessel → deeper waters > 12 nm

- Fishing season *S. guttatus* → Oct-May, with March as a peak season
- Fishing season *S. commeson*→ mar-April and Oct-Nov



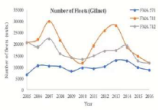
Catch & fleet

Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred Spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan



- S. commerson increasing in South China seas, and fluctuated in other FMA
- S. guttatus increasing on 2018 in the SCSs and Java seas
- Started 2017 used "One data" system for national data collection program

Number of Gillnet



Number of PS

Stock Status

Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

- Length & Weight data Method
- Negative allometric
- Moderate fishing Mortality for S. commerson
- High fishing Mortality for S. guttatus

Species	LW Relationship			Growth Equation			Mortalities		
	a	b	R^2	r	K	L_∞	M	F	Z
S. commerson	0.00002	2.8477	0.9527	-	0.81	142.3	0.66	0.53	1.19
S. guttatus	0.00002	2.8090	0.9110	0.600	0.61	77.7	0.81	1.06	1.87

Management

Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

Indonesia has a Fisheries Management Plan (FMP) for tuna, skipjack and neritic tuna (RPP TCT or **National Tuna Management Plan/NTMP**) in the ministerial decree number 107 of 2015 as revised by ministerial decree number 121 of 2021. Where, **Seer fish is included in the neritic tuna section.** The NTMP covers various issues and problems which are grouped into four aspects. There are: aspects of fish resources, environmental condition, socio-economic, and governance. Meanwhile, the content of the NTMP includes 8 directions and focuses of tuna and tuna like species fisheries management policies, there are:

- improving tuna data,
- controlling FADs,
- fishing vessel registration systems,
- good fish handling methods (CPIB) / ecolabel certification,
- Harvest Strategy for tropical tuna fisheries in archipelagic waters,
- participation in tuna fisheries management forums,
- utilization of tuna fishing opportunities in ZEEI and the high seas, and
- implementation of NTMP.

The revised NTMP has been publicly consulted to relevant stakeholders (central government, academic, local government, NGOs, fishing industries, fishing association)

Issues

Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

- Low sampling coverage (i.e number of sampling site, number of enumerators, number of fishing gear, number of species need to be increase to apropriatly cover all fisheries management area)
- Limited data and information of reproductive biology, and growth of neritic tuna.
- Limited data on comprehensive operational fishing data for neritic fishery.
- Limited funding and resources to support the research and data collection for neritic tuna.

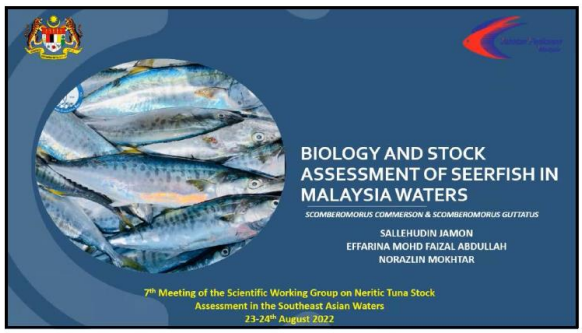
Conclusions and suggestions

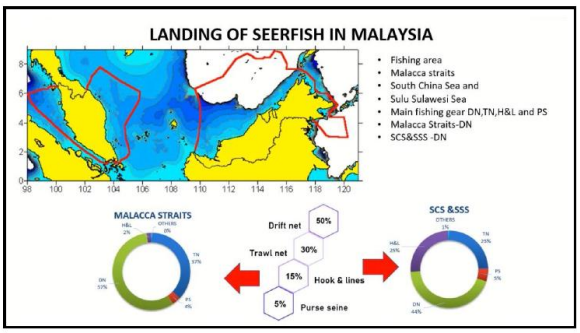
Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

- Conduct comprehensive reproductive biology and growth study for selected neritic tuna
- Improve and strengthen data monitoring for neritic tuna
- Increase capacity building for enumerators, data analist and scientist of SEAFDEC members

Terima Kasih

Scomberomorus commerson and *Scomberomorus guttatus*
Narrow-barred spanish mackerel and Indo-pacific king mackerel
Tenggiri dan tenggiri papan

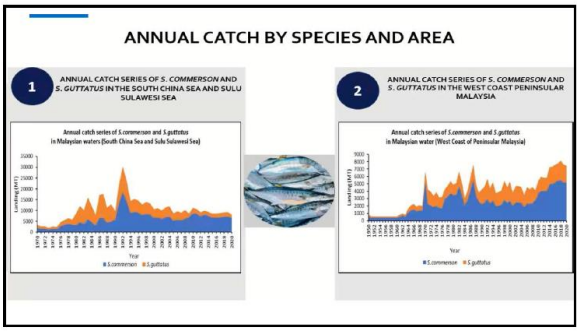


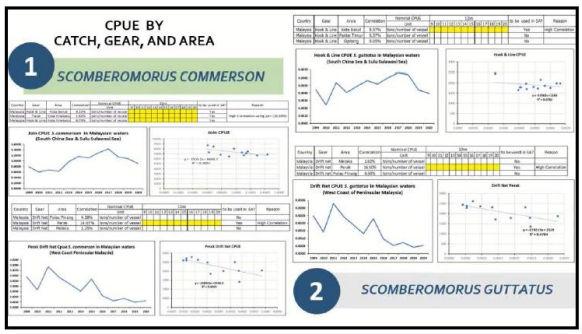


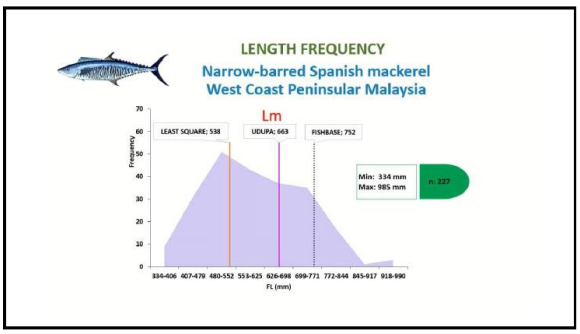
ESTIMATING THE LANDING BY SPS OF SEERFISH

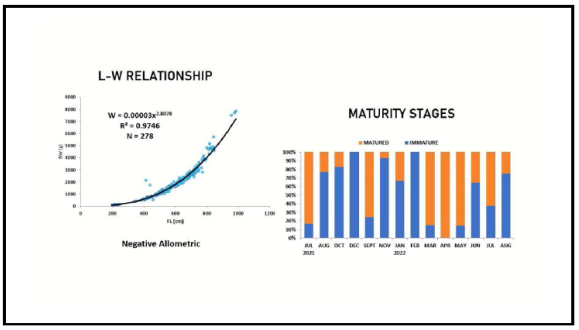
- Percentages catch of seer fish species by fishing gear
- Information from person who incharge in data collection

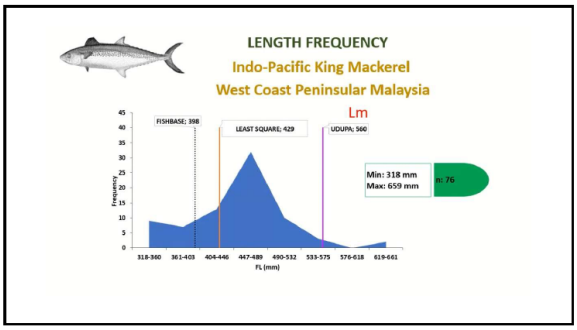
Area	Species	Drift Net	Trawl Net	Hook & Line	Purse Seine	Portable	Lift Net
West Coast of Peninsular Malaysia	*S. commerson*	70%	70%	100%	10%	100%	100%
	S. guttatus	30%	30%	-	90%	-	-
South China Sea & Sulu Sulawesi Sea	*S. commerson*	70%	80%	100%	80%	100%	100%
	S. guttatus	30%	20%	-	20%	-	-

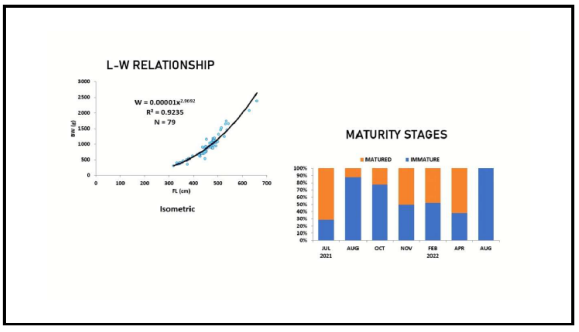








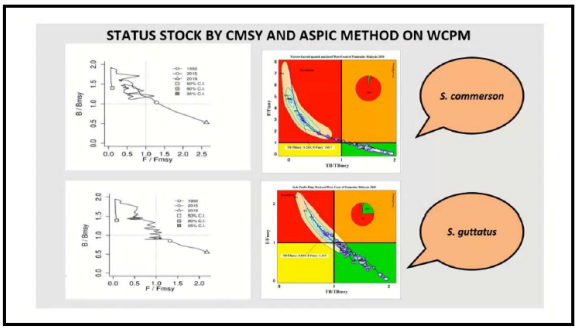


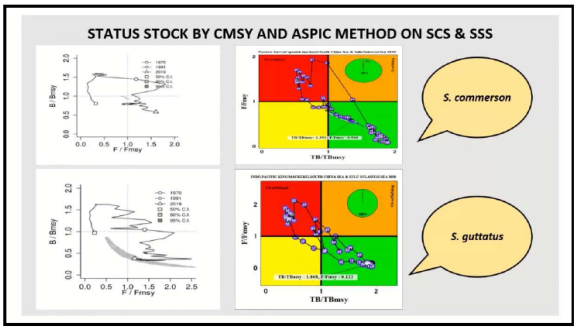


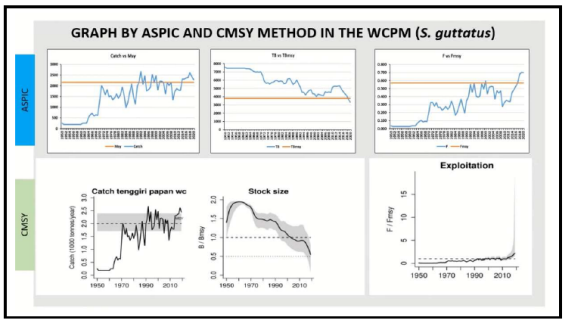
STATUS STOCK BY CMSY AND ASPIC METHOD

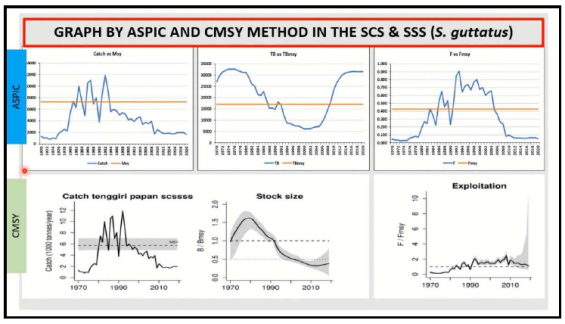
METHOD	AREA	SPESIES	AVE CATCH	MSY	TOTAL BIOMASS	F/FMSY	B/BMSY	STATUS
CMSY	WEST COAST	S.COMMERSON	5,308	3.65	7.99	2.63	0.52	OVERFISHED
		S.GUTTATUS	2,448	2.00	4.25	2.18	0.55	OVERFISHED
	SOUTH CHINA SEA & SULU SULAWESI SEA	S.COMMERSON	6,955	7.75	24.4	1.60	0.58	OVERFISHED
		S.GUTTATUS	1,866	5.73	14.3	1.16	0.38	OVERFISHED
ASPIC	WEST COAST	S.COMMERSON	5,308	4.39	4.565	3.02	0.26	OVERFISHED
		S.GUTTATUS	2,448	2.12	1.235	1.24	0.84	OVERFISHED
	SOUTH CHINA SEA & SULU SULAWESI SEA	S.COMMERSON	6,955	8.69	34.15	0.56	1.35	SAFE ZONE
		S.GUTTATUS	1,866	7.27	31.53	0.12	1.87	SAFE ZONE

