

INTER-AMERICAN TROPICAL TUNA COMMISSION

SCIENTIFIC ADVISORY COMMITTEE

SEVENTH MEETING

La Jolla, California (USA)

09-13 May 2016

DOCUMENT SAC-07-06b(iii) REVISED

CHALLENGES TO COLLECTING SHARK FISHERY DATA IN THE EASTERN PACIFIC OCEAN, AND RECOMMENDATIONS FOR IMPROVEMENT

DATA COLLECTION STANDARDS AND PROCEDURES

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This report was developed in the framework of the FAO *Common Oceans* program, as part of the Sustainable Management of Tuna Fisheries and Biodiversity Conservation in Areas Beyond National Jurisdiction (ABNJs) project

November 2016 (Revised)

EXECUTIVE SUMMARY

Sharks are subject to fishing pressure from a great variety of fisheries in the eastern Pacific Ocean (EPO). They are targeted or caught incidentally (as bycatch) by multi-species and multi-gear fisheries of the coastal nations. In addition, they are also caught as bycatch by the high-seas longline fisheries for tuna and billfish of distant-water (mainly Asian) fleets, as well as by tuna purse-seine fisheries.

The Antigua Convention, which entered into force in 2010, requires that the Inter-American Tropical Tuna Commission (IATTC) “adopt, as necessary, conservation and management measures and recommendations for species ... that are affected by fishing for, or dependent on or associated with” the tuna stocks. Sharks are among these species, and there is a critical need for stock assessments to guide shark management and conservation.

Unfortunately, implementing the conservation goals of Antigua Convention for sharks, or any other non-tuna and billfish-like “associated species”, for that matter, is presently handicapped by several factors. In addition to the uncertainties with respect to the extent to which shark stocks and fishing vessels operating in the EPO fall under the scope of the Antigua Convention, a number of severe challenges must be faced. There is a lack of essential data, which handicaps any attempt to conduct conventional stock assessments and/or produce simple stock status indicators. Although IATTC and national program observers aboard large tuna purse-seine vessels collect shark fishery data, it is estimated that catches from this fishery represent only a small fraction of the total shark removals in the EPO. Other sources of data are urgently needed. Ideally, reliable estimates of species-specific total removals should be obtained. At a minimum, catch and effort and size-composition data by species from the longline fisheries, which are estimated to take the majority of the shark removals in the EPO, should be collected, so that indices of relative abundance and/or other indicators can be applied to assess the status of the shark stocks in the EPO.

This report identifies and discusses in detail the main challenges for shark data collection in the EPO. In addition, it includes recommendations by the IATTC staff to overcome each one of these challenges, improve shark fishery data collection in the EPO, and ultimately help to meet the conservation goals of the Antigua Convention for sharks and other associated species. This work has been made possible through funding from the Food and Agriculture Organization of the United Nations (FAO) and the Global Environmental Facility (GEF) in the framework of the *Common Oceans* program.

1. INTRODUCTION

1.1. Shark fisheries in the EPO

Elasmobranchs, a group of fishes that includes sharks and rays, are highly vulnerable to fishery exploitation, due to their life history characteristics of slow growth, long life cycle, late age of maturity, and low fecundity (Bonfil 1994). There is great concern about the exploitation of stocks of sharks and rays throughout the world's oceans, and the EPO is no exception (Watts and Wu 2005). In this document, the term "sharks" is understood to include rays.

In order to address improving data collection for fisheries that impact sharks, the first and most important step towards any assessment of the status of the shark stocks in the EPO and their level of exploitation is to identify and define those fisheries. Unless specified otherwise, in this report "shark fisheries" means all fisheries in which sharks are caught, whether as target or bycatch; and "removals" means all extractions from the stocks (catch, bycatch, and discards). These fisheries are identified and generally described below based on target species, gear type, and fleet affiliation (EPO coastal versus distant-water states).

