THE ORGANIZATION FOR THE PROMOTION OF RESPONSIBLE TUNA FISHERIES

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FOR CONSERVATION AND SUSTAINABLE USE OF TUNAS

Can purse seine fisheries targeting skipjack co-exist with the sustainability of bigeye stocks?

Ⅰ. History and background

Purse seine settings associated with fish aggregating devices (FADs) have dramatically increased the efficiency of commercial purse seine operations targeting skipjack since the 1990s. Before such epoch making changes took place for purse seine fisheries it was well known that settings associated with floating objects (e.g. logs and carcass of whales) produced good catches but chances for purse seiners to come across such objects were low.

At the same time, tuna longline vessels, in particular large-scale ones have been targeting adults of tuna species including bigeye and yellowfin for several decades before the commencement of the use of FADs in commercial purse seine fisheries.

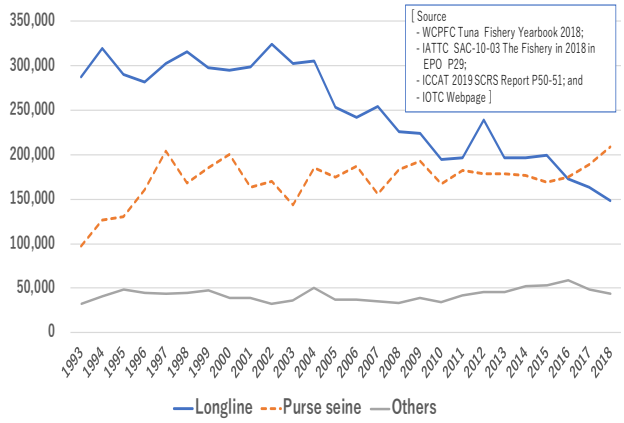
Friction has ocuured between tuna longline fisheries and purse seine fisheries that came to utilize FADs since 1990s.

While longline fisheries which use relatively large-sized hooks to catch adult tuna, purse seine settings associated with FADs catch larger amounts of juvenile bigeye and yellowfin tunas associated with increased catch levels of skipjack.

Ⅱ. Recent Situation

It is remarkable that bigeye stocks have deteriorated because of increased catch (and discard) of juveniles by purse seine settings that have expanded since the 1990s. As a part of such consequences, catches of adult bigeye have been decreasing and in terms of gear types longline fisheries have shown drastic decline in their bigeye catches.

Figure 1: Combined catches (or removals) of bigeye from 4 Oceans by gear (t)



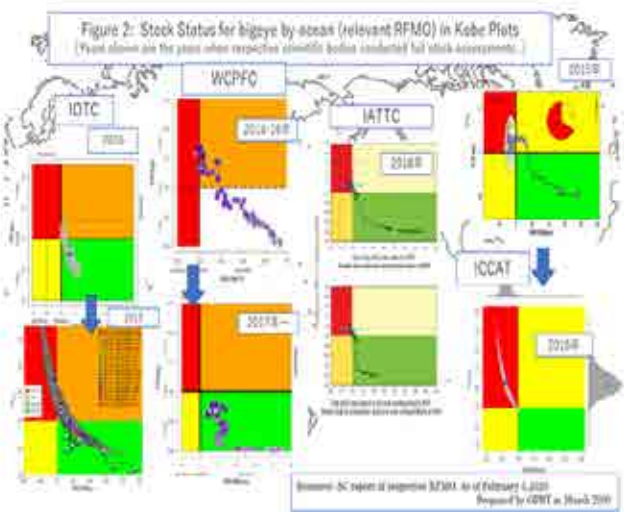
With respect to recent stock status by ocean (area covered by respective t-RFMOs), out of 4 stocks, the Atlantic bigeye is categorized as being in the “Red zone” of the Kobe Plot (the stock is overfished and subject to overfishing), and the eastern Pacific Ocean (EPO) and Indian stocks are in the “Orange zone” namely the stock is not overfished but overfishing is taking place, and if the current catches continue the stock would fall into the “Red zone”.

Only the western and central Pacific Ocean (WCPO) stock is categorized as being in the “Green zone”. The stock assessment conducted in 2017 has indicated results that are contrary to the assessment conducted in 2014 indicating that the stock is in the “Red zone”. The introduction of new aging methodology into the 2017 and 2018 assessments has brought about this optimistic assessment.

