Kobe II Bycatch Workshop Background Paper

SEA TURTLES

1. OVERVIEW

In addition to other anthropogenic activities such as egg predation, directed harvest, and coastal development, the incidental capture of sea turtles in global fisheries is contributing to the decline of sea turtle populations worldwide. In most cases, these interactions are a consequence of commercially valuable fish species and sea turtles overlapping in time and space in areas characterized by high productivity, which makes them important foraging areas for several species, or in areas near to turtle nesting beaches. Coastal fixed nets and trawling activities can also lead to high rates of sea turtle bycatch due to overlapping habitat with target species. Recent research on methods to reduce and minimize the bycatch of sea turtles in fisheries has resulted in bycatch mitigation options for consideration by tuna RFMOs, including gear modifications for longline, some trawl fisheries, and some gillnet fisheries, as well as time-area closures where there is known to be a high concentration of sea turtles.

2. INFORMATION AND RESOURCES FOR ADDRESSING BYCATCH

2.1. Type and Characteristics of Fishery Interactions

Sea turtle interactions with fishing gear have been documented via directed research, logbook data, marine animal sightings, strandings and/or observer programs in longline (both demersal and pelagic), trawl, purse-seine and coastal net, and hook-and-line fisheries around the world. In many cases, it is uncertain whether sea turtles are drawn into the vicinity of fishing gear due to associated stimuli or if they inadvertently interact with the gear. However, due to the high number of reported interactions with certain fishing gears, particularly longlines, it is likely that turtles are attracted to bait, discards, and/or other aspects of fishing operations.

Pelagic Longline Gear: In longline fishing gear, sea turtles are most often captured by ingestion of the hook, embedding of the hook in the flipper or other soft external body part, hooked in the mouth, or entanglement in the line. The likelihood of surviving these interactions depends on the severity of the hooking and/or entanglement, presence of predators, the depth of the fishing gear, whether the turtle can reach the surface to breathe, and the actions of fishers regarding safe de-hooking and release techniques. Bycatch rates of sea turtles are highest in shallow-set gear, where captured turtles have higher chances of immediate survival because they are generally able to reach the surface to breathe, while the reverse is true for deep-set gear. Research has indicated that the size and shape of the hook and the type of bait are primary factors influencing rates of capture in fishing gear. Relatively large circle hooks and whole finfish bait have been shown to reduce rates of capture in several longline fisheries. The circular shape of the hooks is also believed to reduce the likelihood of interaction as well as the severity of injury to the turtle and therefore their use is likely to reduce the mortality as compared to "J" or tuna hooks. Additionally, the use of fish bait versus squid may also be effective in reducing sea turtle catch rates.

Coastal fisheries: There is less information on incidental captures of sea turtles in demersal longline fisheries and in coastal fixed-net fisheries (e.g. gillnet, trammel nets, and pound nets) in comparison to pelagic longline fisheries, yet there is increasing anecdotal and peer-reviewed evidence to suggest that interactions with these gear types are common and mortality rates are high. Interactions with these fisheries are challenging to document, and may be substantial in number. There is a clear need to better evaluate both the frequency and the nature of sea turtle interactions in coastal fisheries, especially gillnet

fisheries. While a complete understanding of the impact of coastal fisheries on sea turtle populations is lacking, preliminary research suggests that illuminating nets during night-time operations can effectively reduce turtle capture rates while maintaining catches of target species. However, this work is limited to trials with green sea turtles in some regions, and it is uncertain how other sea turtle species (and life stages) would behave and whether this approach is an effective mitigation method. Research is underway to identify the factors that may contribute to sea turtle bycatch in these various gear types. This preliminary research has shown that mesh size, set depth and the material of gillnets can be modified to reduce interactions.

Purse Seine Fisheries: Sea turtles can become entangled in the purse seine or in the webbing of FADs and, as a result, can be incidentally captured in purse-seine fisheries. However, because turtles are entangled at the surface, they can often continue to breathe and can be released alive and seemingly unharmed. Few turtles are entangled in the net, and are easy to release from a speedboat placed in the area where the net is pulled up from the water. In both the IATTC and the IOTC, the predominant species entangled in FADs is the olive ridley.

In addition to the entanglement of sea turtles in active FADs, lost or abandoned FADs can continue to serve as an aggregating device for multiple species, including sea turtles, for years. The IOTC has called on its members to look at alternative designs for FADs, including constructing them from degradable materials.

All of the tuna RFMOs have recognized the need to address sea turtle interactions and have initiated efforts to do so. However, information on the rates of sea turtle bycatch in pelagic and coastal fisheries varies by gear type, country, and region. In all five tuna RFMOs, much of the discussion has focused on interactions in pelagic longline or purse-seine fisheries. The available data indicates that longlines have higher interaction rates than purse seines. In addition to longlines and purse seines, in ICCAT there are some mid-water trawls and pole-and-line boats, but there is no information at present regarding interactions in these fisheries. Moreover, IOTC is the only RFMO that has required its members with gillnet vessels to record sea turtle interactions and report to the appropriate country officials when such interactions occur.