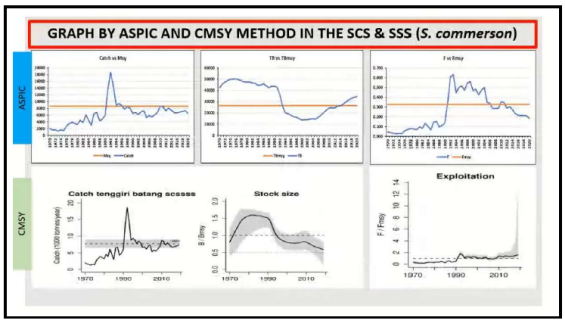
* Monte Carlo C-MSY methods not use CPUE as supporting data in analysis but only nominal catch
* ASPIC results are most reliable because of the usage of the CPUEs in ASPIC analysis

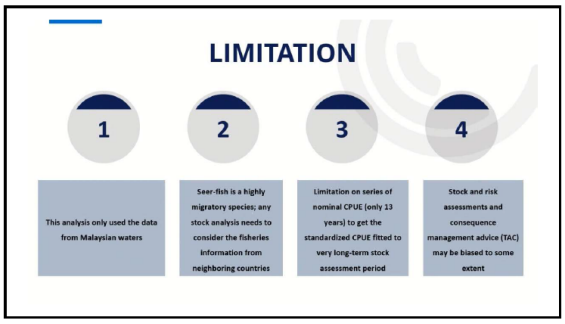


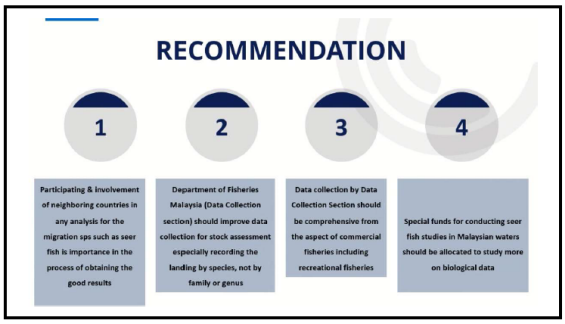



GRAPH BY ASPIC AND CMSY METHOD IN THE WCPM (S. guttatus)
ASPIC
CMSY
Catch tenggiri papan wc
Stock size
Exploitation


GRAPH BY ASPIC AND CMSY METHOD IN THE SCS & SSS (S. guttatus)
ASPIC
CMSY
Catch tenggiri papan scssss
Stock size
Exploitation


GRAPH BY ASPIC AND CMSY METHOD IN THE SCS & SSS (S. commerson)
ASPIC
CMSY
Catch tenggiri batang scsss
Stock size
Exploitation


LIMITATION
1
2
3
4
This analysis only used the data from Malaysian waters
Seer-fish is a highly migratory species; any stock analysis needs to consider the fisheries information from neighboring countries
Limitation on series of nominal CPUE (only 13 years) to get the standardized CPUE fitted to very long-term stock assessment period
Stock and risk assessments and consequence management advice (TAC) may be biased to some extent


RECOMMENDATION
1
2
3
4
Participating & involvement of neighboring countries in any analysis for the migration sps such as seer fish is importance in the process of obtaining the good results
Department of Fisheries Malaysia (Data Collection section) should improve data collection for stock assessment especially recording the landing by species, not by family or genus
Data collection by Data Collection Section should be comprehensive from the aspect of commercial fisheries including recreational fisheries
Special funds for conducting seer fish studies in Malaysian waters should be allocated to study more on biological data

Current Stock Status of Seer Fish in Myanmar

Soe Win
Senior Fishery Officer
Department of Fisheries
Myanmar

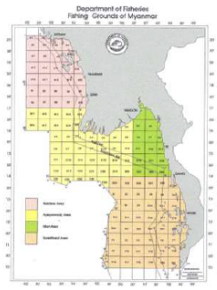
Marine Fisheries

- Coastline 2832 km
- Continental shelf 228,781sq-km
- Fishing ground 486,000 sq-km
- Myeik Archipelago (800 islands)

Demarcated 4 fishing grounds

- Local vessels have privilege to operate fishing at one or two adjacent fishing grounds

Fishing Vessels (2014-15)
In-shore (30ft ,50 HP)
> Mechanized 12,240 fishing boats
> Non mechanized 13,391
> Total 25,631
Off-shore (> 50 HP)
(2014-15)2706
(2021-22)3086



Marine Fisheries

a. In-shore Fishery

- - 10 nautical mile from shore line
- - no more 50 h.p engine & 30 Feet length of the boat.(drift net,longline ,stow net.etc...)

b. Off-shore fishery

- - Outer area of inshore to end of EEZ
- - More than 50H.P engine boat
- - Bottom trawl, Purse seine, Gaint Set Net Surrounding net, Drift net & Long line.

3

Management Measures

- **Closed season**
  - Marine
    - Trawling - April - June
    - Purse Seine -May - June
    - Grouper - July, August, September
    - Sea bass - January, February, March
  - Freshwater - May, June, July
- **Restricted mesh size**
  - Trawler : Fish >2.5 inches ; Shrimp > 2 inches
  - Drift net (Large) : >8 inches
    (Small) : > 3.5 inches
  - Persine net : >1 inches
- **Banned fishing methods**
  - Dynamites/ explosives
  - Chemicals/ Drugs
  - Electricity

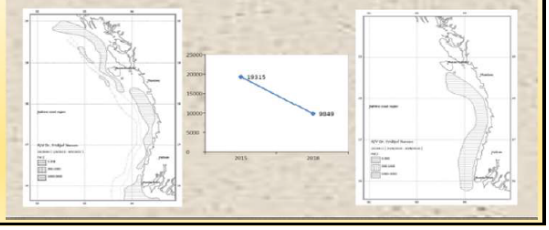
4

CONTENT

- Biomass and changes in species
- Biological Parameters Results
- Bio-economic model Results
- References

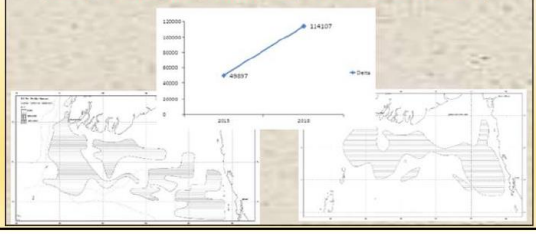
BIOMASS CHANGES IN ACOUSTIC SURVEY (2015 AND 2018)

Rakhine Coast
(Family - Carangidae, Scombridae, Barracuda and Hairtails)



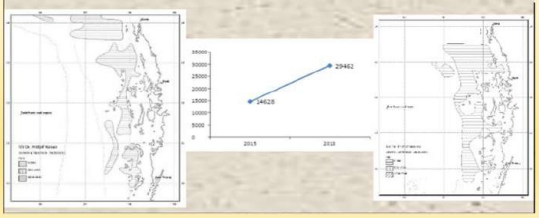
BIOMASS CHANGES IN ACOUSTIC SURVEY (2015 AND 2018)

Delta Coast
(Family - Carangidae, Scombridae, Barracuda and Hairtails)

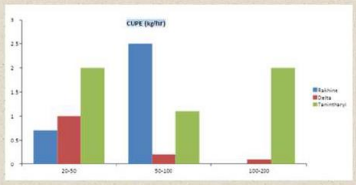


BIOMASS CHANGES IN ACOUSTIC SURVEY (2015 AND 2018)

Tanintharyi Coast
(Family - Carangidae, Scombridae, Barracuda and Hairtails)

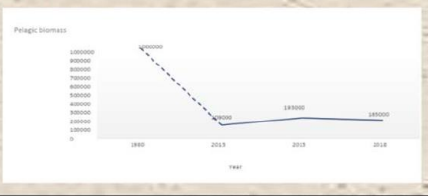


Catch per Unit Effort of Family Scombridae in 2018 Survey



BIOMASS CHANGES IN ACOUSTIC SURVEY (1980, 2013, 2015 AND 2018)

Myanmar Marine Area
(All pelagic)



Biological Parameters of *S. guttatus*

No.	Species	Year	L_{∞}	K	Φ	M	F	Z	E	Lr	L50%	Lm
10	Rastrelliger brachisoma	2018-19	35	3.36	3.614	3.72	1.77	5.49	0.32	12	16.46	17
11	Megalaspis cordyla	2018-19	56.75	0.88	3.452	1.35	0.59	1.94	0.30	10	14.54	22
12	Scombronorus guttatus	2018-19	73.2	0.73	3.594	1.11	1.09	2.2	0.49	13	14.02	40

Bio-economic Model

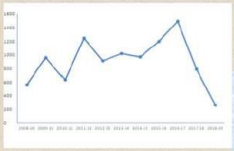
- Used Time Series Data
- - Effort –hp (2008-2009 to 2018-19)
- - Catch – Total catch from Yangon Jetties (2008-2009 to 2018-19)
- Method – Exponential Methods

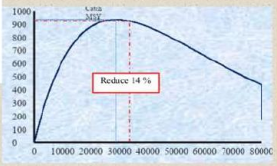
  The Clarke, Yoshimoto and Pooley method (CY&P method)

Limitation

- **Effort Consider only Pelagic Fishing Gears (Need Gillnet Gear)**
- **Total Catch – Combine all mackerel species (*S. Commerson, S. guttatus, S. koreanus*, etc.)**
- **Some fish direct export to neighboring countries**

