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**STAFF RECOMMENDATIONS FOR TUNA FISHERY MANAGEMENT IN THE
EASTERN PACIFIC OCEAN**

CONTENTS

1.	TUNAS	2
1.1.	Conservation of yellowfin, bigeye, and skipjack tunas.....	2
1.2.	Research on yellowfin, skipjack, and bigeye tunas.....	3
1.3.	Pacific bluefin tuna.....	4
1.4.	Northern albacore tuna.....	4
2.	SHARKS AND MOBULID RAYS	4
2.1.	Mitigation of bycatches of sharks.....	4
2.2.	Improving data collection and stock assessments for sharks.....	5
2.3.	Silky sharks.....	6
2.4.	Hammerhead sharks.....	6
2.5.	Mobulid rays.....	6
3.	SEABIRDS	6
4.	SEA TURTLES	7
4.1.	Longline fisheries.....	7
5.	FISH-AGGREGATING DEVICES (FADS)	8
5.1.	Non-entangling and biodegradable FADs.....	8
5.2.	Provision of data on FADs.....	8
6.	DATA	8
6.1.	Fishing gear configurations.....	8
6.2.	Purse-seine fishery.....	8
6.3.	Longline fishery.....	9

This document presents the principal recommendations formulated by the staff for consideration by the Scientific Advisory Committee (SAC). They are mostly related to the conservation and management of tunas and other species affected by the tuna fisheries in the eastern Pacific Ocean (EPO), but also cover other matters, such as data collection, that are important for the staff to be able to carry out its research and advisory responsibilities.

1. TUNAS

1.1. Conservation of yellowfin, bigeye, and skipjack tunas

Summary

The staff's recommendations are based on its current assessments of yellowfin (Document [SAC-08-04b](#)) and bigeye (Document [SAC-08-04a](#)) tunas, which are updates of the 2016 assessments. For **yellowfin**, the base case assessment (Figure 1a) indicates that the stock is overfished ($S < S_{MSY}$), but overfishing is not taking place ($F < F_{MSY}$). For **bigeye**, the base case assessment (Figure 1b) indicates that the stock is not overfished ($S > S_{MSY}$) and that overfishing is not taking place ($F < F_{MSY}$).

The recommended closure required to achieve F_{MSY} , which is based on yellowfin, adjusted for capacity increases, is 72 days, as follows:

F multiplier from the yellowfin stock assessment	1.03
Capacity increase	6.7%
F multiplier adjusted for capacity increase	0.97
Days of closure	72

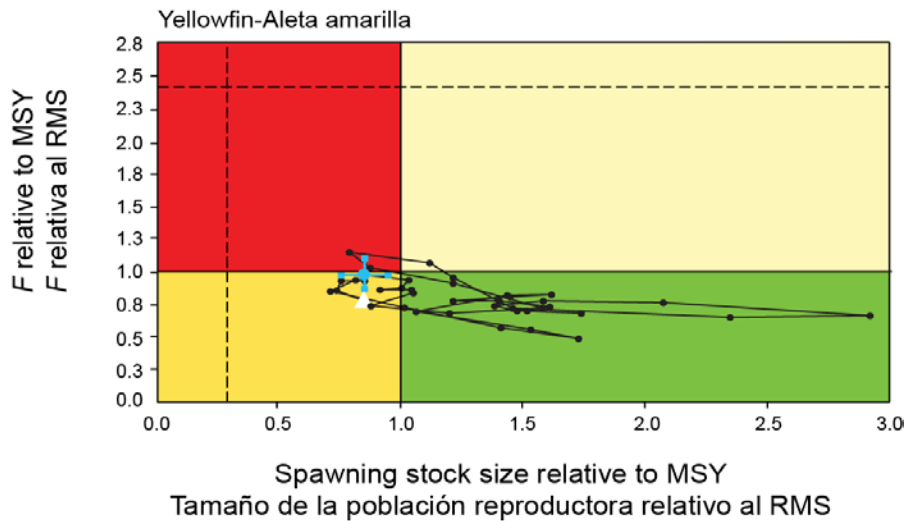


Figure 1a.

