

Review

An overview of purse seine fisheries management in Malaysia

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Keywords: Purse seine fisheries; Multi-species; Fisheries management.

Received: 18 July 2017 / Accepted: 11 September 2017

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Introduction

During coupled decades, pelagic fisheries have made up the largest part of marine catches in Malaysia [1] due to the presence of purse seine fisheries [2,3]. Recently the Department of Fisheries (DoF) Malaysia has attributed their pelagic fisheries with more prominent measures: technical measures (i.e. closed fishing area, fishing zones, conservation of marine habitat), input controls (i.e. control on fishing effort and fishing units, registration of fishers) and community based fisheries management [3].

During the implementation of those measures, some valuable progresses have been accomplished. As stated in the National Plan of Action for the Management of Fishing Capacity in Malaysia (Plan 2) [4] (NPOA II), Malaysian fisheries have dealt with former planned strategies documented in NPOA I [5]. However, the effectiveness and validity of these strategies have not been clearly measured. Moreover, the implementation of each strategies might cause trade-offs to other strategies [6].

This study offers an overview of Malaysian purse seine fisheries in conducting their fisheries management.

Materials and methods

To portray the characteristics of Malaysian purse seine fishery, time series fisheries statistics data (1995-2015) were collected from the website of DoF Malaysia (www.dof.my) and confirmed by Southeast Asia Fisheries Development Center (SEAFDEC)/ Marine Fishery Resources Development and Management Department (MFRDMD) respectively. Both parties also provided some documents of NPOA and status of purse seine fisheries.

Results and Discussion

The characteristics of purse seine fisheries in Malaysia
Fisheries area in Malaysia can be divided into four sub-regions namely the West Coast and East Coast of Peninsular Malaysia, Sabah and Sarawak. Based on Annual Fisheries Statistics [1], Peninsular Malaysia regions played more important role in terms of landing contribution than other areas.

Alike typical Southeast Asia fisheries, Malaysian fisheries is a multi-species, multi-gear, many fishers, many landing sites, and data-poor situation. In this situation, however, the production of marine fisheries is off to 75% where 77% of that was contributed by production of pelagic fish [7]. Purse seine is the most productive gear in contributing pelagic landings (27% of total landings) after trawl. Moreover, the catch per unit effort (CpUE) of purse seine also showed that purse seine is the most effective fishing gear, even though the number of purse seine operated remained stable from time to time compared to other 16 classified gears.

The trend of specified effort units of purse seine from 1995-2015, such as fishing hauls, fishing hours, fishing days, and fishing trips showed that there was high variation of effort used [1]. These variations might be resulted from unreported fishing activities which occurred during 1950 – 2010 due to high number of unlicensed small-scale fishers who lived in inaccessible fishing ports [2].

The status of pelagic fishes is important to develop fishing industry in Malaysia. Regular surveys were carried out to update biomass and maximum sustainable yield (MSY) information. The surveys indicated that the pelagic stock is decreasing and fully exploited, even though some of pelagic species are highly productive [3].

There are some dominant pelagic species caught by purse seine fisheries for 20 years. They are *Decapterus maruadsi* (25-47%), *Sardinella fimbriata* (10-20%), *Selaroides leptolepis* (5-16%), *Rastrelliger* spp (5-10%), and *Euthynnus affinis* (0-17%), and *Alepes kleinii*

The JSFS 85th Anniversary-Commemorative International Symposium
 “Fisheries Science for Future Generations”

Symposium Proceedings, No. 02005

(0-7%). During the latest 15 years, there was change in species composition caught in purse seine fisheries. Some uncommon species were found and compensated other species. Little have known of how diverse and dynamic of catch composition in Malaysia.

Qualitatively evaluation of management measures

Below are the existing management strategies (documented in NPOA II) [4]:

- a. Adjustment of fishing capacity. This action accomplishes by conducting moratorium of new licenses for gears and vessels. It might be benefit to multi-species fishery, since it will reduce mortality among all species included in fishery. However, it has limitation that could not directly restrict the fleets from the individual stocks [14]. In other words, the existing fleets still can target the depleted stocks.
- b. Rehabilitation of fishery resources. Several rehabilitation actions have been implemented, such as establishing fish refugia of some important species (e.g. mackerels, lobsters, sea cucumber), declaring close season of selected areas and modifying fishing zones. These will reduce the mortality rate of either target or non-target species. However, it might require high enforcement effort which is costly. Also, it needs to be considered about the biological information of protected species in terms of migration periods and sites [14–16].
- c. Implementation of quota system through Total Allowable Catch (TAC) estimation. The critical point of applying this action is when determining the TAC [11,12]. Setting the TAC for primary species in multi-species fishery should also consider the proportion of the companion species [14,18]. Since the expected proportion of primary species might be taken as a companion species non-target catch.

It is more applicable to also consider developing fishing community as Japanese coastal fisheries (Fisheries Cooperative Association/FCA) [12]. Under FCA, the members govern their rights voluntary and self-imposed including conducting monitoring and sanction clauses. This might reduce the monitoring cost and strengthen community awareness to their fishery assets.

Conclusions

Under the existing measures, some valuable progresses have been accomplished, but the limitations of these measures remain, since they do not directly constrain the fleets from targeting a depleted stock as uncertainty of management implementation. A package of management strategy evaluation [7-10] that is robust to uncertainty and trade-off of conflicting objectives is needed to be applied.

Acknowledgements

Gratefully acknowledges were given to the Indonesia Endowment Fund for Education (LPDP) and Southeast Asian Fisheries Development Center (SEAFDEC) for their financial support. The authors also would like to thank to DoF Malaysia which provided invaluable documents for this work.

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