Results





CONCLUSION

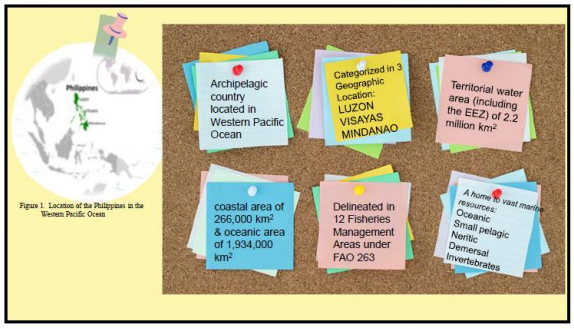
- The most catch data in year 2015-2016 and 2016-2017 over 1400 tones
- Rapidly decrease in year 2017-18 and 2018-19
- Biological results show : We caught under m50% size,
- CY&P methods result: Reduce 14 % of Effort

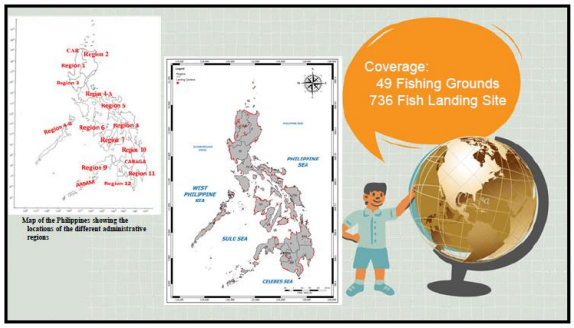
CONCLUSION

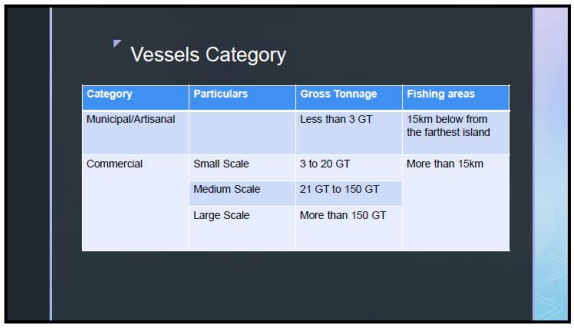
- We are trying to move the way forward as much as we do
- Please participate, contribute
- Be patient

Current Status of Fisheries and Biological parameters of Neritic Tuna in Myanmar

Thank You

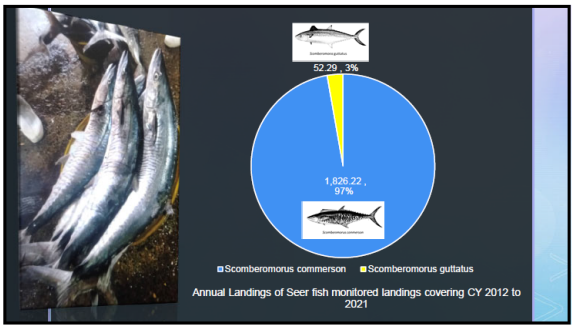


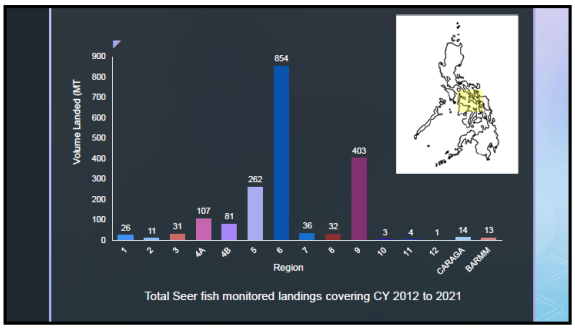


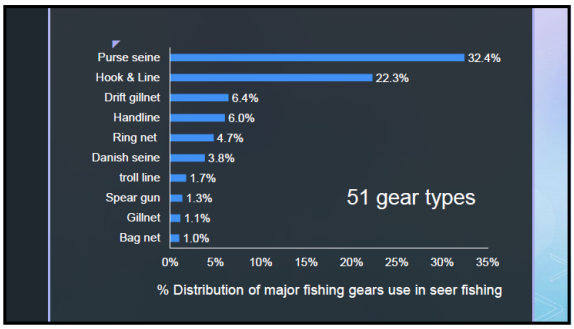


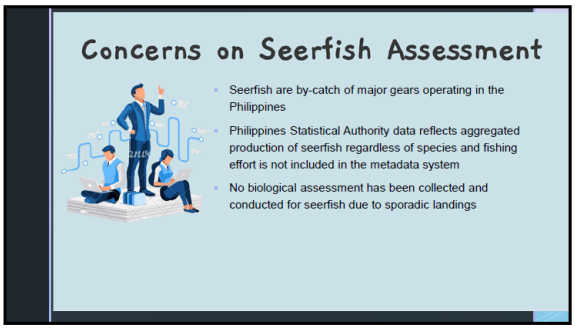
Category	Particulars	Gross Tonnage	Fishing areas
Municipal/Artisanal		Less than 3 GT	15km below from the farthest island
Commercial	Small Scale	3 to 20 GT	More than 15km
	Medium Scale	21 GT to 150 GT	
	Large Scale	More than 150 GT	


Volume Landed (MT
350
300
250
200
150
100
50
-
11
12
76
277
299
297
267
284
245
86
2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Year
Annual Landings of Seerfish monitored landings covering CY 2012 to 2021


52.29 , 3%
1,826.22 , 97%
Scomberomorus commerson
Scomberomorus guttatus
Annual Landings of Seer fish monitored landings covering CY 2012 to 2021


Volume Landed (MT
900
800
700
600
500
400
300
200
100
0
26
11
31
107
81
262
854
36
32
403
3
4
1
14
13
1
2
3
4A
4B
5
6
7
8
9
10
11
12
CARAGA
BARMM
Region
Total Seer fish monitored landings covering CY 2012 to 2021


Purse seine 32.4%
Hook & Line 22.3%
Drift gillnet 6.4%
Handline 6.0%
Ring net 4.7%
Danish seine 3.8%
troll line 1.7%
Spear gun 1.3%
Gillnet 1.1%
Bag net 1.0%
51 gear types
0% 5% 10% 15% 20% 25% 30% 35%
% Distribution of major fishing gears use in seer fishing


Concerns on Seerfish Assessment
Seerfish are by-catch of major gears operating in the Philippines
Philippines Statistical Authority data reflects aggregated production of seerfish regardless of species and fishing effort is not included in the metadata system
No biological assessment has been collected and conducted for seerfish due to sporadic landings

Seerfish fisheries in Thailand

Pavarot Noranarttragoon
Weerapol Thitipongtrakul
Marine Fisheries Research and Development Division, Department of Fisheries
24 August 2022

Fishing fleet

Categorized to 2 fleets based on size, engine power and fishing gear.

Artisanal vessels refers to
- ✓ vessels less than 10 GT
- ✓ equipped with an engine which less than 280 horse-power
- ✓ usually use gillnets, traps, handline, longline or other low efficiency gears

Commercial vessels refers to
- ✓ vessels from 10GT and larger
- ✓ vessels using trawls, purse seine, anchovy purse seine, dredges, and light luring vessels are also defined as commercial vessel regardless the vessel size

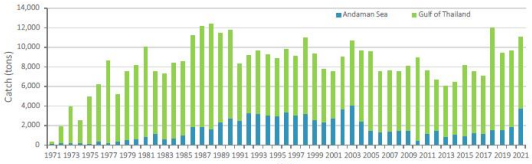
Number of fishing vessels by category in Thai marine waters in 2021 (as of 1st April 2021)

Type of fishing gear	Category of vessel						
	Artisanal	Commercial					Total
			Small	Medium	Large	Extra-large	
	< 10 GT	< 10 GT	10-< 30 GT	30-< 60 GT	60-< 150 GT	> 150 GT	
Total light efficiency		188	2,554	1,694	2,340	82	6,858
Pair trawl		2	2	105	1,010	5	1,124
Otter board trawl		104	456	744	492	16	1,812
Beam trawl		9	152	194	79	-	434
Purse seine		8	33	150	566	45	802
Anchovy purse seine		3	60	19	77	16	175
Anchovy falling net		-	154	283	115	-	552
Anchovy lift net		-	10	20	-	-	30
Lighting vessel		62	1,687	179	1	-	1,929
Total inefficiency	51,237	60	2,021	1,001	161	6	3,249
Total	51,237	248	4575	2695	2501	88	10,107

Outline

1. Overview
2. Fishing fleet
3. Statistics
4. Catch rate
5. Size distribution
6. Biological parameters
7. Management of seerfish resource

Catch statistics



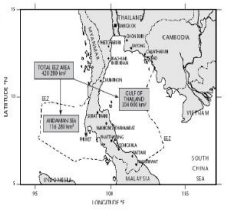
- Seerfish catch has been reported as aggregated seerfish group since 1971
- It showed increasing trends in 1970s-1980s then fluctuated around 8,000 to 11,000 tons until present
- 80% of the catch are from the Gulf of Thailand and 20% are from the Andaman Sea
- Mostly (95%) of reported species are *Scomberomorus commerson* and *Scomberomorus guttatus*

Overviews

Seerfishes are economic fish which is commonly domestic used as fresh fish and dried fish.

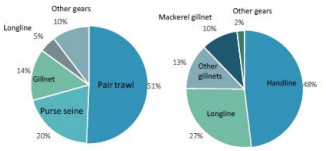
There are five (5) seerfish species reported in Thai waters

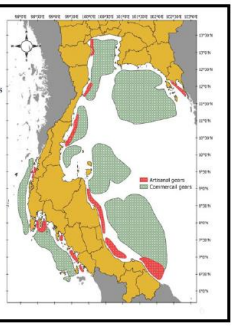
- Narrow-barred Spanish mackerel *Scomberomorus commerson*
- Indo-Pacific king mackerel *Scomberomorus guttatus*
- Streaked seerfish *Scomberomorus lineolatus*
- Wahoo *Acanthocybium solandri*
- Double-lined mackerel *Grammatorcynus bilineatus*



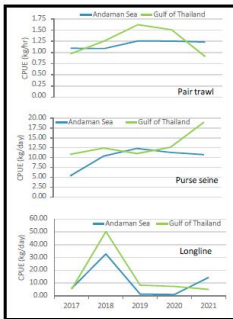
Seerfish catch by fleet

- Seerfishes could be found in all areas of Thai waters, ranges 4-80 meters depth
- 74% of Seerfish catch are from commercial vessels; 26% are from artisanal vessels





Catch rate by gear



Seerfish catch rate from pair trawl fluctuated around 0.97 –1.62 kg/hr, with similar rate both in the Gulf of Thailand and the Andaman Sea.