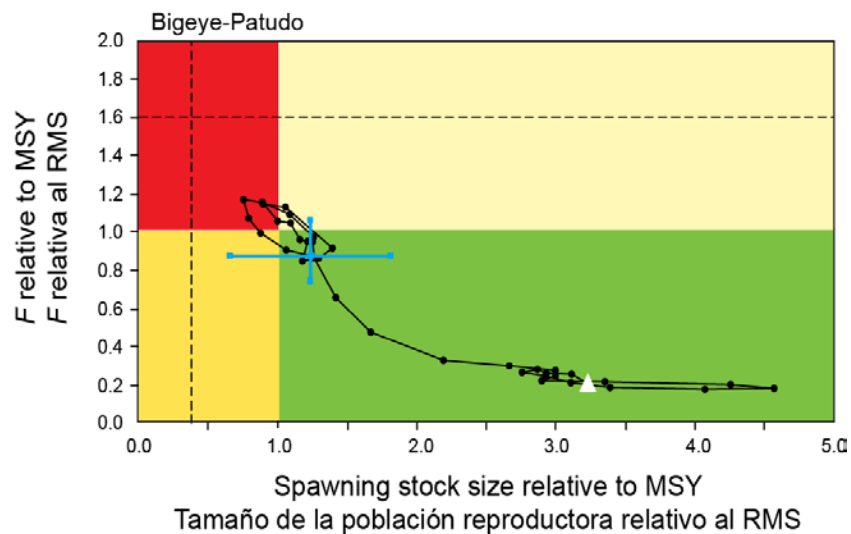


Figure 1b.

Rationale

IATTC Resolution [C-17-01](#) establishes the conservation and management measures for tropical tunas in the EPO applicable in 2017. Paragraph 14 of the resolution requires that “in ... 2017 the IATTC scientific staff ... will propose, if necessary, appropriate measures to be applied in future years.” For yellowfin, the staff’s conclusion from this year’s assessment is that fishing mortality (F) is below F_{MSY} , the level corresponding to the maximum sustainable yield (MSY), as is indicated by the base-case point estimate for the F multiplier¹ of 1.03 ([SAC-08-04b](#), Table 1), which is less than the 1.15 F multiplier for bigeye. However, as of 9 April 2017, the operative capacity² of the purse-seine fleet in the EPO is estimated to be about 6.7% greater than the previous three-year average; adjusted for this increased capacity, the F multipliers are therefore 0.97 and 1.08 for yellowfin and bigeye, respectively. This means that the management measures established in Resolution [C-13-01](#), which were in effect during the period covered by the assessment (1975-2016), have fallen short of the intended effect of “reducing the fishing mortality, adjusted for capacity, of both species to a level not exceeding the MSY”. However, there is a considerable overlap between the target F multiplier of 1.0 and the 95% confidence intervals for the F multipliers of 0.97 and 1.08, indicating that the evidence supporting a conclusion that fishing mortality is above F_{MSY} is not definitive. Nonetheless, the staff considers that the results support extending the purse-seine closure from the 62 days specified in Resolution C-17-01 to 72 days, based on the lower F multiplier for yellowfin. This 72-day closure is based on the assumption that the other provisions of the resolution (*e.g.* the “*corralito*” closure, full retention of purse-seine catches, longline catch limits for bigeye, *etc.*) continue in force. This closure differs from last year’s recommendation because the F multiplier for yellowfin was slightly lower (1.02) last year and the capacity increase from the previous three-year average (11.2%) was higher last year.

As of 30 April 2017, the capacity of the purse-seine fleet operating in the EPO had increased to 263,283 cubic meters (m^3) of well volume from 261,555 m^3 in 2016, which itself was an increase from the 2014-2016 average of 246,787 m^3 . This 6.7% increase in capacity is the cause of the recommended 10-day extension of the purse-seine closure.

