



REPORT

**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE STUDIES FOR
MANAGEMENT OF PURSE SEINE FISHERIES IN THE SOUTHEAST ASIAN
REGION”**

**Kuala Lumpur, Malaysia
18-19 September 2018**



Prepared by:
**Noorul Azliana Jamaludin,
Mohammad Faisal Md Saleh,
Adam Luke Pugas,
Kenji Taki,
Raja Bidin Raja Hassan,
Nurul Nadwa Abdul Fatah**

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MARINE FISHERY RESOURCES DEVELOPMENT AND MANAGEMENT
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4TH CORE EXPERT MEETING ON COMPARATIVE STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES IN THE SOUTHEAST ASIAN REGION



Melia Hotel, Kuala Lumpur, Malaysia

18-19 September 2018

Adopted report

I. INTRODUCTION

1. The 4th Core Expert Meeting on Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region was organized by SEAFDEC/MFRDMD at Melia Hotel, Kuala Lumpur, Malaysia from 18 to 19 September 2018. The meeting was attended by the representatives from Brunei, Cambodia, Malaysia, Myanmar, The Philippines, Thailand and Viet Nam; as well as resource persons from Japan and Malaysia; the representatives from SEAFDEC/SECRETARIAT and SEAFDEC/TD; the Chief, Deputy Chief and Officials from SEAFDEC/MFRDMD. However, the representative from Indonesia could not join this meeting due to other commitment. The List of Participants appears as Annex 1.
2. The objectives of the meeting were: to share the latest information about landings and CPUEs of purse seine (PS) fisheries in the region, to provide explanation for any misleading data/information from all participating Member Countries, to share latest/additional output based on the regional synthesis of purse seine fisheries in the region, to discuss the most appropriate management measures for purse seine fisheries in the region, and to understand the population structure for *Amblygaster sirm*.

II. OPENING OF THE MEETING

3. In his welcome message, the Chief of SEAFDEC/MFRDMD, Mr. Raja Bidin Raja Hassan expressed his gratitude to all participants from the SEAFDEC participating Member Countries for their efforts to attend this meeting and expected to deepen his knowledge on purse seine management which he thinks is more applicable in the ASEAN region. His welcome remarks appear as Annex 2.

4. The meeting was officially opened by the Deputy Chief of SEAFDEC/MFRDMD, Dr. Kenji Taki. He hoped the participating Member Countries could share on the latest information about pelagic fisheries and management of purse seine fishery. He emphasized on the importance to examine the fishing capacity for purse seine and some management measures to address the common issues faced in this region and hoped delegates could tap valuable information from invited resource persons from Japan and Malaysia. The opening address appears as Annex 3.

III. ADOPTION OF AGENDA AND OVERVIEW OF THE PROGRAM ACTIVITY

5. This session was chaired by Chief of SEAFDEC/MFRDMD and the meeting agenda was presented by Dr. Kenji Taki, Deputy Chief of SEAFDEC/MFRDMD. The agenda was adopted with a little amendment as in Annex 4.
6. Project Coordinator, Mr. Mohammad Faisal Md. Saleh, presented the Overview of Project, as appears as Annex 5. Besides reporting the background and objectives of the project, the expected goals of this project were also informed. The activities that have been done so far also been reported. In his presentation, he also emphasized the need of completing data input from the member countries in order to get a clear picture to formulate the management strategies for small pelagic fisheries in the region, as one of the expected goals of the project. For example, Myanmar was requested to provide a complete data input, and he also hoped that the genetic samples of *Amblygaster sirm* should be determined since this is very important to confirm the genetic population structure of this selected species in this region. The meeting members were informed that all outputs will be reported in a terminal report to be published in 2019 and the report will be disseminated to all SEAFDEC member countries. His presentation received a few comments and suggestions, which was agreed by all meeting members. One of the resource person, Prof. Dr. Takashi Matsuishi recommended to use multispecies management instead of selected major species as the new objective for this project, in lined with the progress of other project that involved Purse Seine fisheries management for multispecies in this region. This new approach lead to future research such as Fisheries Management Plan (FMP), will be applicable to all SEAFDEC Member Countries' situation. Chief of MFRDMD, Mr. Raja Bidin Raja Hassan also agreed with the suggestion, furthermore, he added that if the use of major selective species still need to be proceed, the common species like tuna and sardine could be chosen as new subjects to study. The meeting was informed that currently, only one species of *Amblygaster sirm* or spotted sardinella had been selected to study the population structure in the region by using the genetic approach. Dr. Worawit Wanchana from SEAFDEC/SEC suggested sufficient data such as CPUE, biological data, etc. should come out with a standard guideline to reflect effective observations for FMP. He gave an example of ecolabelling schemes approach through Marine Stewardship Council (MCS) as an effort by Member

Countries towards sustainable fisheries. The meeting was also informed and requested by Mr. Chhuon Kimchhea from Cambodia for further funding and technical support on this project in future. MFRDMD will take this request as consideration for future.

IV. COUNTRY REPORT PRESENTATIONS

7. The first country report was presented by Mr. Marzini Haji Zulkipli from Brunei Darussalam as in Annex 6. His presentation mainly focused on the overview of fisheries management measures in Brunei Darussalam. The meeting was informed of the landing trend and CPUE of purse seine in Brunei Darussalam from 1993 to 2017. The major composition of industrial purse seine which had compiled the national reports since 1995 in Brunei Darussalam was also presented. He explained that the data in 1992 was collected from the former employees from DoF Brunei Darussalam and informed most of the catches was from trawl vessels. However, in recent years, Brunei Darussalam encouraged the Purse Seine operators to explore deeper sea for yellowfin and big eye tuna and this initiative will be improved in future management strategies. He also stated the current status of marine capture fisheries in Brunei Darussalam had decreased from 14,966 MT in 2016 to 13,796 MT in 2017. The capture was using the small scale and commercial fishing vessels in which the former comprises of 66% from the total of marine capture fisheries production.

Resource Person, Prof. Dr. Takashi Matsuishi from Hokkaido-University, emphasized that the country report presentation was very crucial in order for member countries' representative to explain their current data information. He was impressed with the way that Brunei Darussalam managed their vessels although the country adopts small-scale fisheries and this could be a good example of excellent data collection for other countries. The meeting had been informed by Brunei Darussalam's representative about the situation happened in 1997 to 2000 whereby no data of purse seine fisheries collected due to high unit pricing of the targeted species, hence the operators were reluctant to catch the species. Some suggestions were made by Prof. Dr. Takashi Matsuishi in order for the results would not be affected if the case of no available data. He also emphasized that the investigation of interannual variations of species composition was very important and strongly recommended species by species data collection in the future.

Mr. Marzini Haji Zulkipli explained the type of vessels used according to fishing zones in Brunei Darussalam whereby Zone 1 is allowed for small scale fishery vessels only whilst big boats and vessels operated in Zones 2 to 4. The fluctuation in number of vessels in Brunei Darussalam was due to some factors, for instance, the lack of operators for technical and vessels ability, weather and manpower. Mr. Chhuon Kimchhea from Cambodia informed that they will start the zoning systems using the examples from other Member Countries like Brunei Darussalam.

8. The second country report was presented by Dr. Chea Tharith, the first representative from Cambodia. His presentation as in [Annex 7](#), focused mainly on overview of purse seine fisheries in Cambodia. Besides showing the statistics of vessels and marine capture production in Cambodia from 1993 to 2015, he also shared the challenges and constraints faced in Cambodia in regards to fisheries management. However, he added that necessary management actions were implemented. Currently, Cambodia is revising the fisheries legislation and in drafting the National Plan of Action against IUU fishing (NPOA-IUU) for 2018-2022. He discussed the need to hire some experts to prevent the IUU and PSM.

The upgraded marine fishery policy in Cambodia was introduced in the meeting by Mr. Chhuon Kimchhea, the second representative from Cambodia. The country just hired the international consultant from European Union (EU) and just proposed the 1st draft for marine fishery policy whereby all fishing vessels operated must be registered. He also added that the upgraded marine fishery policy was using the existing National Marine Policy as the template. He answered to Dr. Worawit Wanchana's query regarding the number of vessel licenses were more than number of existing fishing gears. In his response, the meeting members had been informed that some of the vessels do not require to be registered their fishing gears. He also added that Minister of Public Work and Transport is responsible for vessels registration while Department of Fisheries is only responsible for fishing registration.

9. The report for the East Coast of Peninsular Malaysia (ECPM) was presented by Mr. Sallehudin Jamon from Fisheries Research Institute (FRI) Kg. Acheh, Perak, as in [Annex 8](#). He started his presentation with general Malaysia Fisheries profile followed by landing trend of pelagic fishes and anchovies including species composition. Biological data such as length at first maturity and spawning season of mackerel and scads were also included in his presentation. Other than that, trend of fishing effort for purse seine fisheries in ECPM was also reported. The meeting was informed that the current status for pelagic fish in ECPM using Kobe I Plot is still in green zone. Meanwhile, the risk assessment attempted to allow the increase of catch up to 20% for the next ten years. The management measures for purse seine in ECPM were also presented.

Responding to Prof. Dr. Takashi Matsuishi regarding the declining of fishing effort that affected the relationship between catch and standardized CPUE in 2017, Mr. Sallehudin Jamon clarified that was due to the catch of Indian mackerel and short mackerel was low during that year. However, ECPM has taken note to improve the data analysis after a few suggestions from the Resource Person.

10. The report for the Purse Seine Fishery of the West Coast of Peninsular Malaysia (WCPM) was presented by Mr. Abdul Wahab Abdullah from FRI Kg. Acheh, Perak. His presentation appears as [Annex 9](#). He started with information on type of purse seine vessels, zoning and fishing areas and also on latest relevant rules and regulations. The

meeting was informed that according to Kobe I Plot, the current status of the West Coast is overfished based on pelagic survey data in 2013. Besides that, biological data information such as length at first maturity and spawning season of Indian mackerel were also reported in his presentation. The issues of challenge for pelagic resources in WCPM had also been addressed in his presentation.

The meeting had also been informed by Mr. Sallehudin Jamon that the contrast situation of resource status between WCPM and ECPM was because of many reasons. One of the reasons was political disputes on the license issued to the fishermen. Nevertheless, Chief of MFRDMD added that the finding of overfishing in WCPM was consistent with reports during acoustic survey and it is an alarm for WCPM to reduce number of fishing efforts and fishing vessels, hence the managers had come out with a proposal of closing season for certain species. He also suggested collaboration with the neighbouring countries (Thailand and Indonesia) for management purpose plan.

11. The country report on Purse Seine Fishery in Sarawak, Malaysia was presented by Mr. Jamil Musel from FRI Bintawa, Sarawak. Kobe I Plot from 2009-2017 showed pelagic status of Sarawak waters is still in green zone category. Another analysis using risk assessment showed the green zone for three years if the current catch level remains around the same, but overfishing will happen if the catch increases up to 20% in the next ten years. The interannual variations of total biomass using Kobe I Plot was also presented besides the existing management strategies practiced in Sarawak. His presentation appears as Annex 10. The meeting members were discussed some of the issues and challenges in purse seine fisheries in Sarawak such as the issue of foreign worker employment due to new regulations as well as the sea condition in Sarawak waters itself was not suitable for purse seine which lead to the low number of PS vessels operated. He added that there was a discussion among Sarawak's authority regarding the development of purse seine fisheries in Sarawak. In addition to that, he also reported that as an alternative, some of the fishermen tried to use stick sea cassnet as a new fishing gear but it is still under trial phase. Nevertheless, that new fishing gear managed to catch higher number of squid and mackerels (e.g. 400-500kg/haul).
12. Mr. Mohd Zamani Nayan from Department of Fisheries Sabah, Malaysia presented the "Purse Seine Fisheries in Sabah". He described briefly on the fishing zone in Sabah which is divided into three zones; West Coast (WC) Zone, East Coast (EC) Zone and Tawau (TW) Zone. He addressed some issues and challenges of fishery scenario in Sabah. Kobe Plot showed EC Sabah is in yellow/recovery area. Meanwhile TB/TBmsy and F/Fmsy are in green area, however, unlimited catch will result in overfishing for the next ten years. The Kobe I Plot analysis had also revealed the landing trend of pelagic fish in Sabah from 2009 to 2017 for three types of gears. The existing management strategies in Sabah are same with the rest of Malaysia, for example, joint venture program and building up management plan.

Mr. Mohd Zamani Nayan also expressed his concern on the issue of safety in Sabah waters may affect the number of captures for some time. Mr. Sallehudin Jamon also added the same situation happened in IOTC waters particularly among the fishermen in Somalia. In terms of data analysis, Mr. Supapong Pattarapongpan from SEAFDEC/TD had suggested to use other model instead of depending solely on ASPIC model and he mentioned the same situation had happened before to Gulf of Thailand (GoT) data analysis. In this case, the use of ABC model was more appropriate. However, Mr. Mohd Zamani Nayan clarified that the data has been corrected since 2010 and gave the same negative correlation. His presentation appears as Annex 11.

13. The country report from Myanmar was presented by Mr. Myint Shwe entitled The Management of Purse Seine Fishery in Myanmar. He elaborated that the purse seine operation in Myanmar can be divided into Fish Purse Seine to catch species like Hilsa and Purse Seine Anchovy to catch anchovies in inshore coastal waters. He also showed the major capture pelagic fishes in Myanmar waters as well as fishing season for Indian mackerel. The offshore and inshore purse seine catch activities and CPUE were also presented. The current pelagic stock status from research vessels survey data in 2013 was revealed and he informed that presently there was also a survey conducted near Myanmar coastal waters which yielded 1.5 million MSY (Maximum Sustainable Yield) for both pelagic and demersal. His presentation appears as Annex 12.
14. Mr. Ronnie Romero from the Philippines presented his country report on the purse seine fisheries. Based on his presentation, he provided an overview of the Philippines capture fisheries and scenarios of purse seine fisheries. He also discussed the status of pelagic fish and existing management measures in the Philippines. The meeting agreed that reference points (RP) had been used and the implementation would be a good example of management measures taken to fisheries management in the Southeast Asian region. His presentation appears as Annex 13.
15. Dr. Watcharapong Chumchuen from Thailand reported the Purse Seine Fisheries in Thailand. He briefly explained about the catch and effort statistics, biological information, status of pelagic fish stock and existing management measures in Gulf of Thailand (GoT) and Andaman Sea (ANS). Dr. Worawit Wanchana from SEAFDEC/TD recommended to acquire data from Thai Meteorological Department to determine the exact time of sunset and sunrise for anchovy purse seine's daytime fishing operation. In response to Sarawak Malaysia's delegate, Dr. Watcharapong Chumchuen informed that the MSY calculation was done yearly for pelagic fishes, demersal fishes and anchovies in Thai waters. The meeting was also informed the increasing of number of days per trip in 2011 to 2012 in GOT may due to fishery resource status, fuel cost and improvement of the storage on the fishing vessels thus the fishermen can stayed longer at the sea compared to the previous years of 1-2 days per trip. His presentation appears as Annex 14.

16. Mr. Pham Van Tuyen presented the country report from Viet Nam. In his report, an overview of marine fisheries was explained particularly on the purse seine fisheries in Viet Nam. The total number of fishing boats and purse seiner was revealed besides the landing trends from 2000 to 2017. In addition, trend of CPUE, biological information, current stock status of pelagic resources and existing rules and regulations were also reported. He also shared that Viet Nam is still struggling in the implementation of proper rules and regulations. However, there are many workshops, meetings and discussions conducted by Viet Nam's authority to overcome some issues, such as the implementation of minimum length of the fish capture for some species. The ideas and suggestions from meeting members are always welcome in order to help Viet Nam in this matter. His presentation appears as Annex 15.

17. General discussion of pelagic fisheries based on country presentations:

I. Catch and effort statistics

- i) Chief of MFRDMD, Mr. Raja Bidin Raja Hassan advised Brunei Darussalam to get more information on catch and effort data statistics for better output from the data analysis and the result can be used to determine the performance of purse seine fisheries in the region. He added a combination with more comprehensive data from Brunei Darussalam and other Member Countries can be a good reference on the actual performance of purse seine industry in the region.
- ii) Deputy Chief of MFRDMD, Dr. Kenji Taki advised Thailand to use different method of analysis by using each category of vessel size for purse seine, to take example after Brunei Darussalam that used zone division for CPUE and catch effort in their analysis.
- iii) Representative from SEAFDEC/TD, Mr. Supamong Pattarapongpan suggested to come out with standardized method since all meeting members were aware that different countries have different management measures. Therefore, it was advised to double-check all the result analysed by respected country in best possible way to find out the reference point and then decided which management measure is most suitable before the standardized method or model at regional level is determined.
- iv) Dr. Worawit Wanchana suggested as a way forward, to come out with a manual or template for the data analysis and he believed the pattern analysis used by Malaysia can be a good example for the data analysis for fish stock analysis at regional level.
- v) Dr. Watcharapong Chumchuen gave some suggestions to use CPUE unit as smallest effort unit as possible, for example haul, day or trip, because the large unit (vessel) has large variance when different data sources were analysed together. Mr. Mohammad Faisal Md. Saleh responded that MFRDMD had tried to used effort index as number of vessels and other type of efforts; however, after several

internal discussions, MFRDMD found that the suggested effort index as number of units or vessels and other types of effort were not reliable for regional analysis except effort index as number of trips. Dr. Kenji Taki, however, added that the number of days is the best index for Thailand scenario and his suggestion was agreed by Thailand's representatives although the fleets used different strategies. Representative from Malaysia, Mr. Sallehudin Jamon also agreed that the finding by using number of units and trips resulted in good outcome as compared to other efforts.

II. Biological information

- i) Mr. Mohammad Faisal Md. Saleh highlighted for Member Countries to submit biological information with references as shown by Thailand and Viet Nam in their presentations. He informed that the references are needed to be included in the terminal report publication.
- ii) Dr. Kenji Taki added geographical difference should be included for maturity size and spawning season information for next step of analysis.
- iii) Prof. Dr. Takashi Matsuishi reminded all meeting members to be extra careful in the accuracy of estimations that seems different from the previous reference/historical data information.

III. Stock status

- i) Dr. Kenji Taki mentioned the new approach using ASPIC and Kobe Plot model by Malaysia was the first time presented in the meeting and showed a good progress so far with some revision needed for future analysis.
- ii) Mr. Ronnie Romero added they appreciated the production model proposed by Malaysia, however, he suggested that Malaysia could come out with some recommendations for sustainable fisheries (e.g. management strategies on how to sustain livelihood without affecting the ecological balance).
- iii) Mr. Fileoner O. Eleserio from Philippines also expressed his concern on methods of fishing such as the use of light and sonar, as example. He suggested that lots of variables need to be examined for particular fishing gears and number of days at the sea. In addition, Dr. Kenji Taki favored Malaysia's examples in using three different gears for their analysis on CPUE and suggested to consider further categorization of the gears.

Chief of MFRDMD recommended to come out with standardized unit/effort for different methods for better result of regional analysis.

IV. Management strategies:

- i) Chief of MFRDMD also highlighted the need of all Member Countries to report the progress or impacts on the management measures implemented by their country in the future. As an example, implementation of close seasons approach in Thailand, so that the comparison between before and after implementation can be observed and used as a reference to the other Member Countries.

V. MANAGEMENT MEASURES FOR PURSE SEINE FISHERIES

18. Ms. Wahidah Mohd Arshaad from SEAFDEC/MFRDMD, presented “Genetic study of *Amblygaster sirm* in South China Sea and Andaman Sea”. In her presentation, she highlighted there was separated management unit of *Amblygaster sirm* in Southeast Asia region based on genetic result inferred by Cytochrome *b* (Cyt *b*) DNA marker. She also informed that the extra analysis using other DNA Marker which was Cytochrome C oxidase subunit I (COI) was also done to reconfirm the result. From both DNA markers used, it was concluded that there was a separated population structure of *A. sirm* between South China Sea (including Banda Aceh) and Andaman Sea (particularly from Ranong). However, this finding was not agreed by genetic experts during the Genetic Workshop that took place in Langkawi, Malaysia from 6 to 8 August 2018 previously. From that genetic workshop, it was assumed that the existing of new species/sub-species of *A. sirm* is due to its high genetic distance between these two ecosystems which are South China Sea (including Banda Aceh) and northern Andaman Sea water (Ranong). Therefore, it was decided that a few factors may contributed to the population genetic break such as hybridization, faster rate of genetic evolution or there was the discovery of new or cryptic species. Future studies were recommended for clear result such as using another DNA marker (e.g. microsatellite), morphology study and additional of larger geographical areas. Therefore, she also emphasized the important of samples collected from Myanmar as it was unavailable currently. The meeting was also informed according to FAO, this *A. sirm* species was not found along the Straits of Malacca and it was confirmed by Mr. Sallehudin Jamon based from the local knowledge and this finding would make the study more exciting to be carried out. Dr. Worawit Wanchana also shared the microsatellite study done for *Rastrelliger brachysoma* in GoT waters revealed the different stock structures. Dr. Worawit Wanchana offered to assist in morphology without using any extra cost study from Myanmar and Thailand, however MFRDMD will discuss with Indonesia for further collaboration. Her presentation appears as Annex 16.

19. Resource Person, Mr. Abu Talib Ahmad, the former Senior Director from Malaysia Fisheries Research Institute, Department of Fisheries Malaysia, presented on Rapid Assessments – Risk and Fisheries overview Towards Development of Fisheries Management Plan. From his presentation, rapid assessments for management was reviewed which divided into Risk Assessment and Fisheries Assessment. He also showed the example been used for fisheries assessment for Purse Seine Fishery scenario (multispecies) in WCPM. He also clarified that the high result of Risk Assessment for *Rastrelliger kanagurta* was due to trawl gear used as the main fishing gear for small pelagic, however, under susceptibility that the data was overlapping when compared to gillnet that was not allowed in coastal areas WCPM. He also explained that the Risk Assessment must be done by species, therefore to do the Productivity-Susceptibility Analysis (PSA), all parameters must be considered, however this is not applicable to regional level, therefore, further studies need to be done in future for this subject. The meeting also had been informed that the method used for pre-assessment was only inspired by the method developed by the Europeans for proper management plan and was not to be applied to Southeast Asian purse seine fisheries' scenarios. All meeting members agreed to use this method of assessment for future project lead by MFRDMD. His presentation appears as Annex 17.

20. Mr. Mohammad Faisal Md. Saleh presented the Outputs Based on Regional Synthesis, as appears as Annex 18. In his presentation, he showed the current result of regional analysis done by MFRDMD using calculation of Allowable Biological Catch (ABC) Rule (Rule 2-2) for selected areas in SCS and ANS and also the preliminary analysis using Production Model (Fox Model) for selected areas. Dr. Worawit Wanchana supported the finding found by MFRDMD, however raised issue of the accuracy of the data due to data fluctuations to be used for upcoming JTF VII project. Mr. Mohammad Faisal Md. Saleh responded that MFRDMD have taken note on the mentioned issue, nevertheless the main constraints to get more precise and accurate data were cost and manpower. Chief of MFRDMD then reminded and emphasized Member Countries to follow the right steps during data collections for sake of data accuracy. Mr. Ronnie Romero recommended to come out with standardized method with different modelling to accommodate various situation data. Prof. Dr. Takashi Matsuishi stressed on the precision of data input in order to improve the results' effectiveness. He also added that the regional analysis can be considered as a scientific trial however it is not enough to be used as a scientific evidence for management of pelagic fishes in each Member Countries.

21. Prof. Dr. Takashi Matsuishi presented results from Land Based Survey conducted in 2017 and 2018 on East Coast of Peninsular Malaysia. His presentation received some comments from Mr. Abu Talib bin Ahmad on extra analysis of statistical data but cautioned on the accuracy of the data used. His presentation appears as Annex 19.

22. Prof. Dr. Takashi Matsuishi continued with his second presentation on Latest Topic of Stock Assessment, as in [Annex 20](#). In his presentation, he reviewed the feedback on fisheries management strategy applied for mixed species data. The Feedback Control Management is applicable to mixed species data and poor data situation, which seems to be fit with current situation of purse seine fisheries in the Southeast Asian region. At the end of his presentation, he also stated that multi-gear situation fishery management should be considered for the sake of sustainable fishery.
23. Chief of MFRDMD presented the Fishery Management Plan (FMP) for Small Pelagic in the South China Sea. In his presentation, he explained the requirements needed to execute a successful FMP. He emphasized the need to consider the multiple aspects and issues related to the targeted fishery management plan. Implementation arrangements for FMP also were briefly described. His presentation appears as [Annex 21](#).
24. Prof. Dr. Takashi Matsuishi continued with his presentation on Possible Management Measures for Purse Seine Fisheries in ASEAN Region, as in [Annex 22](#). In his presentation, he explained some issues on different condition between biomass and MSY relationship due to high productivity to some cases. Mr. Abu Talib Ahmad then highlighted on the observation of the multispecies scenarios of the purse seine fisheries. He emphasized on the use of standardized efforts for management purposes. Prof. Dr. Takashi Matsuishi was cautious in using the standardized efforts because it will causes the FMP to become more complicated, as FMP involves multi-gears, however he will look further regarding this matter. Dr. Kenji Taki suggested special consideration on species with lower intrinsic rate (r) species (e.g. *Thunnus tonggol*) and Prof. Dr. Takashi Matsuishi agreed to use multispecies management with special care for the status of tuna-like and shark species with lower intrinsic rate (r) from his simulations. MFRDMD agreed on the need to consider the suggestion for more examinations before develop management plans in the regions. Mr. Ronnie Romero also added the Ecosystem Approach Fisheries Management (EAFM) can also be considered by including the human components, ecological and good governance in developing FMP. All meeting members agreed that developing a FMP is not an easy step and will take some time before it is stabilized, nevertheless MFRDMD will get fully support from all Member Countries on this matter.

WAY FORWARD

25. Deputy Chief of MFRDMD, Dr. Kenji Taki presented the summary of the meeting and the way forward or actions need to be taken for this project, as appears in [Annex 23](#). In addition, Dr. Worawit Wanchana mentioned the need of the otolith/age determination study for as it is beneficial to many people and will attracts innumerable personnel to conduct the study Therefore, he suggested to include this study in the next project (JTF

VII) project. MFRDMD responded that some of their officials will attend a course arranged by national university for learning capacity on this matter. The meeting also discussed the consideration for other minor operating gears if needed, depending on the percentage of catch. Lastly, Dr. Kenji Taki suggested to include the trawl catch in the future project, subjects to the budget availability.

26. A few points had been highlighted in general discussion for management strategies such as:

- i) Deputy Chief of MFRDMD questioned which type of production model needs to be used for the regional analysis. As response, Prof. Dr. Takashi Matsuishi stated that Schaefer Model will be preferred because sometimes Fox Model produces exceeded value or too optimistic for fmsy.
- ii) Members of the meeting have been reminded again on the importance of standardized method development for analyzing their own data management before FMP to be developed.

CLOSING SESSION

27. Closing remark was delivered by Deputy Chief of SEAFDEC/MFRDMD. He conveyed his thanks to all the participants, resource persons and secretariat of the meeting for their hard works and contributions to the workshop, which were very much helpful for upgrading the purse seine fisheries management in the SEA region. His closing remarks appear as Annex 24.



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

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LIST OF PARTICIPANTS

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**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

WELCOME REMARKS

by

Dr. Kenji Taki

Deputy Chief of SEAFDEC/MFRDMD

WELCOME REMARKS

Dr. Kenji Taki

Deputy Chief of SEAFDEC/MFRDMD

**The 4th Core Expert Meeting on “Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region”
(18 – 19 September 2018, Melia Hotel, Kuala Lumpur, Malaysia)**

Chief of SEAFDEC/MFRDMD *Mr. Raja Bidin Raja Hassan*, Our resource person, Dr. Matsuishi from Hokkaido-University, Mr. Abu Talib Ahmad, Former Senior Director of Malaysia Fisheries Research Institute, Department of Fisheries Malaysia. Distinguished experts from participating ASEAN MCs, Project Leader *Mr. Mohammad Faisal* and my colleagues from SEAFDEC/SEC, TD, and MFRDMD, ladies and gentlemen, very good morning.

In opening the Core Expert Meeting on Comparative Studies for Purse Seine Fisheries in the Southeast Asian Region, I would like to express my sincere appreciation to all of you for your participation in this meeting. Welcome to Kuala Lumpur, Malaysia.

As you have been well aware of, management of purse seine fishery is one of the biggest issues among the fisheries in ASEAN region. Management plans for the fisheries are indispensable for sustainable use of these resources. For this purpose, SEAFDEC/MFRDMD has started collecting relevant information under the project entitled “Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region” since 2013. The project activities involve compilation of annual and monthly CPUE, comparison of TAC system in the world, genetic studies of commercially important fishes, and construction of management strategies for the sustainable fisheries. And the purpose of the 4th CEM is;

- to share the latest information about landings and CPUEs of purse seine fisheries in the region,
- to provide explanation for any misleading data/information from all AMSs,
- to share latest output based on the regional synthesis of purse seine fisheries,
- to discuss the most appropriate management measure for purse seine fisheries in the region, and
- to understand the population structure for *Amblygaster sirm.*

The precious presentations on the survey results, stock assessment and management strategies for sustainable use of the resources will be provided by the two resource persons during this meeting. MFRDMD will provide their first attempts of calculations of TAC using ABC Rule 2-2 and preliminary analysis using production model using the relevant data kindly provided by AMS participants. Through these discussions, we are expecting to deepen our knowledge for Purse Seine management system which is more applicable in the ASEAN region.

Although it is only 2 days meeting, I wish you all enjoy staying in the center of Kuala Lumpur. Thank you very much again and wish we have active discussion.



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

OPENING ADDRESS

by

Mr. Raja Bidin Raja Hassan

Chief of SEAFDEC/MFRDMD

OPENING ADDRESS

Mr. Raja Bidin Raja Hassan
Chief of SEAFDEC/MFRDMD

**The 4th Core Expert Meeting on “Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region”
(18 – 19 September 2018, Melia Hotel, Kuala Lumpur, Malaysia)**

Thank you our MC, Mr Firdaus. Assalamualaikum w.r.a and very good morning. Dr Taki, Deputy Chief of SEAFDEC/MFRDMD, our Resource Person, Professor Dr Matsuishi, Dr Worawit, Policy and Program Coordinator, SEAFDEC Bangkok. Distinguish delegates from SEAFDEC Member Countries, Project Coordinator, Mr Mohamad Faisal Md Saleh, SEAFDEC Senior officers, Ladies and gentlemen.

Welcome to Kuala Lumpur, the heart and beautiful city of Malaysia. On behalf of the organizing committee, I would like to extend our warm welcome to everyone (our old and new friends) to our “4th Core Expert Meeting on Comparative Studies for Purse Seine Fishery in the Southeast Asian region” starting from today and will be end on Wednesday 19 September 2018. Last year we also met in Kuala Lumpur, at Furama Hotel, which is walking distant from this Hotel.

Capture fisheries play an important role for protein supply to our nation and region. Demand for fishery products has increased tremendously due to increase in population size especially in Asia, like China and Southeast Asian countries like Indonesia and Malaysia. We realize that the total demand cannot be so dependent on capture fisheries but need to top-up by aquaculture sector.

Nowadays, capture fisheries are facing so many issues, not only due to overexploitation, but also management of the fisheries. Our two days meeting, starting from today will only focus on management of purse seine fishery which targeted for small pelagic fishes which migratory in nature and shared among neighbouring countries in this region.

Due to these characteristics, pelagic resources need to be regionally managed in order to sustain their exploitation as well as their resources for future generation. This is the mandate that we need to carry, as we meet here to discuss detail on possible measures and options that might possible and practical for our region. Taking into account different level of socio economy, complexity of the fisheries and resources.

During this 2-day meeting, we are going to share the latest information about Purse Seine fisheries that would be presented by each participating member countries and existing management of purse seine fishery. In addition, some new concept or model may also address by our resource person/experts from Japan and Malaysia. It is important to examine the fishing capacity for Purse Seine and some management measures to address the common issues faced in this region. We are very lucky, that our resource person from Japan, Professor

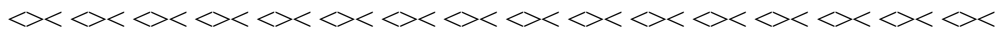
Dr Matsuishi is available and ready to share with us, his vast experience in management of purse seine fisheries.

In addition, we are going to compile the latest information submitted by each participating member country and looking forward for regional synthesis that would include in the terminal report supposed to be circulated in 2019 to all member countries. SEAFDEC as a technical body will work together with ASEAN to find a good solution for management of Purse Seine Fisheries including proposal to introduce input or output control in future.

On behalf of the organizing committee, I would like to extend our gratitude and appreciation to all of you, who are able to attend our workshop and share experience and knowledge about the current purse seine fisheries status. I am also would like to thank our meeting secretariat for their hard working to ensure our meeting run smoothly.

I am also hope everybody will take this opportunity to discuss freely with our expert and gain benefit as much as possible for better management of our fisheries. Lastly, I hope you have an enjoyable stay in Kuala Lumpur and fruitful deliberation during the meeting.

In the name of Allah, the most Great and Merciful, I'm now declaring our meeting officially open. Thank you.





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

MEETING AGENDA

by

Dr. Kenji Taki

Deputy Chief of SEAFDEC/MFRDMD

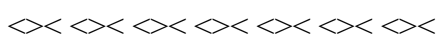
**THE 3rd CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
12-14 September 2017**

PROVISIONAL AGENDA and TIME TABLE Day 1: 18 September 2018 (Tuesday)	
0830 – 0900	Registration
Agenda 1: Opening of the Meeting	
0900 – 0910	Welcome Remarks by Deputy Chief of SEAFDEC/MFRDMD
0910 – 0920	Opening Address by Chief of SEAFDEC/MFRDMD
Agenda 2: Adoption of Agenda and Overview of the Program Activity <i>Chairperson: Chief of SEAFDEC/MFRDMD</i>	
0920 – 0930	Adoption of the Agenda and Arrangement of the Meeting by Deputy Chief
0930 – 1000	Project Overview by Project Coordinator
1000 - 1030	Group Photo and Refreshment
Agenda 3: Country Report Presentations <i>Chairperson: Deputy Chief of SEAFDEC/MFRDMD</i> *updated and additional information	
1030 - 1050	Brunei Darussalam
1050 – 1110	Cambodia
1110 – 1130	Malaysia – East Coast
1130 – 1150	Malaysia – West Coast
1150 – 1210	Malaysia – Sarawak
1210 - 1400	Lunch Break
1400 – 1420	Malaysia – Sabah
1420 – 1440	Myanmar
1440 - 1500	The Philippines
1500 - 1520	Thailand
1520 - 1550	Refreshment
1550 -1610	Viet Nam
1610 - 1640	General discussion of pelagic fisheries based on country presentations

1945	Welcoming Dinner at Melia Kuala Lumpur
Day 2 : 19 September 2018 (Wednesday)	
Agenda 4: Management Measures for Purse Seine Fisheries <i>Chairperson : Chief of SEAFDEC/MFRDMD</i>	
0900 – 0930	Finding on Genetic Population Structure of <i>Amblygaster sirm</i> in Southeast Asian Genetic Study – Ms Wahidah Mohd Arshaad
0930 - 1000	Rapid Assessment – Risk & Fisheries: Towards Development of Fisheries Management Plan – Mr. Abu Talib Ahmad
1000 - 1030	Outputs based on Regional Synthesis by Project Coordinator
1030 - 1100	Tea Break
1100 - 1130	Results of Land-based Survey by Hokkaido University – Dr. Matsuishi
1130 – 1200	Latest Topic of Stock Assessment – Dr. Matsuishi
1200 - 1230	General Discussion on Data Analysis
1230 – 1400	Lunch Break
1400 - 1430	Fisheries Management Plan for Purse Seine Fisheries by Chief
1430 - 1500	Possible Management Measures for Purse Seine Fishery by Resource Person – Dr. Matsuishi
1500 – 1600	General discussion on Management Measures
1600 - 1630	Refreshment
Agenda 5: Way Forward and Closing of the Meeting <i>Chairperson : Chief of SEAFDEC/MFRDMD</i>	
1630-1730	Way Forward and Closing Remarks by Deputy Chief of SEAFDEC/MFRDMD





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Project Overview

Overview and Progress of Project

by

Mr. Mohammad Faisal Md. Saleh

**Project Coordinator
SEAFDEC/MFRDMD**



Overview of Project

Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region

(Japanese Trust Fund VI Program: 2013-2019)

By: SEAFDEC/MFRDMD

19 September 2018

Background

- ❖ Small pelagic fishes such as Indian mackerels, scads and sardinellas are very important in the Southeast Asian region, not only for food resources, but also for employment and livelihood of fishers.
- ❖ Purse seine is one of the major fishing gears to catch those small pelagic fishes.
- ❖ Although formulation of a management plan is required for sustainable use of these resources, management of PS fisheries is still neglected because information of stocks is lacking.
- ❖ Therefore, we need to develop the best way to assess the size and state of the stocks for accurate TAC allocation and to find the most applicable management system for the PS fisheries in the region.
- ❖ Also, effective management of shared stocks requires management measures to be taken for the whole coverage area that is beyond national waters.