The catch rate of purse seine fluctuated around 10.36-18.97 kg/day. It exhibited slightly increasing trend in the Gulf of Thailand while stable in the Andaman Sea.

Catch rate of longline showed fluctuated trend. It increased sharply in 2018 than sudden dropped in the next years.

Stock status and stock assessment in the past

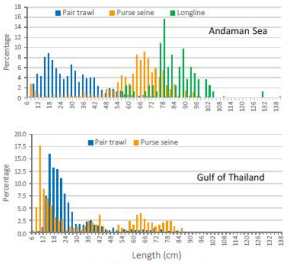
There are no studies of biological parameters and stock assessment of seerfish in Thai waters in the past.

The recent studies were conducted on neritic tunas in 2012-2014.

Species	Parameters							Spawning peak (month)	Study year
	L_∞ (FL)	K	t_0	Z	M	F	LW equation		
Andaman Sea									
Auxis thazard	48.08	1.0	0	3.65	1.28	2.37	$W = 0.0046FL^{3.3888}$	Sep	2012
Euthynnus affinis	67.48	0.9	0	4.68	1.08	3.6	$W = 0.0064FL^{3.2814}$	Nov	2012
Thunnus tonggol							$W = 0.0125FL^{3.1105}$	Apr	2012
Gulf of Thailand									
Auxis thazard	49.05	1.16	0	6.66	1.4	5.26	$W = 0.0052FL^{3.3576}$	Dec, Mar	2012
Euthynnus affinis	61.19	1.1	0	6.7	1.27	5.43	$W = 0.0081FL^{3.214}$	Nov, Apr	2012
Thunnus tonggol							$W = 0.0127FL^{3.1046}$	Feb, Apr	2012

Size distribution: narrow-barred Spanish mackerel

- Longline tends to catch larger seerfish than the other gears, followed by purse seine and pair trawl respectively
- Seerfish size by gear in the Gulf of Thailand seems not different



Scomberomorus commerson

Management of seerfish resource

Thailand fisheries law is based on the Royal Ordinance on Fisheries B.E. 2558 (A.D. 2015) and its amendment in B.E. 2560 (A.D. 2017).

The monitoring, control and surveillance scheme is in place to prevent IUU fishing, and technical management measures are issued based on best scientific data. e.g,

- The licensing scheme
- The control of fishing effort through a total allowable effort (TAE), i.e., limitation of fishing day
- Restrictions on the number and characteristics of fishing gears
- Limitation of mesh size

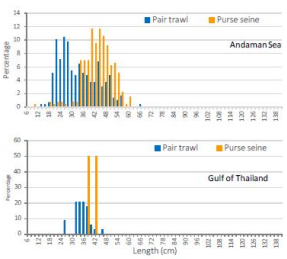
Fisheries resources are managed under three resource groups i.e. demersal fauna, pelagic fish, and anchovies.

- Demersal fauna refers to marine fish that live near seafloor and invertebrate species, e.g., lizard fish, croakers, breams, squids, shrimps, and crabs.
- Pelagic fish include marine fish which live in pelagic area such as mackerels, neritic tunas, sardines, and scads.
- Anchovies are referred to only anchovy species.

Seerfishes are managed under pelagic fish group and has no specific laws or regulations on seerfish fisheries

Size distribution: Indo-Pacific king mackerel

- Purse seine catches larger fish than pair trawl both in the Andaman Sea and Gulf of Thailand



Scomberomorus guttatus

Suggestions

✓ It should have a regional collaboration on seerfish data collection

✓ A data collection protocol on seerfish fisheries should be developed including catch, effort and biological data of concerned species in order to better understand of these fish and be prepared for next seerfish stock assessments in this region

Country report of Thailand on seerfish fisheries

18 August 2022

Pavarot Noranartragoon, Weerapol Thitipongtrakul

Marine Fisheries ReSoutheast Asiarch and Development Division,
Department of Fisheries

1. Overview

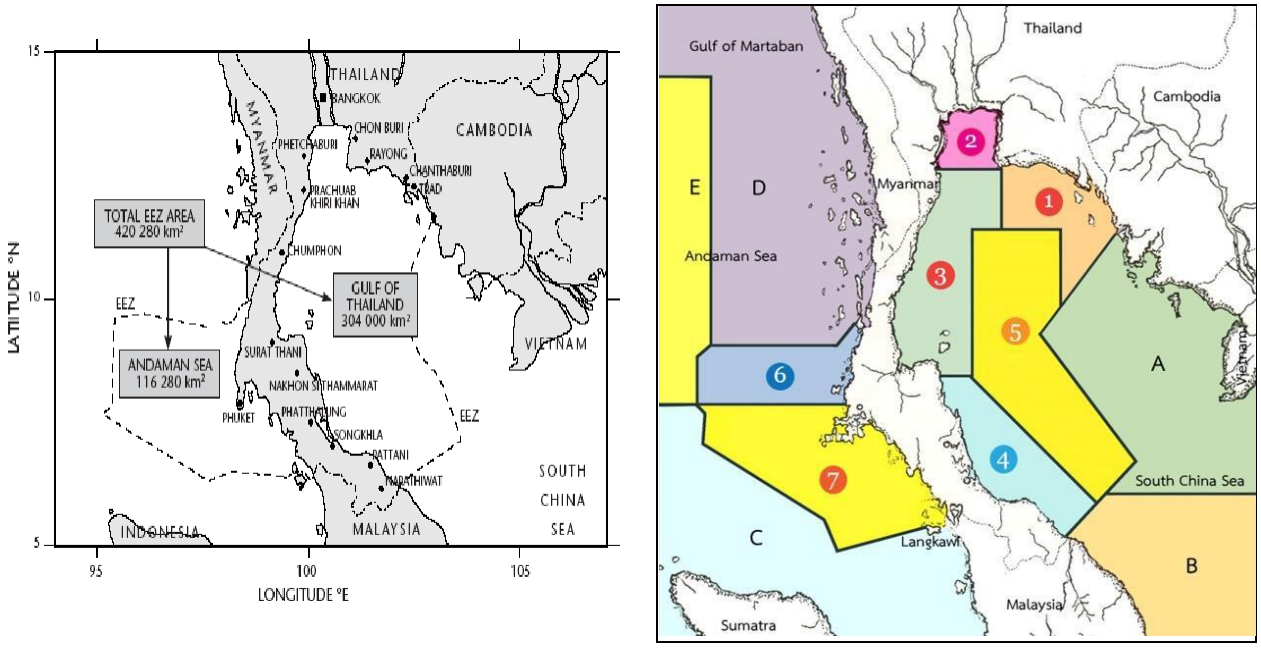
Seerfishes are economic species that highly demand in Thai markets, commonly domestic uses as fresh fish and dried fish. There are five (5) species of seerfishes reported in Thai waters which are *Acanthocybium solandri*, *Grammatorcynus bilineatus*, *Scomberomorus commerson*, *Scomberomorus guttatus*, and *Scomberomorus lineolatus*. (DOF, 2021a) However, only narrow-barred Spanish mackerel (*Scomberomorus commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus)* are the most caught species, around 95% of total seerfish catch.

In regard of fishing fleets, fishing vessels in Thailand are categorized into artisanal and commercial categories based on size, engine power and fishing gear. Generally, artisanal vessel is classified as vessel which the size is less than 10 gross ton. However, the vessels equipped with a 280 horse-power engine are defined as commercial vessel. The vessels using trawls, purse seine, anchovy purse seine, dredges, and light luring vessels are also defined as commercial vessel regardless the vessel size. These vessels are equipped with high performance engine and can operate offshore for weeks. On the other hand, artisanal vessels are defined as vessels using other gears as mentioned above, e.g., gillnets, traps, handline, and longline. Usually, they are small-long tailed boats that operate in coastal area, commonly 1-2 days per trip. In 2019, 61,344 fishing vessels were registered and active, including 51,237 artisanal vessels and 10,107 commercial vessels (DOF, 2021b). The numbers of fishing vessel by fleet are shown in Table 1.

Table 1 Number of fishing vessels by category in Thai marine waters in 2021 (as of 1 April 2021)

Type of fishing gear	Category of vessel						
	Artisanal	Commercial					
			Small	Medium	Large	Extra- large	Total
	< 10 GT	< 10 GT	10-< 30 GT	30-< 60 GT	60-< 150 GT	> 150 GT	
Pair trawl		2	2	105	1,010	5	1,124
Otter board trawl		104	456	744	492	16	1,812
Beam trawl		9	152	194	79	-	434
Purse seine		8	33	150	566	45	802
Anchovy purse seine		3	60	19	77	16	175
Anchovy falling net		-	154	283	115	-	552
Anchovy lift net		-	10	20	-	-	30
Light luring vessel		62	1,687	179	1	-	1,929
Total high efficiency		188	2,554	1,694	2,340	82	6,858
Total low efficiency	51,237	60	2,021	1,001	161	6	3,249
Total	51,237	248	4575	2695	2501	88	10,107

Geographically, Thai waters are divided into two Southeast Asia sides including the Gulf of Thailand located in the Pacific Ocean, and the Andaman Southeast Asia located in the Indian Ocean (Figure 1a), accounted for 420,280 sq.km. in total. The area also divided into 7 statistical areas for management purposes, including internal waters, territorial waters, contiguous waters, and exclusive economic zone (EEZ). The statistical areas also include 5 areas of outside Thai waters, 2 areas in the Pacific Ocean and 3 areas in the Indian Ocean as shown in Figure 1b.



a) b)

Figure 1 Thai waters and fisheries statistical area

a) The Gulf of Thailand and the Andaman Southeast Asia

b) Fisheries statistical area, the figure numbers represent the fishing area in Thai EEZ whereas the alphabets refer to neighboring waters

Figure 2 shows the fishing ground of seerfishes by fleets. Artisanal vessels, size less than 10 GT, usually fish in coastal area with gillnets, handlines, and longline (only in the Andaman Southeast Asia), etc. Commercial vessels, size over 10 GT, that uses highly efficient gears, i.e., purse seine and trawls are regulated to fish outside the coastal area, beyond 3 nautical miles, and spread to deeper areas. In short, fishing ground of the fishes could be found in all areas of Thai waters, ranges 4-80 meters depth.