Resolution C-17-01 establishes a total annual catch limit of the average level observed during 2013-2015 for yellowfin and bigeye (combined) caught by capacity class 4, 5, and 6 purse-seine vessels of 97,711 t for the fishery on floating objects, and 162,182 t on dolphins by Class-6 vessels in 2017. Although this is not recommended by the staff for 2018, if these limits are continued, they should be updated based on the most recent three years of catch (2014-2016), and include unassociated sets.

RECOMMENDATIONS:

Extend the closure of the purse-seine fishery established in Resolution [C-17-01](#) from 62 days to 72 days.

1.2. Research on yellowfin, skipjack, and bigeye tunas

For skipjack, the increasing effort and catches, and the decreasing mean size of the fish in the catch, are cause for concern. Unfortunately, efforts to assess this stock have been unsuccessful, and there is currently no reliable method for calculating an index of its abundance. Therefore, to assess and manage this stock, a comprehensive tagging program is probably the only way forward. Any comprehensive

¹The ratio of the current fishing mortality ($F_{current}$, defined as the average fishing mortality for the three most recent years (2014-2016)) to the fishing mortality that will produce the maximum sustainable yield (F_{MSY}). An F multiplier of 1.0 means that $F_{current} = F_{MSY}$; if it is below 1.0, fishing mortality is excessive ($F_{current} > F_{MSY}$)

²The total well volume, in cubic meters, of all vessels actually operating in the EPO, regardless of whether they are on the IATTC Regional Register. This is the capacity used by the IATTC scientific staff for its assessments of the tuna stocks.

tagging program should consider the inclusion of bigeye and yellowfin.

RECOMMENDATIONS:

Develop and implement a comprehensive tagging program for tropical tunas in the EPO.

1.3. Pacific bluefin tuna

A [new assessment of Pacific bluefin tuna](#) was completed in 2016. Projections in which Resolution [C-14-06](#) (and therefore Resolution [C-16-08](#)) was extended into the future predict that, even under a low-recruitment scenario, the stock will rebuild to the interim rebuilding target.

RECOMMENDATIONS:

The current resolution ([C-16-08](#)) is adequate and, for this reason, no additional recommendations are made. However, the staff encourages the Western and Central Pacific Fisheries Commission (WCPFC) to adopt additional measures to reduce the catch of adults in order to reduce the immediate risk of low spawner abundance on recruitment.

1.4. Northern albacore tuna

The stock assessment of north Pacific albacore completed in April 2014 by the Albacore Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) concluded that the north Pacific albacore stock was not experiencing overfishing and was probably not overfished. The fishing mortality for the latest years in the assessment ($F_{2010-2012}$) was estimated to be below that for $F_{2002-2004}$, which had led previously to the implementation of conservation and management measures for north Pacific albacore by the IATTC (Resolution [C-05-02](#), supplemented by Resolution [C-13-03](#)) and by the WCPFC (WCPFC CMM 2005-03). The Working Group noted that there was no evidence that fishing had reduced the spawning stock biomass below thresholds associated with most potential biomass-based reference points, and that population dynamics in the north Pacific albacore stock are largely driven by recruitment, which is affected by both environmental changes and the stock-recruitment relationship (a measure of the degree to which biomass and recruitment are interdependent). The Working Group concluded that the north Pacific albacore stock was healthy, and that the productivity was sufficient to sustain recent exploitation levels, assuming average historical recruitment in both the short and the long term.

A new full assessment was conducted in April 2017 by the ISC Albacore Working Group. Although the results have not been endorsed by the ISC Plenary, the IATTC staff concluded, based on the available information, that they do not contradict the management recommendations described above.

RECOMMENDATIONS:

The current resolution ([C-13-03](#)) should be continued.

2. SHARKS AND MOBULID RAYS

2.1. Mitigation of bycatches of sharks

Experiments should be conducted on mitigating bycatches of sharks, especially in longline fisheries, and on the survival of sharks and mobulid rays captured by all gear types, with priority given to those gears with significant catches. These should include studies of the effects on survival of shorter sets, of the use of circle hooks, and of different release techniques. Also, CPCs should share any methods or technology developed on their vessels to improve the release of these species.