2.2. Population Status

There are seven species of sea turtles worldwide. The largest of these species, and the only one that does not have a hard shell, is the leatherback sea turtle (*Dermochelys coriacea)*. It is listed on the IUCN Redlist as critically endangered. Most of the Pacific populations of leatherbacks have experienced declines of 80% from historical levels. The primary threats have been identified as bycatch in fisheries and threats on nesting beaches, including poaching of both eggs and adult females, and coastal development. The Atlantic nesting populations of leatherbacks are either increasing or stable, except for those in the Western Caribbean and West Africa. Loggerhead sea turtles (*Caretta caretta)* are currently listed as endangered on the IUCN Redlist. There have been significant declines in several populations, including the North Indian Ocean, the Northwest Atlantic, the North Pacific and the South Pacific loggerhead sea turtles. While degradation and loss of nesting habitat has exacerbated these declines in the North Pacific, fisheries impacts on both populations are substantial. Leatherbacks and loggerheads are the sea turtles most commonly taken as bycatch in pelagic longline fisheries. Hawksbill sea turtles (*Eretmochelys imbricata)* are listed as critically endangered by the IUCN Redlist. The green sea turtle (*Chelonia mydas*) is listed as endangered by the IUCN, and the Kemp's ridley (*Lepidochelys kempii*) is listed as critically endangered. The distribution of the Kemp's ridley is principally restricted to the waters of the United States and Mexico. Olive ridley sea turtles (*Lepidochelys olivacea)* are listed by the IUCN as vulnerable. They are commonly caught in the longline and purse-seine fisheries of the EPO, and the trawl fisheries in the Indian Ocean, and are the only species of sea turtle that is stable or increasing, particularly in the EPO. Flatback sea turtles (*Natator depressus)* range primarily from northern Australian waters to the Indonesia Archipelago and Papua New Guinea, where they may be caught incidentally in the various regional fisheries. Although the flatback is not currently included on the IUCN Redlist, Australia has listed it as

vulnerable.

2.3. Species Distribution

Sea turtles are highly migratory, traveling great distances on the high seas to breed and forage, thus, making the distribution of most species quite broad. Their at-sea distribution has been examined through the use of aerial surveys and satellite transmitters, and through opportunistic fisheries-dependent sightings. Information on at-sea distribution is incomplete, and can be biased due to limited in-water study locations, focus on certain life stages (such as satellite tagging of adult females on nesting beaches), and data acquired from limited observer programs on the high seas.

The available data indicates that sea turtle distribution overlaps with fishing activities in all five tuna RFMOs. Green turtles are distributed tropically and sub-tropically, nesting in over 80 countries throughout the year. Olive ridleys are mainly pelagic and occur throughout the world primarily in tropical and sub-tropical waters. Kemp's ridley turtles are primarily found in the Gulf of Mexico and along the eastern United States. Hawksbill turtles are circumtropical, typically between 30°N and 30°S latitude. Leatherbacks have the broadest thermal tolerance of all species of sea turtles, regularly inhabiting temperate, boreal, and even sub-arctic waters. It is the most widely distributed of the seven species, with individuals undertaking lengthy migrations, such as from the coast of California to the Western Pacific or from east coast of Canada to the Caribbean. Loggerhead sea turtles are found in temperate and subtropical waters worldwide. Many sea turtle species inhabit continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters at various points in their lives. Major nesting grounds are generally located in temperate and subtropical regions, with scattered nesting in the tropics. In general, the distribution of sea turtles overlaps with that of tuna and tuna-like species, thus increasing the likelihood that they will be caught in those fisheries.

2.4. Fishery Impacts

All of the tuna RFMOs have some information on sea turtle interactions from reports submitted by RFMO members or as the result of data collected as part of onboard observer programs. At present, two of the RFMOs have undertaken a quantitative estimate of the number of sea turtles caught across the fleets they manage. Although purse-seine fisheries have a low sea turtle interaction rates relative to other gear types used in tuna RFMO fisheries, the 100% observer coverage on large purse-seine vessels allowed the IATTC to estimate the number of sea turtle mortalities in that fishery at 5 to 172 each year during 1997-2008. Over this time frame, the number decreased as a result of increased awareness among fishers of effective safe handling and release methods.

In contrast to purse-seine fisheries, sea turtle interactions with longlines may be substantial. For example, at the 2004 IATTC Bycatch Working Group, one IATTC member reported bycatches of 166 leatherback sea turtles with a mortality of 25, and 6,000 of other sea turtle species, mostly olive ridleys, with a mortality of 3,000, in its longline fishery in 2000. The IATTC has examined reported sea turtle bycatch within its longline fisheries, including distant-water longline vessels targeting swordfish with shallow longlines, as well as a sizeable fleet of artisanal longline vessels that fish for tunas, billfishes, sharks, and dorado. Since 2005, IATTC staff has worked with international organizations and the governments of several IATTC members to reduce the hooking rates and mortalities of sea turtles in these artisanal fisheries.