Mission

- The project involves compilation and comparison of annual and/or monthly CPUE to examine the trend of resource level for the last three decades in the region.
- MFRDMD will compare purse seine fisheries management systems including TAC systems and other management measures in the world and conduct the genetic study of a commercially important pelagic species.
- At the end of the project, MFRDMD will review available information including stock levels, and MFRDMD and member countries will examine applicable management strategies for sustainable purse seine fisheries in the Southeast Asian region

Objective (1)

1. To compile and compare annual and/or monthly catch per unit effort (CPUE) data for the last three decades in SEA region.
 - Activity 1: Comparative Studies for CPUE and TAC
 - Act 1.1 Case studies for CPUE in the Southeast Asian region
2. To assess unit of effort and to examine other indicators for stock assessment.
 - Act 1.2 Suitable CPUE and other indicators for resource levels in MCs
3. To compare existing management systems/measures of PS fishery which is applicable for management of PS fishery in the region
 - Act 1.3 Comparison of TAC systems in the world (including other management measures)

Objective (2)

4. To compare genetic structures of commercially important small pelagic species in the region.
 - Activity 2. Genetic Data Collection and Analysis
 - Act 2.1 Equipment preparation for genetic study
 - Act 2.2 Sample collection
 - Act 2.3 Genetic study
 - Act 2.4 Data compilation and analysis
5. To propose management strategies for sustainable PS fisheries
 - Activity 3. Meetings for Effective Program Implementation
 - Act 3.1 Core Expert Meeting/Workshop
 - Activity 4. Recommendation for PS Fisheries Management in the SE Asian region
 - Act 4.1 Recommendation for fisheries Management
 - Act 4.2 Preparation and publishing of terminal report

Expected Final Goals of the Project

1. To contribute for the formulation of management strategies for small pelagic fish fisheries in the region;
2. To provide monitoring tools for pelagic fishery resources in the region.

Achievements of implementation

Activity 1: Comparative Studies for CPUE and TAC

MFRDMD continuously collected updated information on PS fisheries from MCs as well as examined the data for regional synthesis of purse seine fisheries in the region to suggest possible suitable stock indicator and management systems in the MCs.

MFRDMD had conducted the Internal Workshop at UiTM Hotel, Dungun, Terengganu (12-14 February 2018) to discuss the catch and effort data by using other method/model than Allowable Biological Control (ABC) method (Rule 2-1 and Rule 2-2).

- In this workshop, The Surplus Production Model was introduced and explained by local Resource Person.
- Use Catch per Trip as CPUE Index because of the consistencies of yearly trend and data availability compared to other CPUE index.
- Subsequently, output generated during this workshop became main precursor in the regional analysis for this project.

Achievements of implementation

Activity 1: Comparative Studies for CPUE and TAC

Hokkaido University, Japan in collaboration with MFRDMD has conducted a series of preliminary surveys in 2017 and 2018 on species composition of purse seine fisheries in 5 major landing centers along the East Coast of Peninsular Malaysia.

- 1st survey: 13rd – 23rd August 2017
- 2nd survey: 1st – 10th July 2018
- 3rd survey: 24th September – 3rd October 2018

Achievements of implementation

Activity 2. Genetic Data Collection and Analysis

Genetic samples from spotted sardinella (*Amblygaster sirm*) collected by participating member countries were analyzed and the preliminary result based on eight sampling locations (namely *Muara, Brunei DS; Kuantan, Kuching and Kudat, Malaysia; Palawan and Bataan, Philippines as well as Songkla and Ranong, Thailand*). The result was presented during the **3rd CEM in September 2017**.

- MFRDMD visited RIMF, Indonesia on 17th January 2017 to discuss on Indonesian specimen collection and laboratory analysis due to restriction on exporting specimens to MFRDMD.
- The preliminary result of genetic analysis for *Amblygaster sirm* suggested the homogenous structure within South China Sea but separated stocks between South China Sea and Andaman Sea.



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Achievements of implementation

Activity 2. Genetic Data Collection and Analysis

An extra number of samples were collected from Ranong (Thailand) with the collaboration with Kasertsart University in **June 2018**. This is to confirm the finding from previous analysis of the genetic structure of spotted sardinella between South China Sea and Andaman Sea. Besides, an extra DNA marker (COI marker) was also selected to support the current result.

MFRDMD has convened an internal genetic workshop at Langkawi, Malaysia (6-9 August 2018) which revealed current findings of genetic analysis.

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Achievements of implementation

Activity 3. Meetings for Effective Program Implementation

MFRDMD consulted with an expertise from Japan (Dr. Matsuishi)

- Study on "Sustainable Fishery Management - latest movement in Japan" (08 March 2015, MFRDMD)
- Discussion on "Total Allowable Effort (TAE) System and Possibility for its Application to the Management of Purse Seine Fishery in the ASEAN region" (19 Nov 2015, MFRDMD)
- Discussion on "Total Allowable Effort (TAE) system and Possibility for its Application to the Management of PS Fishery in the ASEAN region" (18 Nov 2016, Hokkaido University)

MFRDMD conducted internal workshop in Tok Bali, Malaysia to discuss regional synthesis of PS fisheries information (6-7 January 2016).

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Achievements of implementation

Activity 3. Meetings for Effective Program Implementation

MFRDMD has convened a **regional workshop** on Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region at Kuala Lumpur, Malaysia (7-8 March 2017)

- During this workshop, the resource person (Dr. Matsuishi) introduced new options for PS fisheries management in the SEA region namely the **ABC and ABE** strategies. These strategies are more suitable for multispecies situation.
- Feedback control (**Rule 2-1 and Rule 2-2**) are being considered as the most applicable and appropriate for purse seine.



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Achievements of implementation

Activity 3. Meetings for Effective Program Implementation

"The Third CEM on Comparative Studies for Management of PS Fisheries in SEA Region" was held on 12-14 September 2017 in Kuala Lumpur, Malaysia.

- The meeting shared the latest information about landings and CPUEs of PS fisheries in the region, TAC management for multi-species as well as experience learned from the implementation of TAC in Thailand and TRP in the Philippines.
- The meeting also highlighted about the separated management unit of *Amblygaster sirm* in the SEA region and introduced the concept of Fisheries Management Plan (FMP).



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Compilation of Current PS Management

Information of Fisheries, Biology Fishing Effort, and Management in AMSS are compiled both in the AS and SCS.

- List of complete publication:
 1. "Current Status of Purse Seine Fisheries in the Southeast Asian Region" was published in 2015.
 2. Current status of Pelagic Fisheries in the Southeast Asian Region (Fish for The People, 2015).
 3. Meeting report for "Core Expert Meeting on Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region. (2nd CEM, 2016).
 4. Managing Purse Seine Fisheries in the Southeast Asian Region: a joint effort among ASEAN Member States (Fish for the People, 2018)
 5. Meeting report for "The 3rd Core Expert Meeting on Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region. (3rd CEM, 2017).



Proposed activities for 2019

Act. 4: Sub-activity 4.1: Recommendation for fisheries Management

- MFRDMD will continue synthesizing regional information of purse seine fisheries based on the updating data given by MCs after the 4th CEM.
- Study visit at Hokkaido University in collaboration under "Survey of species composition at major landing ports in East Coast of Peninsular Malaysia".
- Internal meeting/workshop on analyzing and synthesizing regional data.

Act. 4: Sub-activity 4.1: Preparation and publishing of terminal report

- Data of catch and effort of regional purse seine fisheries and stock structures of shared small pelagic fish will be analyzed and synthesized. The findings will be published in the terminal report.
- Mini workshop on preparing final report.

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Schedule of Proposed Activity for the year 2019

Proposed Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Activity 4												
Sub-activity 4.1: Recommendation for fisheries Management	X	X	X	X	X	X	X	X	X	X	X	X
Sub-activity 4.2: Preparation and publishing of terminal report	X	X	X	X	X	X	X					

Major impacts or issues

- ❖ For regional synthesis of purse seine fisheries information, Member Countries are requested to submit the updated data within the **agreed time frame**. Aside from that, full regional analysis was also **impacted by data reliability and validity**.
- ❖ For **genetic study** of *Amblygaster sirm*, **samples from Myanmar** is very important to get a better picture of population structure of spotted sardinella around Andaman Sea.

*Terima kasih
Thank you very
much*





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Country Presentation
BRUNEI

**The 4th Expert Meeting on the Comparative Studies for Purse Seine Fisheries in the
Southeast Asian Region**

by

**Mr. Sheikh Al-Idrus Sheikh Nikman^a
Mr. Marzini Haji Zulkipli^b**

^aFisheries Officer

^bAssistant Fisheries Officer

Department of Fisheries, Brunei



BRUNEI DARUSSALAM

THE 4TH EXPERT MEETING ON THE COMPARATIVE STUDIES FOR PURSE SEINE FISHERIES IN THE SOUTHEAST ASIAN REGION

18 September 2018

Presented by :
Hj Sheikh Al Idrus bin Hj Sheikh Nikman
Marzini Haji Zulkifli

Introduction

- Fisheries contribute to economic sector in Brunei Darussalam, contributing 0.3% to national GDP in 2010. The main source of income for Brunei is (offshore) oil and gas, upon which the country has been reliant since the late 1920s, and which accounts for over 90% of export. While marginal in terms of national income, Brunei's marine fisheries play an important role in obtaining seafood, which the population annually consumes up to 47kg per person, although about the half is currently imported from neighboring countries.

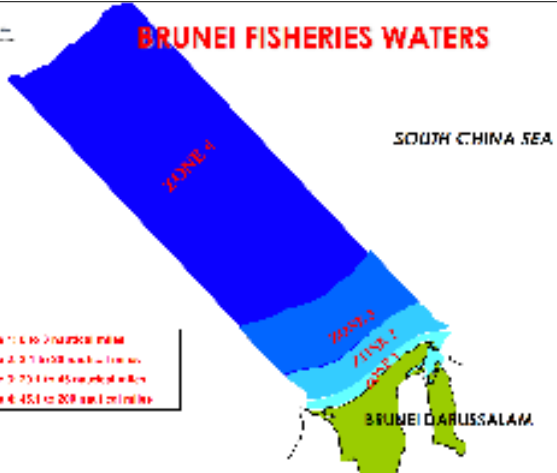
Fisheries management

- Brunei's fisheries fall under the authority of the Department of Fisheries, Ministry of Primary Resources and Tourism, which is responsible for overseeing all aspects of management, including fisheries research, enforcement, marketing, conservation and development.
- Overall, the government's objective for fisheries development is to improve food security, national self-sufficiency, and socio-economic status of fisheries sector workers.

Fisheries management

- A key fisheries management initiative in the use of fishing zones to ensure sustainable exploitation of marine resources and to minimise conflict between small-and large-scale fishers.
- The fishing grounds were split into 4 zone defined by distance from the coast, with regulation defining the type of gear, fishing method, and vessel type that are permissible in each zone.
- Fishing effort in the industrial sector is controlled by limiting the number of licenses that are issued to trawl, purse seine and long line fishing vessels, and catches are monitored through monthly catch logbooks that industrial fishing vessels are required to complete.

BRUNEI FISHERIES WATERS



SOUTH CHINA SEA

BRUNEI DARUSSALAM

Various types of vessels operated in Brunei Darussalam

Type	Zone	Total
Trawl	2	13
Trawl	3	5
Purse seine	2	3
Purse seine	3	2
Purse Seine	4	2
Longline / traps	2	4



Catch and effort statistic (purse seine)

Year	no of vessels	trips	days	hauls	hours	total catch/landings (t)	CPUE (vessel)	CPUE (trip)	CPUE (kg/day/boat)
1993	5	794	794	1,438	6,628	385	77.65	0.49	97.03
1994	2	319	319	618	2,472	56	27.93	0.18	87.56
1995	1	252	252	240	720	115	114.69	0.46	455.12
1996	1	124	124	212	636	74	73.99	0.60	596.70
1997	0	0	0	0	0	0	0.00	0.00	0.00
1998	0	0	0	0	0	0	0.00	0.00	0.00
1999	0	0	0	0	0	0	0.00	0.00	0.00
2000	0	0	0	0	0	0	0.00	0.00	0.00
2001	2	169	169	338	845	124	62.12	0.74	367.59
2002	6	578	578	1,156	2,890	311	51.80	0.54	89.63
2003	6	857	857	1,714	4,285	326	54.34	0.38	63.41
2004	7	862	862	1,724	4,310	511	73.84	0.59	84.74
2005	8	1,071	1,071	2,142	5,355	1,186	148.19	1.11	138.36
2006	9	980	980	1,960	4,900	1,069	118.80	1.09	121.23
2007	9	964	964	1,928	4,820	1,113	123.62	1.15	128.24
2008	9	1,035	1,035	2,070	5,175	901	100.10	0.87	96.71
2009	10	1,048	1,048	2,096	5,240	985	89.48	0.85	85.39
2010	8	1,009	1,009	2,018	5,045	908	113.52	0.90	112.51
2011	13	1,263	1,263	2,526	6,315	986	75.83	0.78	60.04
2012	12	1,507	1,507	3,014	7,535	1,095	91.25	0.73	60.55
2013	14	1,134	1,134	2,268	5,670	1,049	74.92	0.92	66.07
2014	13	1,199	1,199	2,398	5,995	1,032	79.36	0.86	66.19
2015	9	758	758	1,516	3,790	949	105.49	1.25	139.17
2016	9	807	807	1,614	4,035	843	93.67	1.04	116.07
2017	8	579	579	1,159	2,896	1,175	146.86	2.03	187.56
Total	161	17,309	17,513	34,149	91,557	15,102	1,896.08	17.55	3,219.88

Major composition of industrial purse seine catches (% of total catch) in Brunei Darussalam

	1985 ¹	2003 ²	2004 ²	2005 ²
<i>Carangidae</i>	7	-	-	-
<i>Loligo</i> spp	-	5	-	-
<i>Megalapis cordyla</i>	2	8	1	-
<i>Rastrelliger kanagurta</i>	9	18	7	11
Sardines	1	12	16	58
<i>Sciaena</i> spp	-	-	5	-
<i>Scomberomorus commerson</i>	-	4	1	-
Small carangids	65	31	10	11
<i>Sphyræna</i> spp	2	-	-	-
Tunas	-	8	58	9

¹ Derived from Silvestre et al. (1992)
² Derived from National Country Report for Brunei Darussalam, Department of Fisheries Brunei Darussalam.

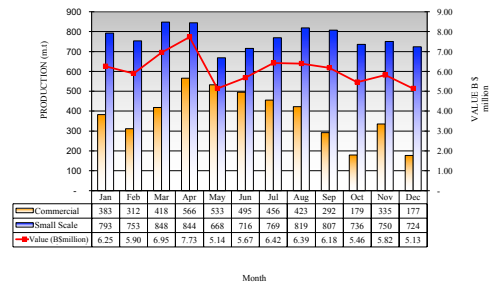
Status production of marine capture fisheries

- The total production of Brunei Darussalam from marine capture fisheries had decreased from 14,966 MT in 2016 to 13,796 MT in 2017 using small-scale and commercial fishing vessels, with the number of vessels decreasing from 28 to 26 respectively. However, the main contributor of about 66% to the country's total marine capture fisheries production is the small-scale fisheries.
- Small-scale fishers have and continue to play an important role in supporting Brunei's local economies and national food security, but the incompleteness of basic fisheries statistics pertaining to this sector may hinder future sustainable management.

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18 September 2018

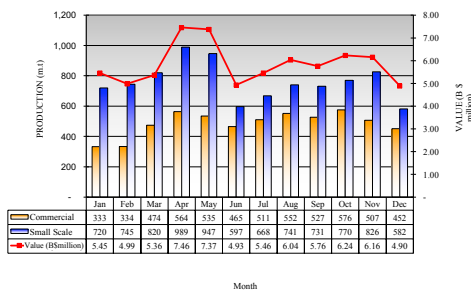
TOTAL MARINE CAPTURE FISHERIES PRODUCTION (m.t) AND VALUE (B\$million) 2017



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18 September 2018

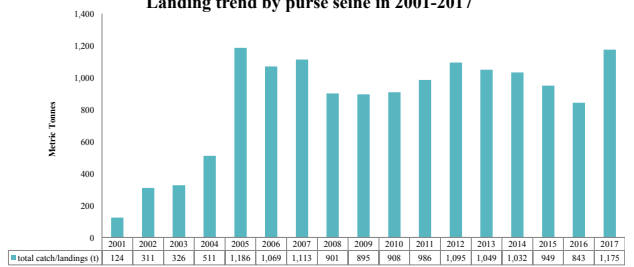
TOTAL MARINE CAPTURE FISHERIES PRODUCTION (m.t) AND VALUE (B\$million) 2016



11

18 September 2018

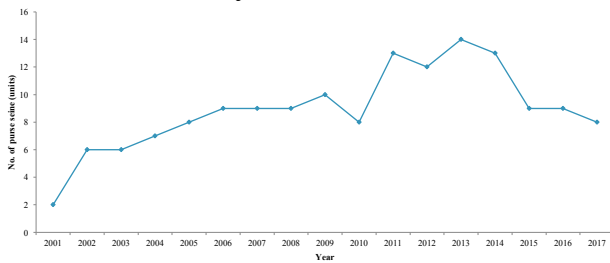
Landing trend by purse seine in 2001-2017



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18 September 2018

Trend of Number of purse seine vessel in Brunei Darussalam



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18 September 2018

THANK YOU
FOR YOUR ATTENTION



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

***Country Presentation*
CAMBODIA**

Purse Seine Fishery in Cambodia

by

**Dr. Chea Tharith^a
Mr. Chhuon Kimchhea^b**

^a **Deputy Director of Marine Fisheries Research and Development Institute
(MaFReDI)**

^b **Deputy Director of Department of Fisheries Affairs
Fisheries Administration, Cambodia**

PURSE SEINE FISHERY IN CAMBODIA

The 4th Core Expert Meeting on Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region

SEAFDEC / MFRDMD

Kuala Lumpur, Malaysia, 18-19 September 2018

Prepared by

CHEA Tharith Marine Fisheries Research and Development Institute

Fisheries Administration (Cambodia)

Marine Waters in Cambodia

Coastline of the country is 435 Km:

- ☐ Koh Kong - 237 km
- ☐ Preah Sihanouk- 175.81 km
- ☐ Kampot- 67 km
- ☐ Kep- 26.50 km



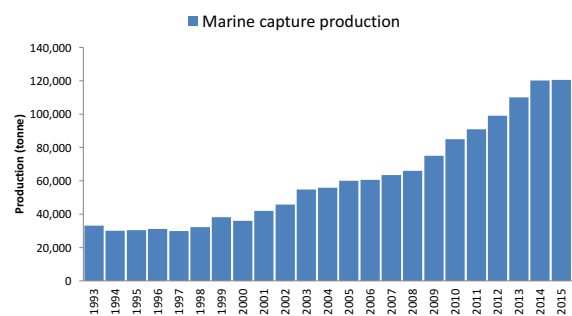
Kingdom of Cambodia:

- ❖ Exclusive Economic Zone (EEZ) area is extended from the shoreline to 200 nautical miles, which covers 55,600 km²

Fishing vessel in Cambodia

Year	2010	2011	2012	2013	2014	2015
Fishing vessel	7263	8055	7605	7603	7482	7686
Fishing gear license	147	155	146	121	115	141
Trawl license	89	82	66	41	48	57

Marine capture production



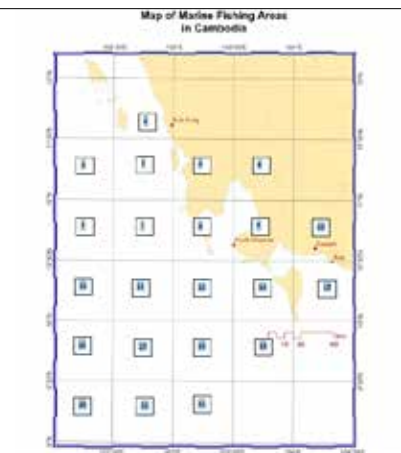
❖ Anchovy purse seine:

- The net is 350-400 m long and 20 m deep.
- Mesh sizes is 3 cm.
- The length of boat ranged within 11-26.70 m with engines of 85- 373 hp
- Electronic equipment used including: radar, GPS, fish finders, echo sounder, scanning sonar.



Fishing ground for anchovy purse seine

- Anchovy purse seine operated from September to April annually
- Fishing ground for anchovy purse seine: 7, 11, 12, 17 and 18.
- Fishing operation: 2-3 trips per month.
- Production: about 5-6 tonnes /boat/ trip
- Species composition: 90% of the catch is contributed by anchovy whereas the rest 10% are other species.



Problems and constraints

- Lack of enforcement on fishing vessel management
- Lack of information on anchovy purse seine vessel
- Lack of scientists and managers in the related field
- **Cambodia** are currently progressing the fisheries legislation and drafting the National Plan of Action against IUU fishing (NPOA-IUU) for 2018-2022.
- Amendment of Fisheries Law
- Strengthen sanctions for compliance
- Upgrade Marine Fisheries Policy

Thank you for your kind attention



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

***Country Presentation*
MALAYSIA**

Country Report: Malaysia – East Coast of Peninsular Malaysia

by

Mr. Sallehudin Jamon

**Senior Research Officer
FRI Kg. Aceh, Department of Fisheries, Malaysia**



The Core Expert Meeting on Comparative Studies for Purse Seine Fisheries in the Southeast Asian Region
18-19 September 2018, Kuala Lumpur, Malaysia
Country Report:
Malaysia – East Coast of Peninsular Malaysia



Introduction Malaysia fisheries profile

Marine fishing areas in Malaysia can be divided into several fishing sub-areas:-

- West (Malacca Straits)
- East coast (South China Sea) of Pen Malaysia,
- Sarawak (South China Sea),
- West Sabah (South China Sea)
- East Sabah (Sulu and Celebes Seas.



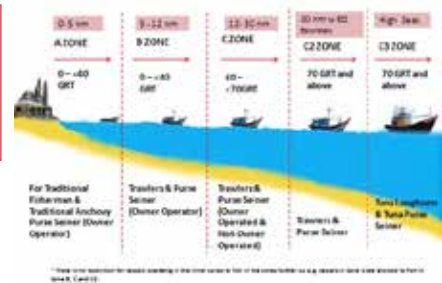
The E & C PM are different. ECPM faces SCS, has a sandy bottom due to the presence of patchy coral reef that occurs along the coast. ECPM subject to severe weather during the north-east monsoon (Nov-Mar), during which no fishing – (except prawn trawling)

Introduction

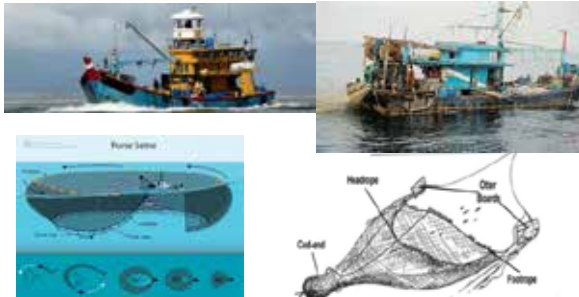
- + The fisheries sector is an important sub-sector in Malaysia and plays a significant role in the national economy.
- + Apart from contributing to the national Gross Domestic Product (GDP), it is also a source of employment, foreign exchange and a source of protein supply for the rural population in the country
- + The marine capture fisheries can be categorized into two main types, namely coastal or inshore fisheries, and offshore fisheries
- + Various types of fishing gear used by the fishermen. -trawl, fish purse seine, driftnet, gill net - and traditional fishing gear, including hook-and-line, bag net, trammel net, lift net and traps. However, the fishing gears that contribute the bulk of the landings are trawls, purse seines, drift nets and gill nets.

Fish Zones

Fishing area of Fish and Anchovy purse seine



Types of Fishing Gear



Purse Seines-(Design and size of fishing gear and fishing vessel)

- + PS Vessel Categorized based on their gross tonnage
- + <10 GRT
- + 10 -24.9 GRT
- + 25 – 39.9 GRT (above 5 nm off shore)
- + 40 – 70 GRT (12 nm off shore) and
- + Above 70 GRT (above 30 nm offshore)



Continue...Purse seine fisheries.....

- + Major fishing gear used to exploit the pelagic fish resources.
- + Two main types –
- + **Fish purse seine**
 - + The fish purse seine, which is used to catch small pelagics
 - + Operated with or without fish aggregating devices (FADs),
 - + The catching efficiency increased by using spotlights and sonar
- + **Anchovy purse-seine**
 - + which is used to catch anchovies in the coastal waters.

Anchovy Purse seine

- + Without spotlights
- + With spotlights



Anchovy Purse seine

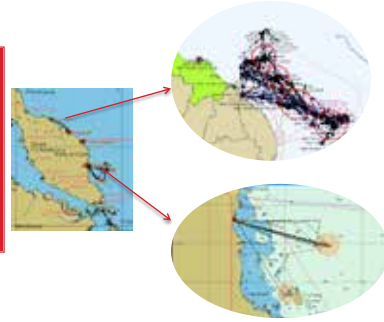
Anchovy PS	Anchovy PS-Light
1. Day operation (0800 – 1700)	1. Night operation (1700 – 0800)
2. Searching school of fish	2. Attract by light
3. Length net -915 m, Width 146 m	3. Length net 73 m, Width -31 - 36 m
4. No of crew 25 persons	4. No of crew 7 – 15 persons



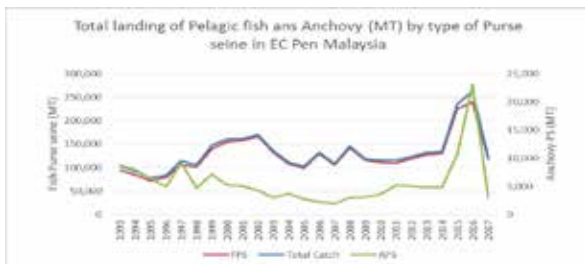
Fishing area

Source:

- Information Collection for Sustainable Pelagic Fisheries in the South China Sea 2006
- Fisheries Resources Survey-Tuna



Landing Trend



Total Landing from 1993 – 2017 by fish and anchovy purse seine in ECPM

Fish Composition(FPS &APS)

Average 2012 - 2016

Small Pelagic Fish 66%

Anchovies 5%

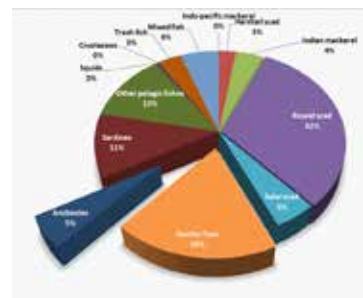
Neritic Tunas 19%

Longtail tuna

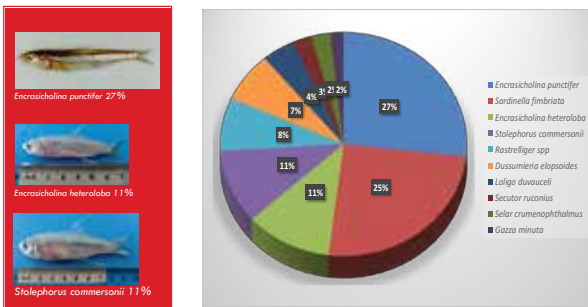
Kawakawa

Frigate tuna

Others 10%



Fish Composition by Anchovy Purse seine



The Length at First Maturity by species

Base on study

Information Collection for Sustainable Pelagic Fisheries in the South China Sea 2006

Species	Total Length at first maturity (mm)	
	F	M
<i>Rastrelliger kanagurta</i>	183 – 184	194 – 233
<i>Decapterus maruadsi</i>	146 – 155	166 – 175
<i>Decapterus macrosoma</i>	154 – 163	156 – 185

Spawning Season

Base on study

Information Collection for Sustainable Pelagic Fisheries in the South China Sea 2006

Species	Spawning Season
<i>Rastrelliger kanagurta</i>	May-Jun & Jul-Sept
<i>Decapterus maruadsi</i>	Mar-May & Jul-Aug
<i>Decapterus macrosoma</i>	Mar-Apr & Jul-Aug

Fishing effort for purse seine fisheries

No of Fish and Anchovy Purse Seine in ECPM, 1986-2017

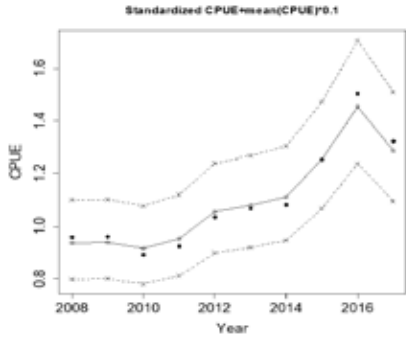
FPS – Decrease since 2008 until present

APS – Decrease since 2013 until present



CPUE (Nominal & Standardized)

Annual standardized CPUE (solid line with 95% Confidential Interval and Nominal CPUE (Black dots)



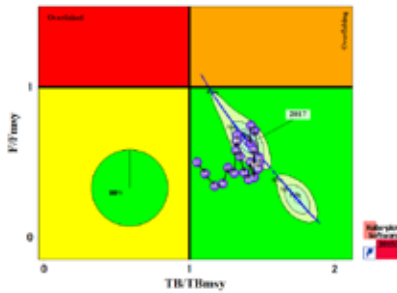
RELATION BETWEEN CATCH VS STANDARDIZED CPUE

Catch (MT) vs STD_CPUE in EC PM



Status of pelagic fish stock

Current status (2017) is in Green zones
 TB/TBmsy = 1.41
 TB 41% higher than MSY
 F/Fmsy = 0.63
 F 37% lower than MSY



Probabilities violating TBmsy and Fmsy in 3 and 10 years

Probabilities(%) violating TBmsy and Fmsy in 3 and 10 years.

Risk levels	Color legend			
	Low risk	Medium low risk	Medium high risk	High risk
Probably	0 - 20%	20 - 50%	50 - 80%	80 - 100%

Current catch level 182,773 t (2015-2017)

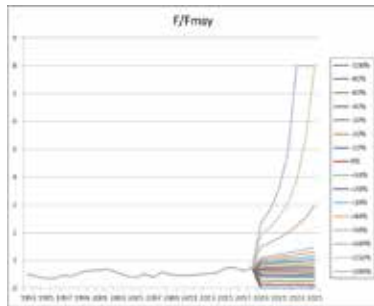
MSY level 183,100 t

10 catch scenarios (tons)	60%	70%	80%	90%	100%	100%	110%	120%	130%	140%
	109,664	127,941	146,218	164,496	183,100	182,773	201,050	219,328	237,605	255,882
TB2020 < TBmsy	0	0	0	0	0	0	0	0	0	1
F2020 > F* MSY	0	0	0	0	0	0	4	11	29	60
TB2027 < TBmsy	0	0	0	2	5	5	9	13	21	38
F2027 > F* MSY	0	0	0	0	5	5	16	54	64	67

(*The current catch levels the average catch in 3 recent years (2015-2017).

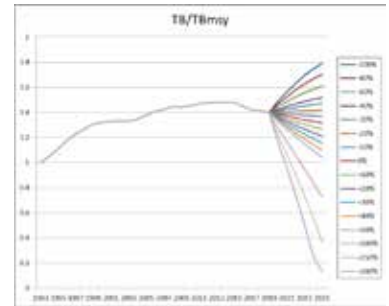
F_Risk

Increased and decreased will affect the status of F/Fmsy



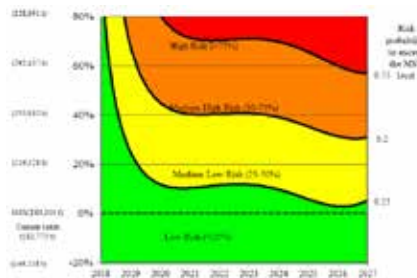
TB_Risk

Increased and decreased will affect the status of TB/TBmsy



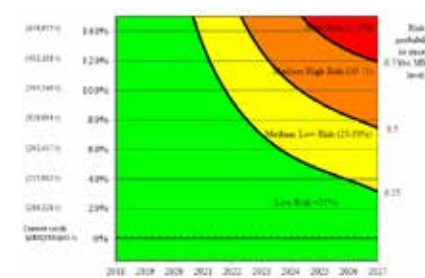
F_Risk

Maintain current catch (2017) for 10 year will give results (Green zone)
 Low Risk (<25%) of Fishing Mortality



TB_Risk

Increased 20% of catch landing form 2017 still give result in green zone in the next 10 years (Low Risk (<25%) in TB



Management measures for purse seine fisheries

- + One of the goals of fisheries management is to achieve sustainable pelagic fisheries
- + The management measures that have been implemented through the legal and institutional framework to control fishing effort include :
 - A. **direct limitation of fishing effort =**
 - + Licenses for Zone A, B and C are no longer issued.
 - + Application for permits for C2 (Deep Sea) zone is no longer issued.
 - + Applications for permits for C3 (International Sea Waters) are still permitted.