RECOMMENDATIONS:

1. Conduct experiments on mitigating bycatches of sharks, especially in longline fisheries, and on the

survival of sharks and mobulid rays captured by all gear types, with priority given to those gears with significant catches.

2.2. Improving data collection and stock assessments for sharks

Paragraph 1 on Resolution [C-16-05](#) on the Management of Shark Species requires that “the IATTC scientific staff shall develop a workplan..., for completing full stock assessments for the silky shark ... and hammerhead sharks ...”

As the IATTC staff has noted previously, improving shark fishery data collection in the EPO is essential if conventional stock assessments and/or other indicators of stock status are to be developed for sharks. An attempt to assess the status of the silky shark in the EPO using conventional stock assessment models was severely handicapped by major uncertainties in the fishery data (Document [SAC-05-11a](#)), and the staff reiterates that stock assessment work on hammerhead sharks is currently not possible due to the scarcity of good quality data for this shark group. Without reliable catch, indices of abundance and composition data for all fisheries catching sharks in the EPO, any further attempts at such assessments are problematic.

Data deficiencies have been identified by the IATTC staff for four general fishery components in the EPO that catch either silky sharks and/or hammerheads: 1) coastal longline and gillnet fisheries ([SAC-07-06b\(iii\)](#); [SAC-08-07e](#)); 2) high-seas longline fisheries ([SAC-08-07b](#); [SAC-08-07e](#)); 3) small³ purse-seine vessels ([SAC-08-06a](#)); and 4) large purse-seine vessels. Progress towards obtaining quality data for fishery component (1) is discussed immediately below and in Appendix 1. In Section 6 below the staff reiterates previous recommendations for data collection for fishery components (2)-(4). Until more detailed data on shark catches are provided to the staff for all fishery components, no timeline to achieve a full assessment can be proposed.

Regarding data deficiencies for coastal longline and gillnet fisheries, work by IATTC staff on shark data collection in these fisheries is being funded by the FAO-GEF ABNJ project. In the first phase, the staff identified a series a series of challenges for collecting shark data in the EPO, and provided recommendations for improvement ([SAC-07-06b\(iii\)](#)). In the second phase, which is in progress, the workplan aims to development an experimental design for a long-term shark fishery sampling program in the EPO (Appendix 1), which will be presented at the SAC in 2019. This addresses the above-mentioned requirement in paragraph 1 of Resolution [C-16-05](#) for this fishery component.

RECOMMENDATION:

On the basis of its previous recommendations for improving shark data collection in the EPO, made in 2016 ([SAC-07-06b\(iii\)](#)), the staff makes the recommendations in Appendix 2.

The recommendations were originally drafted for the Central American CPCs detailed in that document, but are mostly equally applicable to other CPCs with small-scale longline fisheries that catch sharks, whether as target or bycatch. However, one recommendation was specific to Central America and, given the scale and importance of the shark fisheries in Central America and the lack of fishery/biological sampling data from shark landings in that region, the staff reiterates that recommendation, as follows:

RECOMMENDATION:

- a. Develop and implement a pilot fishery/biological data sampling program for sharks in Central America;
- b. Establish an IATTC field office in Central America near some of the ports where most shark landings

³ Carrying capacity ≤ 363 t

occur;

2.3. Silky sharks

As noted above, conventional stock assessments of sharks cannot be considered unless data collection is improved. An alternative scientific basis for precautionary management advice is needed and, for that purpose, a suite of stock status indicators (SSIs) was developed ([SAC-05-11a](#)). The indices for the silky shark, based on data from the purse-seine fishery, have been updated to include data from 2016 ([SAC-08-06a\(i\)](#)). The resulting index for all silky sharks in the south EPO remains at about the 2014-2015 level, whereas in the north EPO it shows a large decrease in 2016 relative to 2015. However, this may be due, at least in part, to changes in oceanographic conditions. Further analysis will be necessary to quantitatively evaluate the origin and magnitude of the bias.