1.1.1. Targeted fisheries

1.1.1.a Longline fisheries of EPO coastal States for large pelagic species: Longline vessels targeting large pelagic species (sharks, tunas, billfishes, dorado). The majority of these vessels are below 20 m length overall (LOA), have a fishing autonomy of less than 25 days at sea, and mostly lack frozen storage capacity (icing is the main preservation method). Separating these fleets by target species is not trivial, as longliners commonly change target species, depending on seasonal availability and market conditions. However, sharks are commonly dominant in the species composition of the catches.

1.1.1.b Multi-species and multi-gear artisanal¹ fisheries of EPO coastal States: Small artisanal vessels targeting elasmobranch species in coastal areas. These vessels are generally <15 m LOA, with small outboard motors. These fisheries are highly seasonal and catch a variety of elasmobranchs that include juvenile and/or neonate sharks (*e.g.* hammerheads) as well as rays. Different gear types (*e.g.* longlines, gillnets) can be used during a single trip. Trip duration ranges from 1 day (when using gillnets) to 3 days (longline). Mothership operations may extend to close to 3 weeks, and increase the range of the fleets to offshore areas (Martínez-Ortiz *et al.* 2015).

1.1.1.c Distant-water shark longline fisheries: The shark longline fleet consists of vessels from outside the EPO (mainly Chinese Taipei) operating under Belizean flag through license agreements. Until 2013 they were licensed to target tuna and tuna-like species on the high seas in the EPO and the Western and Central Pacific Ocean (WCPO) (WCPFC 2013), but this status was not renewed in 2014; however, they can also operate in the Exclusive Economic Zones (EEZs) of other Central American states in the EPO under license agreements. The catch composition of this fleet is clearly dominated by sharks (mainly silky sharks), with landings taking place in Central American ports. Vessel LOA varies from 23 m to 264 m, and fish hold volume from 60 m³ to 1 938 m³. A more detailed description of the operation of this fleet is provided in section 2.1 of Siu and Aires-da-Silva (2016)/[SAC-07-06b\(ii\)](#).

¹ Artisanal fisheries are typically small-scale fisheries for subsistence or for small local markets, generally using traditional fishing techniques and small vessels (<15 m length overall). For practical reasons, the definition used in this report is fisheries involving vessels "less than 1.99 net tonnage, as defined by the 1969 International Convention on Tonnage Measurement of Ships" (IATTC Resolution C-15-04)

1.1.2. Bycatch fisheries

- 1.1.2.a Tuna purse-seine fisheries of EPO coastal and distant-water fleets:** Sharks are taken as bycatch in the tuna purse-seine fishery in the EPO (Román-Verdesoto and Orozco-Zöllner 2005; Roman-Verdesoto 2014; Hall and Roman 2013). The fishery operates with three set types: on tuna associated with dolphins, on tuna associated with floating objects, and on unassociated tuna schools.
- 1.1.2.b Tuna-billfish longline fisheries of EPO distant-water fleets:** High-seas longline fleets, mainly from Asia, targeting tuna and billfish (Suda and Schaefer 1965; Matsumoto *et al.* 2008). Sharks and other large pelagic species are caught as bycatch.
- 1.1.2.c Multi-species and multi-gear fisheries of EPO coastal States:** Sharks and rays (mainly coastal species) are caught as bycatch in multi-gear small-scale artisanal fisheries targeting a multi-species complex (porgy or snapper, corvina, grouper, shrimp, others) in coastal waters. This category includes vessels of section 1.1.1 when not targeting sharks.

1.2. The context of the problem

There is a critical need for stock assessments of sharks to improve their management and conservation in the EPO; unfortunately, this has not been possible to date due to the lack of reliable fishery statistics from all important fisheries.

The case of the silky shark (*Carcharhinus falciformis*) provides a clear illustration of the problem. The species is dominant in the shark bycatches in the tuna purse-seine fisheries (Roman-Verdesoto 2014; Hall and Roman 2013), and therefore seems to be clearly within the scope of the Antigua Convention. Unfortunately, an attempt by the IATTC staff to assess the status of the silky shark using conventional stock assessment models was severely handicapped by major uncertainties in the fishery data, mainly regarding the catch levels of the longline fisheries, which are estimated to be responsible for the majority of the silky shark removals in the EPO ([SAC-05 INF-F](#)).