To date, it does not seem that the new aging methodology and resultant growth are more plausible compared to those employed in the 2014 assessment. In this regard, many items to be pursued are listed in the research recommendation section of the Summary Report of the 15 Session of WCPFC Scientific Committee held in August 2019.

All conservation and management measures of fish and other stocks require relevant scientific information and management advice from the scientific viewpoints. Commissions of the t-RFMOs cannot ignore scientific views in establishing such measures.

To this end, scientific bodies are installed in each of respective t-RFMO frameworks: they are called the Scientific Committee (SC) in WCPFC and IOTC, the



Scientific Advisory Committee (SAC) in IATTC and the Standing Committee on Research and Statistics (SCRS) in ICCAT.

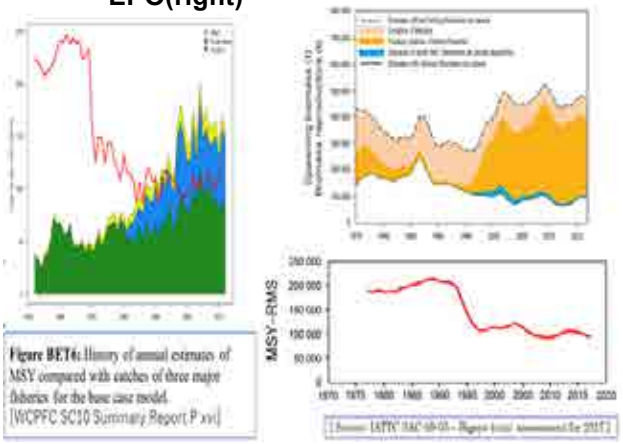
These scientific bodies have pointed out that excessive catches of juvenile of bigeye (and yellowfin) have brought about deterioration of the stock(s) and called for reduction in catches by purse seine settings and other fishing operations that utilize FADs or other floating objects.

"The Commission (ICCAT) should be aware that increased harvests on small fishes by FADs and other fisheries as well as the development of new fisheries could have had negative consequences for the productivity of bigeye tuna fisheries (e.g. reduced yield at MSY and increased SSB required to produce MSY)" [Management Recommendation (for bigeye): P48, 2019 SCRS REPORT]

"Declines in longline effort since 2007, particularly from the Japanese, Taiwanese and Rep. of Korea longline fleets lowered the pressure on the Indian Ocean bigeye tuna stock since 2007. However, recent increase in catch from purse seine fleets have increased this pressure and the stock is estimated to be subject to overfishing." [Outlook, APPENDIX 9 EXECUTIVE SUMMARY: BIGEYE TUNA P83-85 Report of the 22nd session of IOTC Scientific Committee]

Furthermore, scientific bodies have been drawing respective commissions' attention to that high level of fishing mortality of juvenile bigeye (and yellowfin) reduces the level of maximum sustainable yield (MSY) which relevant fisheries can achieve.

Figure3: History of reduction in levels of MSY for bigeye stocks in WCPO(left) and EPO(right)



For eyample, ICCAT SCRS has sent the following advice for bigeye to ICCAT:

"…should the Commission wish to increase long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce fishing mortality of small bigeye tunas." [Management Recommendation (for bigeye): P48, 2019 SCRS REPORT]

This is also the case for the Atlantic yellowfin.

"The Commission should (also) be aware that increased harvests on small yellowfin tuna has had negative consequences to both long-term sustainable yield and stock status (YFT-Figure 13), and that continued increases in the harvest of small yellowfin tuna will continue to reduce the long-term sustainable yield the stock can produce. Should the Commission wish to increase long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce fishing mortality on small yellowfin tuna (e.g. FOB-related and other fishing mortality of small yellowfin tuna)." [Management Recommendation (for yellowfin): P27, 2019 SCRS REPORT]

Similar findings are described for the EPO.

"Before the expansion of the FAD fishery that began in 1993, the MSY was greater than the current MSY and the fishing mortality was much less than F_{MSY}"[IATTC SAC-09-05 – Bigeye tuna: assessment for 2017 P4]

The WCPFC Scientific Committee also pointed out the following in its meeting in 2018 under the new optimistic stock assessment for bigeye in the WCPO.