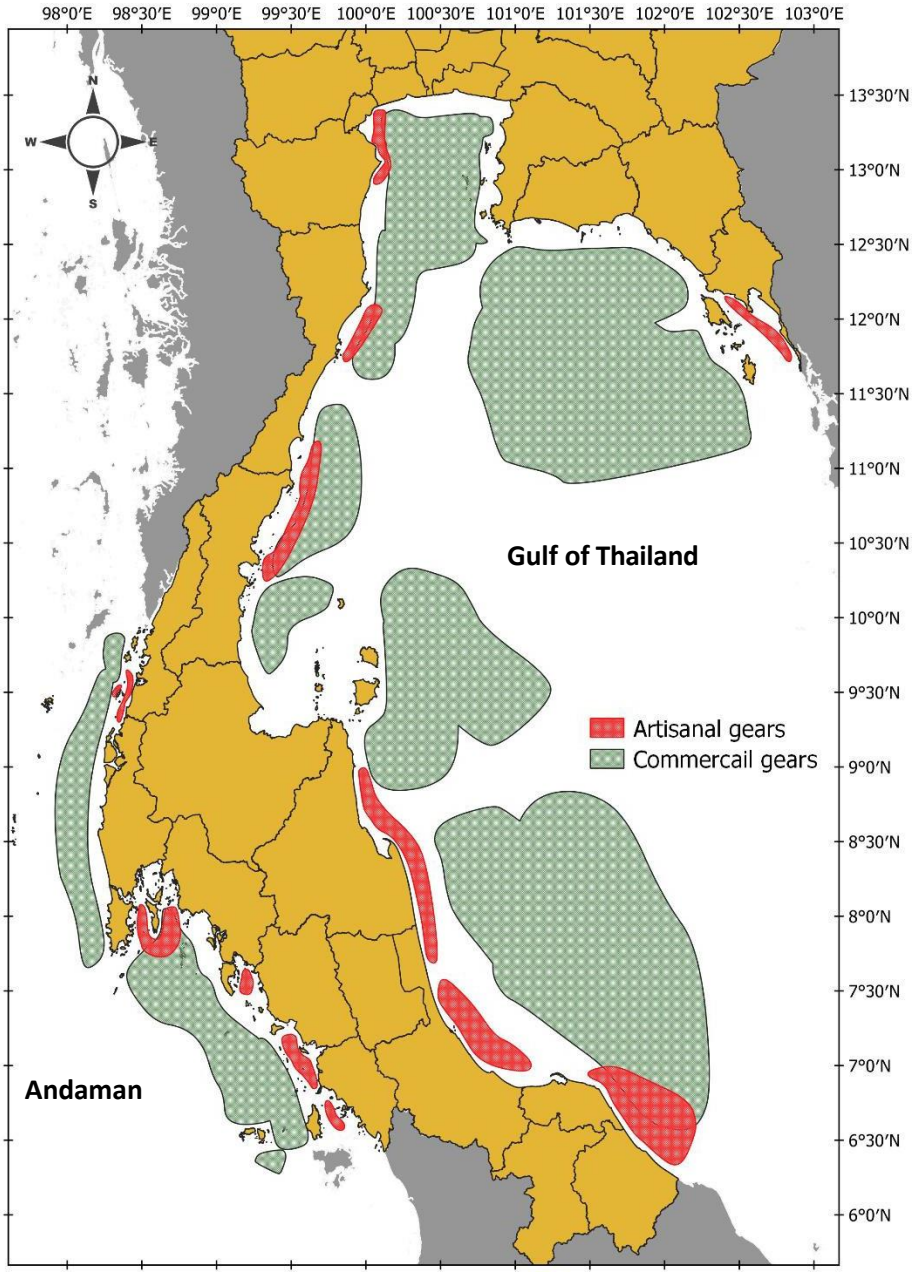


Figure 2 Fishing ground of seerfish in 2021 from scientific sampling, surveyed by the Department of Fisheries

Fishing activities occurred all year round but fishermen have adapted accordingly to monsoon period. There are two monsoons that affects to Thai fisheries, the Southwest monsoon and the Northeast monsoon. The southwest monsoon which causes rainy Southeast Asiason in Thailand starts from April to September. In this Southeast Asiason, the western side of the Gulf of Thailand has calm weather and be good for fishing but it is strong wind in the eastern side of the Gulf and in the Andaman Southeast Asia. On the other hand, the Northeast monsoon affects opposite, it causes winter Southeast Asiason which starts from October to February. Fishing activities in the western Gulf of Thailand are dropped but increased in eastern of the Gulf. The fishing Southeast Asiason in the Andaman Southeast Asia is similar to the eastern side of the Gulf which starts from December to June.

2. Trend and Relevant Statistic

Seerfish catch has been reported as aggregated seerfish group in Thai fisheries statistics since 1971. The catch showed increasing trend in 1970s-1980s and peaked of 12,362 tons in 1989, then fluctuated around 8,000 to 11,000 tons since then (Figure 3). The majority of the catch are from the Gulf of Thailand which accounted for 80% of the total seerfish catch, the rest are from the Andaman Southeast Asia. Mostly reported species are narrow-barred Spanish mackerel (*Scomberomorus commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus)*.

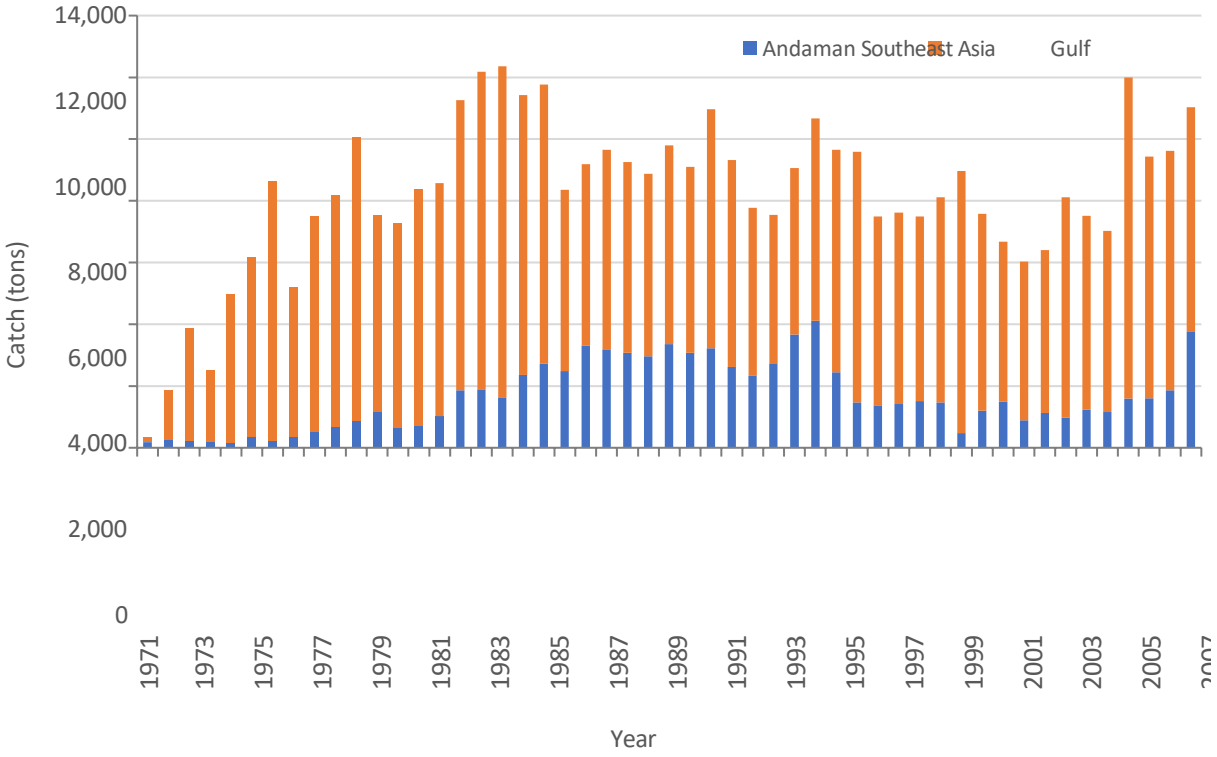


Figure 3 Seerfish catch (aggregated species) in Thai waters, 1971-2021

Seerfishes can be caught by several fishing gears and fleets. Approximately 74% of the fish are from commercial fleets which mainly from purse seine and trawls, while the catches from artisanal fleets are from gillnets, longline and handline (Figure 4). In commercial fleet, the highest percentage of seerfish catch is from pair trawl (51%), followed by purse seine (20%) and gillnets (14%). On the other hand, handline (48%) and longline (27%) are the major gears used to catch seerfishes, followed by mackerel gillnet and other gillnets (Figure 5).