Because of the paucity of reliable shark fishery data from fisheries, in particular the longline fisheries, or vessels other than Class-6² tuna purse-seine vessels the bycatch data collected by the IATTC observer program have been the main source of data for producing indicators of stock status for sharks in the EPO, in particular for silky sharks (Aires-da-Silva *et al.* 2015; [SAC-07-06b.i](#)).

1.3. Objectives of study

Following on from the Metadata report developed under the IATTC/FAO-GEF shark project (Siu and Aires-da-Silva 2016/[SAC-07-06b\(ii\)](#)), the objectives of this report are to identify the main challenges with respect to collecting shark data in the EPO, and make recommendations for improvement. Each of these challenges and recommendations is discussed in detail below.

² Carrying capacity > 363 t

2. CHALLENGES FOR SHARK DATA COLLECTION

CHALLENGE 1. Unclear applicability of the Antigua Convention

The Antigua Convention requires that the IATTC “adopt, as necessary, conservation and management measures and recommendations for species ... that are affected by fishing for, or dependent on or associated with” the tuna stocks. Some elasmobranch species are clearly among these, although the question of which shark species and stocks are covered by the Antigua Convention has been the subject of debate.

In the predominantly oceanic-pelagic environment where most of the fisheries listed in Section 1.1 operate, and where the geographic distributions of shark species overlap with those of the tuna and billfish stocks, the relevance of IATTC involvement in research, management, and conservation of sharks seems clear under the Antigua Convention. Such is the case for pelagic stocks of species such as silky, oceanic whitetip (*Carcharhinus longimanus*), blue (*Prionace glauca*), shortfin mako (*Isurus oxyrinchus*) and thresher (*Alopias* spp.) sharks.

As regards nearshore waters, the coastal State fisheries of Section 1.1 catch a wide variety of more coastal shark species, such as hammerheads (*Sphyrna* spp.), various Carcharhinids, and rays. These mainly artisanal fleets use multiple gears, and frequently shift their target. The degree to which species and stocks caught by these fisheries come under the scope of the Antigua Convention is unclear. For example, while some IATTC Members expect the staff to make recommendations for the conservation of hammerhead sharks in general, others have clearly stated their view that these species do not fall under the Convention. Catches of hammerhead sharks and other coastal elasmobranch species are not common in the high-seas tuna purse-seine (Román-Verdesoto and Orozco-Zöllner 2005) and longline fisheries (e.g. Matsumoto and Bayliff 2008). It is unclear whether the Antigua Convention covers the species and stocks that are caught by small-scale artisanal fisheries based in EPO coastal States that target them specifically, and thus the IATTC may not be responsible for their management and conservation. Also, in practical terms, it is questionable whether the IATTC can address the conservation of these stocks while still attending to its principal duty of managing the tuna fisheries.

Defining the extent to which shark stocks are covered by the Antigua Convention is a logical first step towards elaborating a clear workplan for research, management, and conservation of sharks in the EPO. The staff needs clarification from the Commission on this issue. Once a species list is established, clear guidelines should be established on which fleet and fishery data should be reported to the IATTC, in addition to the data already reported in accordance with current Commission resolutions (see Challenges 2 and 3 below).

If some shark stocks and fleets (for instance, stocks of coastal species and the small-scale artisanal fleets that targeting them) that require research and/or conservation measures are not under the auspices of the IATTC, given that most of these species occur in several EEZs, some alternative arrangement might be necessary for their conservation. These may perhaps involve other stakeholders in the region, such as the *Organización del Sector Pesquero y Acuícola del Istmo Centroamericano* (OSPESCA) and the *Comisión Permanente del Pacífico Sur* (CPPS), or maybe a new regional agreement or organization dedicated to addressing the problem, like the Inter-American Convention (IAC) for the Protection and Conservation of Sea Turtles, for instance. However, if these species and fleets are considered to be under the auspices of the IATTC, additional financial and staff resources would be necessary for aspects such as data collection and research.

RECOMMENDATION 2. The coastal States should develop a standardized classification system for all vessels (excluding purse-seiners and large longliners) that catch sharks in the EPO, whether as target or bycatch.

