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SMALL TUNA ON FLOATING OBJECTS

WCPFC-SC3-Informal Small Group/WP-2

SMALL GROUP 3
(Convener: David Itano)

SC3 Small Discussion Group – Small Tuna on Floating Objects

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Plenary Agenda Item: 5.3 Juvenile bigeye and yellowfin tuna

Focus:

Review of CMM-2005-01, CMM-2006-01 and paragraphs 36-38 of the SC2 Executive Summary

- Review any FAD-related, industry-associated research in relation to mitigating juvenile mortality of bigeye and yellowfin tuna
- Refine analyses of potential management options to reduce such catches.
- Any outcome from industry-associated research (paragraph 7, CMM-2006-01)?

Output for SWG and/or Plenary Discussion:

Consideration of mitigation measures with a focus on the use of FADs

Terminology and problem statement

The more technical scientists and biologists objected to the terminology of ***"juvenile bigeye and yellowfin tuna"*** that implies relevance to maturity stage and reproductive status while ignoring the fact that a large proportion of purse seine-caught yellowfin and longline-caught bigeye tuna are of an acceptable market size but are sexually immature. It was pointed out that the issue at hand refers to ***small tuna taken in association with floating objects***, either FADs or natural floating objects such as logs and debris. This category includes:

1) **"undersize" tuna and tuna-like species** that have little or no current market value at purse seine landing sites, are easily damaged in brailing and are often discarded (either onboard or during transshipment or unloading)

2) **very small sized market tuna species** (yellowfin and bigeye) and tuna-like species (*Euthynnus, Auxis*) that are significant target catch in the **Indonesia and Philippine surface fisheries that** concentrate on anchored FADs, and

3) all bigeye tuna taken by surface fisheries in the WcPO AND small yellowfin tuna (less than approximately 50? cm) captured by surface fisheries on floating object sets.

The desirability to minimize fishing mortality from category (1), the ongoing high level of annual catch from category (2) and the significant increase in category (3) catch has lead to resource and management-related issues now faced by all RFMOs.

All of these sources of fishing mortality suggest a more technically descriptive term of **Small Tuna on Floating Objects (STFO)** may be useful and will be used in this document. It is suggested that this term be applied in further discussion by the WCPFC.

Summary of proposed or implemented management approaches to reduction in STFO fishing mortality

The increasing trend in landings of small tuna are considered partially responsible for pushing the WCPO bigeye and yellowfin resource into a condition where "no increase" or reductions in fishing mortality have been recommended by the SCTB and SC for several years.

The situation has produced several lists of recommended management recommendations to reduce effort and landings of STFO that have been produced at meetings of the SCTB, SC, IATTC and special working groups of the FFC and other organizations. These lists of management options have been divided into **Output Controls** that directly limit catch and **Input Controls** that attempt to reduce effective effort. **Appendix II** summarizes suggested management options to reduce fishing mortality on STFO.

It was noted that the Small Group **should not re-open debates on the relative merit of STFO management options**. However, some consensus in general terms was noted that include the following suggestions:

1) Some combination of INPUT and OUTPUT controls will be necessary, i.e. control of catch and effective effort.

2) Management efforts and the development of a management framework should include ALL TUNA SPECIES so an integrated framework is in place if management of other species (eg albacore, skipjack) becomes necessary.

3) Management measures should be spread to ALL AREAS (high seas and in zone) and significant SOURCES of STFO fishing mortality to be effective and reduce the burden of restrictive management on any one sector.

4) The BASIC PROBLEM is overcapacity in both purse seine and longline effort which should be addressed with significant INPUT controls.

5) Viable solutions, particularly gear or technical solutions need to be worked out specific to ocean area (i.e. WCPO tropical vs EPO) due to differences in oceanography and its influence on tuna behavior.

6) Observers alone are not sufficient to monitor management options and should not be used for compliance, particularly if restrictive TACs are applied. Solutions will require the Technical and Compliance Committee in collaboration with the SC to develop workable observer-independent means to verify catch and set specific information.

However, many responses were relevant to investigation through industry-related research or collaborative studies. These will be summarized at the end of this briefing document.

Review of industry-associated research

Programs in the Indian Ocean worked in close collaboration with tuna purse seine vessels operating on drifting FADs. The EU funded **FADIO[1] Program** used a chartered research vessel equipped with omnidirectional sonar and scientific grade echo sounder capable of target strength measurement to investigate tuna aggregations on commercially set drifting FADs (Dagorn et al. **SC2 FT WP-3**). Similar work was carried out in the western Indian Ocean from a purse seine supply vessel operating with a commercial purse seiner targeting drifting FADs (Miguel et al. **SC2 FT WP-8**). **Moreno et al (SC3 FT WP-5)** worked directly interviewed purse seine captains to explore aggregative behavior of tuna and other fish to drifting FADs. However, means to reduce catches of STFO were not directly investigated.