"SC14 noted that levels of fishing mortality and depletion differ among regions, and that fishery impact was higher in the tropical region (Regions 3, 4, 7 and 8 in the stock assessment model), with particularly high fishing mortality on juvenile bigeye tuna in these regions. SC14 therefore recommends that WCPFC15 could continue to consider measures to reduce fishing mortality from fisheries that take juveniles, with the goal to increase bigeye fishery yields and reduce any further impacts on the spawning biomass for this stock in the tropical regions.' [Summary Report WCPFC SC14]

Ⅲ. Major problems and ways to proceed

In order to recover bigeye (and yellowfin) stocks and to realize a more sustainable utilization of those stocks, at least the following actions should be taken without delay bearing in mind particularly Target 14.4 of SDG14 (see section III, ii) below).

i) Realization of adequate reduction in juvenile catch by FAD settings.

Since the deterioration of bigeye stocks continues, measures established and implemented in t-RFMOs are assessed to be not effective enough to reflect the advice from scientific bodies to reduce fishing mortality of juveniles of bigeye (and yellowfin) brought about by chiefly FAD settings by purse seiners.

This situation should be rectified without delay.

ii) Measures should be taken to increase the level of MSY that can be achieved from bigeye (and yellowfin) stock(s).

We have to be conscious that the Kobe Plot cannot display the levels of MSY and that we need other figures to detect changes in MSY levels.

Furthermore, it should be noted that in the UN Sustainable Development Goals (SDGs) framework SDG 14 is dedicated to "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" and the following is included as one of the targets of Goal 14: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and **implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.**

With respect to interpretation of the phrase**"at least to levels that can produce maximum sustainable yield as determined by their biological characteristics"** we may have to consider biological characteristics such as longevity and reproduction of the species concerned and gear types that utilize the stock concerned, etc. but we can say that

it would be unreasonable if newly emerged fisheries that catch significant amounts of juveniles depressed the total yield from the stock concerned.

For the case of restoration of bigeye (and yellowfin) stocks, effective restriction should be applied to FAD settings by purse seiners to reduce fishing mortality of juveniles.

iii) Close monitoring should be continuously carried out on the status of purse seine operations associated with FADs and relevant management measures should be revised accordingly without delay to ensure their effectiveness.

The efficiency of purse seine operations associated with FADs seems to increase day by day as a result of technical innovations.

For example, the following phenomena can contribute to increase catching efficiency of purse seine operations utilizing FADs: a larger number of purse seiners become capable of conducting FAD setting more than once a day and, the increased number of FADs installed with sonar and satellite transmission devices.

This situation should be monitored closely in a continuous fashion and appropriate management advice should be provided to the scientific body and the Commission of each t-RFMO in order to establish and implement necessary management measures without delay to ensure the sustainability of the stock(s) concerned reflecting such increased efficiency.

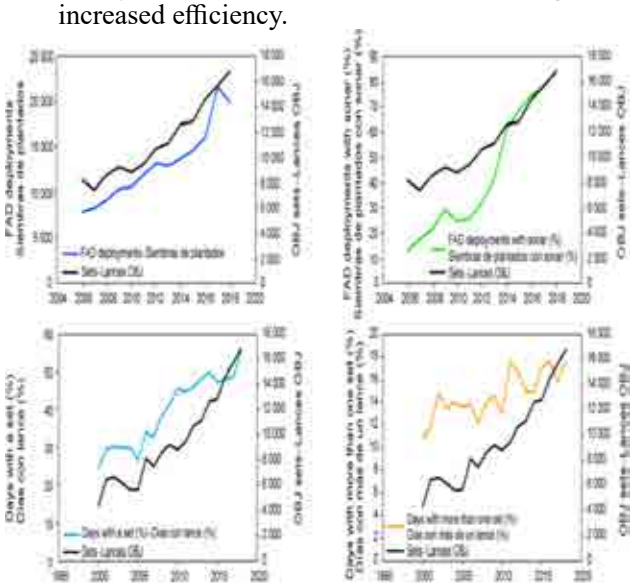


Figure4. Various quantities used to investigate the reason for the increasing number of sets. The proportion of days with a set was calculated as the annual average, for all vessels, of the proportion of days fished with one or more floating-object sets. [Source: IATTC: SAC-10-06 – Stock status indicators for bigeye tuna]

The 4 figures included in Figure4 are for purse seine fleets operating in the EPO.