Resolution C-16-06 includes conservation measures for sharks, with emphasis on the silky shark for the years 2017-2019. Since the resolution entered into force only in January 2017, it is too early to evaluate its effectiveness, which will also depend on how it is implemented.

RECOMMENDATION:

1. The Commission should require all CPCs to provide to the IATTC staff data on the implementation of Resolution C-16-06, which will be summarized and presented by the staff at the SAC meeting in 2018.
2. Continue with Resolution C-16-06, but the staff should review and evaluate the adequacy of measures at the SAC meeting in 2018.

2.4. Hammerhead sharks

As noted above, without reliable catch and effort data for all fisheries that interact with hammerhead sharks, stock assessments are currently not feasible. The staff's recommendations for improving data collection are thus directly relevant here.

2.5. Mobulid rays

Biological and genetic data are needed to identify stock structure, diets, biology and ecology of mobulid rays. To obtain such data requires the development of a sampling program carried out by observers aboard both purse-seine and longline vessels (see sections 2.3 and 6.2.2).

RECOMMENDATION:

Encourage purse-seine and longline vessels to support the collection of samples to improve the quality of biological and genetic data for mobulid rays.

3. SEABIRDS

Resolution [C-11-02](#) should be revised consistent with the current state of knowledge regarding seabird mitigation techniques, as described in document SAC-05 INF-E. The two-column menu approach in C-11-02 should be replaced by a requirement to use at least two of three mitigation methods (line weighting, night setting, and bird-scaring lines) in combination, in a way that will meet the minimum standards recommended by ACAP and Birdlife International. Other mitigation methods should not be approved until their effectiveness is proven.

RECOMMENDATIONS:

1. Revise Resolution [C-11-02](#) consistent with the current state of knowledge regarding seabird mitigation techniques
2. Improve the level of detail in the information provided in annual reports (*e.g.* species, zero bycatch,

stratified data).

4. SEA TURTLES

4.1. Longline fisheries

4.1.1. Crew training

Videos and other educational materials on how to deal with turtles that are hooked or entangled in longlines are available on the IATTC [website](#), and should be used to train crews on how to deal with such cases. CPCs should disseminate information about these materials, and encourage their use. Vessels should also be provided with guides to identifying leatherback, loggerhead, and hawksbill turtles.

Crews should be encouraged to assess the condition of any sea turtle brought aboard the vessel prior to releasing it. To the extent practicable, injured or unresponsive turtles should be kept on board and assisted in a manner consistent with methods described in the FAO's [Guidelines to reduce sea turtle mortality in fishing operations](#) and in the materials on the IATTC [website](#).

4.1.2. Handling captured turtles

The staff recommends that CPCs require every longline vessel operating in an area where sea turtles may be hooked or entangled to carry the following equipment:

- a) a dipnet to safely lift sea turtles aboard the vessel;
- b) a line cutter that is long enough to reach the turtle without lifting it from the water;
- c) dehookers (both inverted-V-shaped and pigtail-shaped);
- d) a bolt cutter capable of cutting hooks; and
- e) equipment capable of safely keeping the sea turtle's mouth open.

Lifting turtles from the water using the fishing lines in which the turtles are hooked or entangled should be prohibited. If a turtle must be removed from the water, an appropriate basket lift or dipnet should be used. If a hooked turtle cannot be safely removed from the water, any remaining line should be cut as close as possible to the hook without inflicting additional harm on the turtle; in no case should the length of line left attached to the hook exceed the length of the turtle's carapace.

Crew members should not attempt to remove swallowed hooks from turtles; the hook should be left in place and the line cut as close to the hook as possible without further injury to the animal. Hooks that are visible or easily accessible may be removed if they satisfy the criteria described in the materials available on the IATTC website.

RECOMMENDATIONS:

1. Require longline vessels operating in areas where sea turtles may be hooked or entangled to carry equipment (dipnet, line cutter, dehookers, bolt cutter, *etc.*) for dehooking and disentangling captured turtles.
2. Prohibit lifting turtles using the fishing lines in which the turtles are hooked or entangled.
3. Prohibit removing swallowed hooks from turtles.
4. Promote and encourage the training of crews in methods for dehooking and disentangling captured turtles.
5. Encourage crews to assess the condition of captured sea turtles prior to releasing them.