TABLE 1. Number and classification of vessels that fish for sharks in the EPO, by flag, category, and gear. T/B: Target/bycatch; LOA: length overall; NRT: net registered tonnage; GN: gillnet; HX: handline; LL: longline; PS: purse seine; TX: trawl net.

Category	Definition	Number	Gear	Date	T/B
BELIZE					
Industrial	Belize vessels that fish in the EPO	11	LL	2014	T/B
COSTA RICA					
Small-scale/ artisanal	<3 nautical miles from coast	6 100	GN/LL	2010	B
Medium-scale	Autonomy <25 days, <40 nautical miles from coast	350	LL	2015	T/B
Advanced	Autonomy >25 days, >40 nautical miles from coast	93	LL	2015	B
Semi-industrial	Trawl net fishery	36	TX	2015	B
Foreign	See section 2.2				
EL SALVADOR					
Industrial	>10 m LOA	3*	LL	2010	T
Artisanal	<10 m LOA	8 300	GN/LL	2010	T/B
GUATEMALA					
Large-scale commercial	30.1-150 NRT	3	PS	2015	B
Medium-scale commercial	2-30 NRT	17		2015	T
Small-scale commercial	1-1.99 NRT	5	LL	2015	T/B
Small-scale artisanal	0.46-0.99 NRT; <10 m LOA, fiberglass hull, outboard motor, autonomy <4 days	4 860	GN/LL	2010	T/B
NICARAGUA					
Industrial	>15 m LOA, mechanically-operated fishing gear, electronic fish-finding and location equipment	50†	LL/TX	2015	T
Artisanal	<15 m LOA, fiberglass hull, outboard motor	4 300	GN/LL	2010	T/B
PANAMA					
High-seas 1	≥100 NRT	344	83 LL; 261 PS/TX	2015	T/B
High-seas 2	10-99 NRT				
Coastal 1	<10 NRT; limited autonomy	3 554	GN/LL/LX	2010	T/B
Coastal 2	Rowed vessels				
International	Panamanian and foreign vessels that fish outside the 200-mile EEZ	82	26 PS/ 56 LL	2015	T

* Inactive since 2011; † 8 of the 50 industrial vessels are <15 m LOA.

CHALLENGE 3. Unclear guidelines about data reporting requirements for EPO coastal States

In IATTC Resolution [C-05-03](#) on the conservation of sharks caught in association with fisheries in the EPO, the Commission stated that it was *“concerned that an extensive unregulated shark fishery is reported to be conducted in the ... EPO by a large number of shark-fishing vessels, including some slightly smaller than 24 m length overall, about which the Commission has little information;”*

Paragraph 11 of the resolution requires that:

“Each CPC³ shall annually report data for catches, effort by gear type, landing and trade of sharks by species, where possible, in accordance with IATTC reporting procedures, including available historical data. CPCs shall send to the IATTC Secretariat, by May 1, at the latest, a comprehensive annual report of the implementation of this Resolution during the previous year.”

In accordance with this resolution and also Resolution [C-04-05](#), the EPO coastal countries report shark catch statistics to the IATTC, but as annual summaries; only Belize reports detailed catch and effort data by 5° x 5° area. Unfortunately, this type of summarized information is not sufficient for stock assessment analysis. During the preparation of the Metadata Report (Siu and Aires-da-Silva 2016/[SAC-07-06b\(ii\)](#)), sources of more detailed shark fishery data were identified, most of which had not been previously submitted to the IATTC. In part this was because, without clear definitions of such terms as “artisanal,” “industrial,” and “coastal” (which in any case are not standardized among countries), it was not clear what data the governments should provide, and in what format.

Historically, the main source of shark fishery data available in EPO coastal States have been landings inspection programs, conducted mainly for compliance purposes. The quality of those data varies among programs: some programs collected data on shark landings by species and fleet (industrial/artisanal), while others pooled all shark species into a single category, which may or may not have been broken down by fleet.