Under the situation where the number of purse seine settings associated with FADs is increasing the following phenomena have been observed that boost the efficiency of FAD setting operations and the impact on the EPO bigeye stock:

a) The total number of FADs deployed in the sea is increasing (shown with the blue line in the upper-left figure);
b) The percentage of the day when purse seiners are successful in conducting settings is increasing (with light blue line in the lower left figure);
c) The percentage of FADs equipped with sonar in the total FADs deployed in the sea is increasing (with green line in the upper right figure); and
d) The percentage of the days with more than one setting in the total days operated in association with FADs is increasing (with orange line in the lower right figure).

Based on those developments, IATTC Staff has provided the Commission with the following recommendations for the previous two years to add a new provision to the Resolution C-17-02 which was adopted in 2017 and covers 2018-2020 for the EPO tropical tunas including bigeye, in order to strengthen management measures for purse seine fisheries in the EPO.

"…The indicators suggest that **additional management measures should be considered to address the continuing increase in the number of sets on floating objects that, despite the longer closure since 2017, is a concern for all three species(Bigeye, Yellowfin and Skipjack).**

RECOMMENDATIONS(for 2020):

1. **Maintain the provisions of the current resolution (C-17-02).**
2. **For the purse-seine fishery, limit the total annual number of floating-object and unassociated sets combined (OBJ+NOA) by Class-6 vessels in 2020 to 15,723. Once the limit is reached, only dolphin-associated (DEL) sets will be allowed during the rest of that year, and all vessels without a Dolphin Mortality Limit must return to port."**

[Source: IATTC-94-03 – Staff recommendations 2019]

Notwithstanding this, no actions have been taken by the Commission to cope with the increased efficiency of FAD settings in the EPO. IATTC is expected to undertake serious deliberations to establish effective management measures at this year's Commission Meeting to be held in August in La Jolla, USA.

Basically, fishing mortality from respective fishing gear types shall be controlled by means of output control, such as catch quota by fishing gear by country. And the conservation and management measures for bigeye stocks to be developed on this basis should realize those three points mentioned in i) - iii) of Section III.

Pending such arrangement will be in place, free-school operations should be promoted further and settings associated with floating objects including FADs should further be decreased.

Ⅳ. Promotion of "free-school settings" is an effective option to pursue

People related to purse seine operations associated with FADs often say "Skipjack is what we want to catch and small bigeye and yellowfin are a nuisance in our fishing". Free school (Unassociated school) set-

tings can meet their interest. Free school settings can bring skipjack as the targeted species with much lower catch of juvenile bigeye (and yellowfin) compared to settings associated with floating objects including FADs.

Figure 5: Schematic chats for FAD set(left) and unassociated set(right)

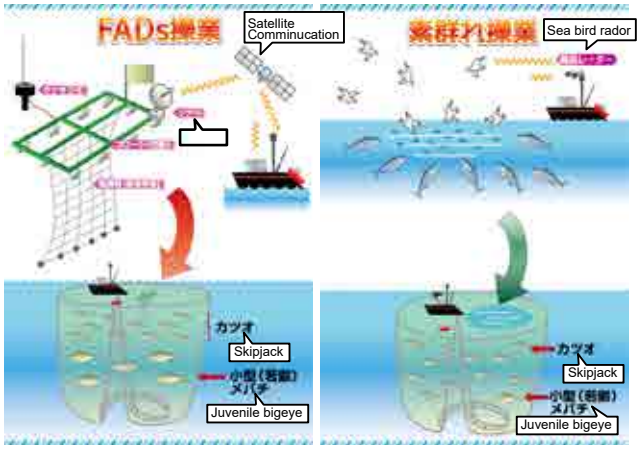
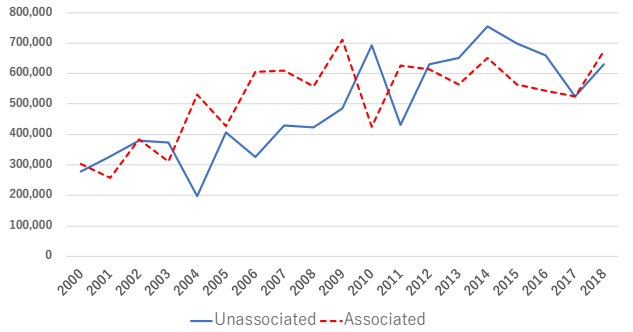


Figure 6: Catches of skipjack by set type(t).