Continue- *Management measures.....*

- B. **Controls on size and power of fishing vessels**
Any attempt by fishermen to change the tonnage or engine power of fishing vessels requires permission from the Director-General of Fisheries.
- C. **Registration of fishermen**
This program controls entry of new individuals into the fishing industry. Every fisherman is required to have a fisherman registration card.
- D. **Resettlement of excess fishermen into the other sectors**
Buy back scheme

Continue- *Management measures.....*

- E. **Closed fishing areas**
Identification of nursery areas that should be protected and managed as a nursing area to ensure survival of juveniles of commercially important fish species –
(i.e. Refugia of lobster in east Johor- under studies)
- F. **Management zones**
Marine Park (i.e. Pulau Redang & Pulau Perhentian)
- G. **Rehabilitation of Resources**
Artificial reef: to alleviate the problem of depleting fish resources in the coastal waters
- H. **Monitoring, Control and Surveillance Program for fisheries management**
Vessel Monitoring System (VMS) and Automatic Identification System (AIS)

Thank You
Terima Kasih





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

***Country Presentation*
MALAYSIA**

Country Report for the West Coast of Peninsular Malaysia (WCPM)

by

Mr. Abdul Wahab Abdullah

**Senior Research Officer
FRI Kg. Aceh, Department of Fisheries, Malaysia**



The 4th Core Expert Meeting on Comparative Studies for Purse Seine Fisheries in the Southeast Asian Region

18-19 September 2018, Kuala Lumpur, Malaysia

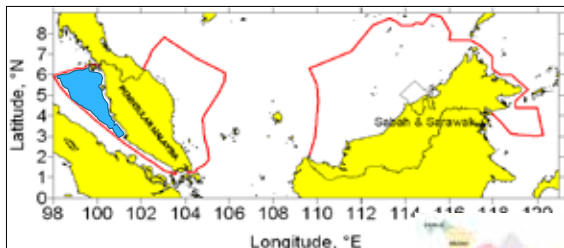
Country Report for The West Coast of Peninsular Malaysia (WCPM)



ABDUL WAHAB ABDULLAH & SALLEHUDIN JAMON
FRI KG ACHEH, DEPARTMENT OF FISHERIES MALAYSIA

INTRODUCTION

Overview of PS fisheries in WCPM



- * The total sea area of WCPM which in The Straits of Malacca is about 30,665km²
- * The PS fishing area for WCPM is limited
- * Involved only 5 states out of 8 - Perlis, Kedah, Pulau Pinang, Perak & Selangor

Overview of PS fisheries in WCPM



- * 2 types of PS – Fish and Anchovy PS
- * Purse seines are the second most efficient fishing gear in contributing to the fish landings after trawlers.
- * 21 % from total landing in WCPM contributed by PS fishery (DOFM statistics, 2016)
- * Majority of FPS uses FADs. Only zone C, C2 and C3 are allowed to use support vessel
- * All APS hunting schools of anchovies during daytime only

PS vessels in WCPM

- * All purse seine vessels are categorized based on their gross tonnage (GRT(Gross Registered Tonnage))
- * For each tonnage, the vessel are allowed to operate within a specified fishing areas such as for the tonnage groups of
 - * Below 39.9 GRT (8 – 15 nm),
 - * 40 – 70 GRT, (15 nm off shore) and
 - * above 70 GRT (above 30 nm off shore).
- * Anchovy PS are allowed to operate within 1-8 nm (Zone A)



PS Fishing gear

- * All PS use surrounding nets with purse line
- * Nylon nets with mesh size between 7.8-100 mm (SEAFDEC, 1989)
- * Support equipment such as radar, GPS, sonar and echosounder and also deck machinery such as power block are mostly used.
- * The use of light raft, fish shelter or “unjam” (FADs) and light boats has increased.
- * Almost all APS has boiling facilities onboard and storage area for boiled anchovies.

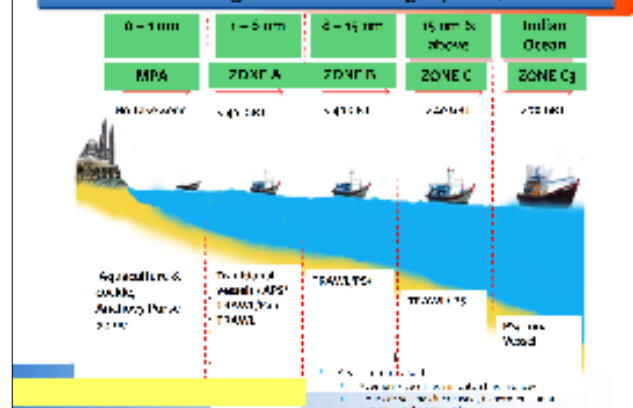


Regulations and licensing

- * Operation zone C and C2 has been combined due to limited area of Straits of Malacca
 - * Compulsory use of AIS equipment for B & C zone vessels* and VMS for C2 vessels
- *Source: DOFM (Pekeliling Bil 11/2014)
- * PS license will be re-new based on yearly performance on these criteria:
 - * Landing of fish \geq 350 MT
 - * MTU equipment activation \geq 80% of sea hours

Source: DOFM (Dasar/Pekeliling/SOP, 29 July 2013)

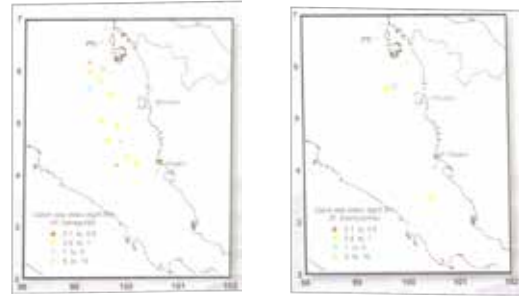
Revised Fishing Zone for WCPM (Perlis, Kedah, P.Pinang, Perak & Selangor) 2014



Main fishing area for FPS



Source: BOBLME-SEAFDEC/MFRDMD (2015)



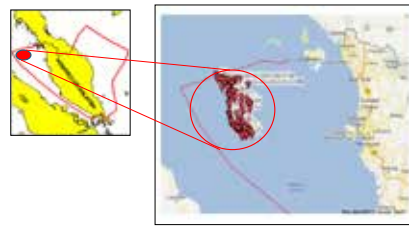
The catch distribution of *Rastrelliger kanagurta* (left) and *Rastrelliger brachysoma* (right) at the WCPM in 2006 (Abu Talib et al. (Eds) 2009)

Main fishing area for APS



Map source: malaysiavisa.org

The common fishing area of PS vessels of >70GRT in WCPM



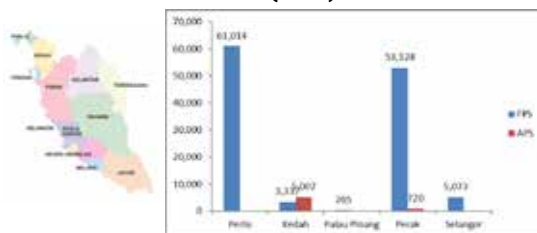
* Most FADs for the PS >70 GRT can be found at this area

FISH AGGREGATING DEVICES (FADs)

- * The FADs normally was set in areas with depths **exceeding 40 meters**. The FADs are made of coconut leaf and anchored by several concrete sacks.
- * Most of the FADs are maintained and some of the owners employed fishermen to look after their FADs to prevent stealing or encroached by other fishermen.
- * Most areas with sufficient depth were located in the **northern most of Malacca Strait**. The larger purse seiners (>70 GRT) can only operate in areas beyond 30 nm from the shore as stated under the Zoning Regulation by the Fisheries Authority.

Trend of landing, number of PS vessels and fishing efforts

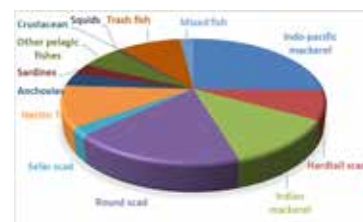
Landing of marine fish by PS types, 2017 (MT)



- * Overall licensed PS vessels in WCPM (2017) 413 units – 343 Fish PS and 70 Anchovy PS
- * Total marine fish landing contributed by PS in WCPM was 128,544 MT (>20% from the overall landings (all gears) in WCPM).

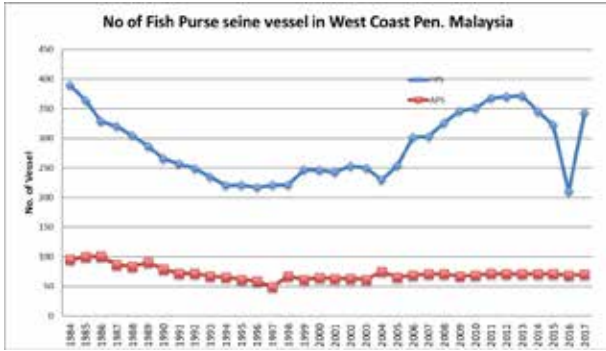
Catch composition of all PS in WCPM

- * The major species were the mackerels, scads, neritic tunas, anchovies and sardines (2008-2016)

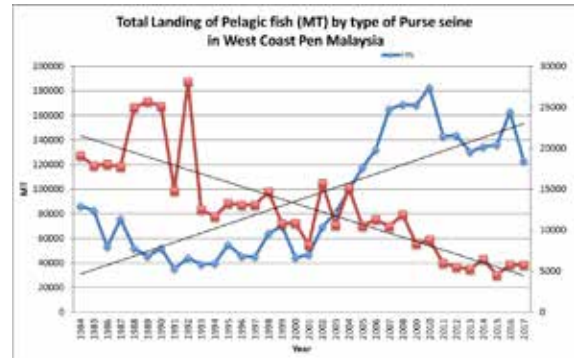


Species catch composition percentage for 9 years (2008-2016)

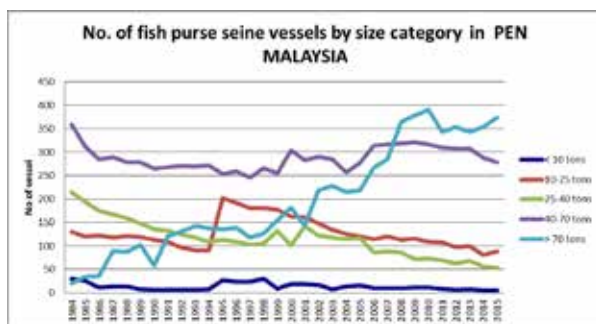
Trends on the number of PS



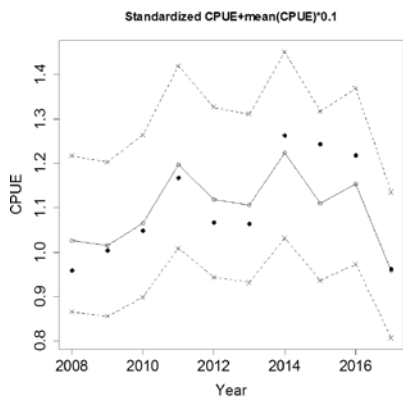
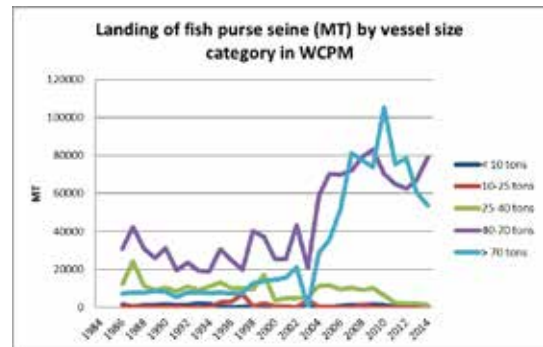
Landing trends of PS



Trends on number of PS vessels by GRT



Nominal catch trend by size category



Status of pelagic fish stock in the WCPM

Comparison of survey results on density of pelagic fish stock at WCPM

Year	Density (MT/km ²)	References
1998	9.6	National fisheries survey report, 2000
2006	7.5	Raja Bidin et al, 2009 in Abu Talib Ahmad et al. (Eds) 2009.
2013	7.45	FRI (2016)

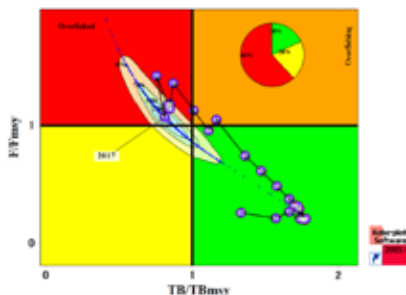
- The latest survey has the density of only 0.67% less than the survey in 2006, but 22.4% less than the 1998 survey.

Pelagic stock assessment surveys in WCPM (using acoustic survey)

Year	MT	
	Biomass	Potential Yield(MSY)
1998	311,000	155,500
2013	235,438	112,684
% reduced	24.3%	27.5%

- The total landing of pelagic fish in WCPM in 2013 was 130,213 MT, which exceed 16% of MSY.
- Steps has been taken to reduce the declining pelagic stocks

KOBE PLOT



Kobe Plot graph showed the current status of pelagic fish in the WCPM is in **OVERFISHED** area (red zone) of the plot. The probability is showed by the pie chart.

Spawning seasons: Indian mackerel *R. kanagurta*

Month	Area	Lm	Reference
Oct and Apr	WCPM	16.7-17.2	Pathansali (1967)
May and Feb	PM	16.6 (SL)	Chee (1977)
Jan to Mar	PM	17.5	FAO (1978)
Sept to Feb	WCPM	22.8-23.8	BOBLME-SEAFDEC/MFRDMD (2015) Malaysia report - unpublished

The occurrence of mature fishes throughout the year indicates that this species maturation is a continuous process

Length of 1st maturity (Lm)

<i>R. kanagurta</i>	Average size of maturity	Reference
Male/Female	20.6 cm	Mansor (1996)
Male/Female	18-19 cm	Abu Talib et al (2009)
Male	22.8-23.2 cm	BOBLME-SEAFDEC/MFRDMD (2015)
Female	23.2-23.8 cm	Malaysia report - unpublished

Closed area in WCPM

- * The existing protected area, under Fisheries Act 1985 are:
- * State of Kedah **Marine Park islands** – Payar Archipelago (**48,058 ha of sea area**), consist of 4 islands; Payar, Kaca, Lembu and Segantang. The islands were gazetted under Marine Parks Malaysia Order 1989
- * **Fisheries Prohibited Area (FPA)** – Tanjung Tuan & Pulau Besar, Melaka. Pulau Besar and Tanjung Tuan Melaka was gazetted as FPA under the Fisheries (Prohibited Areas) Regulation (Amendment) (1988).



Peninsular Malaysia & Payar Archipelago

Issues and challenges

- * The demand to use light as fish aggregating device has increased not only in the PS fishery, even for other type of fishing apparatus.
- * Latest pelagic stock assessment survey (2013) showed the pelagic stocks are depleting and are assumed in the status of over-exploitation. Although some of the pelagic species are highly fecund, the stock may be being overfished and more detailed assessment is needed and should be done on regular basis.
- * Sharing of information in the status of pelagic stocks in Andaman Sea & Straits of Malacca and cooperation between neighbouring countries are pivotal in order to manage properly the stocks.

Thank you



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Country Presentation
MALAYSIA

Country Report on Purse Seine Fisheries in Sarawak

by

Mr. Jamil Musel

**Senior Research Officer
FRI Bintawa, Department of Fisheries, Malaysia**

COUNTRY REPORT ON PURSE SEINE FISHERIES IN SARAWAK

Present By:
Jamil Musel

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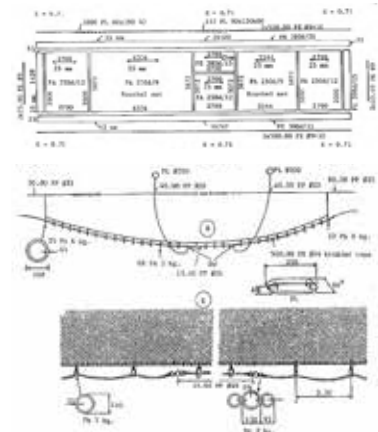
- The demand for fish in Malaysia is on an upward trend, and is expected to increase from 1.3 million metric tonnes in 2010 to 1.9 million metric tonnes in 2020.
- The per capita consumption is predicted to increase from 46 kg to 55 kg over the same period.
- The fishing industry has also contributed close to RM10.22 billion in 2015 and is envisaged to grow annually by 4.9% contributing close to RM 12.96 billion to the Malaysian economy by 2020.
- The industry is an important source of food for the nation, the demand for fish-based protein outstrips the supply generated by the local industry.
- To make up for the shortfall in demand, the country import fish and aquaculture from other countries in the region.

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- Fish purse seine : **Commercial gears** in Sarawak
- **Demersal fish:** Largest part of marine catches
- **Pelagic fish:** Low catch - Low numbers of purse seiners operating in Sarawak (Witter *et al.*, 2015; Gambang *et al.*, 2003)
- **Fishing areas:** Offshore areas and productive fishing grounds (southern bays and in the north)
- **Purse Seine Designed:** Fine mesh & Coarser mesh
Vessel Size: 40 to 70 GRT Gear Size: 240 - 450m
- **Management measures for purse seine fishery:** Licensing and Regulations are provided and managed by the Head of Fisheries, located in Kuala Lumpur

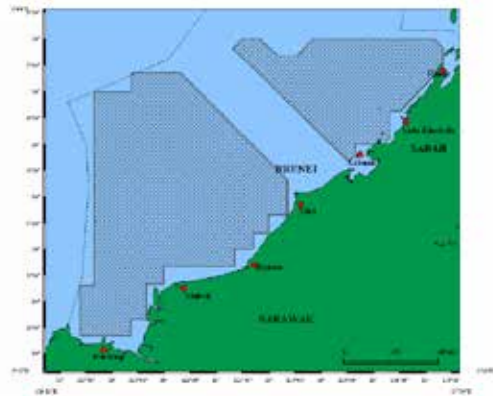
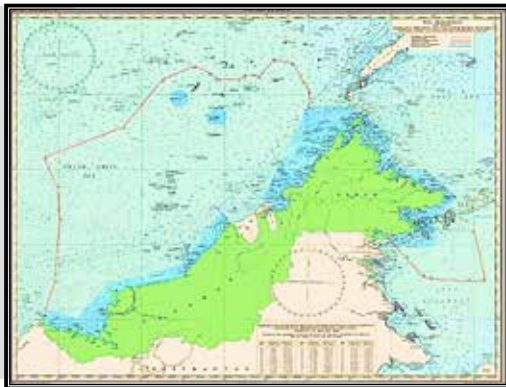
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Fisheries Research Institute Bintulu Kuching Sarawak

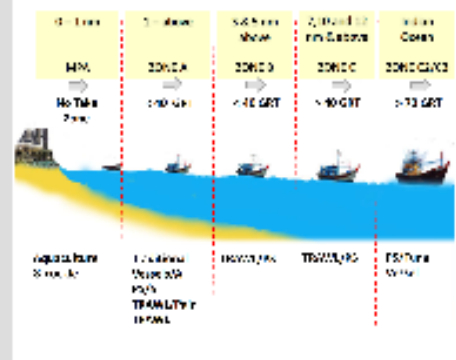
management measures

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- These measures were developed within the framework provided by the fisheries law, The Fisheries Act 1985 (Act 317). Among the main measures are →
- Fishing Zones
- Closed Fishing Area
- Fishing Effort Control
- Fishing Units Control
- Port & At-Sea Control
- Fishermen Registration
- Marine Habitat Conservation
- The Community-based Fisheries Management

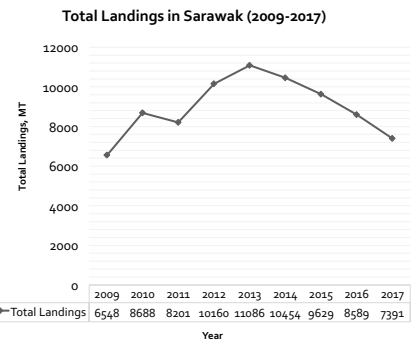
fishing zone

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Landings of Purse Seine Fisheries

Landings

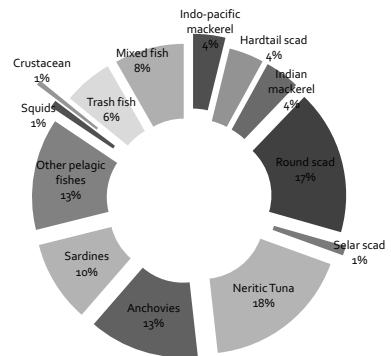


Pelagial Fish



Composition

Catch Composition in Sarawak (2009 - 2017)



Length at 1st maturity

Information

SPECIES	SEX	LENGTH [cm]
<i>Decapterus maruadsi</i>	Male	21.72
	Female	22.67
<i>Decapterus macrosoma</i>	Male	12.81
	Female	19.5
<i>Decapterus russelli</i>	Male	12.98
	Female	11.44
<i>Rastrelliger brachysoma</i>	Male	22.46
	Female	22.46
<i>Rastrelliger kanagurta</i>	Male	21.2
	Female	18.5

*Note: Research by Mr Jamil Musel (2013) & Mr Hadil Rajah (2006)

Spawning season

Information

SPECIES	PERIOD
<i>Decapterus maruadsi</i>	May - June
<i>Decapterus macrosoma</i>	Sep - Oct
<i>Rastrelliger kanagurta</i>	July - Sep

*Note: Year 2003 - 2005

Estimation of growth & mortality

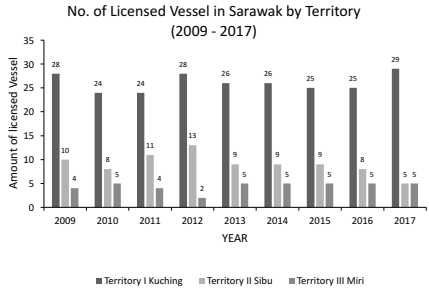
Information

Species	Site	TARGETED SPECIES									
		L _∞	K (yr ⁻¹)	M	F	M/K	Z	φ	E (E/Z)	Rn	
<i>R. kanagurta</i>	2003	272	0.8	0.96	2.57	1.20	3.53	4.772	0.73	0.993	
	2004	272.5	0.94	0.86	16.54	0.91	17.4	4.844	0.73	0.99	
	2005	270.3	0.8	1.06	3.25	1.33	4.31	4.767	0.95	0.993	
<i>R. brachysoma</i>	2003	259	0.9	0.95	3.13	1.06	4.07	4.774	0.77	0.978	
	2004	261	0.7	0.8	6.41	1.14	7.2	4.678	0.89	0.999	
	2005	260	0.9	0.94	4.21	1.04	5.15	4.784	0.82	0.999	
<i>D. maruadsi</i>	2003	257	0.7	0.8	2.72	1.14	3.52	4.665	0.77	0.996	
	2004	258	0.4	0.56	2.7	1.40	3.25	4.425	0.83	0.999	
	2005	254	0.5	0.65	1.46	1.30	2.11	4.509	0.69	0.995	

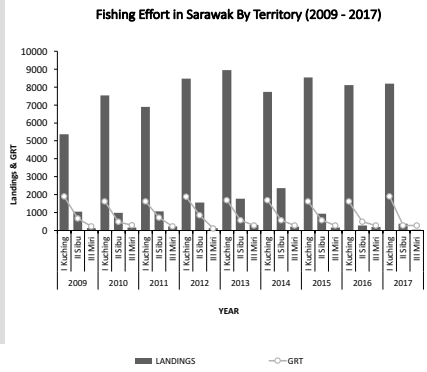
*Note: Year 2003 - 2005

Fishing Effort for Purse Seine Fisheries

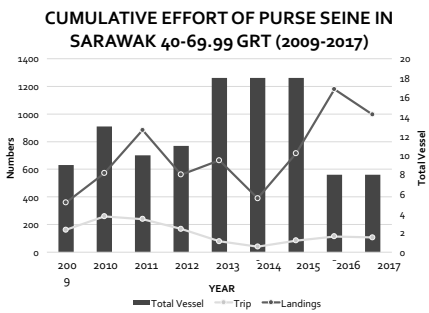
Licenses by Territory



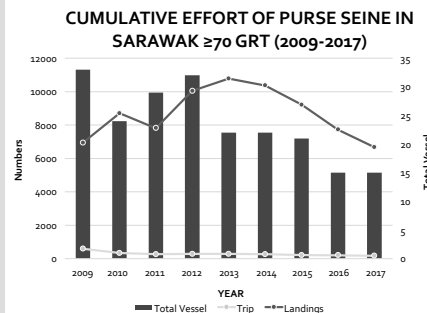
Fishing Effort by Territory



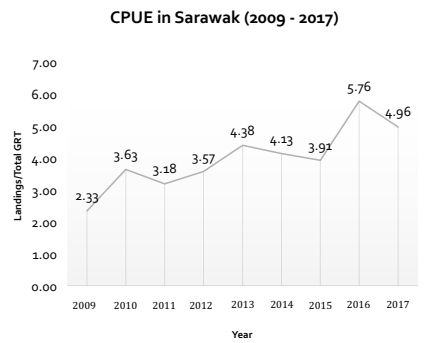
Cumulative Effort (40-69.99 GRT)



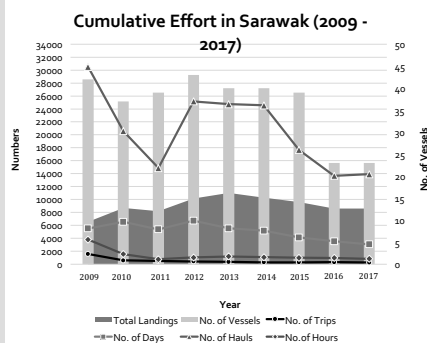
Cumulative Effort (>=70 GRT)



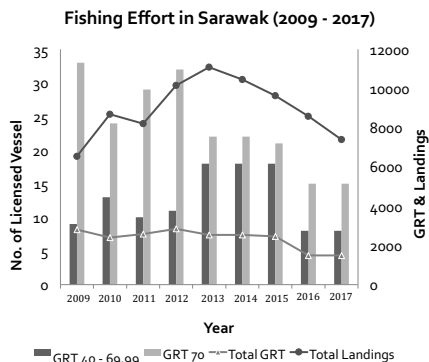
CPUE



Cumulative Effort



Fishing Effort



Status of Pelagic Fish Stock

ITEMS	UNIT	2015
Area	km ²	150,627
Average Density (D)	tonnes/km ²	3.46
Total Biomass (Q)	MT	521,169
Current Yield (Y)	MT	46,777
Potential Yield (MSY)	MT	79,192
Surplus	MT	32,415

Status Analysis of Pelagic Fish Stock via Kobe Plot (2009-2017)

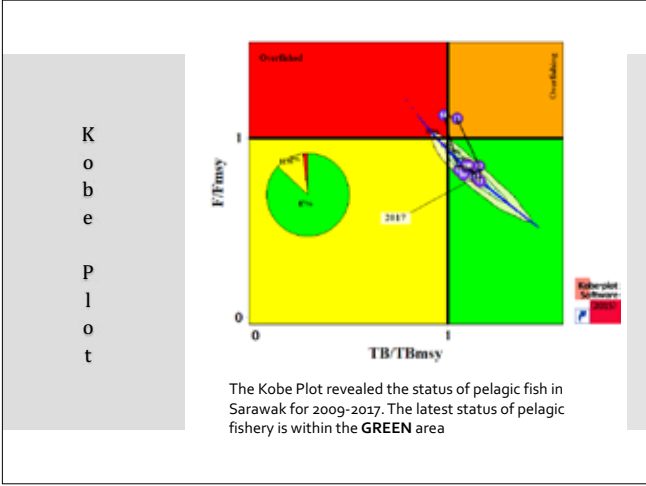
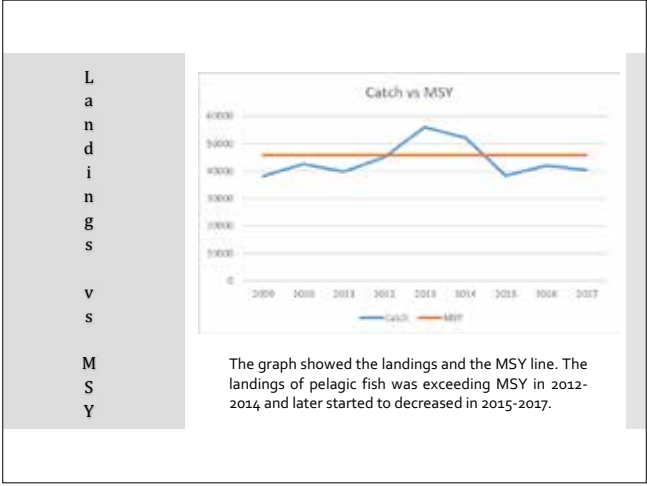
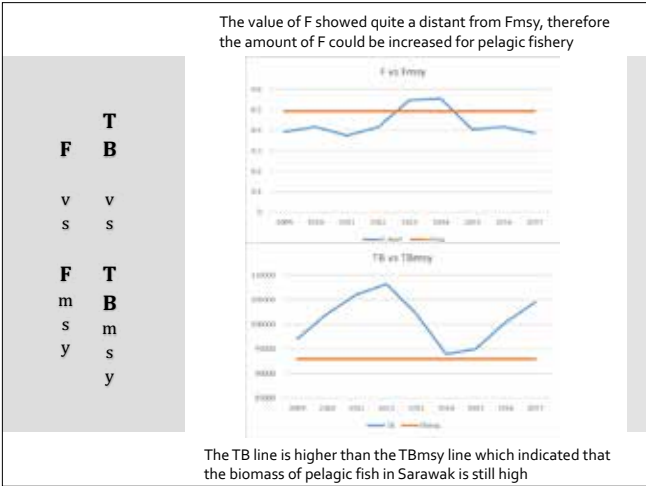
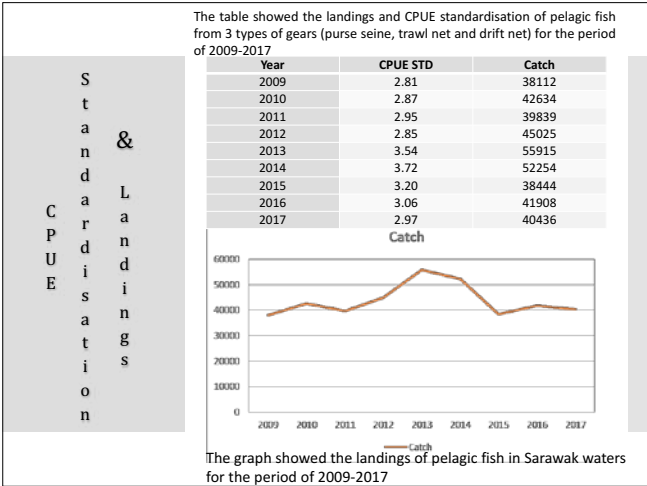
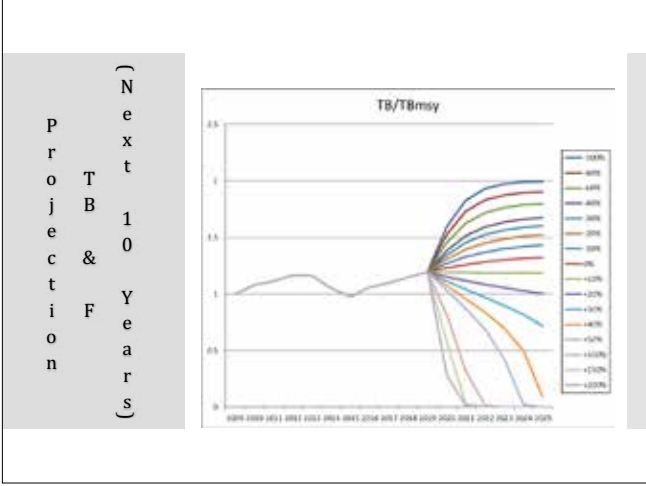
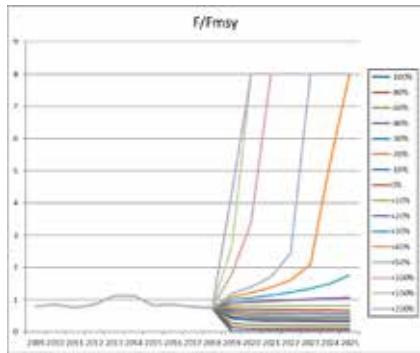


Table with 5 columns: F/Fmsy, TB/TBmsy, F/Fmsy, TB/TBmsy, F/Fmsy. The table contains data for various years and is color-coded (Green, Yellow, Red).

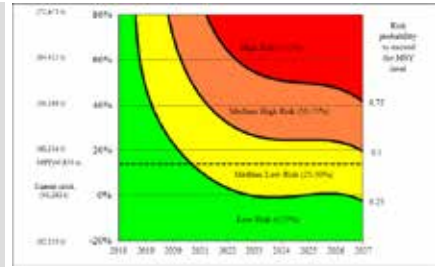
Next 10 Years Projection



Project & Forecast
Next 10 Years



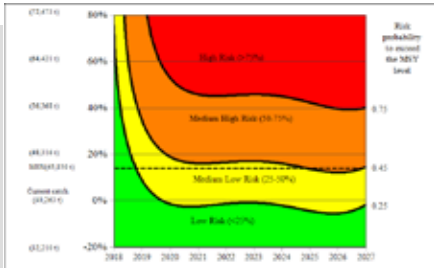
Risk
Total Allowable
Biossessment



The figure showed the status of landings and MSY for pelagic fish in Sarawak (in terms of total biomass)

1. Green Area (next 10 years) – if no increase in landings from 2017
2. Yellow Area (year 2021) – if 40% increase in landings from 2017
3. Overfishing (next 10 years) – if continuously increase in landings more than about 20%

Fishing Risk Assessment
Kobe Plot



The figure showed the status of landings and MSY for pelagic fish in Sarawak (in terms of fishing mortality)

1. Green Area (next 10 years) – if no increase in F (same as 2017)
2. Yellow Area (year 2020) – if increase about 10% of landings from 2017

Existing Management Strategies

- Joint venture program, close season management is not yet applied due to Sarawak have more than enough available resource
- According to our latest survey in 2015 (Fisheries Resource Survey in Malaysian Waters 2013-2016), the surplus of production is 32,415 MT.
- Kobe plot analysis could be utilized to facilitate the pelagic fisheries management.
- According to the research in 2015 and the analysis via kobe plot until 2017, it is showed that the resources in Sarawak waters is underexploited. Therefore, the management could introduce a plan to increase the fishing effort with precautionary approach (eg: increase fishing vessels).