Resolving Challenges 1 and 2 in a timely manner would benefit efforts to develop comprehensive guidelines for data submission, because the data collection situation has recently improved in many coastal States. For example, currently in Central America standardized forms for recording biological, effort, and landings data on sharks in different fisheries are being used by many countries, and shark fisheries are more closely monitored (Siu and Aires-da-Silva 2016). Also, a standardized methodology for obtaining biological and fishery information has been adopted for use throughout the region. The IATTC staff has collaborated with OSPESCA on the development of a database to archive fishery and biological data for Central American fisheries ([Siu et al. 2015](#)). The information archived in this database can easily be incorporated into IATTC databases. The IATTC scientific staff has provided technical support to EPO coastal States in various research projects on artisanal fisheries for which high-quality data exist (Martínez-Ortiz *et al.* 2015; Aires-da-Silva *et al.* 2016). These data have not been reported to the IATTC in detail (*e.g.* 5° x 5° degree catch and effort, detailed trip and logbook data, size-composition data for many large pelagic fishes), or at most have been reported as annual summaries.

Resolution [C-05-03](#) may need to be amended to address this situation. Paragraph 12 states that:

“Paragraphs 2-11 of this resolution apply only to sharks caught in association with fisheries managed by IATTC.”

This resolution could be amended to clarify that more detailed shark fishery data (*e.g.* from landing

³ IATTC Member or Cooperating Non-Member

collected by these programs that should be reported to the IATTC (see Challenge 3).

Sampling of the small-scale artisanal fleets would remain the responsibility of the individual States, essentially for practical reasons, because neither the Commission nor its staff have the necessary financial and human resources to undertake this activity. However, some elements of the sampling programs designed for the larger vessels may be useful for sampling smaller vessels.

RECOMMENDATION 5: The Commission and the coastal States should:

- 5.1. Develop and implement a pilot fishery/biological data sampling program for sharks in Central America;
- 5.2. Establish an IATTC field office in Central America near some of the ports where most shark landings occur;
- 5.3. Expand shark work at the IATTC field office in Panama;
- 5.4. Expand existing shark fishery/biological data collection programs to attain higher levels of coverage. Alternatively, if reductions in coverage are necessary, develop a suitable sampling design.

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CHALLENGE 6: Lack of species-specific trade (export) data

Shark trade records can be useful for monitoring trends in shark fisheries, particularly when other types of fishery statistics (*e.g.* logbook and landings data, observer records) are not available. Sometimes other types of fishery data are available, but are often of poor quality, and in such cases trade records can be used as auxiliary data to check trends estimated from those other sources. In Central America, for example, shark trade records are available for most countries since the mid-2000s, but not at the species level.

High-quality trade data on shark products (*e.g.* species-specific meat, fins) are desirable to obtain from EPO coastal States. Obtaining good shark trade records from Central America is particularly important since the main ports of landing for the shark longline fisheries of distant-water fleets are located in the region (see section 1.1.1.c above).

RECOMMENDATION 6: IATTC Members should follow FAO standards for collecting data on shark fishery products (Dent and Clarke 2015).

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CHALLENGE 7: Observer coverage of tuna purse-seine fisheries

Class-6 vessels⁴. Observers have accompanied nearly all trips (~100% coverage) by Class-6 purse-seine vessels since 1993. The IATTC database contains records, reported by on-board observers, of incidental catches (bycatch) of 28 species of sharks and 9 species of rays by large purse-seine vessels. Catches are reported in number of individuals, although prior to 2005 they were also reported in weight. Data are also collected on set type (dolphin, floating-object, and unassociated), as well as on quantities retained and discarded. During 1993-2004, observers classified sharks into one of three categories (small (< 90 cm), medium (90-150 cm), large (> 150 cm), but since 2005 they attempt to measure individual animals. However, there are concerns that the mode of operation of tuna purse seiners is changing and interfering with the quality of the shark data that are currently being collected. Observers collect and record most of

⁴ Carrying capacity > 363 t

the data on bycatch (and tuna catches) during the process of “[brailing](#)” (bringing the catch aboard the vessel from the net). Some vessels unload their catch directly from the brailer to the well deck, and in this operation the fish are distributed to the vessel’s wells in a way that might prevent the observer from getting accurate identifications and size estimates. It is critical to determine the extent to which this impacts the quality of the observer data on sharks and other bycatches.

