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An impact of purse seine fishery for yellowfin tuna stock

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Abstract

Following Conservation and Management Measure 2013-01, deterministic projection study in SC10 was addressed for yellowfin tuna stock that calculated relative impact of different effort ratio of purse seine types (FAD sets or unassociated sets). However, this study did not suppose stock-recruitment relationship. In order to gain a deeper understanding of yellowfin tuna management, we attempted deterministic projection for yellowfin tuna stock to assume effort reallocation (FAD sets to unassociated sets) and spawner recruitment relationship. A future projection result showed that spawning biomass would increase when effort of FAD sets was redistribute for unassociated sets. These results support effectiveness the operational shift from associated sets to unassociated sets in the management of yellowfin tuna.

Introduction

Conservation and Management Measure 2014-01, as same as CMM 2013-01, requires that SC provide advice to the Commission on the relative impact on fishing mortality for yellowfin, of FAD set measures and any increases of yellowfin purse seine catch in unassociated schools. Previous study (Hampton and Pilling 2014) already addressed this issue, which calculated relative impact of different effort ratio of school type using future projection. However stock-recruitment relationship was not supposed in the projection. These two points may affect the results of the future projection. The aim of this study is to readdress this issue with a future projection assuming effort reallocation and stock-recruitment relationship.

Method

We addressed deterministic projection for yellowfin tuna stock as showed in Table 1.

Table1. An outline of the future projection for yellowfin tuna

- **Recruitment:** Bevrton-Holt spawner recruitment relationship (Davies et al., 2014)
- **Initial population and parameters:** 2014 yellowfin tuna stock assessment result (Davies et al., 2014)
- **Projection model:** Age structured model according to the 2014 stock assessment (Davies et al., 2014)
- **Projection period:** 2015-2022
- **One operation catch:** calculated catch number at age per one day operation (effort) for each sets using estimated average catch number at age and effort from 2010 to 2012.
- **Projection scenario:** Reallocation from FAD sets to unassociated sets (e.g., reallocate number of FAD operation as 5,000, 6,000, 7,000, 8,000, 9,000, 10,000 days to unassociated operation).
- **Projection outputs:** To evaluate the management scenario, we calculated stock status index at 2022 ($SB_{2022}/SB_{F=0(2002\text{-}2011)}$) and amount of catch reduction.

Result and discussion

Spawning biomass

Stock status indices ($SB_{2022}/SB_{F=0(2002\text{-}2011)}$) were increased with reallocation days (Fig.1). Because of recruitment assumption difference, this projection result of stock status is more pessimistic than results of Hampton and Pilling (2014).

Amount of catch

There were clear positive relationships between spawning biomass stock status and number of reduced operation days for all scenarios (Fig. 1). The magnitude of decreasing catch amount of yellowfin tuna for the FAD scenario was larger than the unassociated one. Catch amount decreased because catch amount per one operation day of FAD sets is larger than unassociated sets (Fig. 2).

Conclusion

When effort of FAD sets was redistribute for unassociated sets, spawning biomass would increase. Furthermore, MSY would increase with percentage of purse seine effort on unassociated sets (Hampton and Pilling 2014). These results support effectiveness the operational shift from

associated sets to unassociated sets in the management of yellowfin tuna.

Reference

Davies, N. S. Harley, J. Hampton and S. McKechnie (2014) Stock assessment of yellowfin tuna in the western and central Pacific Ocean Rev 1 (25 July 2014). WCPFC SA-WP-04.

Hampton, J. and G. Pilling (2014) Relative impacts of FAD and free school fishing on yellowfin tuna. WCPFC MI-WP-05.

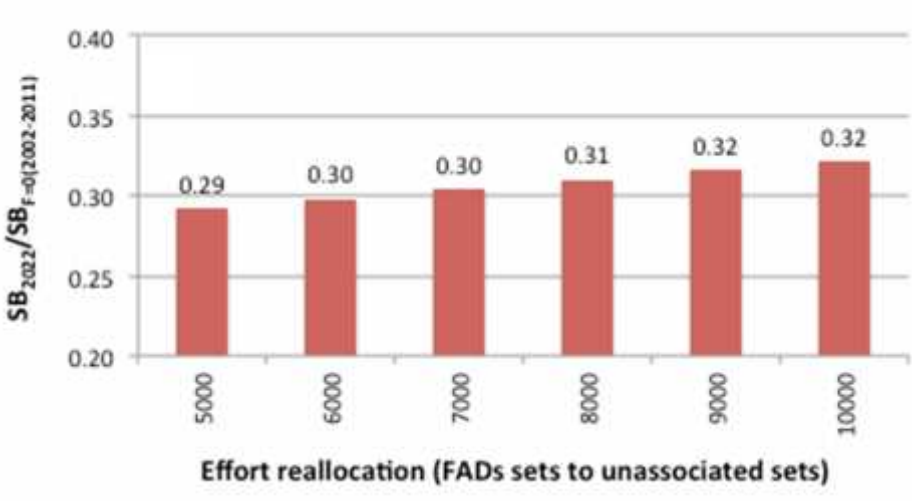

Fig1. Stock status of yellowfin tuna in 2022. Effort reallocation (FADs sets to unassociated sets).

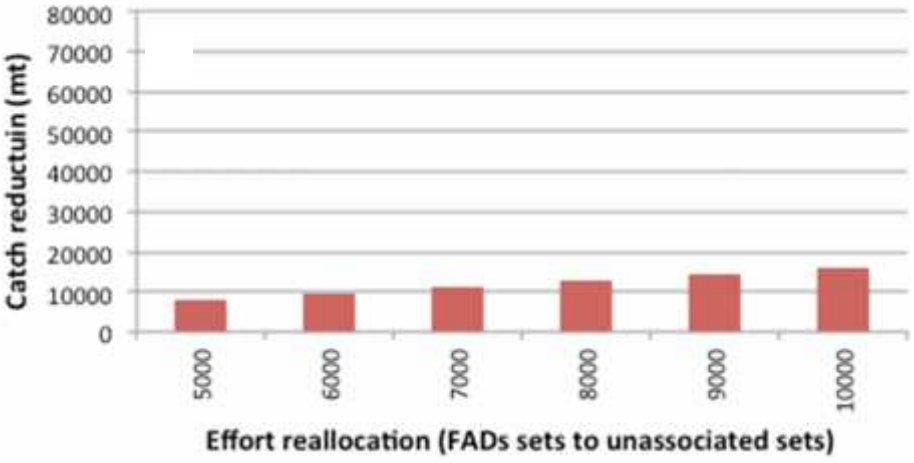

Fig2. Catch decreasing under each regulation. Effort reallocation (FADs sets to unassociated sets).