Thank You



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(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Country Presentation
MALAYSIA

Country Report on Purse Seine Fisheries in Sabah

by

Mr. Mohd Zamani Nayan

**Fisheries Officer
Department of Fisheries Sabah, Malaysia**



COUNTRY REPORT OF PURSE SEINE FISHERIES IN SABAH 18 – 19 SEPTEMBER, 2018

KUALA LUMPUR, MALAYSIA

By:
NAYAN, MOHD ZAMANI
MARINE RESOURCE MANAGEMENT OFFICE
DEPARTMENT OF FISHERIES SABAH

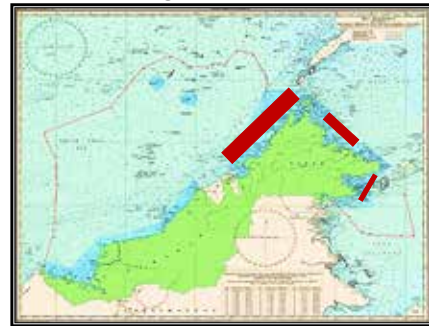
OVERVIEW

- Demand for fish in Malaysia is always rising yearly, and it is expected to increase from 1.3 million mt in 2010 to 1.9 million mt in year 2020
- Fishing industry contributed close to RM 10.22 billion in 2015 and is envisaged to grow annually by 4.9% contributing close to RM 12.96 billion to the Malaysian economy by 2020 (*of course it is still far to pay the debt, we'll try...*)
- Fisheries industry is also an important source of protein for the nation

OVERVIEW

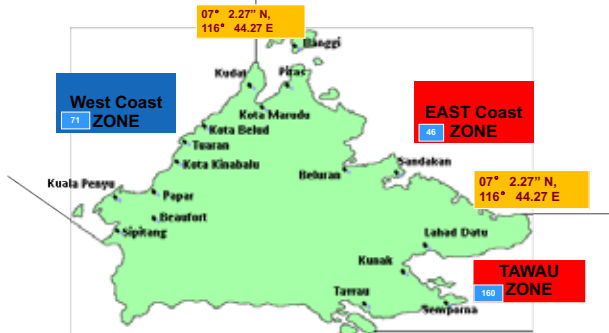
- Purse seine fisheries : is **Commercial gears** in Sabah
- Fishing areas: **all fishing zones**
- Purse Seine Designed: Fine mesh & Coarser mesh
- Vessel Size: 40 to 70 GRT
- Management measures for purse seine fishery: **Licensing and Regulations are provided and managed by Sabah State Fisheries Department**

OVERVIEW



Fisheries Research Institute Sabah

SABAH FISHERIES ZONE

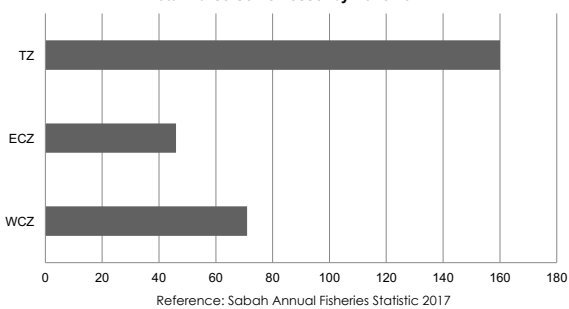


Purse Seine vessel in Sabah

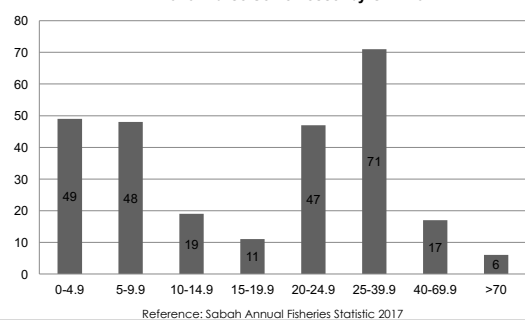


Purse Seine vessels in Sabah

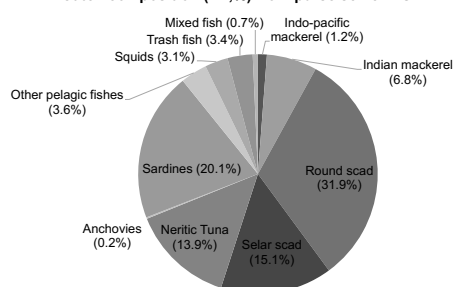
Total Purse Seine Vessel by Zone 2017



No. of Purse Seine Vessel by GRT 2017



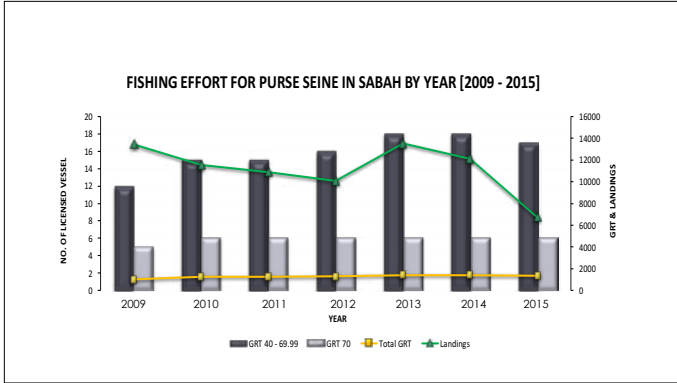
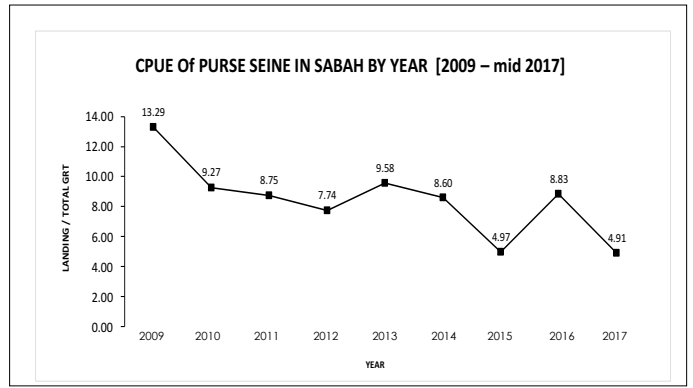
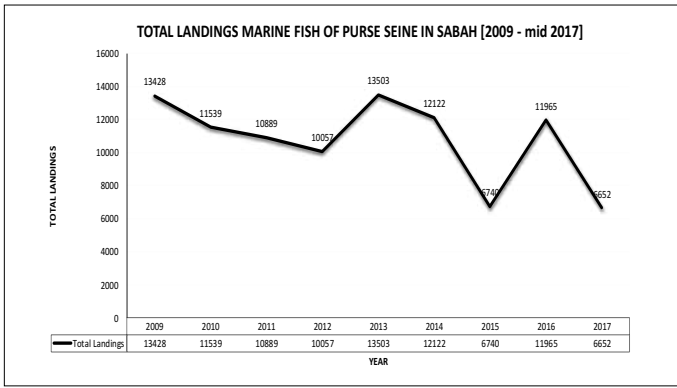
Catch composition (MT,%) from purse seine in SABAH



Fish Biological Information ?

- (a) Length of 1st Maturity
(b) Spawning Season

Need some allocation to continue!



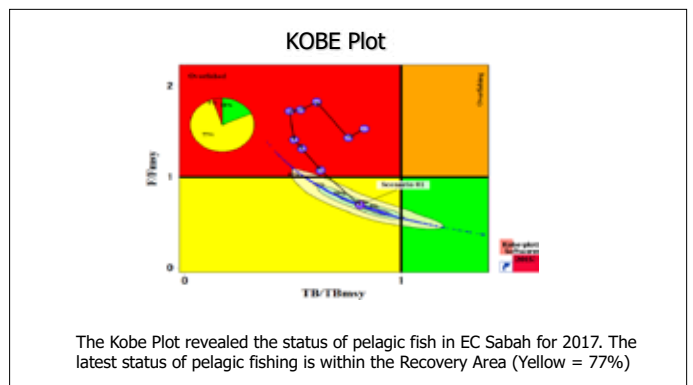
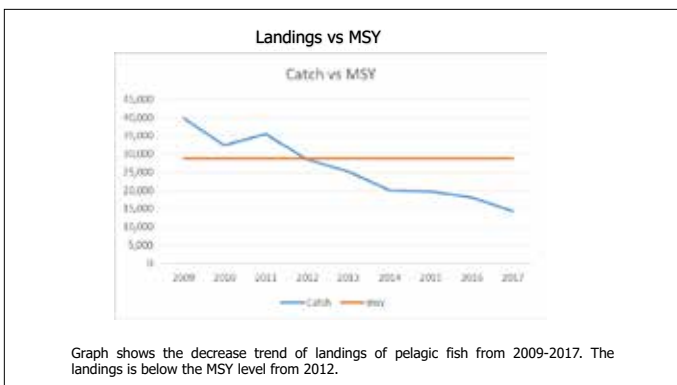
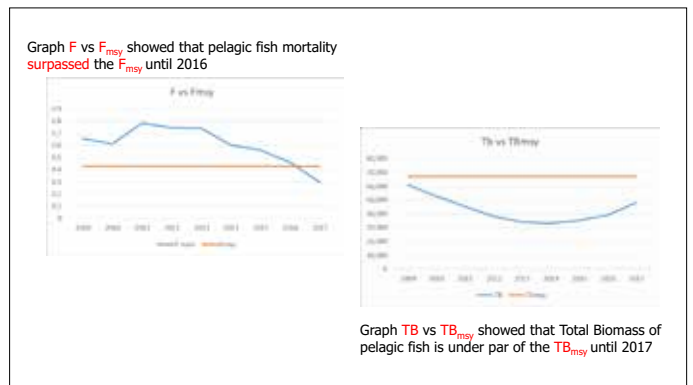
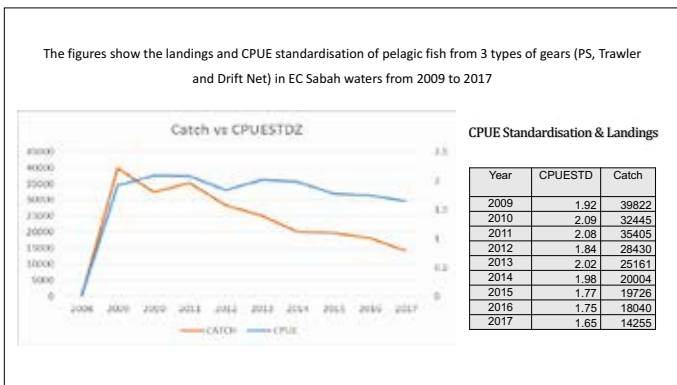
- Management measures were developed within the framework provided by the fisheries law, **The Fisheries Act 1985 (Act 317)**. Among the main measures are:-
- Divided area into several Fishing Zones
 - Closed Fishing Area
 - Fishing Effort Control
 - Fishing Units Control
 - Port & At Sea Control
 - Fishermen Registration
 - Marine Habitat Conservation
 - The Community-based Fisheries Management

ISSUES & CHALLENGES ?

(1) LACK OF PERSONNEL TO GET OF DATA LANDING

(2) LACK OF EXPERT IN FISHING biologist & technologist

Status of Pelagic Fish Stock for East Coast Sabah via Kobe Plot (2009-2017)

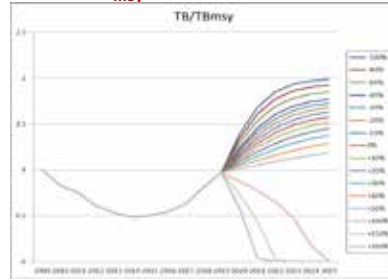


Probabilities (%) Table for Risk Assessment

Based on risk assessment, the current catch level (17,340 tonnes, 3 years average in 2015-2017) can be increased by 56% to the MSY level (27,730 tonnes). Even when the catch is increased to MSY level, the probabilities violating MSY (TB & F) are less than 45% in 10 years (2027).

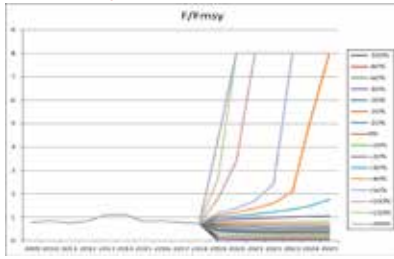
Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Prob. TB & F > MSY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Prob. TB & F < MSY	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Prob. TB & F > 1.5 MSY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Prob. TB & F < 1.5 MSY	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Projection TB/TB_{msy} (for next 10 years ahead, 2027)



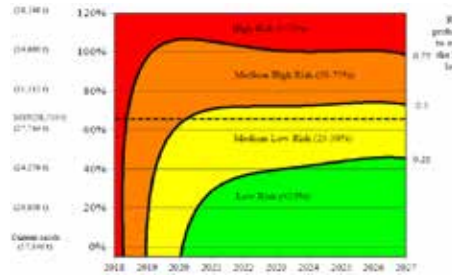
The projection of TB and F until 10 years ahead.

Projection F/F_{msy} (for next 10 years ahead, 2027)



The projection for F and Fmsy by percentage increasing and decreasing until the next 10 years (2027)

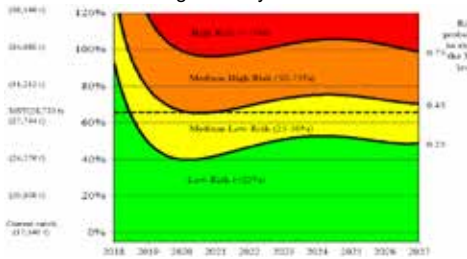
Total Biomass Risk Assessment



The figure shows the status of TB Risk

1. Green Zone (next 10 years) – if no increase in catch (same as 2017)
2. Yellow Zone (year 2020) – if increase by ≤ 60% in catch from 2017

Fishing Mortality Risk Assessment



The figure shows the status of landings and MSY for pelagic fish in EC Sabah.

1. Landing in 2017 (17,340 mt) is still under MSY level (27,730T).
2. Status of pelagic resources in next 10 years will remain in Green zone even when catch is increased by ≤ 50%.
3. Increase in catch ≥ 50% will reach Yellow zone.

Existing Management Strategies

- Joint venture program, close season and closed area management is in the process
- Now Malaysia is in the process of drafting the Fisheries Management Plan in all areas
- Pelagic fisheries management could be facilitated by kobe plot analysis





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

***Country Presentation*
MYANMAR**

Management of Purse Seine Fisheries in Myanmar

by

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Department of Fisheries, Myanmar**

Management of Purse Seine Fisheries in Myanmar

Department of Fisheries
Myanmar

Contents

- Introduction
- Marine Capture Fisheries
- Purse Seine Fisheries
- Commercial Pelagic fishes
- Anchovy Fisheries
- CPUE & Status of pelagic fish stock
- Constraints
- Conclusion

Introduction



Coastal Fisheries activities are classified into two components as follows :-

1. Marine Capture fisheries

- ❖ Inshore Fisheries
- ❖ Offshore Fisheries

2. Mariculture

- ❖ Marine Fish, Soft-shell Crab and Shrimp
- ❖ Seaweed

Marine Capture Fisheries

Marine capture fisheries

a. In-shore Fishery

- Zone: 0-10 nautical mile from shore
- Engine: ≤ 25 hp
- Length of the boat: ≤ 30 ft



b. Off-shore fishery

- Zone: 10 nautical mile to end of EEZ
- Engine: ≥ 25 hp
- Length of the boat: ≥ 30 ft



Offshore Fisheries

Demarcated into 4 fishing grounds

- 1. Rakhine Area
- 2. Ayeyawady Area
- 3. Mon Area
- 4. Tanintharyi Area



Types of off-shore fishing gear

No	Type of Gear
1	Trawl
2	Purse seine
3	Stow net
4	Drift net (Gill net)
5	Long line
6	Squid cast net
7	Fish Trap



Purse Seine Fisheries

Purse Seine Fisheries

- **Two main types of pelagic fishery in Myanmar waters:**
 - Fish purse seine, which is used to catch pelagic species like *Hilsa*
 - Two boats seine, used to catch anchovies in inshore coastal waters
- Purse seine is the major fishing gear used to exploit the pelagic fish resources.
- Common fishing area for purse seine fisheries: Southern area of Rakhine state and Tanintharyi Region



Fish purse seine

- The **fish purse seine** boats are about 50 to 100 GRT and operated in a traditional manner, without fish aggregating devices (FADs). Most purse seiners have an expert skipper in seeking out fish schools by using sonar.
- *Hilsa* fish is mainly harvested and the fishing season for fish purse seine is from October to May annually.



Anchovy purse seines

- **Anchovy purse seines** are two boats seine operated in very shallow waters inshore areas and target mainly anchovies of the genus *Stolephorus*. The anchovy purse seine fishery also harvests small mackerels and sardine species, such as *Rastrelliger* spp. and *Sardinella* spp.
- Two techniques of fishing operation: free school fishing and light luring fishing (night). Fishing season is from October to May annually.
- Anchovy fishery is important particularly along the Southern coast of Rakhine. Post-harvest technique is primitive, mainly rely on sun-drying on the shore.



Purse seine fishing boats

Number of purse seine fishing vessels engaged in offshore and inshore fishery waters

No	Type of Gear	Year										
		2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1	Fish Purse Seine (Offshore)	152	158	161	168	273	278	287	283	284	310	329
2	Anchovy Purse Seine (Inshore)	375	374	375	377	366	362	360	297	217	350	350

Commercial Pelagic fishes

Hilsa shad



- *Hilsa* is very important pelagic fish resource in Myanmar, highly contributed to the national economy by small-scale fishery and industry fishery. It is distributed widely on the entire coast of Myanmar as well as in the inland waters. The fish migrate through the river system, particularly, the Ayeyarwady river complex as spawning ground.
- Fishing season of the delta area is from September to March with two peak seasons namely, August and September. The most effective fishing gears previously is encircling gill nets. Since last decade, purse seine was introduced as new fishing technology in this fisheries in order to increase catch production.

Mackerels



Rastrelliger kanagurta
(Indian Mackerel)



Rastrelliger brachysoma
(Short Mackerel)

The Indian mackerels are caught mainly by fish purse seines, encircling gillnets and occasionally by bottom trawls. Their fishing grounds extend widely from the inshore to the offshore of Myanmar coastal areas.

Sardines



The sardines found in Myanmar waters belong to *Sardinella* spp. Among *Sardinella* spp., the goldstriped sardine (*Sardinella gibbosa*), fringescale sardine (*Sardinella fimbriata*) and spotted sardine (*Sardinella amblygaster*) are commonly found. However, they are grouped together as sardines (*Sardinella* spp) in the Myanmar fisheries statistics .

Sardines are widely distributed with high concentration in the coastal areas. They are caught mainly by purse seines, encircling gillnets and driftnets.

Pelagic Fishes

Round Scads



The round scads found in Myanmar waters are represented by three species of *Decapterus* spp. Among them, *Decapterus macrosoma* and *Decapterus maruadsi* are commonly caught in Myanmar waters. The round scads are widely distributed in the offshore waters.

They are caught mainly by purse seines. The catch of all species of round scads are grouped together as *Decapterus* spp in the Myanmar fisheries statistics .

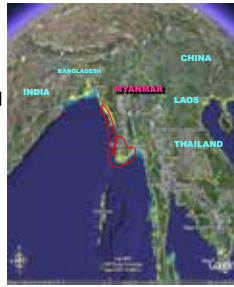
Bigeye scad



- The bigeye scads (*Selar crumenophthalmus*) are abundant and widely distributed in the offshore waters as the round scads.
- They are caught together with the round scads from purse seine fishery and also trawl fishery.

Fishing ground of *Hilsa* in Myanmar

Spawning grounds and migration routes of *Hilsa* shad in the Rakhine Coast. There are no *Hilsa* fishing ground and fishing activities in Myeik Archipelago.



21

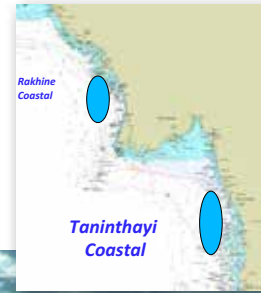
Indian Mackerel and Indo Pacific Mackerel Fishing Grounds



Rastrelliger kanagurta
(Indian Mackerel)



Rastrelliger brachysoma
(Short Mackerel)



Fishing Season of the Indian Mackerel



Area	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rakhine												
Tanintharyi												

Fishing season



Anchovy Fisheries

Anchovy Species



The anchovies in the Myanmar waters belong to the species of *Stolephorus* spp:

- Commerce's anchovy (*Stolephorus commerson*)
- Indian anchovy (*Stolephorus indicus*)



They are commercially important and very abundant in the nearshore waters. The anchovies are caught by small-meshed purse seine and beach seine.

Anchovy fisheries



Anchovy fisheries



Landing of Anchovy purse seine fisheries in Rakhine

Year	Number of boats	Catch (in ton)				Total (in ton)
		Anchovy	Sardine	<i>Rastrelliger</i> spp	Other	
2005-2006	368	4505	1457	100	1030	7092
2006-2007	377	1978	1842	30	3857	7707
2007-2008	375	5024	1028	58	3022	9132
2008-2009	374	6188	2215	44	2170	10617
2009-2010	375	6973	3216	20	3998	14215
2010-2011	377	7873	3926	32	4301	16132
2011-2012	366	5031	1816	53	5812	12712
2012-2013	362	4205	2510	79	4098	10892
2013-2014	360	2156	4773	124	6899	13952

CPUE & Status of Pelagic Fish

Offshore and Inshore Purse Seine Catch Activities and CPUE

• Offshore Fish Purse seine

Number of haul / day = 1 – 2 haul / day
 Number of day / trip = 15 – 20 days
 Number of day / month = 20 days
 Number of fishing month / year = 7 - 8 months
 CPUE = 1.5 to 2.0 ton / day

• Inshore Anchovy Purse seine (two boats seine)

Number of haul / day = 1 – 2 haul / day
 Number of day / trip = 1 – 2 days
 Number of day / month = 10 days
 Number of fishing month / year = 6 months
 CPUE = 1 - 1.5 ton / day (Average)

Present status of pelagic fish stock in 2013

According to the 2013 survey result by research vessel Dr. Fridtjof Nansen in Myanmar water, pelagic fish stock was decrease as shown below;

Comparisons of pelagic fish biomass estimation 1979-80 vs 2013

- 1979-80 : 1,000,000 t (10cm mean Length, apply)
- 2013 : 110,000 t (10cm mean Length, apply)
- Standing stock in 2013 is possibly about 10% of 1980 Biomass

Constraints

- Lack of latest data: information needed for marine fisheries is inadequate.
- Marine fisheries cannot be successfully managed unless information on key aspects is known.
- Accuracy of data collection: the difficulty in marine fisheries data collection is due to the dispersion of data sources. If data collection is done through interviews and port or market, the sampling collectors may not get enough accurate data because data sources are numerous and disperse.
- Difficulty in acquiring actual data: fishing vessels transfer their catch to the port by carrier vessels. Aside, all of the inshore vessel landed their catch at their village and directly harvested by sun drying technique at the beach.
- Knowledge of scientific data collection: data collection is considered as a statistic tools in science and data gathering has to follow proper scientific procedures. The lack of basic knowledge and standardization of data collecting protocols cause difficulties in fish identification for specific marine species.
- Lack of financial support: scientific surveys of fish population in large ecosystem are difficult to be carried out in Myanmar because of limited budgets, equipment and qualified manpower. These constraints need to be resolved through internal arrangement.

Conclusion

- Encourage research and develop long-term monitoring program, database and share information with international and regional conservation and management organizations such as FAO, SEAFDEC , BOBLME, etc. for technical and logistic support.
- Regarding data collection, training program for concerned institutions and stakeholders. (As of now FAO and Myanmar conducting pilot project for fisheries data collecting program)
- More fund should be allocated for future research and data collection program are needed.
- Apart from the government's role in fisheries development, collaboration and cooperation together with international and regional fisheries related agencies are required.

Thanks





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Country Presentation
PHILIPPINES

**The Philippines: 4th Core Expert Meeting on Comparative Studies for Management
of Purse Seine Fisheries in the Southeast Asian Region**

by

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The Philippines: 4th Core Expert Meeting on Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region

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OUTLINE

◆ INTRODUCTION

- ◆ Overview of Philippine Capture Fisheries
- ◆ Purse Seine Fisheries
- ◆ Fishing Area of Purse Seine in the Philippines
- ◆ Management Measures for Purse Seine

◆ LANDING OF PURSE SEINE FISHERIES

- ◆ Trend of landing
- ◆ Information of species composition
- ◆ Biological information
- ◆ Length at first maturity
- ◆ Spawning season

◆ FISHING EFFORT OF PURSE SEINE

- ◆ Total Number of Purse Seine Vessels
- ◆ Trend of CPUE

◆ STATUS OF PELAGIC FISH STOCK

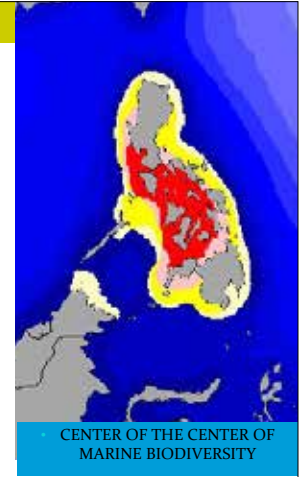
- ◆ Biomass
- ◆ MSY

◆ EXISTING MANAGEMENT STRATEGIES FOR PURSE SEINE

- ◆ Close Season
- ◆ Close Area
- ◆ Joint venture program including chartered vessel arrangement

I. INTRODUCTION

- Philippines archipelago of more than 7,100 islands (archipelago/archipelagic doctrine)
- Archipelagic waters -220 million hectares, approximately 88% of Philippine territory
 - Coastal: 266,000 sq.km
 - Oceanic: 1,934,000 sq. km
- Has centers of diversity and endemism and its biological richness described as "Galapagos times ten" (Heaney and Regalado, 1998)
- 52, 177 DESCRIBED Species and still counting (many more species remain unknown to science)
- One of 17 megadiversity countries, which together contain 70-80% of global biodiversity (Mittermeier et al, 1997)



- More than 1,130 recorded terrestrial species, half of which are found nowhere else in the world
- Awesome floral diversity: 10-14 thousand vascular and non-vascular plants (including fungi), more than half endemic to Philippines
- Marine biodiversity:
 1. Coastline 22,450 kilometers
 2. Estimated 27,000 sq. km coral reefs
 3. Nearly 500 of the more than 800 known species of corals worldwide
 4. More than 2,000 species of fish
 5. More than 40 species of mangrove plants (54 worldwide belonging to 16 families)
 6. 1,062 reported species of seaweeds
 7. 16 identified species of seagrass (Australia most diverse; SE Asia with combined coastline of more than 120,000, in second place)



PHILIPPINE CAPTURE FISHERIES: AN OVERVIEW

Municipal Fishing = refers to fishing within municipal waters using fishing vessels of three (3) gross tons or less, or fishing not requiring the use of fishing vessels.



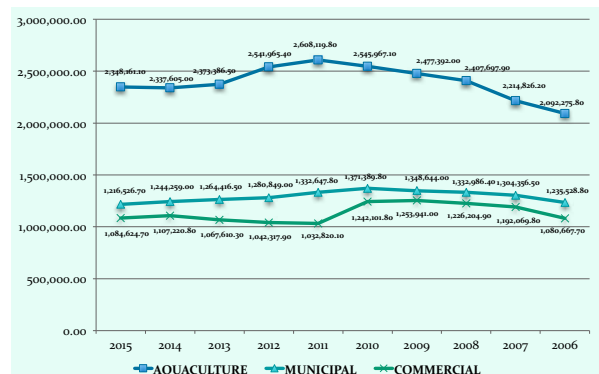
PHILIPPINES CAPTURE FISHERIES: AN OVERVIEW

Commercial Fishing = the taking of fishery species by passive or active gear for trade, business or profit beyond subsistence or sports fishing:

- ❖ **Small Scale Commercial Fishing** = fishing with passive or active gear utilizing fishing vessels of 3.1 gross tons (GT) up to 20 GT;
- ❖ **Medium Scale Commercial Fishing** = fishing utilizing active gears and vessels of 20.1 GT up to 150 GT; and
- ❖ **Large Scale Commercial Fishing** = fishing utilizing active gears and vessels of more than 150 GT.



FISHERIES PRODUCTION (CY 2006-2015)



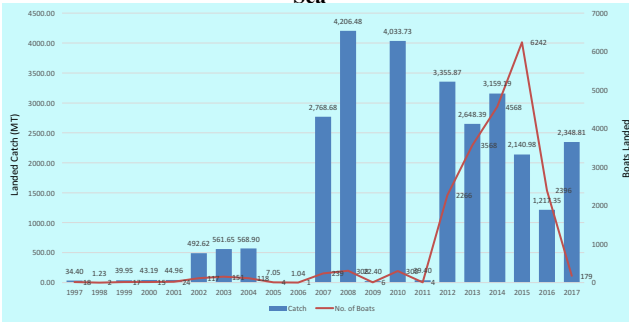
Philippines statistical fishing grounds



Major Purse Seine Fishing Grounds



TREND OF PURSE SEINE LANDINGS in the South China Sea



Source: NSAP. *2017 data only from Zamboanga Coast.
a. Catch and Landed Purse Seine Boats in the South China Sea, Philippines

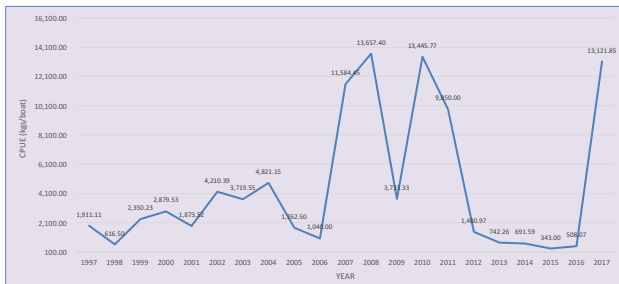
Philippine Flagged Purse Seiner Commercial Fishing Vessels

Commercial Fishing Vessel and Gear License (CFVGL)	Tuna Purse Seine	Sardines/ Mackerel/ Scad Purse Seine
Small-Scale(3-20 GT)	1	13
Medium-Scale (20.1-150 GT)	68	244
Large-Scale (above 150)	95	60
Total	164	317

Source: Fishing Regulations and Licensing Division- BFAR

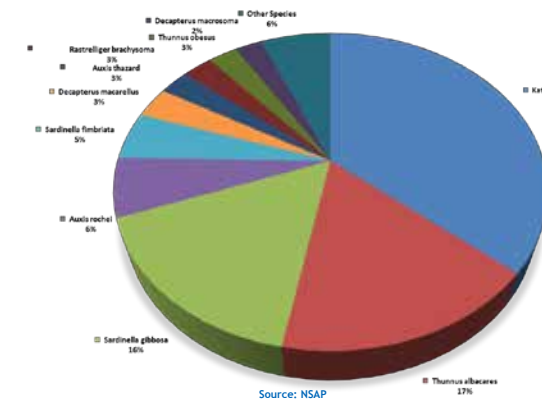
b. Total Number of Purse Seine Vessels by Type, Philippines

FISHING EFFORT OF PURSE SEINE



Source: NSAP. *2017 data only from Zamboanga Coast.
CPUE of Purse Seine in the South China Sea, Philippines

III. Biological information



Information on Species Composition in the South China Sea, Philippines

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
BACUIT BAY					
<i>Atule mate</i>		0.73		17.36	18
<i>Nemipterus hexodon</i>	0.42	0.69		19.47	15.3
<i>Rastrelliger brachysoma</i>		0.65		18.4	
<i>Rastrelliger kanagurta</i>	0.74	0.65	19.81	20.84	
BALABAC STRAIT		0.6		23.21	18
<i>Atule mate</i>		0.6		23.21	18
BANGUI BAY		0.68		14.2	17
<i>Selar crumenophthalmus</i>	0.6	0.68	16.25	14.2	17

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
CALATAGAN/BALAYAN BAY					
<i>Decapterus macrodon</i>	0	0.76	0	14.91	0
<i>Nemipterus hexodon</i>	0.6		14.09	0	0
<i>Sardinella lemuru</i>	0.87	0.76	16.84	15.53	0
<i>Selar boops</i>	0.64		16.31	0	0
<i>Selar crumenophthalmus</i>	0.87		14.84	0	0
<i>Upeneus vittatus</i>	0.65		14.65	0	0

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
ILOCOS COAST/NWPS					
<i>Decapterus macrosoma</i>	0.52		16.88		16.5
<i>Nemipterus bathybius</i>	0.68	0.6	18.03	27.22	22.5
<i>Selar crumenophthalmus</i>	0.75	0.76	21.14	19.41	20.1
MURUAN BAY					
<i>Atule mate</i>		0.54		17.63	18
<i>Decapterus russelli</i>	0.78		12.89		
<i>Rastrelliger kanagurta</i>	0.63		19.7		
<i>Selar crumenophthalmus</i>	0.59	0.75		17.25	

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
LINGAYEN GULF					
<i>Decapterus macrosoma</i>	0.59		12.5	0	13.3
<i>Decapterus maruadsi</i>	0.76	0.59	13.71	13.66	13.7
<i>Nemipterus bathybius</i>	0.81	0.77	10.21	10.99	22.5
<i>Rastrelliger brachysoma</i>	0.77	0.68	20.12	22.32	16.7
<i>Saurida tumbil</i>	0.66	0.61	10.7	13.14	28.4
<i>Selar crumenophthalmus</i>	0.59	0.6	14.67	12.97	21.2

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
MALANUT BAY					
<i>Atule mate</i>	0	0.63	0	21.58	18
<i>Decapterus macrosoma</i>	0.79		17.83	0	0
<i>Decapterus russelli</i>	0.65		12.54	0	0
<i>Nemipterus hexodo</i>	0	0.63	0	21.23	15.3
<i>Rastrelliger kanagurta</i>	0.54	0.74	0	23.06	0
<i>Selar crumenophthalmus</i>	0.59		18.51	0	0

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
MINDORO STRIAT					
<i>Selar crumenophthalmus</i>	0	0.69	0	13.75	0

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
PAGDANAN BAY					
<i>Decapterus russelli</i>	0.8		13.3	0	0
<i>Rastrelliger kanagurta</i>	0.84		21.85	0	0
PASALENG BAY					
<i>Decapterus macrosoma</i>	0.72		23.64	0	16.3
ULUGAN BAY					
<i>Atule mate</i>	0	0.63	0	18.8	18
<i>Decapterus macrosoma</i>	0.61	0	20.92	0	0
<i>Decapterus russelli</i>	0.67		17.76	0	0
<i>Nemipterus furcosus</i>	0	0.57	0	19.03	16.6
<i>Rastrelliger kanagurta</i>	0.59		21.76	0	0

Length at First Maturity and Exploitation

Source: NSAP

Biological Information of Major Species in SCS Fishing Grounds

Fishing Ground and Species	2015 E Value	2016 E Value	L50 (CY 2015)	L50 (CY 2016)	Lm
WEST PHILIPPINE SEA (RIZAL)					
<i>Atule mate</i>		0.6		26.57	18
<i>Decapterus macrosoma</i>	0.68		15.78		
<i>Nemipterus hexodon</i>		0.45		16.92	15.3
WEST PHILIPPINE, SEA PALAWAN					
<i>Decapterus macrosoma</i>		0.75		16.45	

Length at First Maturity and Exploitation

Source: NSAP

Comparison of Growth Parameter Estimates for *Sardinella gibbosa*, *S. fimbriata* and *Rastrelliger brachysoma* by Fishing Ground

Species	Year	Lmax (cm)	L ₀	K _{g/y}	OT	Fishing Ground	Reference
<i>Sardinella gibbosa</i>	1991	17.00	20.00	0.80	2.53	Guimaras Strait	Fabbeso.org
	2014	16.84	18.50	0.88	2.47	Manila Bay	This Study, 2014
<i>Sardinella fimbriata</i>	1959	-	18.00	0.70	2.36	Manila Bay	Inglis, <i>et al</i> 1964
	1965	-	22.00	1.15	2.75	Palawan	Inglis, <i>et al</i> 1964
	1983-1986	23.75	23.70	0.90	2.75	Leyte Gulf	Larapio-Gonzales, <i>et al</i> 1997
	1984-1986	20.69	22.30	0.90	2.65	Guimaras Strait	Larapio-Gonzales, <i>et al</i> 1997
	1987	24.00	24.00	1.20	2.87	Tayabas Bay	Larapio-Gonzales, <i>et al</i> 1997
	1990	13.00	16.50	0.80	2.34	Manila Bay	MADECOR, 1995
<i>Rastrelliger brachysoma</i>	2014	18.04	18.50	0.95	2.51	Manila Bay	This Study, 2014
	1976-1979	34.50	34.00	1.10	3.10	Manila Bay	Inglis, <i>et al</i> 1964
	1979-1980	-	25.00	1.00	3.00	Same Sea	Inglis, <i>et al</i> 1964
	1981	-	24.50	1.28	2.89	Rapay Gulf	Corpus, <i>A, et al</i> 1983
	1984-1986	29.50	28.50	1.40	3.06	Guimaras Strait	Larapio-Gonzales, <i>et al</i> 1997
	1995	34.50	24.50	0.85	2.71	Manila Bay	MADECOR, 1995
2014	27.50	28.7	1.30	3.03	Manila Bay	This Study, 2014	

Source: Fisheries Resources and Ecological Assessment of Manila Bay 2012-2015

Comparison of Mortality Parameter Estimates, L₅₀ and E-values for *Sardinella gibbosa*, *S. fimbriata* and *Rastrelliger brachysoma* by Fishing Ground

Species	Year	Z (yr ⁻¹)	F (yr ⁻¹)	M (yr ⁻¹)	L ₅₀ (cm)	E	Fishing Ground	Reference
<i>Sardinella gibbosa</i>	2014	3.82	5.94	1.88	10.96	0.76	Manila Bay	This Study, 2014
	1959	3.30	1.79	1.63	-	0.52	Manila Bay	Inglis, <i>et al</i> 1964
<i>Sardinella fimbriata</i>	1965	6.56	4.44	2.12	-	0.68	Palawan	Inglis, <i>et al</i> 1964
	1983-1986	3.29	1.40	1.89	-	0.43	Leyte Gulf	Larapio-Gonzales, <i>et al</i> 1997
	1984-1986	2.49	0.71	1.78	-	0.29	Guimaras Strait	Larapio-Gonzales, <i>et al</i> 1997
	1987	5.50	3.18	2.12	-	0.6	Tayabas Bay	Larapio-Gonzales, <i>et al</i> 1997
	1995	3.60	1.79	1.85	-	0.40	Manila Bay	MADECOR, 1995
	2014	5.86	3.88	1.98	11.52	0.66	Manila Bay	This Study, 2014
<i>Rastrelliger brachysoma</i>	1976-1979	4.27	2.43	1.84	-	0.57	Manila Bay	Inglis, <i>et al</i> 1964
	1979-1980	9.49	6.93	2.56	-	0.73	Same Sea	Inglis, <i>et al</i> 1964
	1981	6.09	3.93	2.16	-	0.65	Rapay Gulf	Corpus, <i>A, et al</i> 1983
	1984-1986	4.33	2.08	2.25	-	0.48	Guimaras Strait	Larapio-Gonzales, <i>et al</i> 1997
	1995	4.96	3.23	1.73	-	0.65	Manila Bay	MADECOR, 1995
	2014	7.47	5.32	2.15	17.59	0.71	Manila Bay	This Study, 2014

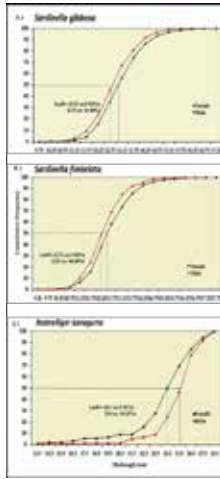
Source: Fisheries Resources and Ecological Assessment of Manila Bay 2012-2015

Biological Information

Length at First Maturity (Lm50) of Female and Male Dominant Species in Manila Bay (2014-2015).