5. FISH-AGGREGATING DEVICES (FADs)

5.1. Non-entangling and biodegradable FADs

Materials and designs for fully biodegradable FADs are being explored and tested. At-sea tests are being carried out by fishing vessels, and the durability of the devices is being studied. Also, materials such as net webbing, hung under FADs to attract tunas, can entangle other fauna under FADs and their use should be avoided; they should be replaced with non-entangling materials, such as ropes.

RECOMMENDATIONS:

1. Continue current experiments with materials and designs for biodegradable FAD, in collaboration with the fishing industry. Continue research on the effectiveness, in terms of avoiding entangling fauna, of alternative materials hung under FADs.

5.2. Provision of data on FADs

CPCs are required by Resolution C-16-01 to provide the data collected on FADs for the previous calendar year no later than 60 days prior to each regular meeting of the SAC, and the scientific staff of the IATTC is required to present a preliminary analysis of that information to the SAC. The staff may have to analyze the data before this deadline, therefore more timely provision of data would allow a more thorough analysis.

RECOMMENDATION:

CPCs should provide the data from each trip as soon as they are available.

6. DATA

6.1. Fishing gear configurations

RECOMMENDATION:

Require that vessels submit the purse-seine and longline gear description forms appended to Document [SAC-05-05](#). Any significant modifications made to the gear subsequently should be reported on these forms prior to departing port with the modified gear.

6.2. Purse-seine fishery

6.2.1. Observer coverage of purse-seine vessels of less than 364 t carrying capacity

Trips by small vessels are rarely sampled by observer programs ([SAC-08-06a](#)), thus vessel logbooks and cannery unloading records are the principal sources of data on the activities of these vessels. However, they generally do not contain information on tuna discards and are not available in near real-time, which could be problematic in the implementation of Resolution [C-17-01](#). In addition, bycatch information is not always recorded in logbooks, which hampers efforts to conduct assessments for such species. A full-time observer program would be needed to obtain the data necessary for estimating the quantity and species composition of bycatches by small vessels, and understanding the strategies and dynamics of their operations.

RECOMMENDATIONS:

1. Establish an observer program for purse-seine vessels of less than 363 t carrying capacity, at a level of coverage sufficient for estimating the catches and bycatches by all such vessels.
2. Examine the feasibility of using electronic monitoring systems aboard small purse-seine vessels.

6.2.2. Use of electronic monitoring systems to record catches on purse-seine vessels

In recent years, the equipment and procedures used to load catches into the wells of purse-seine vessels have changed. Brailers now have larger capacities, and the catch is unloaded directly from the brailer to the well deck through an opening in the working deck, instead of into a hopper on the working deck. These changes make it increasingly difficult for the observers to determine the species, sizes, and quantities of both target and bycatch species. This improvement in data collection is especially important given the requirements of Resolution C-17-01 to identify catches by species.

RECOMMENDATION:

Establish an experimental program for using electronic monitoring systems as a means of improving data quality on vessels that use these new brailing procedures and gear.

6.3. Longline fishery

6.3.1. Observer coverage

In Resolution [C-11-08](#), the Commission established that “each CPC shall ensure that at least 5% of the fishing effort made by its longline fishing vessels greater than 20 m length overall carry a scientific observer”. 5% coverage is too low for calculating accurate estimates of the catches of species caught infrequently in those fisheries, such as some sharks of conservation concern; studies show that 20% coverage is the minimum level required for such estimates.

RECOMMENDATION:

The staff maintains its recommendation of at least 20% observer coverage of longline vessels over 20 m length overall.

6.3.2. Data standards and reporting

The data provided by CPCs in their annual reports on longline observer programs are generally inadequate for scientific purposes ([SAC-08-07e](#)). The SAC has not yet determined a format for these data, as specified in Resolution C-11-08, which also calls for common reporting standards for the observer data.