No specific industry-associated research using commercial fishing vessels was noted in the WCPO prior to this meeting. Satoh et al. (SC3 FT-WP-4) will be presented at SC3 indicating preliminary work on the relationship between drifting FAD depth and catch rates of bigeye tuna.

Analysis in the EPO determined that a relatively small number of purse seine vessels were capturing a disproportionate percentage of bigeye tuna on floating object sets **(Harley et al 2004; Harley and Suter 2007 and SC3 FT IP-2**). **Langley (2004)** examined factors that may influence bigeye catch in floating object sets in the WCPO. The study noted a high variability in bigeye catch between individual vessels (on drifting object sets) with some vessels having considerably higher catch rates of bigeye.

Analysis as to whether some difference in FAD construction or FAD-related fishing technique may influence bigeye catch rates was not possible in the WCPO as important FAD-related gear and operational parameters were not available. In contrast, IATTC observers collect detailed information on floating objects investigated or set by purse seiners in the EPO. **Lennert-Cody et al. (2007 and SC3-FT-IP-1)** used this information to examine several gear and operational parameters of drifting FAD by EPO tuna purse seine vessels. Of the gear characteristics examined, the hanging depth of the drifting FAD and the hanging depth of the purse seine net had the greatest positive effect on bigeye catch, but geographic location within the EPO had the greatest overall influence on bigeye catch.

[1] FADIO (Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems): a European Union funded project on development of new observational instruments and the behavior of fish around drifting FADs

Recommendations on industry-related research on STFO

Several suggestions were received on studies that the SC should conduct in collaboration with the tuna industry as summarized below:

1. An analysis to determine what size of yellowfin tuna should be considered in discussion of reducing fishing mortality of STFO incorporating such parameters as stock condition, recruitment indices, yield-per-recruit, and economic considerations.

2. A comparative study on relative rates of STFO and floating-object associated fauna between

    a. floating objects in the eastern vs western regions of the WCPO;
    b. analysis of the relative rates of STFO (especially bigeye) between drifting FADs and anchored FADs; and
    c. relative rates of STFO taken in archipelagic areas close to large island environments vs catch rates offshore or in high seas areas

3. A detailed analysis of bigeye catch on floating object sets by time of day

4. A much broader use of TDRs or other depth recording devices in conjunction with ADCP or Doppler current meters and pursing time to characterize actual pursing depth of WCPO purse seine gear in different areas and conditions.

5. Designed acoustic studies ON BOARD commercial purse seine vessels engaged in commercial fishing operations to document the accuracy of set size, species composition and fish size prior to setting.

6. Collaborative work between the SC, TCC and the tuna industry to develop practical observer-independent means to monitor fishing activity on purse seine and longline vessels AND size composition data with relevance to compliance issues.

7. Closer collaboration and communication between the SC and the tuna industry to seek new ideas and workable solutions to reducing the take of STFO, particularly on drifting and anchored FADs.

8. Examination of vessel specific bigeye quotas with vessel owners as a means to reduce bigeye catch and improve targeting by purse seine fisheries.

General ideas on how to reduce STFO fishing mortality and landings and implement industry-associated research

Other comments of a general nature were submitted relevant to reducing STFO landings with ways in which industry-related research may progress. Some suggestions are included below.

1. Require larger minimum processing sizes of yellowfin by canneries and a lower price for purse seine caught bigeye tuna

2. Provide an incentive-based allocation of effort within the VDS system for purse seine effort on unassociated schools

3. Provide exclusive access to purse seine closed zones to vessels willing to cooperate with scientific studies to reduce STFO catch and bigeye catch inparticular.

Recommendations

The largest constraint of scientists working with commercial vessels was recognized as the prohibitive charter costs and loss of revenue by commercially operating fleets. Some means to offset vessel time while providing cooperating vessels with an incentive to participate will need to be developed. Structured scientific cruises working close to commercial fleets are desirable but extremely expensive. The main point is that these cruises attempt to emulate commercial conditions and are not able to better utilize the accumulated experience and knowledge of commercial fishermen who are undeniably the experts on acoustic recognition, school assessment and tuna behavior. Closer collaboration and communication with the tuna industry should be supported by the Commission in order to seek practical and efficient means to reduce fishing mortality on small tuna taken in WCPO surface fisheries.