While catch of skipjack(SKJ) levels for both set types are almost the same recently in the WCPO(Figure 6), the total catches of bigeye(BET) by associated sets [A sets] ranging from 20,000-65,000t during 2000-2018 have been much higher than that of unassociated sets [U sets](2,000-10,000t)(Figure 7).

BET catch per set is much lower for the U sets compared to the A sets.

BET (bycatch)/SKJ (target) ratios in terms of catch for the U sets have been much lower (0.6-1.8%) than that for the A sets (5-19%)(Figure 8).

Figure 7: Comparison between Unassociated and Associated setting

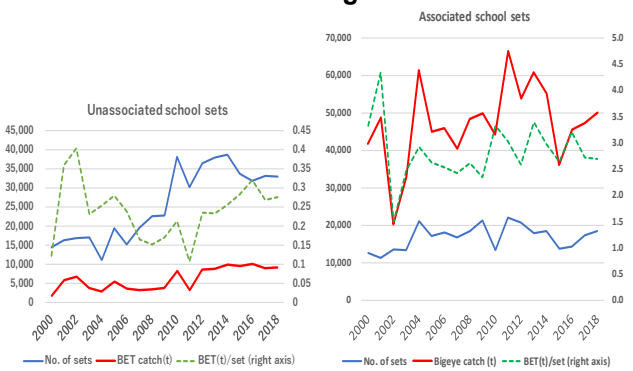
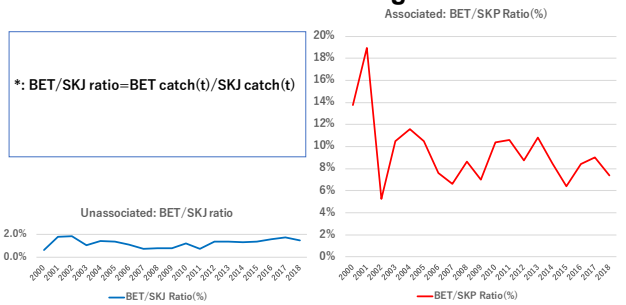


Figure 8: BET/SKJ ratios* between Unassociated and Associated settings



However, average catch of SKJ per set for the U sets (16-22t/set) is lower than that for the A sets (23-41t/set). Of the total number of sets, the percentage of successful sets is lower for the U sets.

The figure 9 displayed below indicates the breakdowns to free-school setting, log setting and FAD settings of the total effort (left) and total catch (right) by major CCMs with major purse seine fleets. While Japan has the highest percentage of free-school settings in both total effort and catch results, followed by the Republic of Korea and Taiwan, there are CCMs that have major purse seine fleets with lower percentages of free school settings and there is room for further efforts to promote free school settings. Such endeavors will lead to a further reduction in fishing mortality of juvenile bigeye and yellowfin caused by purse seiners if more FAD settings are converted to free school settings.

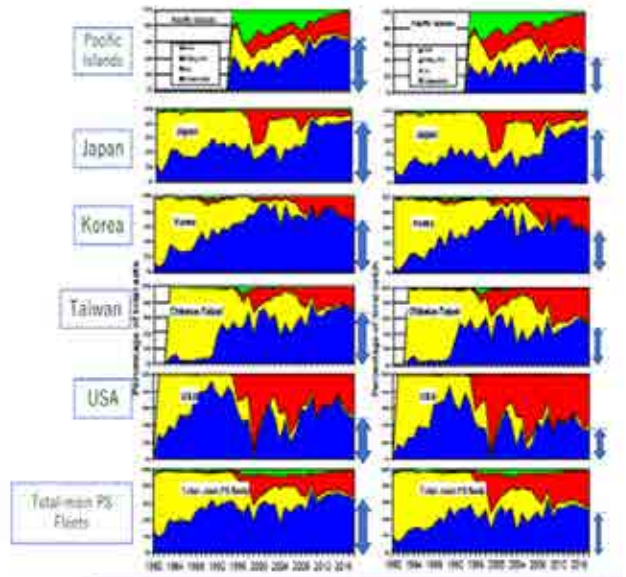


Figure9: Time series showing the percentage of total sets (left) and total catch (right) by School type for the major purse-seine fleets operating in the WCPO
■: Unassociated, ■: Log, ■: Drifting FAD, ■: Other Resouce: P7 SC15-GN-WP-01

Recent technical innovations are expected to make unassociated settings more attractive by e.g. improving school detection with drone technology. Other technological developments should also be pursued aiming at a reduction of unsuccessful settings which result in much lower than average catches.

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