The data submitted to the IATTC under Resolution C-03-05 are generally reported at the lowest resolution (“Level 3”) required, and often with operational data (number of sets, number of vessels, *etc.*) inadequate for expanding catch and/or effort to the total fleet or for standardizing effort ([SAC-08-07b](#)).

RECOMMENDATIONS:

- 1) Establish a set of minimum data fields to be recorded by the scientific observers on longline vessels.
- 2) CPCs submit all required observer data from 1 January 2013.
- 3) Require CPCs to submit detailed set-by-set operational data—including species-specific catch, effort, and gear configurations— for their longline fisheries.

APPENDIX 1

Workplan for the second phase of the IATTC shark work funded by the FAO-GEF ABNJ project: “Development of the Experimental Design for a Long-term Shark Fishery Sampling Program in the Eastern Pacific Ocean”:

- *Workshop on “Development of the Experimental Design for a Long-term Shark Fishery Sampling Program in the EPO”* (September 2017): The workshop will focus on Central America, where the shark data deficiencies are particularly strong and where much of the shark catches are taken, but lessons learned from the project could be applicable to other IATTC EPO coastal States, tuna RFMOs and international and national fisheries organizations. An external panel of experts in fisheries sampling and scientific/technical experts from IATTC Central American States will provide advice on the feasibility and applicability of alternative sampling designs for the pilot study.
- *Implementation of shark sampling pilot study in Central American ports (September 2017-October 2018)*. A one-year shark sampling pilot study, based on the recommendations of the 2017 workshop and carried out by teams of port samplers trained by IATTC staff, will be implemented in Central America.
- *Analysis of data collected under the shark sampling pilot study and preparation of final report (October-November 2018)*. A final report will be prepared, with recommendations for the sampling design of a long-term shark sampling program in the EPO.
- Present the recommendations for a *Long-term Shark Fishery Sampling Program in the EPO* at SAC-10 and the annual meeting of IATTC (May, June 2019).

APPENDIX 2

RECOMMENDATIONS FOR IMPROVING DATA COLLECTION AND STOCK ASSESSMENTS FOR SHARKS

1. Inconsistent vessel classifications

A standardized classification system needs to be based, if possible, on criteria that are objective, quantifiable and verifiable, and comparable among fleets and flags. The staff recommends a system based on the vessels’ length overall (LOA).

RECOMMENDATION:

CPCs should develop a standardized classification system, based preferably on the vessels’ length overall (LOA), for all vessels (excluding purse-seiners and large longliners) that catch sharks in the EPO, whether as target or bycatch.

2. Improved data reporting

RECOMMENDATION:

Require that trip-by-trip catch composition and effort data from vessel logbooks and/or landings inspection programs be reported to the IATTC staff in addition to the annual summary reports currently required.

3. Variable coverage of shark landings

RECOMMENDATION: CPCs should:

- a. Continue to inspect shark landings with existing fishery inspection programs;
- b. Standardize existing landings inspection programs among CPCs;
- c. Collect information on fishing effort to achieve complete coverage of the shark fishing fleets.

4. Lack of fishery/biological sampling data from shark landings

RECOMMENDATION:

Expand existing shark fishery/biological data collection programs to attain higher levels of coverage.

5. Lack of species-specific trade (export) data

RECOMMENDATION:

CPCs should follow FAO standards for collecting data on shark fishery products.

6. Observer coverage of tuna purse-seine fisheries

RECOMMENDATION: The Commission, taking into consideration the ecosystem-based conservation goals of the Antigua Convention, should:

- a. **Class 1-5 vessels:** Expand current observer programs and/or the use of EMS to improve the quantification of bycatches, including sharks and dorado.

7. Insufficient coverage by longline fishery observer programs and data quality concerns

RECOMMENDATION: CPCs with longline vessels over 20 m LOA should continue to develop and improve their observer programs under IATTC Resolution [C-11-08](#). The following improvements are recommended:

- a. Expand observer coverage to 20% of fishing effort.
- b. Establish minimum data standards and reporting requirements for longline observer programs under resolution C-11-08.