Species	Lm(50)	
	Female	Male
<i>Sardinella gibbosa</i>	13.25 cm	12.75 cm
<i>Sardinella fimbriata</i>	12.75 cm	12.25 cm
<i>Rastrelliger kanagurta</i>	24.5 cm	25.5 cm

Source: Fisheries Resources and Ecological Assessment of Manila Bay 2012-2015



Spawning Season

Species	Major Spawning	Minor Spawning	Fishing Ground
<i>Sardinella gibbosa</i>	March - April	October - December	Manila Bay
<i>Sardinella fimbriata</i>	February - May	October - December	Manila Bay
<i>Rastrelliger kanagurta</i>	October - December	May - June	Manila Bay

Source: Fisheries Resources and Ecological Assessment of Manila Bay 2012-2015

Biological Information

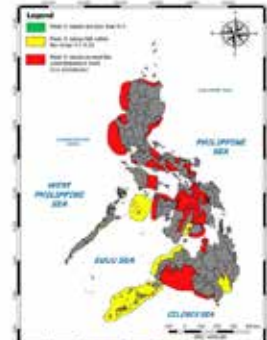
Spawning Season, Samar Sea

Species	J	F	M	A	M	J	J	A	S	O	N	D
Agumaa (<i>Rastrelliger faughni</i>)				1	2							
Galungong (<i>Decapetes spp.</i>)												1, 2
Hairtail				2	2							
Hasa-hasa (<i>Rastrelliger brachysoma</i>)					2							
Alumahan, Barao (<i>Rastrelliger kanagurta</i>)				2	2	2						
Matambaka (<i>Selar crumenophthalmus</i>)							2					

IV. Pelagic Stock Status (NSAP 2015)

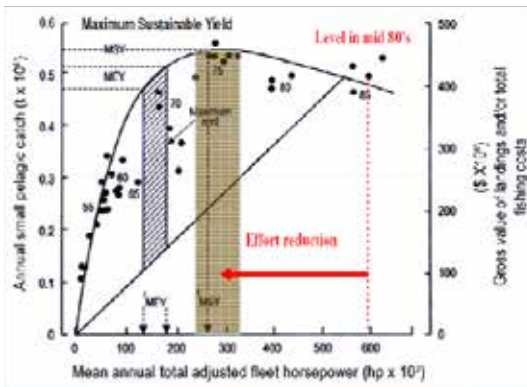


Status of Philippines **neritic tunas** by fishing ground based on Exploitation (E) values using NSAP length-frequency data, 2015.

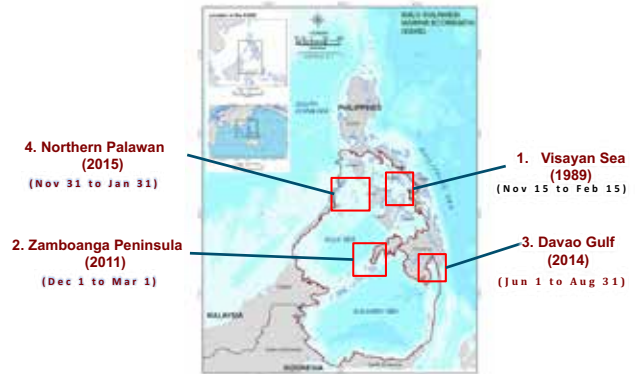


Status of Philippines **small pelagic fishes** by fishing ground based on Exploitation (E) values using NSAP length-frequency data, 2015.

IV. MSY for Pelagic Species (Dalezl et al. 1996)



V. Existing Management Strategies for Purse Seine Close Season and Closed Area



V. Proposed Management Strategies in Relation to EAFM



VI. Proposed Reference Points

INDICATOR	BENCHMARK		Monitoring methods or source of data	Monitoring Frequency and who is in charge	Evaluation (notes on progress)
	Baseline	Target			
Computed length at first maturity	total length:				
			NSAP repro-bio-study	Every 3 years-Project Leader	On the 4 th year
Zamboanga	<i>S. lemuru</i> - 15 cm (2013-2014)	TRP = 16cm LRP = 13 cm Trigger= 14 cm	Sampling framework		
San Bernardino-Ticao Pass	<i>S. lemuru</i> - 15 cm	TRP = 17 LRP = 14 Trigger= 16			
Visayan Sea	<i>S. gibbosa</i> - 10 cm	TRP = 12cm LRP = 10cm Trigger= 11 cm			

VI. Proposed Reference Points

INDICATOR	BENCHMARK		Monitoring methods or source of data	Monitoring Frequency and who is in charge	Evaluation (notes on progress)
	Baseline	Target			
Bohol Sea	<i>S. lemuru</i> - 15 cm (2013-2014)	TRP = 16cm			
		LRP = 13 cm			
		Trigger= 14 cm			
Manila Bay	<i>S. lemuru</i> - 15 cm	TRP = 16cm			
		LRP = 13 cm			
		Trigger= 14 cm			
	<i>S. gibbosa</i> -13.25 cm (needs validation)	TRP = 14 cm			
		LRP = 10 cm			
		Trigger= 11 cm			

VI. Proposed Reference Points

INDICATOR	BENCHMARK		Monitoring methods or source of data	Monitoring Frequency and who is in charge	Evaluation (notes on progress)
	Baseline	Target			
e-values generated per FA ¹			NSAP sampling framework	annual	annual
Zamboanga	<i>S. lemuru</i> -0.60	TRP = 0.5			
		LRP = 0.6			
Visayan	<i>S. gibbosa</i> -0.79				
		<i>S. lemuru</i> -0.67			
SBS-TP	<i>S. lemuru</i> -to be established				
Bohol Sea	<i>S. lemuru</i> -0.68				
Manila Bay	<i>S. gibbosa</i> -0.74				

VI. Proposed Reference Points

INDICATOR	BENCHMARK		Monitoring methods or source of data	Monitoring Frequency and who is in charge	Evaluation (notes on progress)
	Baseline	Target			
Bohol Sea	<i>S. lemuru</i> - 15 cm (2013-2014)	TRP = 16cm			
		LRP = 13 cm			
		Trigger= 14 cm			
Manila Bay	<i>S. lemuru</i> - 15 cm	TRP = 16cm			
		LRP = 13 cm			
		Trigger= 14 cm			
	<i>S. gibbosa</i> -13.25 cm (needs validation)	TRP = 14 cm			
		LRP = 10 cm			
		Trigger= 11 cm			

VI. Proposed Reference Points

INDICATOR	BENCHMARK		Monitoring methods or source of data	Monitoring Frequency and who is in charge	Evaluation (notes on progress)
	Baseline	Target			
e-values generated per FA ¹			NSAP sampling framework	annual	annual
Zamboanga	<i>S. lemuru</i> -0.60	TRP = 0.5			
		LRP = 0.6			
Visayan	<i>S. gibbosa</i> -0.79				
		<i>S. lemuru</i> -0.67			
SBS-TP	<i>S. lemuru</i> -to be established				
	<i>S. lemuru</i> -0.68				
Bohol Sea	<i>S. gibbosa</i> -0.74				
Manila Bay					

VI. Proposed Reference Points

INDICATOR	Baseline	Target	Monitoring methods or source of data	Monitoring Frequency and who is in charge	Evaluation (notes on progress)
Spawning potential ratio ²	13%-18% (<i>S. gibbosa</i>)	20% (Prince, et al; for tropical countries)	NSAP repro-bio	Every 3 years	On the 4 th year
Zamboanga	<i>S. lemuru</i> -	TRP = 30% LRP = 20%			
Visayan	<i>S. gibbosa</i> 15%				
SBS-TP	<i>S. lemuru</i> -to be supplied				
Bohol Sea	<i>S. lemuru</i> -to be supplied				
Manila Bay	<i>S. gibbosa</i> - to be supplied				

*TRP: Target Reference Point
*LRP: Limit Reference Point

National Fisheries Management Legislation



- Republic Act (RA) 8550 "The Philippines Fisheries Code of 1998 as amended by RA 10654 "An Act to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing"

LEGISLATIONS RELATED TO FISHERIES MANAGEMENT

- ❖ The Wildlife Conservation and Protection Act of 2001 (RA 9147)
- ❖ Agriculture and Fisheries Modernization Act (AFMA) (RA8435)
- ❖ Local Government Code (LGC) (RA 7160)
- ❖ ARMM Organic Act (RA6734).



Management Measures in Relation to Purse Seine Fisheries

- National Tuna Management Plan
- National Plan of Action to Deter Illegal, Unreported and Unregulated Fishing (NPOA-IUUF)
- National Tuna Fish Aggregating Device (FAD) Management Policy
- Demarcation of Fishery Management Areas (FMA)
- Sardine Management Plans
- Round scad Management Plan
- Management of Long Distance Fishing
- Establishment of RPs for HCR
- Implementation of eCDTS
- BoatR and FishR

Maraming salamat po !



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Country Presentation
THAILAND

Purse Seine Fisheries in Thailand

by

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Department of Fisheries, Thailand

Purse Seine Fisheries in Thailand

Watcharapong CHUMCHUEN^a
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Department of Fisheries, Thailand

Outline

1. Introduction
2. Catch and effort statistics
3. Biological information
4. Status of pelagic fish stock
5. Existing management strategies

2

1. Introduction

3



Thailand

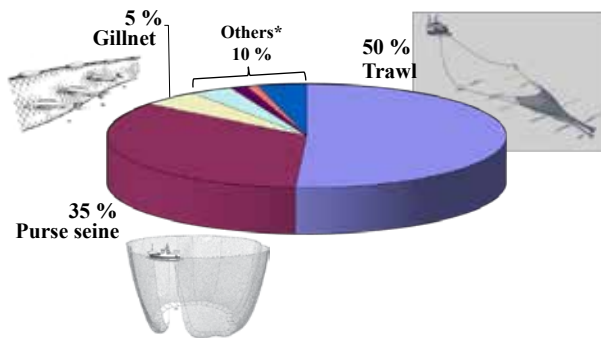
- 23 coastal provinces
- Coastline: 2,614 km along Gulf of Thailand (GOT) and Andaman Sea (ANS)
- Total EEZ: 420,280 km²

Marine capture fisheries in Thailand

- Landing: > 1.1 million t of catch in 2016
- Involving 0.68 million people

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Capture production of Thailand by fishing gear in 2016

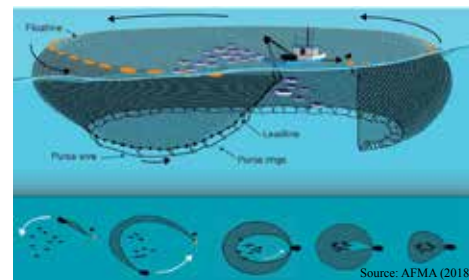


*Consist of falling net, push net, lift net, traps, hook and line, etc

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Purse seine fishing in Thailand

- Thai purse seine (TPS)
- Anchovy purse seine (APS)



6

TPS (*Uan dum* = Black seine)



- Net: PA (polyamide) with black colour
- Length of float-line: 400-1,800 m
- Net depth: 60-110 m
- Mesh size: ≥ 25 mm

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- Fishing techniques can be divided into 3 operation types
 - Free school (FS)
 - Light luring (LL)
 - Fish aggregating device (FAD)
- Catch: Indo-Pacific mackerel, Indian mackerel, sardine, scads, bonitos, black pomfret and ponyfish

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APS



- Net: PA (knotless) with green or brown colour
- Length of float-line: 250-450 m
- Net depth: 15-80 m
- Mesh size: > 6 mm

- 2 types of anchovy purse seiners
 - Fishing boat without boiler
 - Fishing boat with boiler
- Catch: anchovies

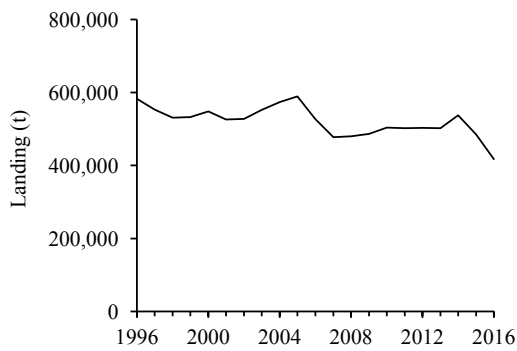


Fishing areas

- Main fishing grounds are located in GOT and ANS
- Depth of fishing grounds for both Thai and anchovy purse seiners is < 100 m

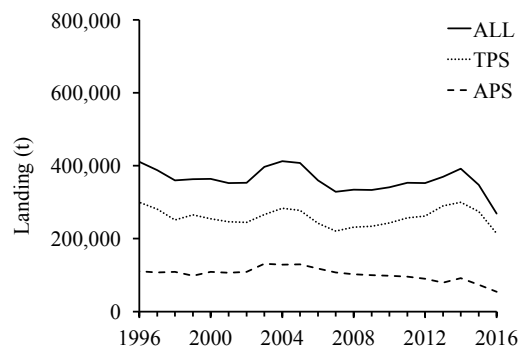
2. Catch and effort statistics

Total landing (t) by all purse seiners



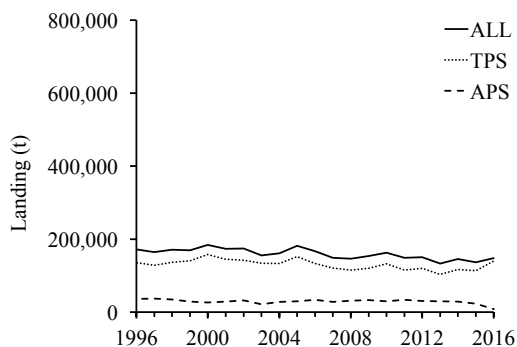
13

Total landing (t) from GOT



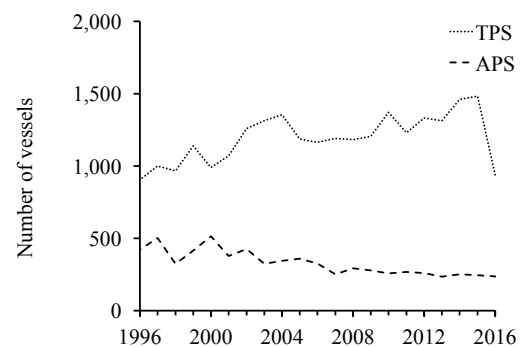
14

Total landing (t) from ANS



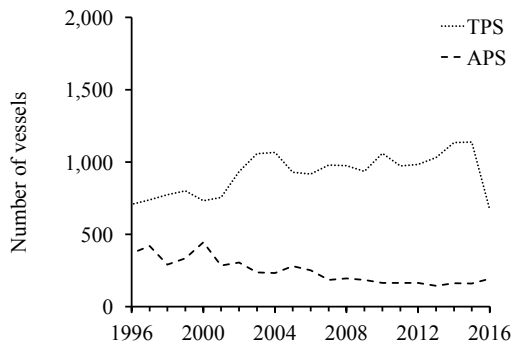
15

Number of purse seine vessels



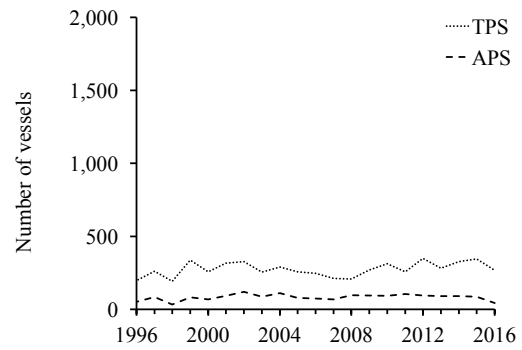
16

Number of purse seine vessels in GOT



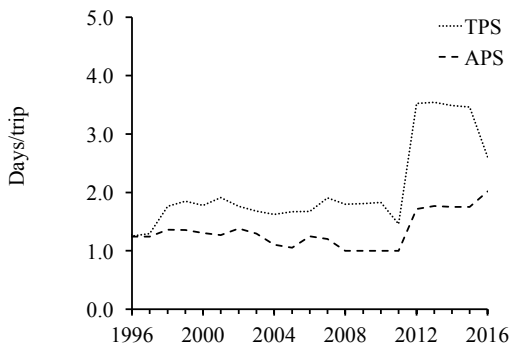
17

Number of purse seine vessels in ANS



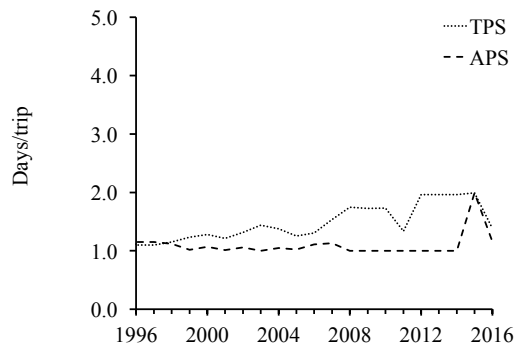
18

Number of fishing days/trip in GOT



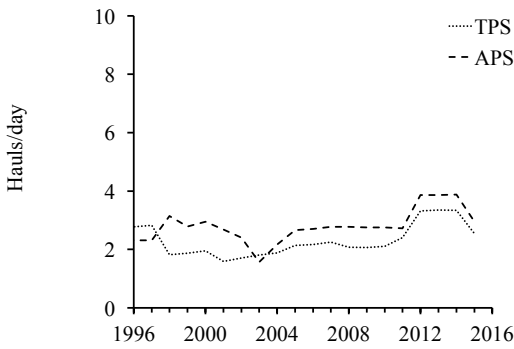
19

Number of fishing days/trip in ANS



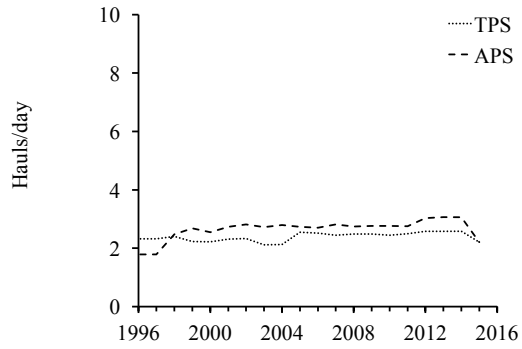
20

Number of hauls/day in GOT



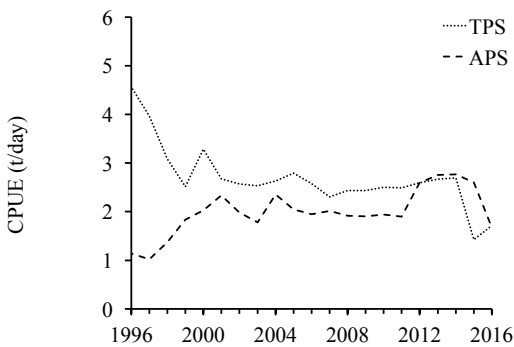
21

Number of hauls/day in ANS



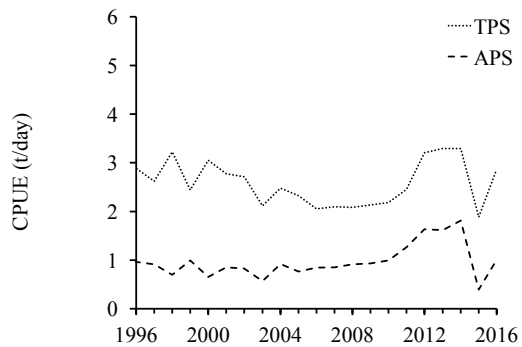
22

Catch per unit effort (CPUE) in GOT



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Catch per unit effort (CPUE) in ANS

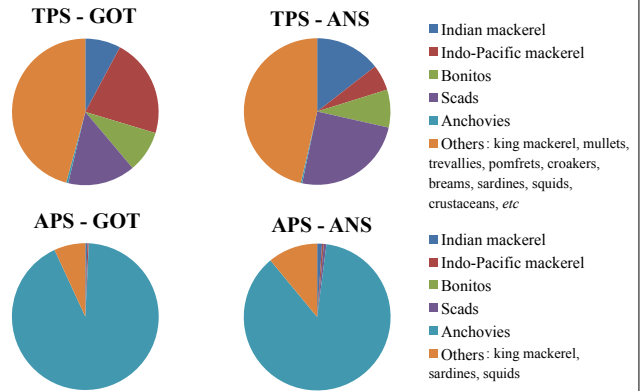


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3. Biological information

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Species composition



Length at 1st maturity of female

Species	Total length (cm)	
	GOT	ANS
<i>Rastrelliger brachysoma</i>	17.95 ^a	15.33 ^a
<i>Rastrelliger kanagurta</i>	17.12 ^a	18.92 ^a
<i>Sardinella gibbosa</i>	10.35 ^b	13.12 ^c
<i>Decapterus maruadsi</i>	13.19 ^d	15.66 ^e
<i>Selar crumenophthalmus</i>	18.25 ^f	19.95 ^g
<i>Encrasicholina punctifer</i>	6.51 ^h	6.47 ⁱ
<i>Encrasicholina heteroloba</i>	7.49 ^j	6.44 ⁱ
<i>Encrasicholina devisi</i>	7.81 ^j	7.21 ⁱ

^aKrajangdara *et al.* (2007); ^bNasuchon *et al.* (2010); ^cKrajangdara and Chalee (2004); ^dHussadee *et al.* (2015); ^eSupongpan *et al.* (2003); ^fPhutharaksa *et al.* (2008); ^gChalee and Yakoh (2013); ^hSinanun *et al.* (2012); ⁱYakoh *et al.* (2014); ^jNasuchon and Pantuleng (2005)

Spawning Season

Species	Peak season	
	GOT	ANS
<i>Rastrelliger brachysoma</i>	Feb-May/Jul-Oct ^a	Nov-May/Jul-Sep ^a
<i>Rastrelliger kanagurta</i>	Jan-Mar/May/Jul/Sep/Nov ^a	Dec-Mar/Aug-Sep ^a
<i>Sardinella gibbosa</i>	Mar-Dec ^b	Apr-Jun/Aug-Sep/Nov-Jan ^c
<i>Decapterus maruadsi</i>	Jan-Mar/May-Jul ^d	Dec-Feb ^e
<i>Selar crumenophthalmus</i>	Mar-Jun/Oct-Nov ^f	Sep ^g
<i>Encrasicholina punctifer</i>	N.A.	Jan ^h
<i>Encrasicholina heteroloba</i>	Nov-Jan ⁱ	Jul ^h
<i>Encrasicholina devisi</i>	N.A.	Jun ^h

^aKrajangdara *et al.* (2007); ^bNasuchon *et al.* (2010); ^cKrajangdara and Chalee (2004); ^dHussadee *et al.* (2015); ^eSupongpan *et al.* (2003); ^fPhutharaksa *et al.* (2008); ^gChalee and Yakoh (2013); ^hYakoh *et al.* (2014); ⁱMunprasit (1996)

Growth and mortality parameters

Species	L _∞ (cm)	K (year ⁻¹)	T ₀ (year)	Z (year ⁻¹)	M (year ⁻¹)	F (year ⁻¹)
<i>Rastrelliger brachysoma</i> ^a	22.00	2.50	-0.003	6.12	N.A.	N.A.
<i>Rastrelliger kanagurta</i> ^b	26.98	1.60	-0.003	5.32	2.56	2.76
<i>Sardinella gibbosa</i> ^c	21.68	1.61	-0.007	9.91	2.21	7.70
<i>Decapterus maruadsi</i> ^d	27.75	1.01	0.000	6.43	1.89	4.54
<i>Selar crumenophthalmus</i> ^e	28.40	1.87	0.000	7.03	2.22	4.81
<i>Encrasicholina punctifer</i> ^f	10.80	1.85	-0.011	11.35	2.90	8.45
<i>Encrasicholina Heteroloba</i> ^f	10.60	1.70	-0.011	10.91	2.76	8.15
<i>Encrasicholina devisi</i> ^f	10.54	1.80	-0.011	9.59	2.88	6.72

^aSinanun *et al.* (2012); ^bThongsila *et al.* (2012); ^cBoonjorn *et al.* (2013); ^dYamrungrueng *et al.* (2018); ^eKhemakorn *et al.* (2015); ^fBoonsuk *et al.* (2010)

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4. Status on pelagic fish stock

Maximum sustainable yield (MSY) vs Catch (MFRDD, 2018)

Group	Area	MSY (t) (A)	Catch (t) (B)	(B)/(A)
Pelagic fishes	GOT	250,739	199,507	0.80
	ANS	118,755	121,400	1.02
	All	369,494	320,907	0.87
Anchovies	GOT	201,564	108,212	0.54
	ANS	33,194	13,570	0.41
	All	234,758	121,782	0.52

5. Existing management strategies

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Management measures

- New Fisheries Acts (Royal Ordinance on Fisheries) have been established in 2015 and revised in 2017
- Regulations for marine capture were updated
- For purse seine, the regulations are enforced to control the gear and effort
- Vessel owners must renew their fishing license every 2 years

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- **Mesh size:** ≥ 25 mm for TPS and > 6 mm for APS
- **Fishing time:** only daytime operation is allowed for APS
- **Closed seasons:** 4 periods in GOT and 1 period in ANS
- **Closed areas:** Trad Bay for LL operation of TPS and coastal zone announced by each coastal province

Thank you for your kind attention



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**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

***Country Presentation*
VIET NAM**

The Purse Seine Fisheries in Viet Nam

by

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The Purse Seine Fisheries in Vietnam

The 4th Core Expert Meeting

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PURSE SEINE FISHERIES

1) INTRODUCTION

- Overview of Viet Nam fisheries
- Overview of purse seine

PURSE SEINE FISHERIES

- Purse seine is one of the most important type of fishing gear in the marine fishing sector of Viet Nam.
- Purse seine have potential to operate in offshore areas.
- The catch of purse seine accounts for 16-22% (~20.6%) of the total catch.
- The main species of the local and commercial types of surrounding net are small pelagic fish including: sardines, mackerels, round scads, neritic tunas, anchovies etc.

PURSE SEINE FISHERIES

2) CATCH AND EFFORT STATISTIC BY PURSE SEINE.

- Total no. of fishing vessels vs. Vessel of PS.
- Trend of Purse seiners
- Other fishing efforts (trips, days, hauls)
- CPUEs
- Total catch & PS catch

1) INTRODUCTION ON THE PURSE SEINE (PS)

2) CATCH AND EFFORT STATISTIC BY PS

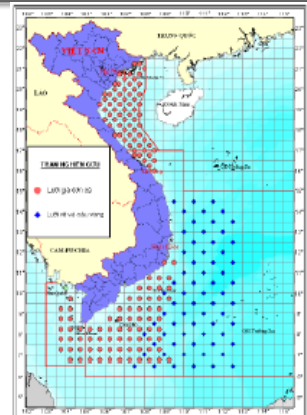
3) BIOLOGICAL INFORMATION

4) STATUS OF PELAGIC FISH STOCK

5) EXISTING MANAGEMENT STRATEGIES FOR PS FISHERIES

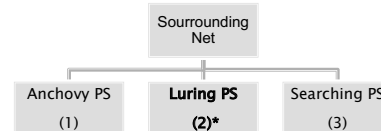
OVERVIEW

- ❖ Viet Nam has a long coastline of 3,260 km; and a large EEZ of more than 1 million km²;
- ❖ Marine Captured Fisheries play an important role in the social and economic development;
- ❖ The total number of fishing boats have increased rapidly from about 79,996 units (2007) up to 108,504 units (2017);
- ❖ The productions were increased, but CPUE decreased gradually;
- ❖ Vietnam fisheries are multi-species, multi-fishing gears and small scale. Thus difficulty for proper statistical data collection



PURSE SEINE

- ❖ Classification of fishing gears in Viet Nam: (Surrounding Net):



1) Anchovy purse seine: target on anchovy (popular in S.W)

2*) Luring purse seine: for small pelagic fishes (most popular)

3) Searching Purse Seine: not popular

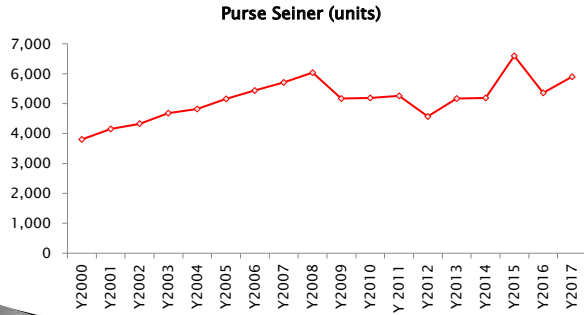
- Small pelagic fish
- Tuna purse seine

TOTAL NUMBER OF FISHING VESSEL vs. PS

Year	Total fishing vessel (units)	Purse Seiner (units)	Reference
Y2000	75,928	3,804	D-Fish, (2000-2017)
Y2001	78,978	4,148	
Y2002	81,800	4,327	
Y2003	83,122	4,684	
Y2004	85,430	4,818	
Y2005	90,880	5,163	
Y2006	93,651	5,438	
Y2007	95,609	5,712	
Y2008	102,231	6,033	
Y2009	120,326	5,171	
Y2010	128,021	5,191	
Y 2011	128,363	5,261	
Y2012	123,125	4,567	
Y2013	117,016	5,171	
Y2014	105,086	5,191	
Y2015	107,308	6,596	
Y2016	108,706	5,361	
Y2017	108,504	5,897	

Trend of purse seiners

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TOTAL NUMBER OF TRIPS, DAYS, HAULS

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Year	Trips/year	Days/year	Hauls/day	Reference
Y2000	12	202	1-3	RIMF- Nguyen Van Khang et al., 2011
Y2001	12	200	1-3	
Y2002	12	202	1-3	
Y2003	13	203	1-3	
Y2004	12	202	1-3	
Y2005	11	180	1-3	
Y2006	11	174	1-3	
Y2007	10	168	1-3	
Y2008	11	185	1-3	
Y2009	12	202	1-3	
Y2010	11	179	1-2	RIMF- Nguyen Phi Toan et al., 2016
Y2011	11	177	1-2	
Y2012	11	174	1-2	
Y2013	10	172	1-2	
Y2014	10	170	1-2	
Y2015	10	167	1-2	

TREND OF CPUE

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Year	CPUE tons/vessel/year	CPUE kg/day/vessel	CPUE tons/vessel/year (with hp>=90)	CPUE kg/day/vessel (with hp>=90)	Reference
Y2000	84	700			RIMF- Nguyen Van Khang et al., 2011
Y2001	79	663			
Y2002	51	425			
Y2003	59	487			
Y2004	51	420			
Y2005	47	182			
Y2006	61	453			
Y2007	72	716			
Y2008	91	781			
Y2009	133	734			
Y2010			78	751	RIMF- Nguyen Phi Toan et al., 2016
Y 2011			79	770	
Y2012			68	715	
Y2013			61	696	
Y2014			77	835	
Y2015			115	1,255	

TOTAL CATCHES vs. PS CATCHES

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Year	Total catch (tons)	Reference	Year	Total catch/landings (tons) of PS	Reference
Y2000	1,280,591	MARD (2000-2017) Statistics	Y2000	320,636	RIMF- Nguyen Van Khang et al., 2011
Y2001	1,347,800		Y2001	328,562	
Y2002	1,434,800		Y2002	220,895	
Y2003	1,426,223		Y2003	276,813	
Y2004	1,724,200		Y2004	243,446	
Y2005	1,809,700		Y2005	245,074	
Y2006	1,823,700		Y2006	329,224	
Y2007	1,876,000		Y2007	413,374	
Y2008	1,937,000		Y2008	547,713	
Y2009	2,068,000		Y2009	688,133	
Y2010	2,240,000	Y2010	358,400	492,800	Estimated
Y2011	2,340,000	Y2011	374,400	514,800	
Y2012	2,434,000	Y2012	389,440	535,480	
Y2013	2,607,000	Y2013	417,120	573,540	
Y2014	2,722,000	Y2014	435,520	598,840	
Y2015	2,840,000	Y2015	454,400	624,800	
Y2016	3,035,900	Y2016	485,744	667,898	
Y2017	3,199,000	Y2017	511,840	703,780	

(* Blue Data): PS Catches = 16-22% * Total catches

TARGET OF PS FISHERIES

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3) BIOLOGICAL INFORMATION:

- Catch compositions
- Dominant species
- Lm50
- Spawning
- Growth and mortality parameters

SPECIES COMPOSITION OF PS FISHERIES

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- 1) Anchovy PS: target for anchovy
- 2) Luring PS:

Scientific Name	Nhóm thương phẩm	Rate (%)				Ref
		Tonkin Gulf	Central water	Southeast	Southwest	
<i>Decapterus spp</i>	Cá nục	57.4	40.0	48.9	8.3	Vũ Việt Hà, 2015
Scombridae	Cá ngừ	12.0	32.4	19.4	31.3	
<i>Rastrelliger Kanagurta</i>	Cá bạc má	7.4	1.2	8.9	5.9	
Engraulidae	Cá cơm	6.4	-	-	18.0	
<i>Priacanthus spp</i>	Cá trác	-	3.1	2.8	-	
<i>Sardinella spp</i>	Cá trích	4.9	-	1.7	1.2	
<i>Atule mate</i>	Cá ngừ	3.3	2.8	3.8	3.4	
Other fish	Cá khác	8.6	6.3	5.4	9.8	
<i>Selaroides leptolepis</i>	Cá chỉ vàng	-	7.9	1.9	-	
<i>Megalaspis cordyla</i>	Cá sông gió	-	6.3	-	-	
<i>Alepes spp</i>	Cá tráo	-	-	7.2	3.8	
<i>Rastrelliger brachysoma</i>	Cá ba thú	-	-	-	18.3	
Total		100.0	100.0	100.0	100.0	

Notes: "-" less than 1% of total catch; "Other fish": rest of fish species less than 1% of total catch

- 3) Searching PS: target for tuna (coastal and offshore tuna)

DOMINANT SPECIES – by Purse Seine

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No	Common name (EN)	Scientific Name
1	Yellowtail scad	<i>Atule mate</i>
2	Wolf-herring	<i>Chirocentrus dorab</i>
3	Dolphin fish	<i>Coryphaena spp.</i>
4	Shortfin scad	<i>Decapterus macrosoma</i>
5	Japanese scad	<i>Decapterus maruadsi</i>
6	Torpedo scad	<i>Megalaspis cordyla</i>
7	Black pomfret	<i>Parastromateus niger</i>
8	Short mackerel	<i>Rastrelliger brachysoma</i>
9	Indian mackerel	<i>Rastrelliger kanagurta</i>
10	Herring	<i>Sardinella spp.</i>
11	Japanese mackerel	<i>Scomber spp.</i>
12	Scomberoides	<i>Scomberoides spp.</i>
13	Bigeye scad	<i>Selar spp.</i>
14	Yellowstripe scad	<i>Selaroides leptolepis</i>
15	Barracuda	<i>Sphyraena spp.</i>
16	Anchovy	<i>Stolephorus spp.</i>
17	Japanese horse mackerel	<i>Trachurus japonicus</i>
18	Hairtail	<i>Trichurus spp.</i>

Growth and mortality parameters (2011-2015)

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Sites	species	Growth		Mortalities			Exploitation	Reference	
		L _∞	K	Z	M	F	M/K		E=F/Z
1. Tonkin Gulf	<i>Decapterus maruadsi</i>	27.8	0.97	3.25	1.76	2.19	1.81	0.55	RIMF, Nguyen Viet Nghia et al (2017)
	<i>Encrasicholina heteroloba</i>	10.5	1.5	6.92	3.07	3.15	2.05	0.51	
	<i>Rastrelliger kanagurta</i>	26.8	1.2	6.36	2.08	3.15	1.73	0.50	
	<i>Auxis rochei</i>	32	0.68	3.19	1.36	1.83	2.00	0.57	
2. Central water	<i>Decapterus maruadsi</i>	27.8	0.98	4.06	1.80	2.26	1.84	0.56	
	<i>Encrasicholina punctifer</i>	11	1.7	7.33	3.34	3.99	1.96	0.54	
	<i>Rastrelliger kanagurta</i>	27.8	1.1	4.33	1.94	2.39	1.76	0.55	
	<i>Auxis rochei</i>	32.3	0.68	6.22	1.36	4.86	2.00	0.78	
3. Southeast	<i>Auxis thazard</i>	45.7	0.62	2.31	1.16	1.15	1.87	0.50	
	<i>Decapterus maruadsi</i>	25.7	1.1	4.67	1.99	2.69	1.81	0.58	
4. Southwest	<i>Rastrelliger kanagurta</i>	26.8	1.2	6.39	2.08	4.31	1.73	0.67	
	<i>Atule mate</i>	27.8	0.97	3.56	1.79	1.77	1.85	0.50	
	<i>Encrasicholina heteroloba</i>	8.4	1.8	6.96	3.74	3.22	2.08	0.46	
	<i>Rastrelliger brachysoma</i>	22.6	1.8	7.75	2.84	4.91	1.58	0.63	
	<i>Rastrelliger kanagurta</i>	23.6	1.5	5.12	2.49	2.63	1.66	0.51	
	<i>Selaroides leptolepis</i>	16.3	1.2	4.24	2.39	1.85	1.99	0.44	

Spawning season (2011-2015)

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Sites	Targeted species	Year	Viet Nam		Reference
			Spawning season	Lm (cm)	
1. Tonkin Gulf	<i>Decapterus maruadsi</i>	2014-2015	Feb - May and July-Aug	17.3	RIMF, Nguyen Viet Nghia et al (2017)
	<i>Encrasicholina heteroloba</i>	2014-2015	June-Aug and Oct -Nov	6.1	
	<i>Rastrelliger kanagurta</i>	2014-2015	Feb -May	18.3	
2. Central water	<i>Auxis rochei</i>	2014-2015	July - Aug and Apr-May	21.6	
	<i>Decapterus maruadsi</i>	2014-2015	Mar - May	19.8	
	<i>Encrasicholina punctifer</i>	2014-2015		5.3	
3. Southeast	<i>Rastrelliger kanagurta</i>	2014-2015	Mar - May and Sep - Oct	18.2	
	<i>Auxis rochei</i>	2014-2015	Feb - July	21.6	
	<i>Auxis thazard</i>	2014-2015	Feb - July	30.5	
	<i>Decapterus maruadsi</i>	2014-2015	Feb - July	16.4	
4. Southwest	<i>Rastrelliger kanagurta</i>	2014-2015	Feb - July	18.9	
	<i>Atule mate</i>	2014-2015	Apr - Aug	16.8	
	<i>Encrasicholina heteroloba</i>	2014-2015		4.9	
	<i>Rastrelliger brachysoma</i>	2014-2015	Fep - Apr and Aug - Oct	14.5	
	<i>Rastrelliger kanagurta</i>	2014-2015	June - Aug	16.4	
	<i>Selaroides leptolepis</i>	2014-2015	Jan - May	9.8	

PURSE SEINE FISHERIES

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5) EXISTING MANAGEMENT STRATEGIES FOR PS FISHERIES.