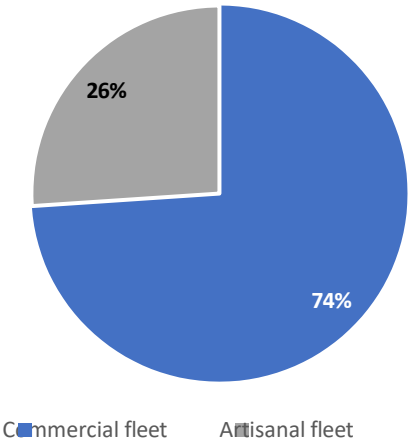


Figure 4 Average percentage of seerfish catch by fleet, 2019-2021

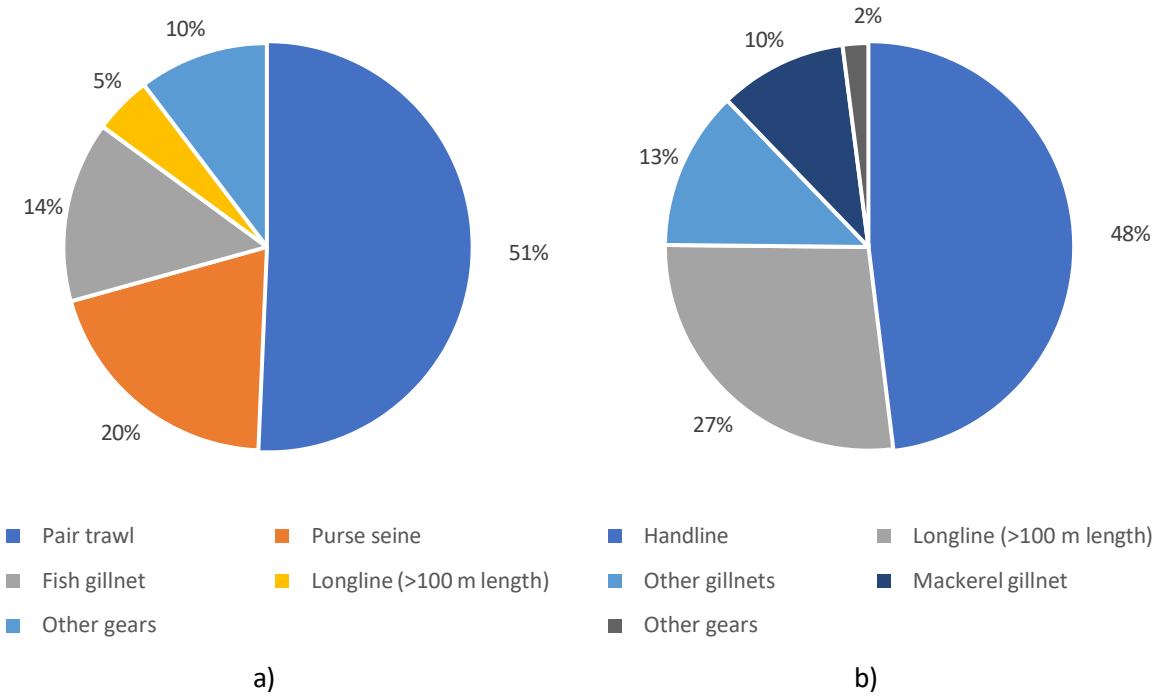
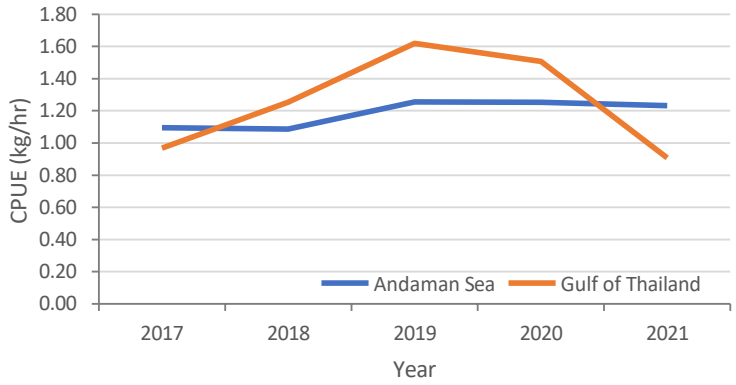
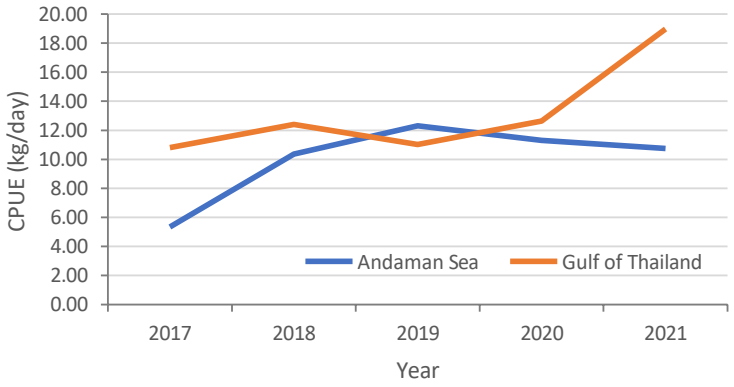


Figure 5 Average percentage of caught seerfish by gear, 2019-2021
a) Commercial fleet
b) Artisanal fleet

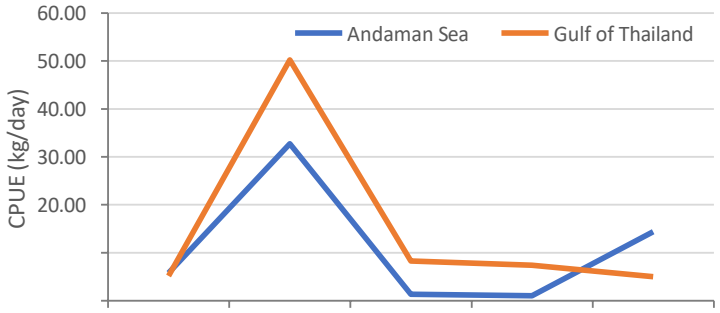
In regard of catch rate, seerfish catch rate of pair trawl has fluctuated around 0.97–1.62 kg/hr. The catch rates in the Gulf of Thailand and the Andaman Southeast Asia show similar trend, as they did not express increasing nor decreasing trend in the last 5 years (Figure 6a). The catch rate of purse seine seems different as it exhibits slightly increasing trend of seerfish catch that fluctuated around 10.36-
18.97 kg/day. The purse seine catch rate in the Gulf of Thailand is little higher than in the Andaman Southeast Asia (Figure 6b). On the other hand, catch rate of longline which majority use by artisanal fishers showed fluctuated trend. it increased sharply in 2018 than sudden dropped in the next years (Figure 6c).



a) pair trawl



b) purse seine



c) longline

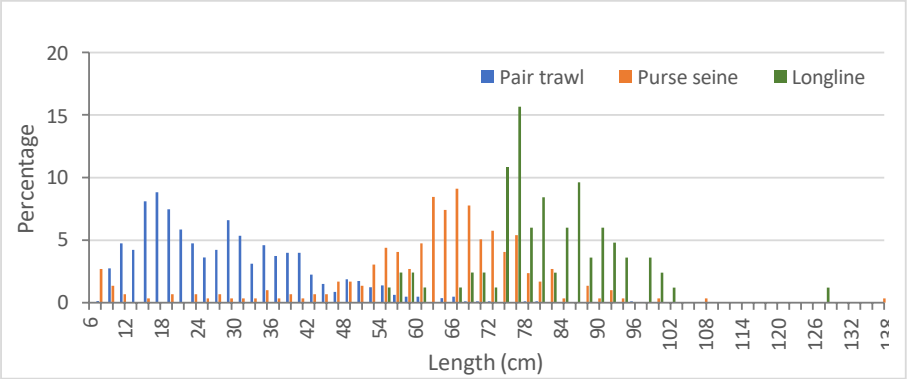
Figure 6 Seerfish catch rate by dominant gears in Thai waters, 2017-2021

Seerfish length varies by fishing gear used. The average length of narrow-barred Spanish mackerel (*Scomberomorus commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus)* caught by dominant gears in 2021 are presented in Table 2. Longline tends to catch larger seerfish than the other gears, followed by purse seine and pair trawl respectively, but seerfish size by gear in the Gulf of Thailand seems not different. The length distribution by fishing of narrow-barred Spanish mackerel and Indo-Pacific king mackerel are shown in Figure 7.

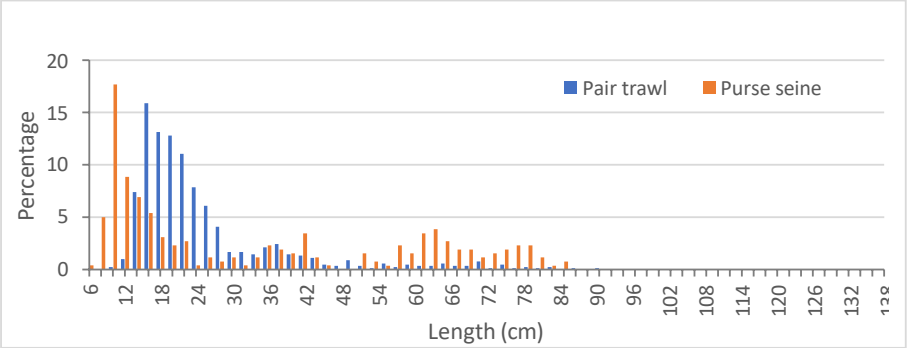
Table 2 Average length (cm) of common seerfish species caught by dominant gears in Thai waters in 2021

Area	Species	Gear	Mean	Minimum	Maximum
ADS	*Scomberomorus commerson*	Pair trawl	30.01 ± 13.52	9.5	98.0
ADS	*Scomberomorus commerson*	Purse seine	64.11 ± 18.55	9.0	140.0
ADS	*Scomberomorus commerson*	Longline	83.74 ± 11.77	57.0	131.0
GOT	*Scomberomorus commerson*	Pair trawl	26.15 ± 13.19	10.0	93.5
GOT	*Scomberomorus commerson*	Purse seine	35.17 ± 25.40	7.5	87.0
ADS	*Scomberomorus guttatus*	Pair trawl	34.43 ± 10.06	14.5	67.0
ADS	*Scomberomorus guttatus*	Purse seine	44.24 ± 7.62	11.5	61.5
GOT	*Scomberomorus guttatus*	Pair trawl	36.07 ± 4.17	26.5	47.0
GOT	*Scomberomorus guttatus*	Purse seine	41.25 ± 2.83	39.0	43.0

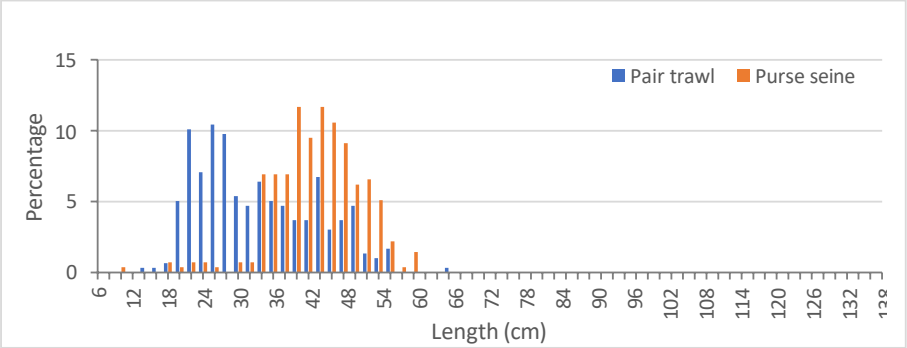
Remark: ADS means the Andaman Southeast Asia, GOT means the Gulf of Thailand



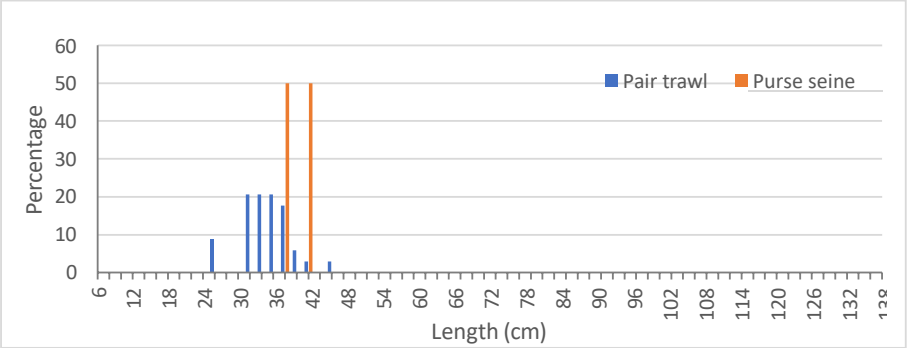
a) *S. commerson* in the Andaman Sea



b) *S. commerson* in the Gulf of Thailand



c) *S. guttatus* in the Andaman Sea



d) *S. guttatus* in the Gulf of Thailand

Figure 7 Length distribution of *Scomberomorus commerson* and *Scomberomorus guttatus* by gear in 2021

1. Stock Status

There are no studies of biological parameters and stock assessment of seerfish in Thai waters in the past.