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Appemdix II. Proposed or implemented approaches to reduce small tuna catch

OUTPUT CONTROLS (controls on catch, e.g. TACs, quotas)

Catch limits for:

1) all tuna species,
2) bigeye only,
3) yellowfin + bigeye
4) bigeye less than some size, e.g. 60 cm
5) limits on skipjack catch on floating objects as a proxy for bigeye/small yellowfin catch

These catch limits can be further specified by:

1) All areas or within sub-regions
2) By fleet or fishery sector
3) By fleet category (DWFN, Domestic, JV, etc.)
4) By smaller categories i.e. by vessel, trip, operator, company
5) By zone, i.e. High Seas, archipelagic, EEZ

Catch limits can also be competitive or allocated on:

1) a merit based system
2) a demerit based system
3) increased for collaboration with management-based research

INPUT CONTROLS (control of effective effort)

Capacity limits (limiting factors, for example)

1) number, size, fish hold space of vessels
2) Effort, e.g. fishing days, number of sets
3) Effort type, e.g. by set type, area

Time / Area Closures

1) permanent, seasonal, annually adjusted, given choices
2) by set type

Limits on operational efficiency

1) Banning of tender vessels, light boats, search boats, helicopters, etc.
2) mandatory in port periods (actually an effort reduction scenario)
3) Limits on vessel machinery, electronics
4) Regulations on fishing practices (i.e. mandating time of set)

Catch specific restrictions

1) minimum size restrictions
2) compulsory retention of tuna

Gear specific restrictions and use of technical mitigation

1) minimum mesh size regulation
2) limits on net depth, length
3) installation of sorting grids, release panels, etc.

Floating object or FAD-specific controls (per time/area, boat, company, fleet, etc)
1) No floating object sets
2) Restrict number of anchored FADs per area
3) Restrict number of drifting FADs
4) Limits on number/type of radio buoys
5) Regulate FAD design (size, depth of aggregator, electronics attached, light, chumming)

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References

Dagorn L., Holland K., Puente E., Taquet M., Ramos A., Brault P., Nottestad L., Georgakarakos S., Deneubourg J.-L., Aumeeruddy R., Josse E., Dalen J. FADIO (Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems): a European Union funded project on development of new observational instruments and the behavior of fish around drifting FADs. Institute de recherche pour le développement (IRD), Seychelles, Indian Ocean. France

Harley, S. J., P. K. Tomlinson, and J. M. Suter. 2004. Possible utility of catch limits for individual purse-seine vessels to reduce fishing mortality on bigeye tuna in the eastern Pacific Ocean, 8 p. Inter-American Tropical Tuna Commission, 5th working group on stock assessments, 11−13 May 2004, Document SAR-5-05 BET A. IATTC, 8604 La Jolla Shore Drive, La Jolla, California 92037.

Harley, S. J. [1] and J. M. Suter [2]. The potential use of time-area closures to reduce catches of bigeye tuna (Thunnus obesus) in the purse-seine fishery of the eastern Pacific Ocean. [*reprint from Fish. Bull. 105:49-61 (2007*)] [1] Ministry of Fisheries, Wellington, New Zealand. [2] IATTC, La Jolla, California, USA.

Langley, A. 2004. An analysis of the main factors influencing the catch of bigeye tuna in purse seine drifting FAD sets. 17th Meeting of the Standing Committee on Tuna and Billfish. 9-18 August 2004. Majuro, Marshall Islands. FTWG-4. 20 pp.

Lennert-Cody, C. E. [1] , J. J. Roberts [2], and R. J. Stephenson [3]. Effects of gear characteristics on the presence of bigeye tuna (Thunnus obesus) in the catches of the purse-seine fishery of the eastern Pacific Ocean. (submitted ICES Journal of Marine Science, June 2007). [1] IATTC, La Jolla, California, USA. [2] Duke University Marine Geospatial Ecology Laboratory, Durham, North Carolina, USA. [3] contact via [1]

Miquel, J.2 , A. Delgado de Molina1 , J. Ariz1 , R. Delgado de Molina1 , S. Déniz, N. Díaz2 , Iglesias2 , J.C. Santana1 y P. Brehmer3. Acoustic Selectivity in Tropical Tuna (Experimental Purse-seine Campaign in the Indian Ocean). 1 Instituto Español de Oceanografía, Santa Cruz de Tenerife, Islas Canarias. 2 Instituto Español de Oceanografía, Palma de Mallorca, España. 3 Institut de Recherche pour le Développement, Sete, France.

Moreno, G. [1], Laurent Dagorn [2], Gorka Sancho [3], David Itano [4]. Fish behaviour from fishermen knowledge: the case study of tropical tuna around drifting fish aggregating devices (DFADs). (summary of Can. J. Fish. Aquat. Sci. In press). [1] AZTI, Sukarrieta, Spain. [2] IRD, Sete, France. [3] College of Charleston, Grice Marine Laboratory, Charleston, South Carolina, USA. [4] PFRP, University of Hawaii, Honolulu, Hawaii, USA.