In addition to the data that are already being collected by the observers, there is a need for other high-quality data (*e.g.* improved catch and size composition estimates, samples for biological studies such as age and growth, reproductive biology and genetic studies) for the research necessary to meet the goals of the Antigua Convention. Observers already have many duties, and there are concerns that asking them to collect more information on sharks might interfere with their other obligations. One option for collecting these additional data might be to define a certain proportion of trips during which the observer would focus on the collection of those data. On some vessels, the catch is unloaded first into a hopper on the working deck, where the fish can be sorted and the observer can collect data. Also, a few newer vessels have conveyor belts to move the fish to the wells, which offer an opportunity for sampling.

Electronic monitoring systems (EMS, Restrepo *et al.* 2014) can also be employed to complement observer data. Experiments with EMS, using high-definition video, have already taken place on tuna purse-seine vessels (Ruiz *et al.* 2014), and have proven effective for identifying and quantifying bycatches of large-bodied species on the main deck as well as on the well deck. High-definition video can also provide information on fish size and release efforts.

Classes 1- 5. Trips by smaller purse-seine vessels (Classes 1-5⁵) are rarely covered by observer programs ([SAC-07-07f.i](#)), and the IATTC logbook database does not contain information on at-sea discards by these vessels ([SAC-07-07f.j](#); [SAC-07 INF-C\(d\)](#)). Shark bycatches by small vessels need to be better understood and quantified. The IATTC staff has attempted to estimate silky shark and dorado bycatches by applying the catch rates for large vessels to the data on sets by the smaller vessels, but these estimates may be inappropriate (Document [SAC-05 INF-F](#); Aires-da_Silva *et al.* 2016), for two reasons: i) the fishing areas of large and small purse-seine vessels overlap, but are not identical; the small vessels tend to fish much closer to the coast ([SAC-07-07f.i](#)); and ii) the fishing operation may differ between small and large vessels. Both of these factors could contribute to differences in bycatch composition, so it may not be appropriate to use observer information from large vessels to estimate the bycatches of small vessels. Bycatch estimates derived directly from data for trips by smaller purse-seine vessels are desirable. The fishing behavior of the small vessels has changed noticeably in recent years, and the need to monitor small vessels is a topic of current discussion ([SAC-07-07f.i](#)). There are concerns that smaller vessels may not be suitable for carrying observers, in which case EMS may be an option (Restrepo *et al.* 2014).

RECOMMENDATION 7: The Commission, taking into consideration the new ecosystem-based conservation goals of the Antigua Convention, should:

7.1 Class-6 vessels:

- i. Collect data in order to quantitatively describe the brailing procedures of all Class-6 purse-seine vessels.
- ii. Collect data to determine the extent to which the type of brailing procedure impacts the quality of the observer data on sharks and other bycatch species.
- iii. Consider the use of EMS to relieve observers from some of their duties, and create opportunities for collecting additional data on bycatches of sharks and other species.

7.2 Classes 1-5 vessels: Establish a regular observer program that would improve the quantification of

⁵ Carrying capacity ≤ 363 t

bycatches, including sharks and dorado. For vessels not suitable for carrying observers, EMS options should be considered.

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CHALLENGE 8: Insufficient coverage by longline fishery observer programs and data quality concerns

Resolution [C-11-08](#) established an observer program for longline vessels over 20 meters length overall (vessels in section 1.1.2b and, in some cases, 1.1.1c). Beginning in 2013, at least 5% of the fishing effort (defined as effective days fishing, excluding transit days) by such vessels had to be accompanied by a scientific observer. The Resolution establishes that “*The main task of the scientific observers shall be to record any available biological information, the catches of targeted fish species, species composition and any available biological information as well as any interactions with non-target species such as sea turtles, seabirds and sharks*”.

Paragraph 5 of Resolution [C-11-08](#) mandated the development of a common reporting format detailing the required data to be collected by observers on longline vessels. The form that reflects the approved format and content is available [here](#).