2. Stock Assessments in the past

The recent studies on neritic tunas were done in 2012-2014. The studies were conducted in Thai waters, in the Gulf of Thailand and the Andaman Southeast Asia, which aimed to review neritic tuna fisheries, resources and its biological parameters. The three (3) species of neritic tunas, i.e., frigate tuna (*Auxis thazard*), kawakawa (*Euthynnus affinis*), and longtail tuna (*Thunnus tonggol*) were focusing on the studies. The related parameters are shown in Table 3. However, there are no studies on stock or parameters in regard of seerfish and do not have species stock assessments on neritic tunas and seerfishes in Thai waters in the past.

Table 3 Neritic tuna parameters in Thai waters

Species	Parameters							Spawning peak (month)	Study year
	L_∞ (FL)	K	t_0	Z	M	F	LW equation		
Andaman Southeast Asia									
Auxis thazard	48.08	1.0	0	3.65	1.28	2.37	$W = 0.0046FL^{3.3888}$	Sep	2012
Euthynnus affinis	67.48	0.9	0	4.68	1.08	3.6	$W = 0.0064FL^{3.2814}$	Nov	2012
Thunnus tonggol							$W = 0.0125FL^{3.1105}$	Apr	2012
Gulf of Thailand									
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Thunnus tonggol							$W = 0.0127FL^{3.1046}$	Feb, Apr	2012

3. Seerfish Management

Thailand's fisheries law is currently based on the Royal Ordinance on Fisheries B.E. 2558 (A.D. 2015) and its amendment in B.E. 2560 (A.D. 2017). It was enacted to improve the status of aquatic resources and to achieve sustainable fisheries in Thai waters including fresh water and marine. The monitoring, control and surveillance scheme is in place to ensure that all fishing activities are not IUU fishing, together with technical management measures which issued based on best scientific data. For example, the control of fishing effort through a total allowable effort (TAE) and licensing scheme, restrictions on the number and characteristics of fishing gears, probation on some destructive fishing gears, limitation of mesh size of trawls, etc.

Under the law, fisheries resources in Thai waters are managed commensurate with the maximum sustainable yield (MSY) through input control scheme. The resources are classified into three groups for management purpose, i.e., demersal fauna, pelagic fish, and anchovies. Demersal fauna refers to marine fish that live near Southeast Asiafloor and invertebrate species, e.g., lizard fish, croakers, breams, squids, shrimps, and crabs. Pelagic fish include marine fish which live in pelagic area such as mackerels, neritic tunas, sardines,

and scads. Anchovies are referred to only anchovy species.

Seerfishes are managed under pelagic fish group; however, it has no specific laws or regulations on seerfish fisheries.

3. Problems and Constrains

Thai fisheries are considered as multi-species and multi-gear fisheries that is common characteristic in tropical area, that one gear can catch many species, also one species can be caught by many gears at the same time. As seerfish can be caught by many gears from commercial and artisanal vessels, it is difficult to collect fishing data from all gears. Therefore, it needs large amount of budget and effort to collect comprehensive fishing data of seerfish fisheries, as well as biological parameters that required independent or scientific studies to do so.

4. Suggestion and Conclusion

In conclusion, seerfishes are common fish found in Thai waters and are high-demand economic species. These fish could be caught by many fishing gears from artisanal gears such as small scale longliners, handlines or gill nets, to commercial gears such as purse seiners or trawls. Majority of seerfish catch are from commercial fisheries. The fishing grounds are found throughout Thai waters which depth varies from 4-80 meters. Seerfish production in Thailand ranged around 8,000-11,000 tons annually with fluctuated trend in the past five years. Catch rate is different in each dominant gears but showed similar trend in the Gulf of Thailand and the Andaman Southeast Asia. Size of seerfish catch is different by gear used, that longline tends to catch larger seerfish followed by purse seine while seerfish from trawls seem to be smaller. Seerfish resource is managed under pelagic fish group in Thai fisheries management regime which limited on the annual allowable quota and fishing effort regulation. The stock assessment of seerfish is not available in Thai waters. Thailand does not have the assessment on these fish in the past, as well as biological parameters of seerfish are not available.

Due to multi-species fisheries characteristic in tropical region, Thailand suggests that it should have a regional collaboration on seerfish data collection and develop a data collection protocol like neritic tunas including catch, effort and biological data of concerned species. In order to better understanding of these fish and be prepare for next seerfish stock assessments in this region.

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Yakoh, A., Kongprom, A. & Kaewmanee, P. 2016. Reproductive Biology of Frigate Tuna (*Auxis thazard* (Lacepède, 1800) and Eastern Little Tuna (*Euthynnus affinis* (Cantor, 1849) in the Andaman Southeast Asia Coast of Thailand. Technical paper No.15/2016. Marine Fisheries ReSoutheast Asiarch and Development Division, Department of Fisheries.

STOCK STATUS OF SEERFISH IN VIETNAM

7th Meeting of Scientific Working Group on Neritic Tunas Stock Assessment in the Southeast Asian Waters
23-24th August 2022

Research Institute for Marine Fisheries

FISHERIES MANAGEMENT

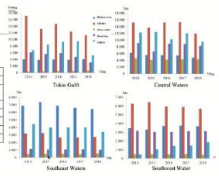
- Management by zones;
  - Coastal: <6m boat
  - Near-shore: 6-15m boat
  - Off-shore: >15m boat
- Management cycle: setting 'quota' for every 5 years, e.g. fishing licenses/catches
- Development Strategy: setting of TAC for whole fisheries;
- Master Plan: setting of TAC/fishing license for whole fisheries.
- Fisheries data collection: Monthly
- Stock assessments: every 5 years

Research Institute for Marine Fisheries

FISHING FLEETS

Fishing fleets structure

No	Type	Number of fishing boat				
		2014	2015	2016	2017	2018
1	Bottom trawl	20.652	20.201	20.108	19.756	19.170
2	Gill net	41.832	36.749	38.609	36.430	31.688
3	Purse	5.909	5.934	5.703	5.753	6.046
4	Hand line	19.725	16.461	19.022	17.830	15.691
5	Others	24.032	26.107	25.191	27.095	20.077
Total:		112.240	105.363	108.784	106.864	92.672



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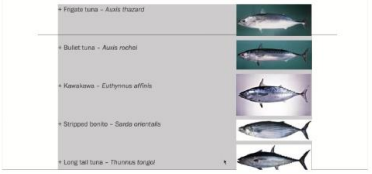
Neritic tunas in Vietnam waters



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DATA SOURCES

Independent surveys:
- Small pelagic: Hydro-acoustic
- Oceanic pelagic: Gill-net, Longline/Handline
- Demersal: Bottom trawl
- Ichthyo-plankton: egg/larvae
- Oceanographic survey

Fishery data:
- Catch/effort: Landing survey, log-book;
- Biological data: Length, age, biology for target species;
- Observer: Species catch composition, biological data

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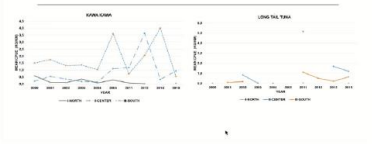
CATCH RATE (CPUE)

Cpue drift gill net survey



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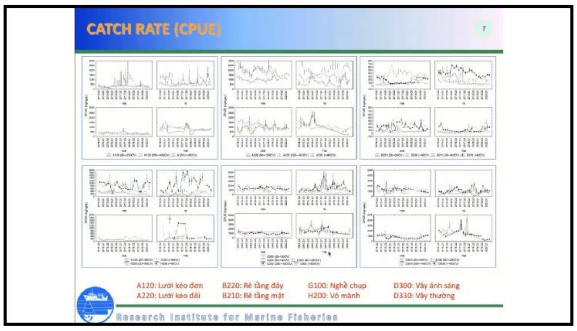
CATCH RATE (CPUE)
A120: Lưới kéo đơn
A220: Lưới kéo đôi
B220: Rê tầng đáy
B210: Rê tầng mặt
G100: Nghề chụp
H200: Vó mành
D300: Vây ánh sáng
D330: Vây thường
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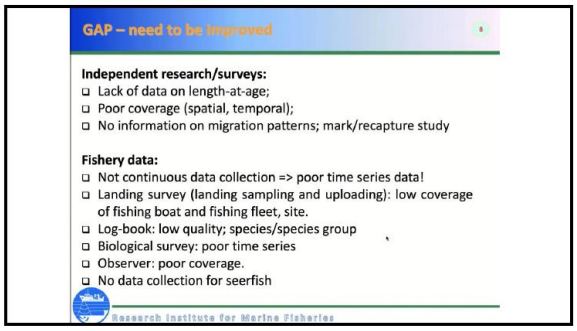
GAP – need to be improved
Independent research/surveys:
Lack of data on length-at-age;
Poor coverage (spatial, temporal);
No information on migration patterns; mark/recapture study
Fishery data:
Not continuous data collection => poor time series data!
Landing survey (landing sampling and uploading): low coverage of fishing boat and fishing fleet, site.
Log-book: low quality; species/species group
Biological survey: poor time series
Observer: poor coverage.
No data collection for seerfish
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Consideration on the future works
Tom Nishida
Resource person

(1)Technical issues
(2)Logistical issues

Consideration on the future works: (1) Technical issues

We have been using only ASPIC to now.
Is it OK to continue to use?
Or any other SA model should be applied?

We will NOW discuss this important issue.

1st Quick review on SA methods

3 major categories of SA methods (Nishida, 2015): Key ➔ Reference points

Type no.	Type	Input	Data period	IMPORTNT for MANAGEMENT Reference points (MSY, Fmsy, TBmsy etc.)	Models (Examples)
1	Qualitative assessment	Parameters			● PSA ● SAFE *(relative assessment)*
2	Quantitative stock assessments	Real data	Short term (Snap shot)	Partially Estimated	● FISTAT ● Y/R (S/Y)
3			Long term	Fully Estimated (based on population dynamics by the long-term data)	(1) SRA (Catch only method) (2) Production model (ASPIC) (3) Age (size) structured models (VPA, ASPM) (4) Integrated models (SS3, SCAS, SCAA)

We definitely need to use NO. 3 if we have a long time series data

Then which SA method (Type 3) should be used in addition to ASPIC?

Models		Example	Data and parameters required: Stock structure	Catch	CPUE	CAA or CAS	Biological information: Age (size)	M	LW	Growth equation	Maturity fecundity	Selectivity (F by gear)	Movement
Data limit approach		SRA (catch only)											
Production models (PM)		ASPIC											
Age structured model	Simple (gear aggregated)	VPA											
		ADAPT-VPA											
	Age structured PM (between PM & IM)	ASPM										Given	
	Integrated Model (IM) (less complex)	SCAA										Estimated	
	Integrated Model (IM) (complex)	SS3											

ASPM is suggested as biological data is used. But it is much more complex than ASPIC.
➔ We need much more efforts (>10 times) to learn (Capacity Building).