- Documents on management fisheries
- Regulation related to PS (input control).

4) STATUS OF PELAGIC FISH STOCK

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In general, the estimated standing biomass of the marine fisheries resources in Vietnam 2011-2015, at 4.36 million tons (ranging from 4.1 to 4.6 million tons) in which:

- Small pelagic fishes about 2,650 thousand tons; MSY about 1,580 thousand tons;
- Demersal fishes are 683 thousand tons;
- Oceanic pelagic fishes are 1,031 thousand tons.

Maximum Sustainable Yield, MYS (Small pelagic fish)

Area	2011-2015		Reference
	Biomass	MSY	
Gulf Tonkin	626	375.6	RIMF, Nguyen Viet Nghia et al. (2017)
Central water	616.4	369.9	
Southeast	891.5	534.9	
Southwest	510.5	306.3	
Total	2,644.40	1,586.70	

FISHERIES MANAGERMENTS

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- 1) Fisheries management, Viet Nm has issued legal documents such as Fisheries Law (2003) – in 2019 – Fisheries Law (2017) and Decrees (33), Circulars (02/2006, 62/2008)...etc.
- 2) Recently, Viet Nam Government has issued "Master plan on fisheries development of Viet Nam to 2020, vision to 2030".

In which:

- + By 2020, to stabilize exploitation fisheries output of 2.4 million tones.
- + Total number of fishing boat in the whole VN: 110,000 units (2020), 95,000 units (2030). Offshore fishing boat remain about 30,000 units.
- + There are some research about season areas and fishing areas which are being studied.



REGULATIONS RELATED TO PS

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1) Minimum mesh size at the bunt at Circulars 02/2006 of Ministry of Fisheries (old)

No	Vietnamese name	English name	Minimum mesh size at the bunt (mm)	Reference
1	Lưới vây cá cơm	Anchovy PS	10 mm	MOF, (2006)
2	Lưới vây rút chì	Luring PS	18 mm	Circulars 02/2006

2) Minimum length of some small pelagic at Circulars 62/2008 of Ministry of Agriculture

No	Vietnamese name	Scientific name	(cm)	Reference
1	Cá Trích xương	<i>Sardinella jussieu</i>	8	MARD, (2008) Circulars 62/2008
2	Cá Trích tròn	<i>Sardinella aurita</i>	10	
3	Cá Cơm	<i>Anchoviella spp.</i>	5	
4	Cá nục sỏ	<i>Decapterus maruadsi</i>	12	
5	Cá Chỉ vàng	<i>Selaroides leptolepis</i>	9	
6	Cá Thu chấm	<i>Scomberomorus guttatus</i>	32	
7	Cá Thu nhát	<i>Scomber japonicus</i>	20	
8	Cá Ngừ chù	<i>Auxis thazard</i>	22	
9	Cá Ngừ chấm	<i>Euthynnus affinis</i>	36	
10	Cá Bạc má	<i>Rastrelliger kanagurta</i>	15	

3) Beside, regulations of fishing restrict area, time at Circulars 62/2008...

REMARKS

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ISSUES

- Decrease of the marine fisheries resources in all waters of Viet Nam.
- Fishing techniques underdeveloped.
- Lack of funds for research of fish stocks, biological information for target species.
- The level of education of fishermen are low.
- The implementation of fisheries management regulations are limited at fishermen communities.
- Not yet effective fisheries management tools for purse seine fisheries.

FUTURE WORKS

- To raise knowledge, especially for coastal fishermen communities continuously.
- Strengthen capacity for various stakeholders (scientists, managers, policy makers, fishermen, etc.).
- Collaborative and comprehensive study for managements.

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MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT (MARD)

RIMF and D-FISH

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Thanks for your attention!
Trân trọng cảm ơn!





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

Genetic Population Structure of *Amblygaster sirm* in Southeast Asian Region

by

**Ms. Wahidah Mohd Arshaad^a
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^aSenior Researcher
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SEAFDEC/MFRDMD



Genetic Population Structure of *Amblygaster sirm* in Southeast Asian Region

Prepared by
WAHIDAH Mohd Arshaad
NOORUL AZLIANA Jamaludin
19 September 2018

Introduction

- CEM in 2014 had agreed to choose *Amblygaster sirm* as the targeted species for genetic population study and mtDNA cytochrome *b* as the genetic marker.
- Based from the previous result and also presented in CEM 2016, **no significant or homogenous structure** of *Amblygaster sirm* in **4 locations in South China Sea** (Kudat, Kuantan, Muara and Songkhla).

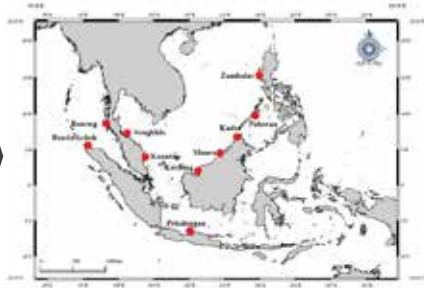
However...

- From CEM 2017, the results based from both sides; South China Sea and Andaman Sea (particularly from Ranong) shows a genetic different from *Amblygaster sirm* inferred by mtDNA Cyt *b* gene.
- To confirm this result, additional data was taken and analysis was done using other gene (mtDNA COI) for comparison/confirmation.
- The current result was discussed among genetic experts during workshop in August 2018 at Langkawi, Malaysia.

Materials and Methods



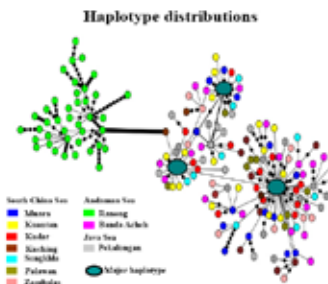
Sampling sites (Cyt *b*)



10 locations, 323 samples

Results (Cyt *b*)

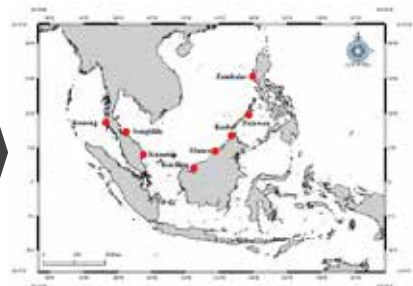
1. **TWO groups** of *Amblygaster sirm* with **HIGH** genetic distance between South China Sea (including Banda Aceh (southern Andaman Sea) and Ranong (northern Andaman Sea).



	Muara	Kuching	Kudat	Kuantan	Palawan	Songkhla	Zambales	Pakalangan	Banda Aceh	Ranong
Muara	0.000									
Kuching	0.003	0.004								
Kudat	0.003	0.003	0.002							
Kuantan	0.003	0.003	0.002	0.003						
Palawan	0.003	0.003	0.003	0.003	0.003					
Songkhla	0.003	0.003	0.003	0.003	0.003	0.003				
Zambales	0.003	0.003	0.003	0.003	0.003	0.003	0.003			
Pakalangan	0.004	0.004	0.003	0.003	0.003	0.003	0.004	0.004		
Banda Aceh	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.004	
Ranong	0.021	0.021	0.016	0.015	0.011	0.011	0.011	0.011	0.011	0.007

Genetic differentiation (distance) shows **very high divergence (~7%)** between Ranong and other locations.

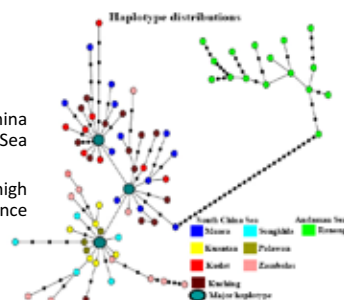
Sampling sites (COI)



8 locations, 138 samples

Results (COI)

1. **TWO groups** for South China Sea and Andaman Sea (Ranong).
2. Same result as Cyt *b* with high genetic distance/divergence (~5%).



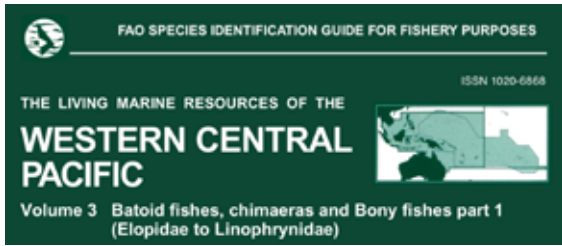
Amblygaster sirm (morphology)



Kuala Terengganu, Malaysia

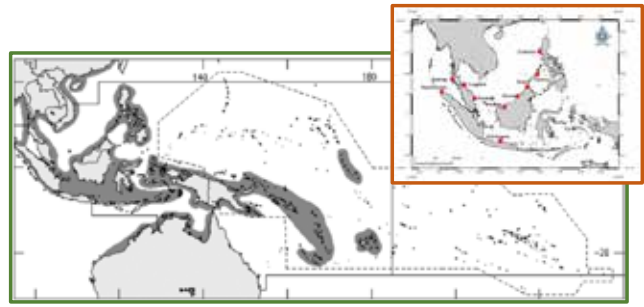


Ranong, Thailand



28/04/2019

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28/04/2019

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This led to the assumptions (from the workshop in August, 2018)

- Two different stocks of *Amblygaster sirm* between Ranong (northern Andaman Sea) and South China Sea (including southern Andaman Sea) - not agreed by genetic experts due to the genetic distance was very high.
- Different species/existing of sub-species. Possibility of expansion of genetic content but not in morphology.

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Contribution factors/recommendations

- There are many factors that could have attributed to the existence of the sub-species or taxon such as;
 - i. Hybrid
 - ii. Faster rate of genetic evolution
 - iii. Discovery of new or cryptic species

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Recommendations

- Future studies should include nuclear DNA such as microsatellites and RAG to provide paternal origin information.
- Additional samples from Bay of Bengal could also verify the current results.
- A more detailed morphological investigations is also crucial to identify any subtle differences between the two clades.
- A larger geographical coverage is essential for the Andaman Sea (northern).

28/04/2019

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Conclusion

Both the DNA markers used in this study revealed two highly genetic divergent stocks; Ranong vs the rest of the populations (South China Sea and Andaman Sea (southern part)). It is recommended that these stocks should be independently managed.

28/04/2019

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Thank
You



28/04/2019

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**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
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**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

**Rapid Assessments – Risk and Fisheries overview Towards Development of
Fisheries Management Plan**

by

Mr. Abu Talib Ahmad

Resource Person

Former Senior Director of FRI Batu Maung, Department of Fisheries, Malaysia

TOWARDS DEVELOPMENT OF FISHERIES MANAGEMENT PLAN

BY

MR. ABU TALIB AHMAD
FORMER FRI MALAYSIA, SENIOR DIRECTOR

19 SEPTEMBER 2018

(1)

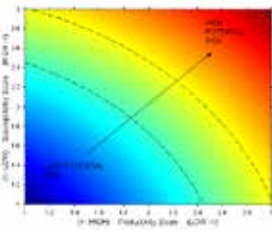
RAPID ASSESSMENTS FOR MANAGEMENT

- (1) Risk based approaches are designed to handle data poor situations –have been developed in Australia and then applied by the Marine Stewardship Council (MSC)
- (2) Fisheries Assessment evaluate fisheries against performance standards to help focus and guide management responses. It adopted from MSC Benchmarking Standard methodology.

Combining these approaches;

- There is much value for an EAFM, i.e. An integrated approach, and helps implement the FAO Code of Conduct for Responsible Fisheries (CCRF)
 - Cost Effective, Flexible and Relevant to management.
- (2)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)



Source: Hobday et al., 2007

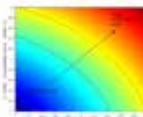
Examines for each species:

- Seven attributes under **productivity**
(1. age at maturity, 2. Max. Age, 3. Fecundity, 4. Max. Size, 5. Size at maturity, 6. Reproductive strategy, 7. Trophic level)
 - Four attributes of the different aspects under **susceptibility** (~ q)
(1. Availability, 2. Encounterability, 3. Selectivity, 4. Post capture mortality)
- => Risk level for the species

(3)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

Interpretation of the results:



- ✗ The results measure the potential risk from direct impacts of fishing on the fish species in terms of potential to be stock overfished or experiencing overfishing.
 - ✗ Impacts from other anthropogenic factors such as pollution, climate change, habitat lost etc. are not included.
 - ✗ PSA helps managers to determine whether existing management measures and regulations were appropriate, and
 - ✗ Identify appropriate effort of specific data collection for this complex multi-species fishery.
- (4)

(2). FISHERIES ASSESSMENT: (MSC PRE-ASSESSMENT –ASSESSING EAF PERFORMANCE & SETTING WORKABLE GOALS)



(5)

(2). FISHERIES ASSESSMENT

The 3 MSC Principles (in response to EAF)

Principle 1 (Stock Status)	A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery .
Principle 2 (Ecosystem Impacts)	Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends
Principle 3 (Fisheries Management)	The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

(6)

(2). FISHERIES ASSESSMENT

Principles 1:
A fishery must be conducted in a manner that does **not lead to over-fishing** or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably **leads to their recovery**.

Performance Indicator/ Criterion	Details	Status Weak/Inter./Good
1.1 : Outcome		
1.1.1 : The Stock	-the stock allow recruitment to take place -the stock is around its target ref. point	
1.1.2 : Reference Points	-the ref. point is can be est., allow reproductive capacity & consistence with BMSY	If unknown: - do TAC, PSA, Kobe Plot, etc.
1.2 : Harvest Strategy		
1.2.1 : Harvest Strategy	-Towards achieving management objectives, (tested) & monitored.	
1.2.2 : Harvest Control –Rules & Tools	-well define & in place, is appropriate / effective in achieving levels required	
1.2.3 : Information Monitoring	-Info. on stock (structure, productivity), fleet & other are available to support 1.2.1	
1.2.4 : Assessment of Stock Status	-assessment evaluating stock status relative to ref. points (subject to peer review)	

(7)

(2). FISHERIES ASSESSMENT

Principle 2 :
Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of **the ecosystem** (including habitat and associated dependent and ecologically related species) on which the fishery depends

Performance Indicator/ Criterion	Details	Status Weak/Inter./Good
2.1 Retained Species		
2.1.1 Stock Status	-within biological limits, allow recovery	If unknown:
2.1.2 Management Strategy	-strategy in place for managing by-catch -Information on strategy that implemented	- do TAC, PSA, Kobe Plot, etc
2.1.3 Information/ monitoring	-Information is adequate to support a partial strategy to manage main retained species.	
2.2 By-catch Species	-By-catch sp. arey likely within biological limit.	
2.3 ETP Species	-Direct effects are highly unlikely to create unacceptable impacts to ETP species.	
2.4 Habitat	-The fishery unlikely to reduce habitat structure and function	
2.5 Ecosystem (Comm., trophic impacts etc)	-fishery is unlikely to disrupt the key elements underlying ecosystem structure and function	

(8)

(2). FISHERIES ASSESSMENT

Principle 3:

The fishery is subject to an **effective management** system that respects local, national and international **laws and standards** and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Performance Indicator/ Criterion	Details	Status
		Weak/inter/Good
3.1 Governance and policy	ref. to PAFM, EAFM and PSA measures?	
3.1.1 Legal and/or customary framework	consistent with local, national & l/national laws	
3.1.2 Consultation, roles & responsibilities		
3.1.3 Long term objectives	have clear long-term obj.	
3.1.4 Incentives for sustainable fishing	system provide economic & social incentives	
3.2 Fishery-specific management system		
3.2.1 Fishery- specific objectives		
3.2.2 Decision-making processes		
3.2.3 Compliance & enforcement		
3.2.4 Research plan	Results are avail. to all?	
3.2.5 Management performance evaluation	Peer review structure?	

(9)

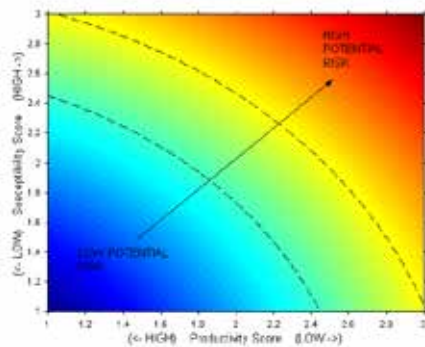
(2). FISHERIES ASSESSMENT

The out-comes: Summary scores of the 3 principles

Unit of Assessment		Indian Mackerel											
		Principle 1: Stock status			Principle 2: Ecosystem impacts			Principle 3: Governance & Management					
Species	Gear	Outcome	Harvest zone	Retained	Bycatch	ETP	Habitat	Ecosystem	Policy	Management	Enforcement	Research	Review
L. mackerel	Purse seine	1.1. Stocking	1.2. Harvest zone	2.1. Retained	2.2. Ecosystem	3.1. Policy	3.2. Management	3.3. Enforcement	3.4. Research	3.5. Review	3.6. Compliance	3.7. Evaluation	3.8. Improvement
L. mackerel	Boat otter trawl	1.1. Stocking	1.2. Harvest zone	2.1. Retained	2.2. Ecosystem	3.1. Policy	3.2. Management	3.3. Enforcement	3.4. Research	3.5. Review	3.6. Compliance	3.7. Evaluation	3.8. Improvement
L. mackerel	Gill nets	1.1. Stocking	1.2. Harvest zone	2.1. Retained	2.2. Ecosystem	3.1. Policy	3.2. Management	3.3. Enforcement	3.4. Research	3.5. Review	3.6. Compliance	3.7. Evaluation	3.8. Improvement

(10)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)



(11)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

Two case studies on Small Pelagic

A). Indian Mackerel – multi gears

- (BOBLME project report)

B). Purse-seine Fishery – multi species

- (West Coast Peninsular Malaysia, FAO W/shop)

(12)

PELAGIC FISHES: PERCENTAGE CONTRIBUTION OF LANDINGS BY GEAR TYPE

Fishery on the West Coast of Peninsular Malaysia: Percentage contribution by gear, >10% is case study (B)

ISCAAR Code	Family Name	Scientific Name	Valid Common Name	Contribution (%)		
				Trawl	Purseine	Drift/Gill
24	CLUPEIDAE	<i>Pellona ditchea</i>	Indian pellona	31	51	18
		<i>Wala elongata</i>	Elongate wala	22	44	34
		<i>Siganus argenteus</i>	Streamlined spinefoot	43	8*	3*
	LEIOGNATHIDAE	<i>Leiognathus splendens</i>	Splendid ponyfish	23	12	64
		<i>Leiognathus bindus</i>	Omble ponyfish	23	12	64
		<i>Scolecoperca</i>	Deep pigmyse ponyfish	23	12	64
		<i>Gazza minuta</i>	Toothpony	23	12	64
34	CARANGIDAE	<i>Parastromateus niger</i>	Black pomfret	74	2*	22
		<i>Alopius sp.</i>	Shrimp scad	33	62	4*
		<i>Alopius melanoptera</i>	Blackfin scad	33	62	4*
		<i>Atrypus atrypus</i>	Clefbelly trevally	33	62	4*
		<i>Alopius maculatus</i>	Yellowtail scad	18	60	2*
		<i>Decapterus macrodon</i>	Shortfin scad	3*	97	
		<i>Decapterus maruadi</i>	Japanese scad	3*	97	
		<i>Megastoma conyle</i>	Torpedo scad	43	62	6*
		<i>Gnatharodon speciosus</i>	Golden trevally	16	84	
		<i>Selar biops</i>	Oxeye scad	37	63	
		<i>Solea cornuocapitulum</i>	Bigeve scad	37	63	
		<i>Selene setiferus</i>	Yellowstripe scad	62	18	
	SPHYRAENIDAE	<i>Sphyraena jello</i>	Pickhandle barracuda	85	4*	6*
35	CLUPEIDAE	<i>Sardinella fimbriata</i>	Fringescale sardinella	50	46	
		<i>Dussumneria acuta</i>	Rainbow sardine	15	85	
		<i>Morone chirocentrus</i>	Slender rainbow sardine	15	85	
		<i>Engraulis mordax</i>	White sardine	17	81	2*
	ENGRAULIDAE	<i>Collette dussumieri</i>	Goldspotted grenadier anch	3*	4	
		<i>Stolephorus indicus</i>	Indian anchovy	3*	4	
		<i>Stolephorus commersonii</i>	Commerson's anchovy	3*	4	
36	SCOMBRIDAE	<i>Thunnus tonggol</i>	Longtail tuna	8*	91	1*
		<i>Euthynnus affinis</i>	Eastern little tuna	1*	99	
		<i>Scomberomorus commerson</i>	Narrowbarred spanish mac	34	5	60
		<i>Scomberomorus guttatus</i>	Indo-pacific king mackerel	34	5	60
		<i>Rastrelliger kanagani</i>	Indian mackerel	32	5	62
		<i>Rastrelliger brachyoma</i>	Short mackerel	18	43	39
	TRICHLURIDAE	<i>Trichurus lepturus</i>	Largehead hairtail	80	17	1*

Case study (A)

(13)

TABLE 1: PRODUCTIVITY ATTRIBUTES AND SCORES

Productivity attributes	Low productivity (high risk) Score : 3	Med productivity (medium risk) Score : 2	High productivity (low risk) Score : 1
1. Avg. age at maturity	>15 years	5 - 15 years	<5 years
2. Avg. max. age	>25 years	10 - 25 years	<10 years
3. Fecundity	<100 eggs /year	100 - 20,000 eggs/yr	>20,000 eggs/year
4. Avg. max. size	>300 cm	100 - 300 cm	<100 cm
5. Avg. size at maturity	>200 cm	40 - 200 cm	<40 cm
6. Reproductive strategy	Live bearer	Demersal egg layer	Broadcast spawner
7. Trophic level	>3.25	2.75 - 3.25	<2.75

(14)

TABLE 2: SUSCEPTIBILITY ATTRIBUTES AND SCORES

Susceptibility attribute	Low susceptibility (low risk), Score 1	Medium susceptibility (medium risk), 2	High susceptibility (high risk), score 3
1. Availability – overlap of species range with fishery	<10% overlap	10-30% overlap	>30% overlap
2. Encounterability – Habitat and depth check	Low overlap with fishing gear	Medium overlap with fishing gear	High overlap with fishing gear
3. Selectivity (varies per gear type)	< mesh size, or >5m in length	1-2 times mesh size, or 4-5m in length	>2 times mesh size or up to 4m in length
4. Post capture mortality	Evidence of post capture release and survival	Released alive	Retained spp. or majority dead when released

(15)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

A). Indian Mackerel

(Andaman Sea: Indonesia, Malaysia, Myanmar & Thailand)

(16)

PSA: INDIAN MACKEREL, BOBLME

Indian mackerel (target species) - key productivity attributes

Attribute	Indian mackerel	Risk level
1. Av. age at maturity	6 months – 1 year	Low (1)
2. Av. maximum age	4 years	Low (1)
3. Fecundity	22,000-94,000	Low (1)
4. Av. maximum size	35 cm	Low (1)
5. Av. size at maturity	18 - 19 cm	Low (1)
6. Reproductive strategy	Broadcast spawner	Low (1)
7. Trophic level	3.19	Medium (2)

Source: FishBase

4. Avg. max. size >400 cm 100-400 cm <100 cm
 5. Avg. size at maturity >200 cm 40-200 cm <60 cm
 6. Reproductive strategy Live bearer Demersal egg layer Broadcast spawner
 7. Trophic level >3.25 2.75-3.25 <2.75

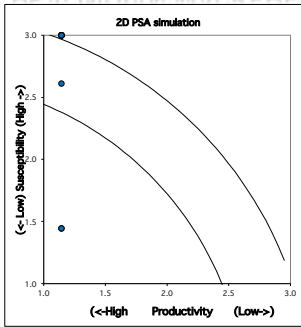
(17)

PSA: INDIAN MACKEREL (TARGET SP.), BOBLME

Country	Fishing Gear	PRODUCTIVITY							SUSCEPTIBILITY			BALL RISK VALUE				
		Average age at maturity	Maximum age	Average size at maturity	Reproductive strategy	Trophic level	Total fecundity	Availability	Sensitivity	Post-capture mortality	Total susceptibility	Risk score	Risk category	Medium risk		
Indonesia	Purse seine	1	1	1	1	1	1	2	1.34	3	3	3	3.00	3.21	High	>3.18
	Bottom Otter trawl	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
Malaysia	Purse seine	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
	Bottom Otter trawl	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
Thailand	Purse seine	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
	Bottom Otter trawl	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
Myanmar	Purse seine	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
	Bottom Otter trawl	1	1	1	1	1	2	1.14	3	3	3	3.00	3.21	High	>3.18	
		1	1	1	1	1	2	1.14	2.25	2.8	3	3	2.81	2.85	Med	>2.64

(18)

PSA: INDIAN MACKEREL (TARGET SP.), BOBLME



The PSA Plot for Indian mackerel caught by three types of gear in the Andaman Sea

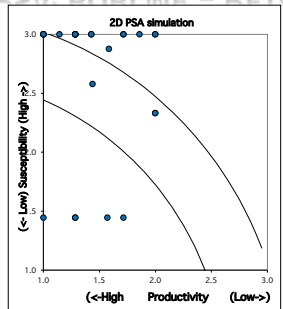
PSA Plot for Indian mackerel
 Total risk = 2.85 (medium to high risk)
 Low risk: Gill nets
 High risk: Trawl

(19)

Gear	Fish name	PRODUCTIVITY							SUSCEPTIBILITY			BALL RISK VALUE			
		Average age at maturity	Maximum age	Average size at maturity	Reproductive strategy	Trophic level	Total fecundity	Availability	Sensitivity	Post-capture mortality	Total susceptibility	Risk score	Risk category	Medium risk	
Purse seine	Indo-pacific mackerel	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Shoaljack tuna	2	2	2	2	2	2	2.00	2	3	3	2.33	3.07	Med	>3.18
	Longtail tuna	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Frigate tuna	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Bigeye tuna	2	2	2	2	2	2	2.00	2	3	3	2.33	3.07	Med	>3.18
	Eastern little tuna	2	2	2	2	2	2	2.00	3	3	3	3.00	3.16	Med	>3.18
	Yellowfin tuna	2	2	2	2	2	2	2.00	3	3	3	3.00	3.16	Med	>3.18
Bottom Otter trawl	Round scad	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Hardtail scad	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Anchovy	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Round scad	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Hardtail scad	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Penaaid shrimp (P. monodon)	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	P. shrimp (P. semisulcatus)	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
Gill net	Indo-pacific mackerel	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Squid	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Pomphret	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Snapper	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Grouper	2	2	2	2	2	2	2.00	3	3	3	3.00	3.16	Med	>3.18
	Small carangids	1	1	1	1	1	1	1.00	3	3	3	3.00	3.16	Med	>3.18
	Indo-pacific mackerel	1	1	1	1	1	1	1.00	2	3	3	1.44	1.76	Low	>1.41
Seerfish	2	1	1	2	2	1	3	1.71	1	2	3	1.44	2.24	Low	>1.41
Indo-Pacific king mackerel	1	2	1	1	2	1	3	1.57	1	2	3	1.44	2.13	Low	>1.41
Small carangids	1	1	1	1	1	1	3	1.29	1	2	3	1.44	1.93	Low	>1.41
Sardine species	1	1	1	1	1	1	3	1.29	1	2	3	1.44	1.93	Low	>1.41
		1.45	1.4	1.5	1.5	1.5	2.8	1.584	2.8	3	3	2.88	3.29	High	>3.18

(20)

PSA: BOBLME – RETAINED SPECIES



The PSA Plot for retained species caught by three types of gear in the Andaman Sea

PSA Plot for retained species
 Total risk = 3.29 (high risk)
 Low risk: Gill nets
 High risk: Trawl & Purse seine

(21)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

B). Purse-seine Fishery

- A case study in the west coast of Peninsular Malaysia

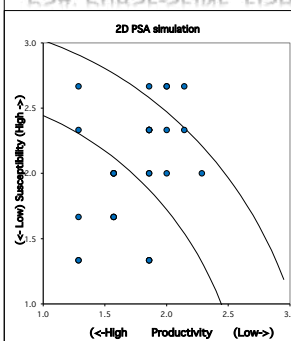
(22)

PSA: PURSE-SEINE FISHERIES

Species	PRODUCTIVITY ATTRIBUTES							SUSCEPTIBILITY ATTRIBUTES			OVERALL RISK VALUES	
	Average age at maturity	Maximum age	Average size at maturity	Reproductive strategy	Trophic level	Total fecundity	Availability	Sensitivity	Post-capture mortality	2D Overall risk value (PSA)	2D PRES Overall risk category (multiplicative)	
Indian peltona	1	1	1	1	1	1	1	1.00	3	3	2.92	Med
Elongate fisha	3	1	2	1	1	3	2.00	2	3	2	3.07	Med
Splendid ponyfish	1	1	2	1	1	1	1.29	1	1	2	1.33	Low
Onate ponyfish	1	1	3	1	1	1	1.29	1	1	2	1.33	Low
Deep pugnose ponyfish	3	1	3	1	1	3	1.86	1	1	2	1.33	Low
Toothpory	3	1	3	1	1	3	1.86	1	1	2	1.33	Low
Shrimp scad	3	1	3	1	1	3	1.86	1	1	2	1.33	Low
Blackfin scad	3	1	3	1	1	3	1.86	1	3	2	2.00	Med
Crabapple trevally	3	1	3	1	1	3	1.86	1	3	2	2.00	Med
Yellowtail scad	3	1	3	1	1	3	1.86	1	1	3	1.87	Low
Shorfin scad	3	1	1	1	1	3	1.57	2	1	3	2.00	Med
Japanese scad	3	1	1	1	1	3	1.57	1	1	3	1.67	Low
Tropid scad	3	1	3	1	1	3	2.00	2	1	3	2.00	Med
Golden trevally	3	1	3	2	3	3	2.25	2	1	3	2.00	Med
Choye scad	1	1	3	1	1	3	1.57	2	1	3	2.00	Med
Bugeye scad	3	1	1	1	1	3	1.87	1	1	3	1.83	Low
Yellowtail scad	3	1	1	1	1	3	1.57	2	1	3	2.00	Med
Yellowstripe scad	3	1	1	1	1	3	1.57	2	1	3	2.00	Med
Goldstripe sardinella	1	1	1	1	1	3	1.29	1	1	3	1.67	Low
Frigate sardinella	3	1	3	1	1	3	1.86	1	3	3	2.33	Med
Rainbow sardine	3	1	3	1	1	3	1.86	1	3	3	2.33	Med
Slender rainbow sardine	3	1	3	1	1	3	1.86	1	3	3	2.33	Med
White sardine	3	1	3	1	1	3	1.86	1	3	3	2.33	Med
Redspotted gnatfish anchovy	1	1	3	1	1	3	1.57	1	3	2	2.00	Med
Longtail tuna	2	3	1	2	2	3	2.00	2	3	3	2.67	Med
Eastern little tuna	2	3	1	2	2	3	2.00	2	3	3	2.67	Med
Narrowbanded spanish mackerel	2	3	1	2	2	3	2.00	2	3	3	2.67	Med
Indo-pacific king mackerel	2	3	1	2	2	3	2.00	2	3	3	2.67	Med
Indian mackerel	1	1	2	1	1	2	1.29	2	3	3	2.27	Med
Short mackerel	3	1	1	3	1	1	1.29	2	3	3	2.27	Med
Largehead hardtail	2	1	3	2	3	2	2.14	2	2	3	2.33	Med
	2.43	1.29	2.2	1.4	1.5	1.2	1.78	1.5	2	2.2	2.28	Med

(23)

PSA: PURSE-SEINE FISHERIES



The PSA Plot for Purse seine Fishery for 30 species caught on the west coast of Peninsular Malaysia

PSA Plot for Purse-seine Fishery for 30 spp.
 Total risk = 2.68 (medium risk)
 High risk species group (14%): small tuna & tuna like-species.