Paragraph 7 of Resolution [C-11-08](#) requires CPCs with longline observer programs to submit data annually, in a format established by the SAC. However, to date the SAC has not established such a format, and the practice of CPCs has been to submit a summary of their data in a format of their choosing. At the 89th Meeting of the IATTC in 2015, the Members recommended that the IATTC staff propose a format for submission of longline observer data. IATTC staff consider that the most useful data would be the raw data collected by observers in an unsummarized format. Therefore, the staff recommendation is that the SAC approve the submission by CPCs of raw observer data collected under Resolution [C-11-08](#) to the Commission, through the Director.

In the interim, IATTC Members that participate in this observer program are required to submit annual reports to the IATTC for their respective longline fleets. For trips with observers aboard, the reported information should include, at a minimum:

- a. Number of vessels
- b. Total catch
- c. Total effort (number of hooks, by hook type; effective days fishing, excluding transit days)
- d. Species composition of the target catch
- e. Number of sea turtles caught incidentally, by species
- f. Number of sea turtles caught incidentally and released, by species
- g. Number of sharks caught, by species
- h. Number of rays caught, by species
- i. Number of billfishes caught, by species
- j. Percentage coverage of fishing effort by observers

RECOMMENDATION 8: IATTC 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. **Increase the level of coverage by observers.** In other studies in which large amounts of information have been collected, observer coverage of 20% of fishing effort has been found to be adequate to provide reliable estimates of bycatches of infrequently-caught species. The staff maintains its recommendation that the current requirement of 5% coverage of large longline vessels be increased to 20% until sufficient information is available to justify a revision.

- b. **Update reports with missing data.** Resolution [C-11-08](#) stipulates that the reports be submitted by March 31 of each year. This does not allow CPCs sufficient time to process all the data for the previous year, since fishing trips departing in December of one year may not finish until the following year. As a result, as many of the reports noted, the reports for the most current year are incomplete. It is recommended that each year CPCs submit reports for the most recent year, and update their reports for the two previous years, so that only the most recent year will have incomplete data.
- c. **Submit raw observer data to the Commission.** The SAC should approve the submission of all raw observer data collected under Resolution [C-11-08](#) to the Commission, through the Director, in order to fulfill the mandate of paragraph 7. Until that approach or some other more specific format for high resolution longline observer data is approved, CPCs should continue to submit summary annual reports consistent with the guidance provided.
- d. **Include all required data in the interim summary reports.** In many cases, data for many of the required minimum items (see list above) were missing in the reports. CPCs should ensure that all the data are included, or explain their omission.
- e. **Identify species in the catch.** In all reports the total catch was reported as the sum of all species, without any indication of which species were included. Catches of each of the major target species should be reported individually. Catches of non-target species should be reported to the level of individual species where possible or, at the very least, be reported by general group.
- f. **Retained and discarded catches.** Many of the reports do not identify whether the catch figures represent total catch or retained catch. All observed catch should be reported and categorized into retained catch and discards.
- g. **Units of effort.** Some national reports provide effort as total days at sea, rather than effective fishing days. This inconsistency creates uncertainty when applying known bycatch rates to estimate EPO totals, and makes it difficult to compare fleets. Effective fishing days should be provided. Number of hooks set by observed vessels should be reported.
- h. **Hooks.** National reports should include, at a minimum, an estimate of the total number of hooks set by that CPC's longline fleet during the year, together with information on the gear that may facilitate standardization and analyses.
- i. **Electronic Monitoring Systems.** CPCs should consider the introduction of electronic monitoring systems as a means to increase their coverage and/or complement the data already collected by human fishery observers.
- j. **Biological data.** CPCs should explore options for collecting biological data.

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CHALLENGE 9: Limitations with longline fleet bycatch data reported by distant-water fleets

Data on bycatches by the tuna longline fleet are provided to the IATTC by the vessels' flag authorities. Some data on bycatches of sharks and rays have been provided, but they are sporadic and incomplete ([SAC-07-INF C\(d\)](#)).

RECOMMENDATION 9: The flag authorities of distant-water longline fleets should report to the Commission:

- 7.1. Total removals, by species
- 7.2. Total number of hooks

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