Why we need ASPM (age specific PM)

We need the other SA model with Biology (different specs) than ASPIC.
Why ?
We need to use biological data that we have collected.
(If we don't use, why we need to collect ?)
We need one representative biological data/parameter
(not like Catch and CPUE by country)

It will be very useful if we compare results
between ASPIC and ASPM then results are similar
Then we can have confident in results
➔ Can provide reliable management advice.

Do we need the Limit Reference Point ?

Yes! Because we need more conservative management advice
To now we use only Target Reference Point (MSY)

What is the Limit Reference Point?
More conservative Reference Point with species specific coefficient
For example (IOTC)

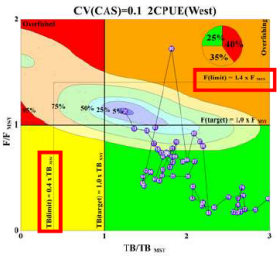
Table 1. Interim target and limit reference points.

Stock	Target Reference Point	Limit Reference Point
Albacore Yellowfin tuna Swordfish	$B_{TARGET} = B_{MSY}$; $F_{TARGET} = F_{MSY}$	$B_{LIM} = 0.40\ B_{MSY}$ $F_{LIM} = 1.40\ F_{MSY}$
Bigeye tuna	$B_{TARGET} = B_{MSY}$ $F_{TARGET} = F_{MSY}$	$B_{LIM} = 0.50\ B_{MSY}$ $F_{LIM} = 1.30\ F_{MSY}$
Skipjack tuna	$B_{TARGET} = B_{MSY}$ $F_{TARGET} = F_{MSY}$	$B_{LIM} = 0.40\ B_{MSY}$ $F_{LIM} = 1.50\ F_{MSY}$

If TB and/or F violate Limit Reference Point, we need more strict management measure such as closures.

We also need to make the Kobe II risk matrix for Limit Reference Point

See example (next slide)



IOTC albacore SA by SCAS (Nishida, 2022)

Example: Kobe II Strategy Matrix (Target & Limit Reference Point)
Bigeye tuna stock assessment(IOTC, 2021)

Table 2. Bigeye tuna: Stock Synthesis base case Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for constant catch projections (relative to average catch level from 2018 (81,413 t): -10%, -20%, -30%, -40%) projected for 3 and 10 years

Reference point and projection timeframe	Alternative catch projections (relative to the catch level from 2018) and weighted probability (%) scenarios that exceed reference point				
	60% (48,848 t)	70% (56,990 t)	80% (65,130 t)	90% (73,272 t)	100% (81,413 t)
$SB_{2031} < SB_{MSY}$	51.1	53.3	54.2	57.1	58.9
$F_{2031} > F_{MSY}$	7.3	17.8	32	47.9	62.8
$SB_{2038} < SB_{MSY}$	8	19.5	35.1	49.1	60.8
$F_{2038} > F_{MSY}$	1.1	6.9	19.8	37.7	55.6
Reference point and projection timeframe	**Alternative catch projections (relative to the catch level from 2018) and probability (%) of violating MSY-based limit reference points (SB_{lim} = 0.5 SB_{MSY}; F_{lim} = 1.3 F_{MSY})**				
	60% (48,848 t)	70% (56,990 t)	80% (65,130 t)	90% (73,272 t)	100% (81,413 t)
$SB_{2031} < SB_{LIM}$	0	0	0	0	0
$F_{2031} > F_{LIM}$	6.0	11.0	17.0	28.0	39.0
$SB_{2028} < SB_{LIM}$	0.0	0.0	6.0	11.0	22.0
$F_{2028} > F_{LIM}$	0.0	6.0	17.0	22.0	39.0

What are the "data" when we talk about the "data poor (limit)" situation?
They are: data period (years), data quality (uncertainties),
Catch, CPUE, parameters (biology and ecology) etc.

Here we consider Catch & CPUE assuming data period is OK (> 10 years) & quality is known.
Then, in what situation, we should use SRA (Catch only method) or ASPIC (Catch & CPUE)?

Cath		Catch is controlled by TAC etc.	CPUE		which one (SRA or ASPIC) should be applied?
available ?	Quality		available ?	Quality	
NO			NO		both cannot be used
			YES	NG	
			YES	OK	both cannot be used (but the CPUE trends analyses can be conducted).
YES	NG		YES	NG	both cannot be used
	OK	YES		NG	both cannot be used
	OK	NO		NG	SRA
	OK			OK	ASPIC

OK, then, How about ASPIC. Still OK to use? Let review the evolution of PM

Evolution	Type	Authors	Features				Comments
			Equilibrium Condition (EC) (death=increase) (never happen)	Error type: Observation (data) error	Error type: Process (model) error	Bayesian (better) Approach	
old	Original PM	Shaeffer(1954), PT(1969) & Fox (1970)	YES				Classical (Not recommended to use due to EC)
	ASPIC (Ver5)	Prager (2004)	NO				Basic, standard & common (SEAFDEC, RFMOs & countries)
	ASPIC (ver7.5)	Prager (2017)					
new	JABBA (Just Another Bayesian Biomass Assessment)	Winker (2018)					Best but high standard (slowly expanding) Recommended

ASPIC is still OK as it is a standard approach.
We may challenge the best PM (JABBA) in the future.

Summary: Suggestion of the future SA models
(SEAFDEC neritic tuna project will gradually reach to the RFMO standard level)
Need the feedback from SWG7

Category	Model	Type	Past	Current	Future (near)	Future (long)	Note
PM	ASPIC	basic model					if JABBA can be used then no ASPIC needed
Age structure PM using biological data	ASPM	advanced model					need the budgets to develop the menu driven software like ASPIC, Kobe plot etc.
Best PM	JABBA						

Menu driven software vs. R driven program
Pros and cons

	flexibility (input & output)	skill for programming	time to run	users
menu driven software	fixed	no need	no need (ready to run)	anyone, especially for non technical users & programming illiteracies
R driven program	flexible	required	need time till the program completed	limited (those who wants make their own programs)

Consideration on the future works: (1) technical issues

2 important issues for the future works

(1) We need to check the fishing conditions from Fishers (field voice)
➔ need to check our standardized CPUE trends are correct.
This will be the important task by participants
(member countries need to check) (future works)

(2) Normally stock statuses are a few years behind (time lag)
➔ Need to incorporate this in the management advice (future)

Consideration on the future works: (2) Logistical issues

Need to work together with SEAFDEC member countries exploiting neritic tuna

⬇

We can get the global & fruitful information
(catch, CPUE, biology, fishers voices, extra info.)

⬇

We can do more plausible (realistic) SA & RA

Consideration on the future works: Which species we should assess next time

As recommended in the SWG6, SA cycles should be:
➔ 2 years: un-safe stock status species (non green zone) (before too late!)
➔ 3 years: safe stock status species (green zone)

Summary of stock statuses on 7 neritic tuna species(*) by year & area in the SE Asian waters and the top priority for the next SA

Commercial importance	Species	Area	2013	2014	2015	2016	2017	2018	2019	2020	Top priority for the next SA
High	Longtail	Pacific	100%					100%			
		Indian		62%				63%			
	Kawakawa (**)	Pacific	100%					84%			
		Indian		47%				76%			high
	Narrow-barred Spanish mackerel	Pacific				85%			50%(***)		high
		Indian				71%				66%	high
	Indo-Pacific king mackarel	Pacific				90%			100%		high (inconsistent & need good CPUE)
		Indian				97%				100%	
Middle	*Frigate tuna*	*Pacific*	*Unknown as no stock assessments have not yet conducted to now*								
		Indian									
	Bullet tuna	*Pacific*									
		Indian									
Low	*Bonito*	*Pacific*									
		Indian									

(*) 1st SWG, Selangor, Malaysia (2014).
(**) We need to decide if we do 2 separate SA in each area (Pacific and Indian).
(***) Actually the stock status is in the green zone, but uncertainties (50% in red) is the highest. That is why it is red.

Consideration on the future works: (2) Logistical issues

Capacity Building
Data collection, collations, processing, and QC (massage)
(Catch, CPUE and biological info)

⬇

We cannot do all during the workshop
Need a few months before the WS (as we did in the past)

⬇

In the past, a few people are assigned for these tasks and worked together with the resource person

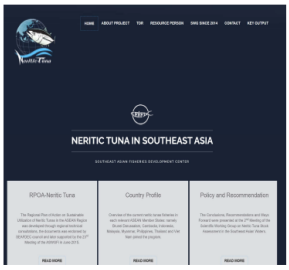
Selection of good CPUE can be done during the WS.

Consideration on the future works: (2) Logistical issues

Keep updated
Bagus SEAFDEC neritic tuna home page
http://www.seafdec.or.th/neritic-tunas/
(2013-2019) by adding materials after 2020

Good portal & very popular ➔
Many people & organizations in the world have been accessed this site and wish to continue to utilize & share the info.

The resource person received many inquiries via this site.



Summary : future works (3 points)

(1) Top priority (4 species)
Kawakawa (IO)+Spanish mackerel (PO+IO)+King mackerel (PO)

(2) Continue to use ASPIC (standard method)
then develop ASPM & JABBA if the budgets available

(3) Capacity Building on Data
Collection, compilation, process, QC, selection of CPUE (Fishers voice)

Annex 16

CLOSING REMARKS

Dr Masahito Hirota
Deputy Chief of SEAFDEC/MFRDMD

The Seventh Meeting of the Scientific Working Group on Neritic Tunas Stock Assessment in the Southeast Asian Waters

SEAFDEC/MFRDMD, Kuala Terengganu, Malaysia
23 August 2022

Dr Worawit Wanchana, Policy and Program Coordinator; Dr Supapong from SEAFDEC/TD; Dr Nishda and Dr Katoh from FRA Japan, Mr Abd. Haris Hilmi Ahmad Arshad, Chief of SEAFDEC/MFRDMD, and Ladies and Gentlemen, Good afternoon.

Thank you very much for the active participation from eight SEAFDEC Member Countries. Because of the long-term Covid-19 pandemic, we've set a video meeting today. Here, we would like to apologize for the inconvenience of this form. Activities of SWG-neritic tunas are supported by the Japanese Trust Fund 6 Phase II project, titled "Fisheries Management Strategies for Pelagic Fish Resources in the Southeast Asian Region." We are now at the halfway point of the road map for 5years project. Toward the final goal, today's discussion will surely give us an excellent meaning for the further progress of this project. From these outputs, we will provide scientific advice for the sustainable management of pelagic resources in this region. I hope we will work closely and continuously together to achieve its goal. Now, I declare the meeting closed. Thank you very much.