(24)

(2). FISHERIES ASSESSMENT

		Indian Mackerel															
Unit of Assessment	Country	Principle 1: Stock status			Principle 2: Ecosystem impacts						Principle 3: Governance & Management						
		Outcome	Harvest strategy	Retained	Discards	ETP	Habitat	Ecosystem	Governance & Policy	Fishery specific man.							
L. mackerel	Purse seine	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
L. mackerel	B/O otter trawl	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
L. mackerel	Gill nets	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

(28)

(2). FISHERIES ASSESSMENT

Two Case studies on Small Pelagic:

A). Indian Mackerel – multi gears

- (BOBLME project report)

B). Purse-seine Fishery – multi species

- (West Coast Peninsular Malaysia)

(29)

(2). FISHERIES ASSESSMENT

A). Indian Mackerel – multi gears

- (BOBLME project report)

(30)

A). Indian Mackerel – multi gears, BOBLME project report

Principle 1: Stock Status

PI	Title	Weak	Intermediate	Good	Reference
1.1 STOCK STATUS - MALAYSIA					
1.1.1 Purse seine, Trawl and Gillnets					
1.1.1	Target spp status	✓			DoFM statistics, 2008 Hassan et al, 2006 in Ahmed, 2009
Explanatory Statement					
Researchers believe CPUE is increasing and the status of the Indian Mackerel resource is therefore deemed to be good and not a priority for management. However, population parameters derived from a scientific survey conducted in 2006 showed high exploitation levels for West Coast stocks. The survey also estimated that the west coast peninsula of Malaysia, an area totaling nearly 28,000km ² supported a pelagic resource of 210,000t (Hassan et al, 2006). This estimate is 23.8% lower than that estimated in the previous survey conducted in 1998.					
1.1.2	Reference points	✓			DoFM questionnaire response
Explanatory Statement					
Several RK population parameters are presented, but no reference points are set. A total pelagic biomass was estimated at 210,000t, suggesting west coast landings (140,000 t) of RK & mainly RB would give a high F value.					
1.1.3	Stock rebuilding	✓			FRI, DoFM interview
Explanatory Statement					
No stock rebuilding strategy					

(31)

(2). FISHERIES ASSESSMENT

A). Indian Mackerel – multi gears, BOBLME project report

Principle 1: Stock Status

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Country	Stock	Outcome			Harvest strategy		
		1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.2.3
ID	Indian mackerel	2	2	2	2	2	2
TH	Indian mackerel	2	2	2	2	2	2
MY	Indian mackerel	2	2	2	2	2	2
MM	Indian mackerel	2	2	2	2	2	2

Ranking:

Good ■ Intermediate ■ Weak ■ Not applicable ■

- There is evidence for the status of this species is over-fished throughout much of the region.
- PSA suggests that the stock is particularly vulnerable to purse seines and bottom otter trawlers.
- There are no reference points used in management and as a result, harvest rules and controls are weak.

(32)

A). Indian Mackerel – Principle 2: Ecosystem Impact

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Malaysia: Purse seine

PI	Title	Weak	Intermediate	Good	Reference
Other retained species					
2.1.1	Retained spp Status		✓		DoFM, IOTC.
Explanatory Statement					
The main retained species are known, as RK is primarily captured offshore, the interaction with coastal fisheries including demersal fisheries is less than for example RB. Tuna may be captured when targeting shoals of small pelagic (making up 7% of seine catch).					

Assessment must be done by gear type for each country.

Malaysia: Trawl fishery

Retained species					
2.1.1	Retained spp Status	✓			DoFM, IOTC.
Explanatory Statement					
The main retained species are known but their status is not. See Error Statement Reference source not found, for risk assessment of other retained species. A RK is primarily captured offshore, the interaction with coastal fisheries including demersal fisheries is less than for example in the RB fishery. However status c many offshore resources is thought to be depleted.					

Malaysia: Gillnet

Other Retained species					
2.1.1	Retained spp Status	✓			DoFM, IOTC.
Explanatory Statement					
The main retained species are known (mainly demersal), but status is either not assessed or known to be depleted. A small proportion of RK (10% total landings) is captured by the traditional inshore fishery using gillnet.					

(33)

A). Indian Mackerel – Principle 2: Ecosystem Impact

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Country	Fishing Gear	Principle 2: Ecosystem Impacts														
		Retained			Discards			ETP			Habitat			Ecosystem		
		2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.2.3	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.4.3	2.5.1	2.5.2	2.5.3
ID	Purse seine	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
ID	B/Otter Trawl	0	0	1	2	2	2	1	0	1	0	1	1	1	1	0
ID	Gill nets	0	0	0	2	2	2	1	0	0	1	1	1	1	1	1
TH	Purse seine	1	1	2	2	2	2	1	1	1	1	2	2	1	1	1
TH	B/Otter Trawl	0	0	2	2	2	2	1	0	1	1	0	1	1	0	0
MY	Purse seine	1	0	2	2	2	2	1	0	1	1	2	2	1	1	1
MY	B/Otter Trawl	0	0	2	2	2	2	1	0	1	2	0	1	2	0	0
MY	Gill nets	0	0	2	2	2	2	1	0	1	1	1	1	1	1	1
MM	Purse seine	1	1	0	2	2	2	1	1	1	1	2	2	1	1	0
MM	B/Otter Trawl	0	1	1	2	2	2	1	0	1	1	0	1	1	0	0

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A). Indian Mackerel – Principle 3: Governance & Management

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Country	Fishing Gear	Principle 3: Governance & Management									
		Governance & Policy				Fishery specific management					
		3.1.1	3.1.2	3.1.3	3.1.4	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	
ID	PS, BOT, GN	1	2	1	0	0	0	1	1	1	
TH	PS, BOT	1	2	1	0	0	0	1	1	1	
MY	PS, BOT, GN	2	2	1	1	0	0	1	1	1	
MM	PS, BOT	1	1	1	0	0	0	1	1	0	

Good ■ Intermediate ■ Weak ■ Not applicable ■

- Legal and institutional structures are mainly in place.
- Weaknesses were observed in the continued use of subsidies that serve to increase fishing effort as well as weak fisheries-specific objectives, decision-making process, research plans, MCS strategies and performance evaluation.
- Weaknesses were both specific to Indian mackerel management as well as to management of small pelagic species.

(35)

(2). FISHERIES ASSESSMENT

B). Purse seine Fishery – multi species

- (West coast of Peninsular Malaysia)

(36)

(2). FISHERIES ASSESSMENT

B). Purse seine fishery - Summary scores for 3 principles

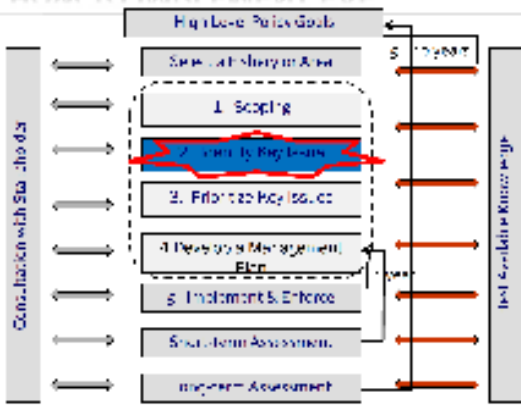
Principle 1: Stock status (Small Pelagic)							
Outcome		Harvest strategy					
1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.2.3	1.2.4	
Stock status	Reference points	Stock rebuilding if necessary	Performance of harvest strategy	Harvest control rules and tools	Information and monitoring	Assessment	
0	0	*	0	0	0	1	

Principle 2: Ecosystem Impacts (Purse seine)										
Retained			ETP			Habitat		Ecosystem		
2.1.1	2.1.2	2.1.3	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.5.1	2.5.2	
Retained status	Retained management	Statistical info / monitoring	ETP status	ETP management	ETP info / monitoring	Habitat status	Habitat management	Habitat info / monitoring	Ecosystem status	Ecosystem strategy
0	0	1	1	1	0	2	2	2	2	0

Principle 3: Governance & Management (Purse seine)									
Governance & Policy					Fishery specific management				
3.1.1	3.1.2	3.1.3	3.1.4	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	
Legal customary framework	Consultation, roles & responsibilities	Long-term objectives	Incentive for sustainable fishing	Fishery specific objectives	Decision-making processes	Compliance & enforcement	Research plan	Management performance evaluation	
1	2	1	1	2	2	1	2	1	

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HOW TO IMPLEMENT EAF



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140 Source: The Ecog... ..

THANK
YOU





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

Outputs Based on Regional Synthesis

by

Mr. Mohammad Faisal Md. Saleh

**Project Coordinator
SEAFDEC/MFRDMD**



- ## Objectives
1. Data screening for analysis using Allowable Biological Catch (ABC) Rule and Production Model.
 2. Calculation of ABC using Rule 2-2 for selected areas and synthesized South China Sea and Andaman Sea.
 3. Preliminary analysis using Equilibrium Production Model for selected areas.

Catch and effort data screening (provided from 8 MCs)

Annual catch of 8 MCs in SCS and AS

Year	LANDING (mt)										TOTAL AS					
	South China Sea							Andaman Sea								
	BRU	KH	IN	MY	PH	TH	VN	IN	MY	MM						
1996	74		61,223	119,941		410,693					88,620	58,436	171,806	318,862		
1997			59,055	140,077	34,400	388,009					88,345	58,152	164,701	311,198		
1998			58,764	147,423	1,233	360,118					86,364	78,498	170,879	335,741		
1999			63,888	189,314	39,954	363,236					86,042	81,075	168,971	336,088		
2000			67,457	210,216	43,193	363,900	322,389				94,152	55,223	184,129	333,584		
2001	124		57,916	205,768	44,965	352,789	330,435				96,570	54,861	173,533	324,964		
2002	311		61,554	218,170		353,224	222,638				85,397	84,607	174,243	343,704		
2003	326		62,558	178,751		397,276	278,622				91,753	95,056	155,265	341,997		
2004	511		80,018	163,146		412,411	245,187				90,173	114,263	161,510	336,746		
2005	1,186		73,764	167,560	2,400	407,296	101,532				61,049	128,180	181,798	371,027		
2006	1,069		66,369	188,085	1,040	359,983	257,453				873,999	70,175	143,428	7,092	166,986	387,681
2007	1,113	592	75,940	169,754		328,305	149,100				724,804	68,237	115,522	7,707	149,105	406,571
2008	901	260	86,731	209,316		334,070	178,700				809,978	65,872	180,580	16,224	145,988	408,664
2009	895	270	106,280	181,952	22,400	333,466	191,300				836,563	65,690	176,884	137,887	153,467	533,928
2010	908		95,346	179,911		341,274	212,000				829,439	69,522	191,667	72,124	162,512	495,825
2011	986		53,897	184,190	39,400	333,161	237,000				868,633	91,279	149,271	51,978	148,771	441,299
2012	1,095		128,576	189,790	284,867	352,314	215,200				1,171,842	98,824	149,237	27,580	150,517	426,158
2013	1,049		47,991	208,005	445,811	369,431	226,900				1,299,186	101,136	135,471	16,132	133,017	385,756
2014	1,032		56,128	201,880	51,552	391,653	252,300				958,444	96,191	140,946	185,583	142,593	565,313
2015	949		279,218	13,367	347,960	434,200					1,075,695		140,735	10,892	134,203	285,830

Annual no. of vessels of 8 MCs in SCS and AS

Year	NO OF VESSELS (unit)										TOTAL AS		
	South China Sea							Andaman Sea					
	BRU	KH	IN	MY	PH	TH	VN	IN	MY	MM			
1996	1	16	47	726		1,077		1,867	1,538	276		250	2,084
1997	15	58	689		18	1,157		1,937	1,811	270		345	2,426
1998	15	66	602		2	1,064		1,749	2,003	288		225	2,516
1999	8	64	736		17	1,134		1,959	1,918	309		420	2,647
2000	10	110	767		15	1,178		2,080	2,131	311		326	2,768
2001	2	14	110	734		24	1,039	1,923	2,198	306		410	2,914
2002	6	10	96	755			1,239	2,106	1,570	316		447	2,333
2003	6	12	81	747			1,295	2,141	2,942	312		342	3,596
2004	7	10	181	722			1,298	2,218	2,262	305		401	2,968
2005	8	10	222	734		1	1,210	2,185	1,519	320		335	2,174
2006	9	6	426	744		1	1,169	2,355	2,031	371	368	321	3,091
2007	9	4	421	766			1,162	2,362	1,936	374	367	279	2,956
2008	9	1	1,585	861			1,170	9,659	1,995	397	527	304	3,223
2009	10	1	1,543	834		6	1,120	10,669	2,314	413	532	364	3,623
2010	8	4	1,122	837			1,223	8,348	11,542	1,766	420	536	3,127
2011	13	1	1,312	795		4	1,135	8,521	1,611	440	545	363	2,959
2012	12	1	2,188	812	268	1,148	1,123	9,552	1,839	441	639	443	3,362
2013	14		2,383	801	930	1,175	4,726	10,029	1,763	443	640	373	3,219
2014	13		3,963	791	11	1,296	4,696	10,770	1,498	416	647	417	2,978
2015	9		800	23	1,297	4,992	7,121		394	580	431		1,405

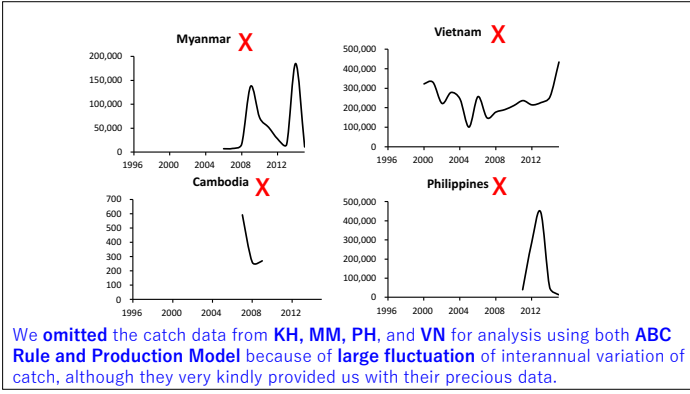
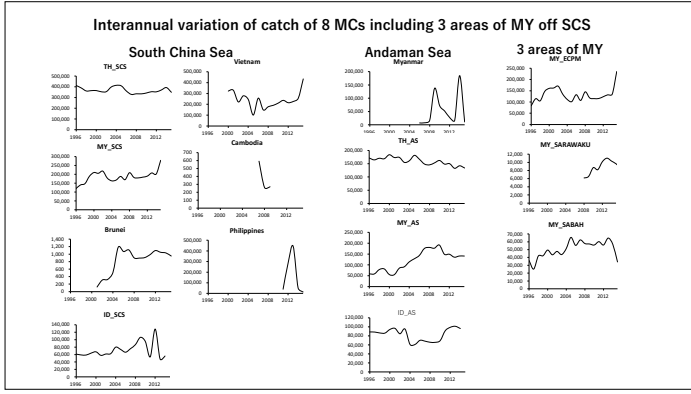
Annual no. of trips of 4 MCs in SCS and AS

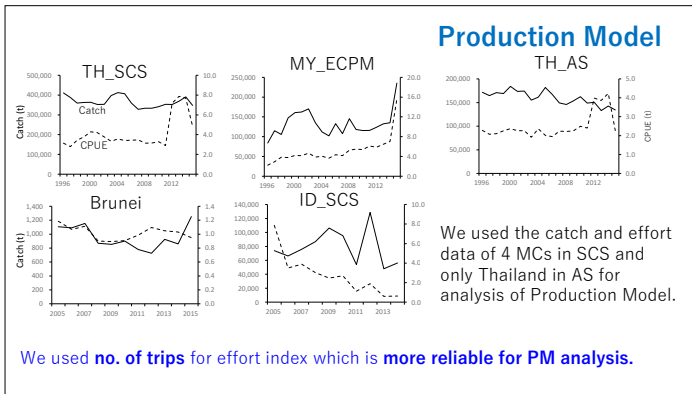
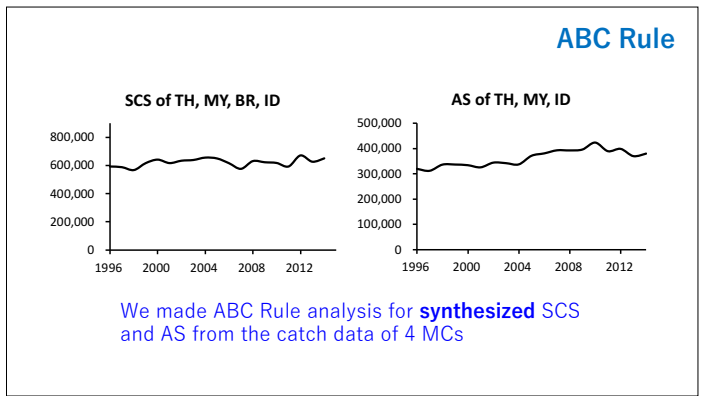
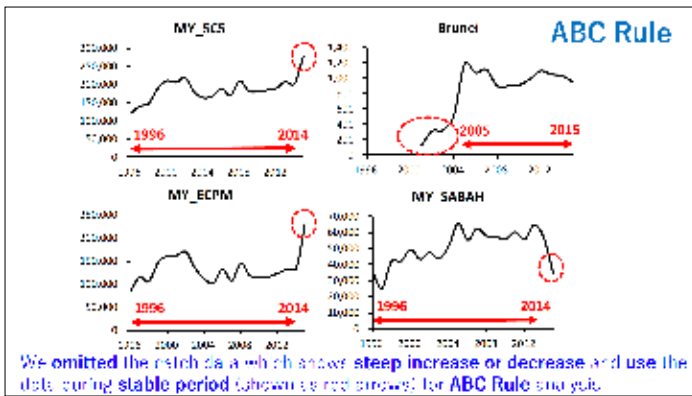
Year	TRIPS (trips)					TOTAL AS
	South China Sea				Andaman Sea	
	BRU	IN	MY (ECPM)	TH	TH	
1996	124		37,413	130,586		168,123
1997			39,572	139,059		178,631
1998			27,587	104,620		132,207
1999			39,083	96,342		135,425
2000			38,562	84,715		123,277
2001	169		123,210			123,210
2002	578		36,853	93,746		130,807
2003	857		34,876	119,399		155,132
2004	862		27,855	115,915		144,322
2005	1,071	9,384	28,028	119,676		158,159
2006	980	18,954	30,667	104,692		155,293
2007	964	19,524	25,868	94,549		140,905
2008	1,035	28,615	27,655	106,442		162,747
2009	1,048	43,048	21,583	105,420		171,099
2010	1,009	35,342	21,481	103,817		161,649
2011	1,263	47,866	18,988	121,425		189,542
2012	1,507	67,777	21,089	48,926		139,299
2013	1,134	81,137	20,478	46,956		149,705
2014	1,199	89,562	19,210	50,876		160,847
2015	758		15,109	71,754		87,621

Annual catch, no. of vessels, no. of trips of 3 areas of Malaysia off SCS

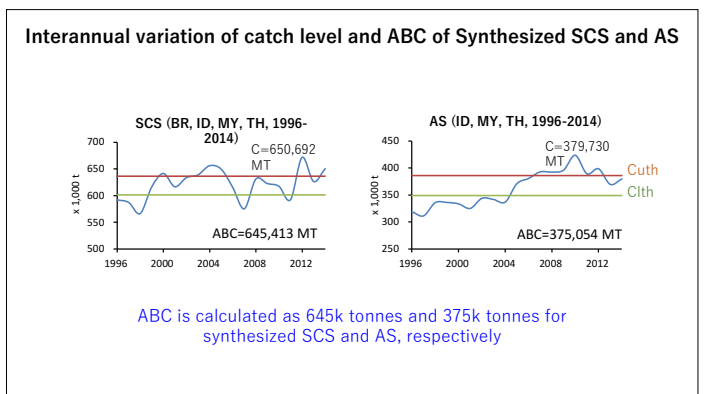
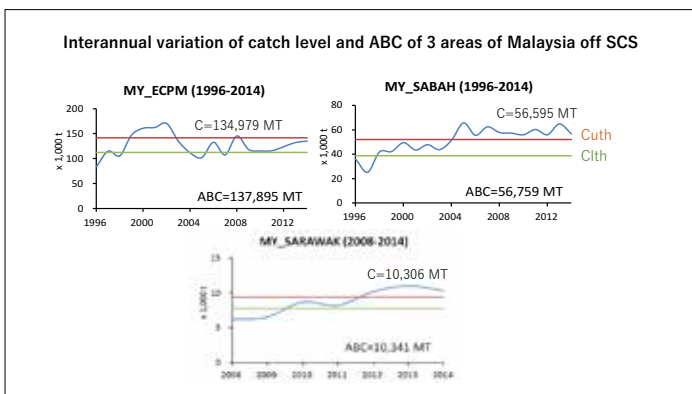
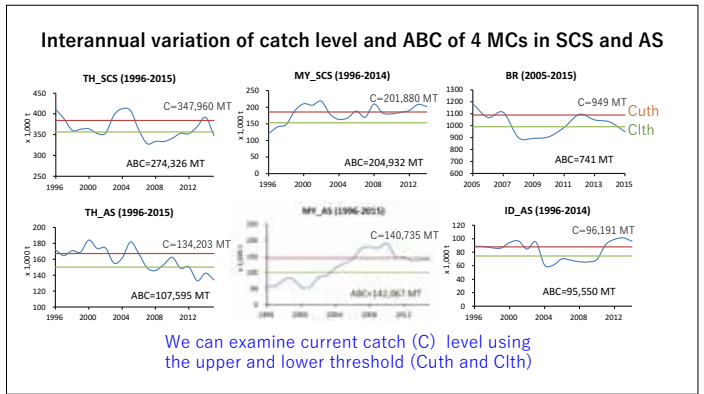
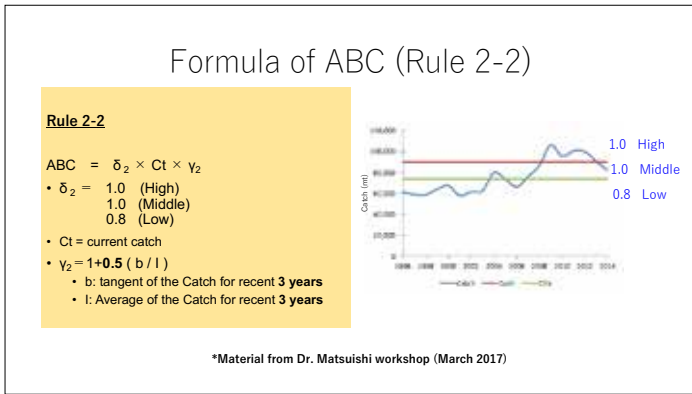
Year	MALAYSIA (South China Sea)											
	LANDING (mt)			NO. OF VESSEL (units)			TRIPS (trips)					
	ECPM	Sabah	Sarawak	TOTAL SCS	ECPM	Sabah	Sarawak	TOTAL SCS	ECPM	Sabah	Sarawak	
1996	83,769	36,172		119,941	548	155	23	726	37,413			37,413
1997	114,962	25,115		140,077	493	177	19	689	39,572			39,572
1998	105,519	41,904		147,423	404	177	21	602	27,587			27,587
1999	147,169	42,145		189,314	520	191	25	736	39,083			39,083
2000	160,760	49,456		210,216	554	191	22	767	38,562			38,562
2001	162,360	43,408		205,768	546	166	22	734	38,983			38,983
2002	170,420	47,750		218,170	567	166	22	755	36,483			36,483
2003	135,049	43,702		178,751	555	166	26	747	34,876			34,876
2004	111,720	51,426		163,146	530	166	26	722	27,855			27,855
2005	101,919	65,641		167,560	529	166	39	734	28,028			28,028
2006	132,638	55,447		188,085	522	166	56	744	30,667			30,667
2007	107,327	62,427		169,754	553	166	47	766	25,868			25,868
2008	145,377	57,767	6,172	209,316	606	202	53	861	27,655	544		28,199
2009	118,185	57,219	6,548	181,952	590	202	42	834	21,583	30,396	1,588	53,567
2010	115,326	55,897	8,688	179,911	589	211	37	837	21,481	35,214	590	57,285
2011	115,771	60,218	8,201	184,190	507	249	39	795	18,988	31,320	500	50,808
2012	123,719	55,911	10,160	189,790	495	274	43	812	21,089	30,770	446	52,305
2013	132,169	64,813	11,023	208,005	487	274	40	801	20,478	34,307	358	55,143
2014	134,979	56,595	10,306	201,880	486	265	40	791	19,210	31,986	303	51,499
2015	235,328	34,261	9,629	279,218	493	268	39	800	15,109	31,830	297	47,236

Data screening for analysis using ABC Rule and Production Model

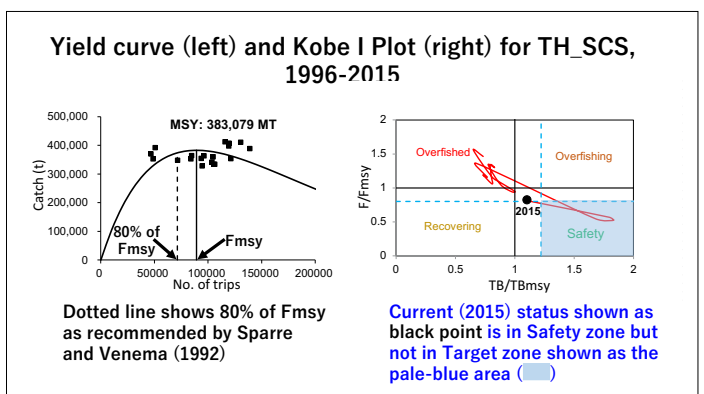




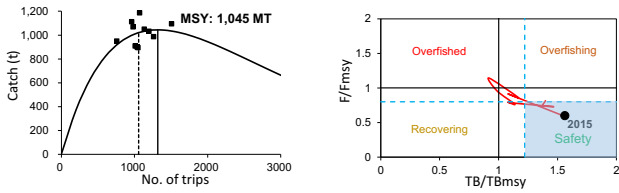
Output of analysis using ABC Rule 2-2



Output of analysis using Production Model (FOX)

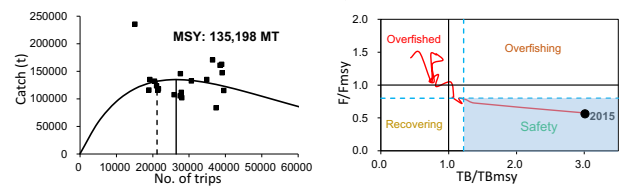


Yield curve (left) and Kobe I Plot (right) for Brunei, 2005-2015



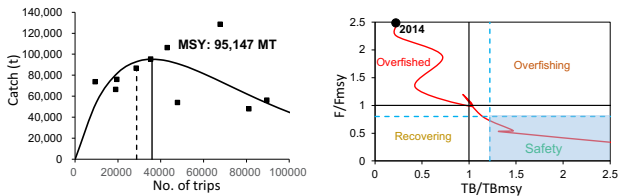
Current (2015) status is in Target zone

Yield curve (left) and Kobe I Plot (right) for MY_ECPM, 1996-2015



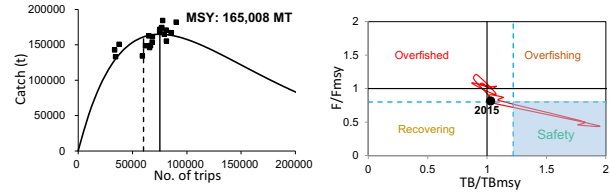
Current (2015) status is in Target zone

Yield curve (left) and Kobe I Plot (right) for ID_SCS, 2005-2014



Current (2014) status is Overfished

Yield curve (left) and Kobe I Plot (right) for TH_AS, 1996-2015



Current (2015) status is in Safety zone but not in Target zone

Current status, MSY, and target Fmsy for 4 MCs in the SCS and AS

Country	Area	Year	Current MSY (t)	Current F/Fmsy	Target F/Fmsy	Target MSY (t)
TH	AS	2015	165,008	0.8	0.8	165,008
ID	SCS	2014	95,147	1.8	0.8	95,147
MY	ECPM	2015	135,198	0.8	0.8	135,198
TH	AS	2015	165,008	0.8	0.8	165,008

Target effort is much lower than current effort for ID_SCS

Conclusion

- 1) We examined the catch and effort data provided by 8 MCs, and found the data from KH, MM, PH, and VN could not be used for the current analysis because of large fluctuation of interannual variations of catch.
- 2) We used the catch data from 4 MCs (SCS and AS) for ABC Rule 2-2 analysis by: i) Selected MCs; ii) 3 areas of MY off SCS; iii) synthesized SCS and AS.
- 3) We made analysis using Production Model for 4 MCs in SCS and only Thailand in AS and examined the current status using the Kobe I Plot with target zone index (less than 80% of Fmsy).
- 4) With support and assistance from participating MCs, we could further investigate the reason of fluctuation of interannual variation of fishery data toward improvement of analysis in the future.



TERIMA KASIH
ARIGATO GOZAIMASU
SAUM ARKOUN
KYAY ZUU TIN PAR TAL
KAP KHUN KRA
SALAMAT
CÁM ÔN BAN





**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

Land-Based Survey

by

Prof. Dr. Takashi Matsuishi

**Resource person
Hokkaido University**

Some Result of LAND-BASED SURVEY

12 – 23 August 2017
01-10 July 2018

EAST COAST PENINSULAR MALAYSIA

Ledhyane Ika Harlyan
MATSUISHI Takashi Fritz
Faculty of Fisheries Sciences, Hokkaido University
19 SEPTEMBER 2018



Conventional Fisheries Management and Stock Assessment

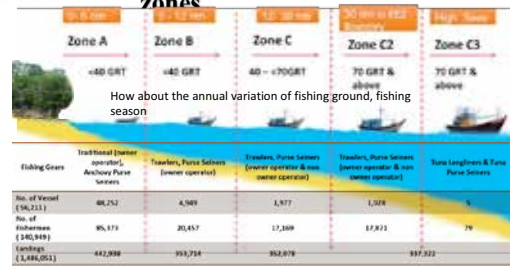
1. Catch statistics **by Species** (Total catch + **Species composition**)
2. **Single Species** Stock assessment
3. Productivity estimation (MSY / Prediction) **for the species**
4. Catch limit / Effort limit
5. **Species Specific** Fisheries Management Measures
 1. Effort control **for the species**
 2. Gear selectivity **for the species**
 3. Seasonal / Areal Closure **for the species**
6. Implementation and MCS

Objectives

- To find a possibility to conduct **conventional single species management**
 - Whether specific species has specific **fishing ground**
 - Whether specific species has **fishing season**
 - How about the **annual variation** of fishing ground, fishing season
- To proof that *“conventional single species management is impossible”* is quite difficult.
- Enough survey and analysis are necessary to proof.

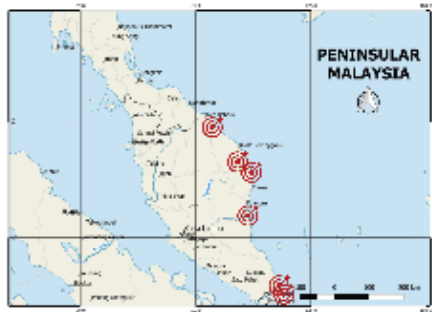
Fisheries Management

A ZONATION Malaysian waters fishing zones



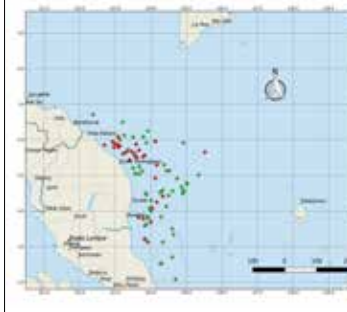
Source: Current status of purse seine fisheries in the south east Asian region (Hassan, 2015)

Research Sites



1. Teluk Belanga fishing port, Kemaman
 2. Pulau Kemuning fishing port, Jeranggan
 3. Kuala Besut fishing port, Terengganu
 4. Kuantan fishing port, Pahang
 5. Endau fishing port, Johor
 6. Sempang fishing port, Johor
- 12-23 August 2017
01-10 July 2018

Area study profile : Vessel zones

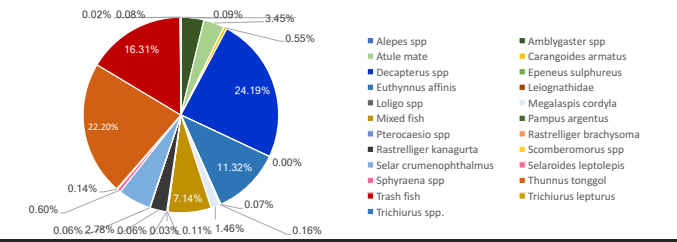


Portraying the zone distribution over East coast peninsular Malaysia (ECPM) area

- Purse seine fisheries use C and C2 vessels
- Vessels are well distributed
- Some vessels in the inner zones go further
- Vessels from Southern areas go fishing to the Northern areas
- Southern areas have less potential fishing areas (due to country borders) than the Northern areas

Species Composition

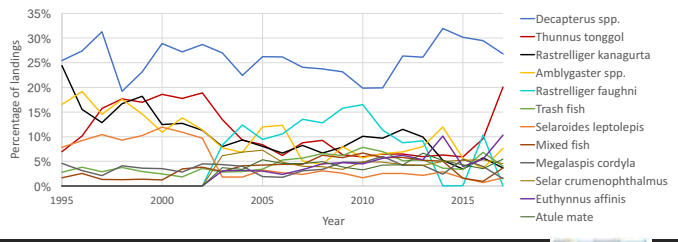
(survey data 2017 and 2018)



- There are 23 species found during the surveys
- The composition is dominated by some species; Decapterus spp (24.19%), Thunnus tonggol (22.2%), Euthynnus affinis (11.32%) and compiled with small amount of other species.
- It represented the catch statistics of 1995 – 2017

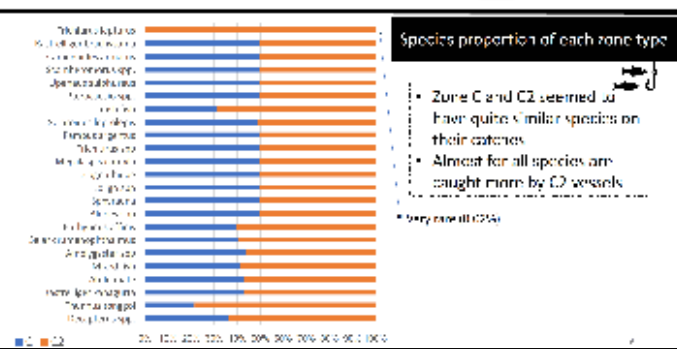
Species composition

(catch statistics data 1995 – 2017)



- The landings of these 12 species are 89.14% of total landings all species
- Overall species composition has slightly changed over 20 years
- Some species began their contribution in the early 2000s

Area study profile : Vessel zones



Species proportion of each zone type

- Zone C and C2 seemed to have quite similar species on their catches
- Almost for all species are caught more by C2 vessels
- Very rare all C2A

Area study profile : Vessel zones

Species Diversity in each vessel zone

• Species richness (Shannon)

• Max. diversity (H')

• Pielou

• Evenness in each vessel zone

• Species richness (Shannon)

• Max. diversity (H')

• Pielou

Species richness

Species richness (Shannon)

Max. diversity (H')

Pielou

Evenness in each vessel zone

Species richness (Shannon)

Max. diversity (H')

Pielou

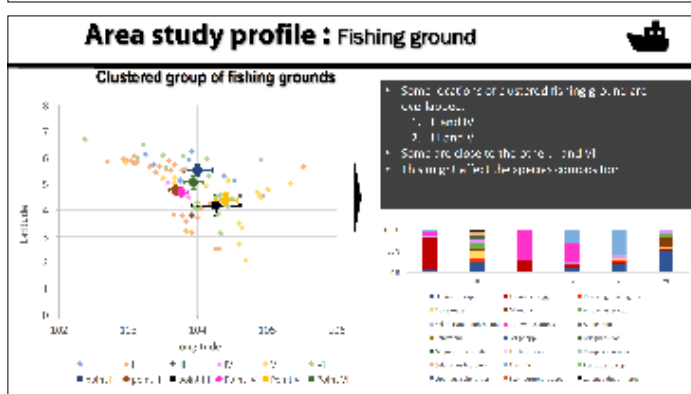
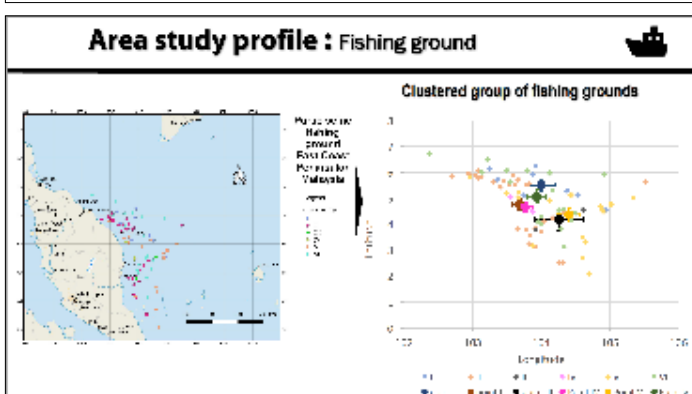
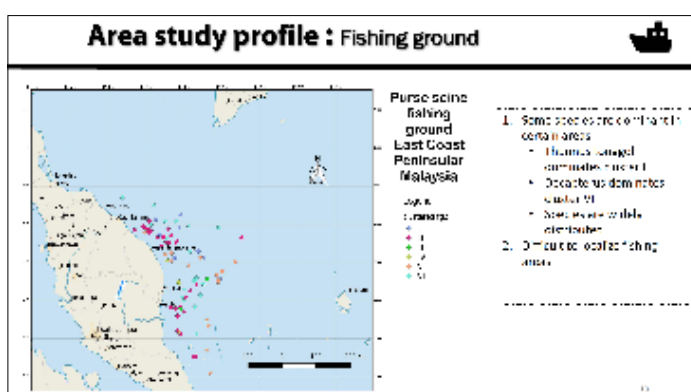
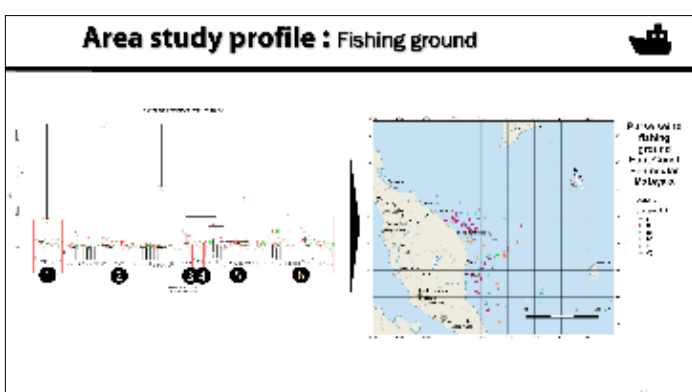
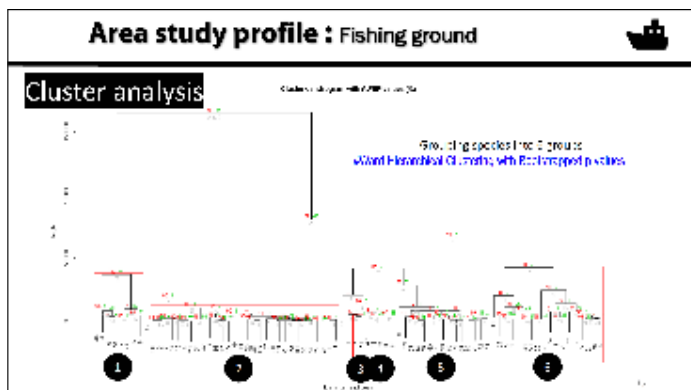
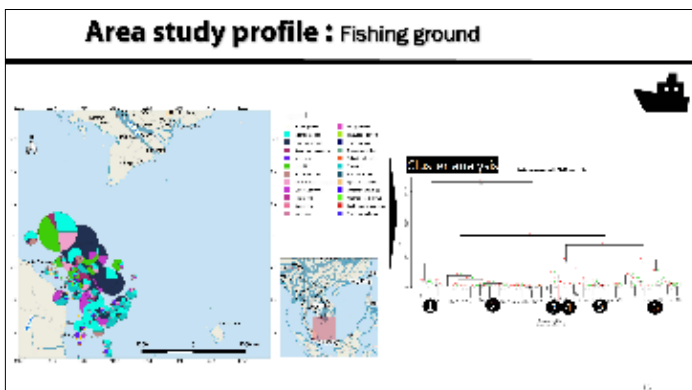
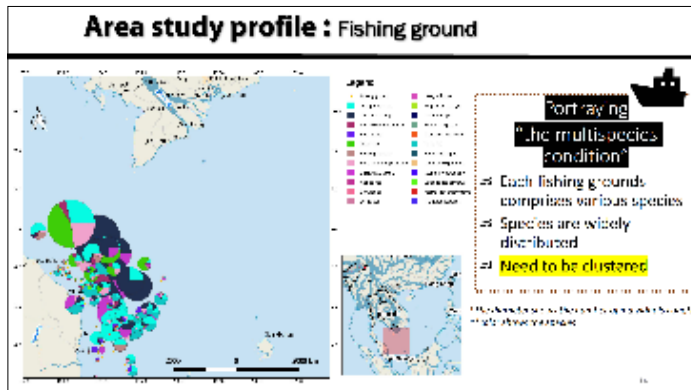
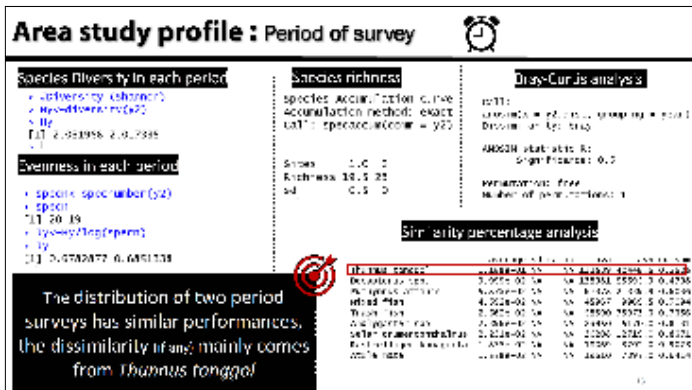
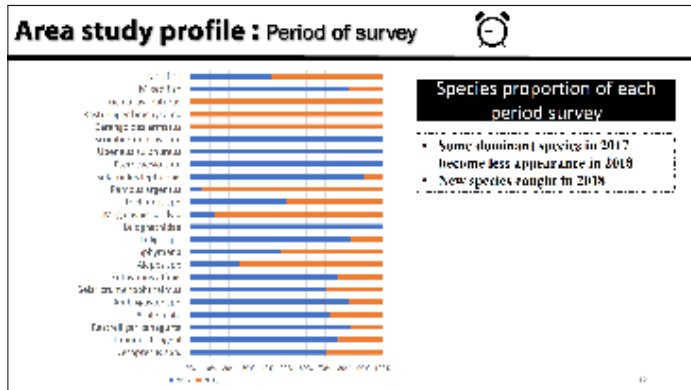
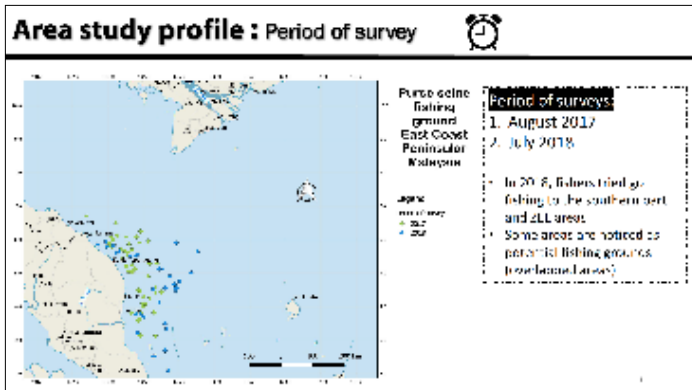
Bray-Curtis analysis

Bray-Curtis analysis

Bray-Curtis analysis

Bray-Curtis analysis

The distribution of two vessel zones has similar performances, the dissimilarity among mainly comes from Thunnus tonggol





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**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

Latest Topic of Stock Assessment

by

Prof. Dr. Takashi Matsuishi

**Resource person
Hokkaido University**

Latest Topic of Stock Assessment

MATSUISHI Takashi Fritz

HOKKAIDO UNIVERSITY
19 SEPTEMBER 2018



FIGURE 1
WORLD CAPTURE FISHERIES AND AQUACULTURE PRODUCTION



NOTE: Excludes aquaculture, ornamental, alligator and crocodile, seaweed and other aquatic plants

FIGURE 16
THE THREE TEMPORAL PATTERNS IN FISH LANDINGS, 1950–2015

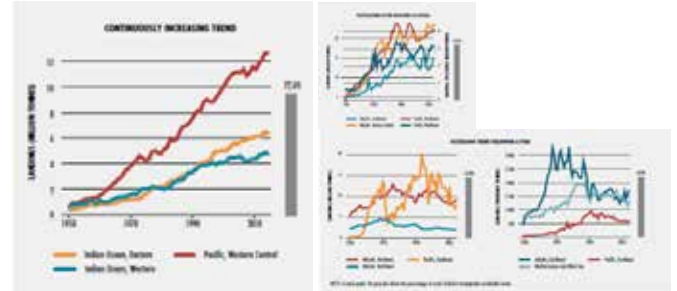
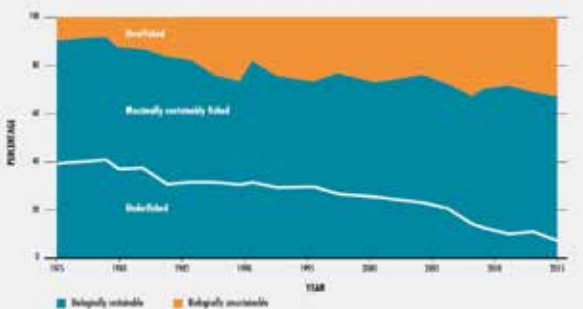
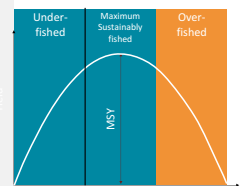
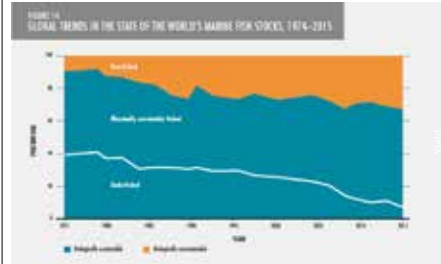


FIGURE 14
GLOBAL TRENDS IN THE STATE OF THE WORLD'S MARINE FISH STOCKS, 1974–2015



Possibility to increase Yield



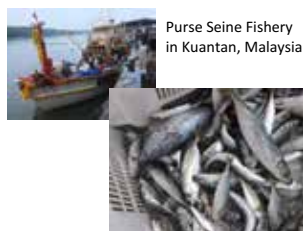
Evaluation of Feedback Fisheries Management Strategy Applied for Mixed Species Data

MATSUISHI Takashi Fritz
D. Wu, R. Kinashi and
Ledhyane Ika Hariyan
Faculty of Fisheries Sciences,

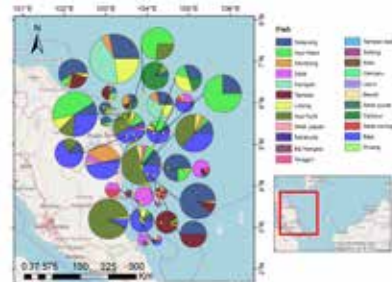


Mixed Species Problem

- In tropical countries, Fishery information is sometimes limited
- Catch statistics is not available by species
- Fisheries Management should be applied for multi species gear (purse seine etc)
- Single species population assessment and fisheries management model are not applicable without validation.



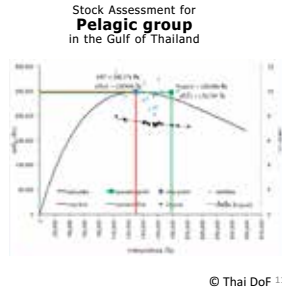
Species Composition by Purse Seine Vessel in East Cost of Peninsula Malaysia



Surveyed on August 2017
with SEAFDEC/MFRDMD
Hariyan et al. unpubl.
data

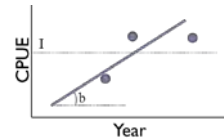
Stock Assessment Methods

- Age based method (VPA etc)
 - Aging is difficult for tropical fished
- Production Model
 - Applicable if effort range is wider
- Feedback Control Management
 - Applicable in data poor situation
 - Maybe conservative
- All are developed for **Single Species Fishery**



Rule 2-1 in Japanese Stock Assessment Procedure

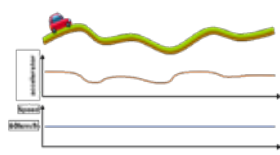
- Applied for **Data Poor Situation**
- Population Estimation is not available
- Data: C_t , Stock Level, CPUE
- $ABC = \delta_1 \times C_t \times \gamma_1$
- $\delta_1 = 1.0$ (High)
 1.0 (Middle)
 0.8 (Low)
- $\gamma_1 = 1 + k b / I$
 - k : feedback parameter (1.0)
 - b : tangent of the CPUE for recent 3 years
 - I : Average of the CPUE for recent 3 years



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Feedback Effort Control

- The idea is appeared in Tanaka(1980)
 - Tanaka, S. (1980). A theoretical consideration on the management of a stock-fishery system by catch quota and on its dynamical properties. *Bulletin of the Japanese Society of Scientific Fisheries*.
- If the biomass is increasing, more fishing effort can be allowed, and vice versa.



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Aim of this study

- Conduct simulation of **fishing operation and management by feedback control rule with mixed species situation**
- Analyze the result by comparing **MSY** to examine the applicability of the feedback control rule **for the mixed species situation**

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Method

- Based on Hiramatsu (2004),
- Three (3) species
 - Population dynamics are independent
 - Caught by same gear (multi-species gear)
 - Catch and CPUE are not divided to species (mixed species data)
- Simulation for 51 years 100 iterations
 - 21 years for constant effort
 - Populations at 1st and 21st year are given ($K/2$)
 - After 22nd year, caught following Rule 2-1 calculated from mixed species data
 - Catch for each species are proportional to the biomass
 - Observe the population dynamics and catch for each species

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Equations

$$B_{y+1} = \left\{ B_y + r B_y \left(1 - \frac{B_y}{K} \right) \right\} \exp \left(\sigma_R \varepsilon_{yR} - \frac{1}{2} \sigma_R^2 \right) - q X_y B_y$$

$$I_y = \frac{B_y + B_{y+1}}{2} \exp \left(\sigma_I \eta_y - \frac{1}{2} \sigma_I^2 \right)$$

- K Carrying Capacity
- r Intrinsic Growth Rate
- B_y Biomass
- X_y Effort
- I_y Population Index
- σ_R s.d. for process error
- σ_I s.d. for observation error
- $\varepsilon_y, \eta_y \sim N(0,1)$

16

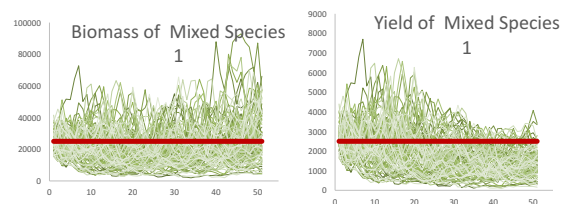
Parameters

	Case 1			Case 2		
	Sp 1	Sp 2	Sp 3	Sp 1	Sp 2	Sp 3
B0	25,000	10,000	5,000	25,000	10,000	5,000
qE	0.106	0.106	0.106	0.106	0.106	0.106
r	0.2	0.5	1.0	0.2	0.5	1.0
K	50,000	20,000	10,000	50,000	20,000	10,000
Bmsy	25,000	10,000	5,000	25,000	10,000	5,000
MSY	2,500			2,500		
Trend	M-M			M-M		
Error	0.2			0.3		

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Example of a Result

Case 1



18

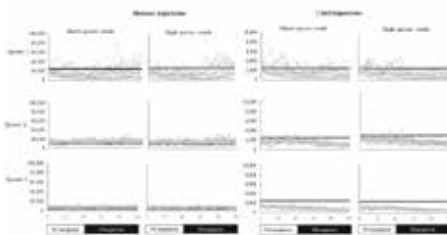


Fig. 2. Biomass and catch trajectories for three species after applying the default feedback harvest control rule to both mixed-species and single-species data, for the most common scenario ($B_y = B_0$). Only 20 trajectories are shown in each figure; both σ_e and σ_r were fixed at 0.2. Bold horizontal lines through the biomass and catch trajectories, respectively, indicate the B_{msy} level and MSY level.

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Result

Case 1

After Mix Mgmt	Sp 1	Sp 2	Sp 3	Total
Yield/MSY	58%	46%	27%	35%
B51/Bmsy	99%	166%	176%	126%
Failure	0%	0%	0%	0%

Single Mgmt	Sp 1	Sp 2	Sp 3	Total
Yield/MSY	46%	46%	27%	30%
B51/Bmsy	104%	165%	185%	129%
Failure	7%	0%	0%	7%

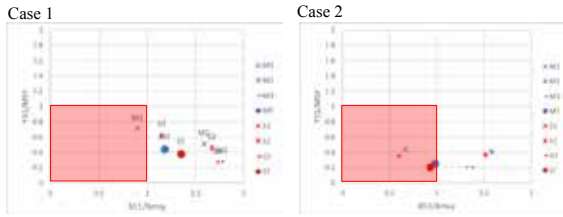
Case 2

After Mix Mgmt	Sp 1	Sp 2	Sp 3	Total
Yield/MSY	43%	41%	20%	25%
B51/Bmsy	67%	158%	131%	98%
Failure	0%	1%	15%	16%

Single Mgmt	Sp 1	Sp 2	Sp 3	Total
Yield/MSY	35%	37%	20%	21%
B51/Bmsy	60%	152%	137%	93%
Failure	23%	0%	16%	36%

20

Result



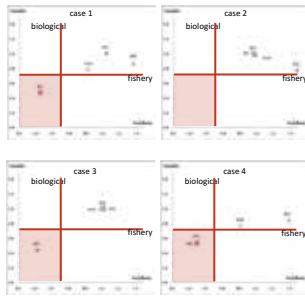
21

Calculation in progress

- More species parameters (r, K)
- More parameters for errors (σ_R, σ_i)
- Optimum parameters for the feedback control (k, σ)
- Examine the influence of population dynamics before the management
- Examine the influence of duration for calculating CPUE trends (b)

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Result of Multi-species Production Model

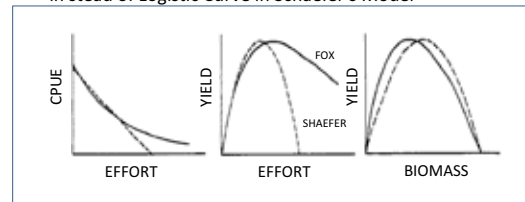


r is different among 3 species
 r -L: r is large
 r -S: r is small
 (L is twice than S)

	SP1	SP2	SP3
case	minor	major	major
1	L	S	L
2	L	S	S
3	S	L	L
4	S	S	L

Fox Model and Shaefer Model

- Fox model assume the production follows Gompertz curve in stead of Logistic Curve in Schaefer's Model



Conclusion

- Feedback control procedure has a similar performance for mixed species data comparing single species data, as far as in the limited simulation cases.
- For applying the single species model for mixed species data, validity should be assessed through simulation studies.
- Implementation for multi-species, multi-gear situation fishery management should be also carefully considered.
- These researches can contribute sustainable fishery in ASEAN Region.





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**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

Fishery Management Plan for Small Pelagic in the South China Sea Area

by

Mr. Raja Bidin Raja Hassan

Chief of SEAFDEC/MFRDMD

Fishery Management Plan (FMP)

by

CHIEF of SEAFDEC/MFRDMD

19 September 2018

Title:
Fishery Management Plan
for Small Pelagic in the
South China Sea Area

Vision

- To exploit and manage small pelagic resources sustainably

Glossary

- Provide definitions for key terms used in the management plan to ensure that readers interpret the plan correctly.

i.e. Small pelagic –
MSY –

Background

Description of the fishery:

- Map to show the geographical area of the fishery
- Jurisdictional (local, provincial, national, regional) boundaries,
- General ecosystem/habitats that the fishery operates
- Seasonality associated with the fishery's operation
- Gears used (PS, GN)
- Targeted species

History of fishing and management

- Provide a brief description of the past development of the fishery in terms of fleets, fishing effort, the gear used, the people and communities involved, etc.
- Provide a summary of previous management plans (if any) for the fishery and, in subsequent versions, any amendments to previous versions.

Current status of the fishery's resources

- Summarize the status of the various stocks exploited by the fishery (Kobe Plot) – whether they are estimated to be overfished, fully fished, underfished, or whether the status is undetermined

Socio-economic benefits of the fishery, including postharvest:

- Outline the value of the fishery in terms of its landings and where the catch is sold (i.e. locally or exported).
- Describe how the catch is handled, processed, marketed and utilized.

Stakeholders

- Describe the main stakeholders involved in the fishery (e.g. the fishers involved, associated or dependent industries, conservationists, adjacent fisheries, artisanal fisheries, recreational fishers) and their interests.
- Detail other uses and users of the ecosystem, especially activities that could, or are, causing significant impacts or conflicts. Outline current arrangements for coordination and consultation processes with stakeholder groups (engagement)

Any special environmental considerations for the fishery

- Details of critical habitats, any particularly sensitive areas and endangered species interactions (dolphin).

Institutional aspects

- Describe the current legislative background of the fishery, existing jurisdictional arrangements, roles and responsibilities.
- Detail the decision-making process, including recognized stakeholders and government departments, the nature of any rights granted in the fishery, details of those holding the rights and their responsibilities. Describe current, scientific research and MCS arrangements. Outline the current consultation process that has led to the need to develop this plan and how the current development of the plan is to proceed

Major issues for management

- Describe the various **management issues** that the plan needs to address.
- These are the issues that have been identified and prioritized using the **risk assessment and stakeholder consultation processes**. These may include conflict between fleet segments, overcapacity, an unprofitable trawl sector, growth overfishing, various bycatch issues, habitat impacts, ecosystem impacts, IUU fishing, the exploitation of low-value fish, impacts of management on supporting and tangential industries, ghost fishing and other unidentified mortalities

Management goals

- **Agree (two or three priorities) goals that represent the outcomes you want from addressing the issues**

Management objectives

- Describe the specific objectives of the plan. These need to address the high priority issues identified above. They also need to be able to be addressed by management measures

Indicators and Benchmarks (Performance measures)

- For each objective, and associated measure(s), there should be:
 - 1) The indicator(s) that need to be monitored
 - 2) A clear description of current benchmarks
 - 3) How to measure the achievement (or failure) of the management plan in meeting the objective.
- There is a need to be realistic when developing these: avoid locking in timeframes that may be difficult to achieve.

Management measures

- This should therefore be the **largest part of the Management Plan** and will be an assemblage of measures
- For each measure, specify: **1) the components of the measure; 2) the time frame(s) by which it will be implemented. 3) the agency, group and/or individual(s) responsible for its implementation; 4) the information required to monitor these indicator(s).**
- **Examples of measures might be the nature, extent and timing of spatial closures to trawling to achieve objectives concerning artisanal conflicts, bycatch issues, etc.; the design of gear modifications designed to reduce discarding or interactions with ETP species; the design of a capacity reduction scheme; and/or a fishing effort limitation programme, etc.**

Implementation arrangements

- **Legal basis and financing:** Legislative requirements, basis in law, official recognition, resourcing and funding needs and sources.
- **Committees:** Structure of the steering committees, advisory committees, consultative committees and their various roles and responsibilities; the membership descriptions of these committees (e.g. four commercial fishers, one environmental representative, one management representative, one scientist, one economist, etc.) and the roles and responsibilities of each member; the process for appointment of members; the responsibilities of the various agencies, governments and institutions involved. Training and education requirements and how to deliver them.
- **Information and monitoring:** Data collection and MCS requirements and responsibilities (i.e. the information outlined in Sections 6 and 7 of these guidelines).
- **Review and update:** Frequency, nature and format of ongoing and periodic reviews, feedback loops, audits and updates of the plan.
- **Communication of the plan:** This section would also include a description of any **communication strategy** concerning the plan and/or the management of the fishery, including details of **outreach mechanisms**, roles and responsibilities of individuals with respect to media liaison, and the associated **resourcing requirements**.



**THE 4TH CORE EXPERT MEETING ON “COMPARATIVE
STUDIES FOR MANAGEMENT OF PURSE SEINE FISHERIES
IN THE SOUTHEAST ASIAN REGION”
(JAPANESE TRUST FUND VI)**



**Kuala Lumpur, Malaysia
18-19 September 2018**

Management Measures for Purse Seine Fisheries

Possible Management Measures for Purse Seine Fisheries in ASEAN Region

by

Prof. Dr. Takashi Matsuishi

**Resource person
Hokkaido University**

Framework of the fisheries management for purse seine

2

Purse seine fishery is highly multi-species fisheries.
Sometimes species composition is not reliable.
Fisher can not select species = Non selective fisheries.

- ▶ Consider pelagic fish group as a stock.
- ▶ Calculate MSY or ABC for fisheries not species.
- ▶ Implement fisheries management to the fisheries.
- ▶ Special care for specific species if necessary.

Data collection

3

- ▶ Improved.
- ▶ Some countries still has difficulties
- ▶ For some countries, data cleaning may be needed
- ▶ Catch statistics better than Effort.
- ▶ Effort unit can be selected from various units
- ▶ Sometimes standardization of the CPUE is necessary

Calculation

4

- ▶ ASPIC can be useful when CPUE can available.
- ▶ Be sure to use cleaned data
- ▶ Be careful to choose model Fox / Shaefer
 - ▶ Fox can made overestimate for optimal effort
- ▶ ABC rule type 2 can be used for data poor situation.
- ▶ Estimation can be conservative / safe

Fisheries Management Measure

5

- ▶ Input control
 - ▶ Number of Vessel
 - ▶ Operation days
 - ▶ Number of Halts
- ▶ Other control
 - ▶ Zooning
 - ▶ Seasonal / Areal closure
- ▶ Output control
 - ▶ Catch Limit (TAC)

Combination of Input and Output Control

6

- ▶ Output control is sometimes difficult to implement because it needs real-time catch statistics.
- ▶ Input control can be applied if catch statistics has time lag.
- ▶ Adjust fishing effort to F_{MSY} or $F_{cur} TAC/C_{cur}$
- ▶ Monitor the catch and adjust fishing effort to achieve TAC

Fisheries Management Plan

7

- ▶ To implement regional fisheries management of purse seine fisheries, FMP will be important for explain to the decision maker and stakeholders
- ▶ TAC allocation rule should be decided and made consensus among countries.

Monitoring Control and Surveillance (MCS)

8

- ▶ FMP have to include measures on MCS
- ▶ Port state measures can be used for MCS
- ▶ Similar challenges to IUU fisheries

Regular meeting on the Purse seine Fisheries Management

9

- ▶ Several Meetings
 - ▶ Data collection
 - ▶ Calculation
 - ▶ TAC decision
 - ▶ Allocation
 - ▶ MCS
- ▶ Fisher (group) have to commit all procedures

Time Schedule --- example

10

- ▶ Jan-Dec 2019 : Data collection
- ▶ Jan-May 2020 : Data check and cleaning
- ▶ Jun-Aug 2020 : Calculation to ABC2021
- ▶ Sep-Oct 2020 : Decision on TAC2021
- ▶ Nov-Dec 2020: Allocation to the nations
- ▶ Jan-Dec 2021: Implementation

Special species

11

- ▶ Sharks and Rays
- ▶ Neritic Tuna
- ▶ Depleted stock
 - ▶ *Rastliger brachysoma* in GOT
- ▶ Stock Identification
- ▶ Biological Data
- ▶ Migration
- ▶ Single species stock assessment
 - ▶ Age based method
- ▶ Single species fishery management for all gears targeting



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18-19 September 2018**

Way Forward

by

Dr. Kenji Taki

Deputy Chief of SEAFDEC/MFRDMD

Proposal of Way Forward

by

Deputy Chief of SEAFDEC/MFRDMD

19 September 2018

Remarks from Resource Persons

- Dr. Matsuishi recommended multispecies management with special care for the status of tuna-like and shark species with lower intrinsic rate (r) from his simulations.
- Mr. Abu Talib illustrated rapid assessments for Risk and Fisheries Assessment for our data-poor situation using examples of Indian Mackerel and Purse Seine fisheries.
- We need to examine their studies and develop our management plans in our regions.

Remarks on Genetic

- Genetic study using COI showed the existence of apparent different stock of *A. sirm* between northern AS and SCS along with southern AS.
- Further examination using other methods (considering budget) is needed along with wider samplings from Bay of Bengal.
- A more detailed morphological investigations is also crucial.

Remarks on Country Reports

Examples of current stock assessments applied by AMSs

- 4 regions of Malaysia: un-equilibrium production model using ASPIC and Kobe Plot.
 - Issue: Need to select better effort indices and require clearer procedure.
 - Standardization and scaling of CPUEs.
- The Philippines: Relative Y/R and B/R analysis using FISAT.
 - Issues: Need to improve growth curve from length-frequency data.
- Thailand: Equilibrium FOX production model.
- MFRDMD: ABC Rule 2-2 and equilibrium FOX production model.
 - Issues: Need to investigate the reason of fluctuation (ABC).
 - (Essential of relevant info provided from AMSs).
 - Need to select better effort indices for synthesized analysis (PM).

Remarks on Country Reports

Reasons of fluctuation of catch & effort & CPUE:

- Regulations (e.g. Thailand).
- Intention of control of catch for keeping high unit price for specific species (e.g. Cambodia).
- Change of pattern of operation due to improvement of technology on board (e.g. day per trips for Thailand).
- Defect of data itself etc.

Remarks on Country Reports

Effort indices

- There are many gear types with several size categories and several methods (e.g. Free school, Light luring, FAD).
- Brunei Darussalam: Possibility of becoming leading countries in SEA for establishment of effective data collection in the future.

Remarks on Country Reports

Effort indices

Thailand: Good model case for searching better indices

- Number of units (vessels): Not good because of several vessels with licenses without sailing.
- Number of trips: Not good because of recent steep increase of days per trip due to development of storage ability.
- Number of days: Better index, no consideration of categorize of vessel sizes seem to be currently little problem due to assumable small difference of catchability among vessels, although further analysis is needed.
- Number of hauls: Not good because of wide range of no. of hauls per day among vessels.

Remarks on Country Reports

Biological parameters

- There are a lot of info on size, maturation period, maturity size etc. provided from AMSs so far.
- For *A. sirm*, the analysis of geographical variations of these parameters (with data reliability check) might partly contribute to the clarification of population structure from the ecological point of view.



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CLOSING REMARKS

by

Dr. Kenji Taki

Deputy Chief of SEAFDEC/MFRDMD

CLOSING REMARKS

Dr. Kenji Taki
Deputy Chief of SEAFDEC/MFRDMD

**The 4th Core Expert Meeting on “Comparative Studies for Management of Purse Seine Fisheries in the Southeast Asian Region”
(18 – 19 September 2018, Melia Hotel, Kuala Lumpur, Malaysia)**

Chief of SEAFDEC/MFRDMD, *Mr. Raja Bidin Raja Hassan*, Our resource person, Dr. Matsuishi from Hokkaido-University, Mr. Abu Talib Ahmad, Former Senior Director of Malaysia Fisheries Research Institute, Department of Fisheries Malaysia. Distinguished expertise from participating Member Countries, Project Leader *Mr. Mohammad Faisal* and my colleagues from SEAFDEC/SEC (Dr. Worawit), SEAFDEC/TD and MFRDMD; Ladies and Gentlemen.

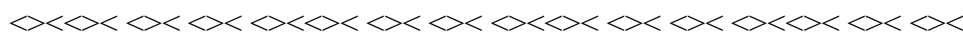
First of all, I would like to appreciate all of you for your active participation in the "The 4th Core Expert Meeting on Comparative Studies for Purse Seine Fisheries in the Southeast Asian region". During the 2 days meeting, we have shared the latest information about landing and CPUEs of PS fisheries in the region, compiled the current management measures for PS fisheries in the region, shared experience on data processing for management of purse seine fisheries, and updated the population structure for *Amblygaster sirm*.

In the country reports, four delegations of Malaysia provided the current status of stock using un-equilibrium production model from ASPIC and Kobe Plot, and MFRDMD provided the results using ABC Rule 2-2 and equilibrium production model, which become the important steps for the further development of stock assessment in the region. On the other hand, Thailand provided the good model case for searching better effort indices for their analysis.

Also, thank you for our resource persons, Dr Matsuishi and Mr. Abu Talib. Dr. Matsuishi provided us the recommendation of multispecies management with special care for tuna-like species and sharks from his interesting simulations. Mr. Abu Talib showed the examples of rapid risk and fisheries assessment toward development of fisheries management plan. These examples have provided us very important direction for further development of management in our region.

In closing the meeting, I appreciate again for your cooperation. Especially, I really appreciate our resource persons for their hard work and contribution to the workshop, which is very much helpful for our upgrading the fisheries management in the region.

My special thanks also go to our Meeting Secretariat working very hard behind the scenes. All your efforts made this workshop very successful. Last but not least, I wish all of you have a safe journey back home. Now I declare the 4th Core Expert Meeting closed. Thank you very much and have a nice day.





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**Marine Fishery Resources Development and Management Department
Southeast Asian Fisheries Development Center**



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