The WCPFC has discussed sea turtle bycatch within its convention area since 2005, when several papers related to sea turtle bycatch estimates in WCPFC fisheries were submitted. One of the first sea turtle bycatch estimates for WCPFC fisheries was conducted using observer data from the SPC (for the tropical shallow longline, tropical deep longline, temperate albacore longline, and a single purse seine fishery) in the central part of the WCPFC area. This estimate indicated that 6,962 (with a mortality of 931) turtles were captured by the four fisheries between 1990 and 2004. With a confidence interval of plus or minus 22,567, this estimate contains a great deal of uncertainty due to limited observer data, highlighting again the need for increased data collection as a way to improve the usefulness of bycatch estimates to making

conservation and management decisions.

Other estimates of sea turtle interactions in WCPFC fisheries have come from extrapolations from observer and effort data collected by WCPFC members, including fisheries targeting both tuna and swordfish. In some cases, the estimated percentage of sea turtle mortality relative to population size was significant, such as with the eastern and western Pacific stocks of the leatherback sea turtle, for which mortality was estimated at 12% and 5%, respectively, of the total population size. It is important to note, however, that other threats are impacting these populations besides longline fisheries, including coastal gillnet fisheries and direct harvest of adult females and their eggs.

Other Pacific-wide estimates for loggerhead and leatherback sea turtles indicate that between 2,600 and 6,000 loggerhead mortalities and between 1,000 and 3,200 leatherback mortalities may be resulting from pelagic longline gear. Again, much uncertainty surrounds these estimates, revealing the difficulty of estimating sea turtle bycatch due the paucity of observer data.

There has not been such a detailed discussion on sea turtle bycatch estimates in the other three tuna RFMOs, in part because of the lack of information from which to derive estimates. For example, the CCSBT has not conducted its own stock assessments on sea turtle populations, focusing more on assessing the impact of its fleets on these populations. In 2009, however, the CCSBT attempted to develop sea turtle bycatch estimates for the global southern bluefin tuna fishery, but was not confident of producing scaled estimates due to varying types of analyses conducted by different members and with inconsistency among the corresponding types of information and degree of species-specific information provided. There were also differences in the quality of CCSBT members' observer data between their fisheries, including low observer coverage in some fisheries, limited information provided by some members, and the representativeness of observer data. This resulted in only a synthesis of total observed sea turtle interactions. Therefore, these numbers only provide a partial indication of the actual levels of sea turtle bycatch for southern bluefin tuna fisheries.

Both ICCAT and IOTC subsidiary bodies responsible for analyzing bycatch species have expressed the need for higher observer coverage to reliably record interactions with bycatch species (including sea turtles) and to estimate bycatch mortality. In several of the tuna RFMOs, observer coverage is largely provided by individual national fleets and may not be representative of the fishery as a whole. IATTC and WCPFC are the only tuna RFMOs that have RFMO-wide observer programs, but in only portions of their fisheries. IOTC is in the process of developing an observer program and has been reaching out to other RFMOs and regional organizations during this process.

2.5. Bycatch Mitigation Measures

Given that much of the discussion in the RFMOs has focused around sea turtle interactions in pelagic longlines, the bycatch mitigation measures discussed by tuna RFMOs have centered on longlines and the corresponding bait and hooks used. Several of the RFMOs have reviewed the use of different hook types and bait combinations in longline fisheries as a way to reduce sea turtle interactions and mortalities. Some of the tuna RFMOs have requested members to conduct research in this field, consistent with FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations (FAO Sea Turtle Guidelines). A growing list of nations have conducted significant research on different sizes of circle hooks and found that sea turtle bycatch is reduced using a combination of large circle hooks with whole finfish bait. This research has been dicussed in the WCPFC, ICCAT and IATTC. At the same time, other research reviewed by the WCPFC and ICCAT indicated that differences in hook type do not reduce interactions with or catch rates of sea turtles, but that certain hook and bait type combinations may actually lead to increased sea turtle catch rates. While these findings may appear to confound one other, ICCAT discussions have also noted that in addition to hook size, set depth, and type of bait, time of day and location of areas where gear were set were also important factors contributing to sea turtle bycatch. This illustrates the need for additional research the factors listed above, to identify effective sea turtle bycatch mitigation methods.

At present, only the WCPFC includes large circle hooks as part of a menu of choices required for shallow set fisheries, the other two options are use of fish bait or the use of some other measure that is subsequently approved by the WCPFC. All other tuna RFMOs encourage their members to conduct research on sea turtle bycatch mitigation methods, but have not implemented binding conservation measures as a result. Still, some RFMO members require circle hooks and/or whole finfish bait or encourage their vessels to use circle hooks on a voluntary basis. As RFMOs continue to consider the use of different hook types as a way to mitigate the impact of their fisheries on sea turtles, it should be noted that there is not standard terminology from one fishery to another. For example, what is considered a 16/0 circle hook in one part of the world, may describe a different hook in another part of the world. There is a need to have a standardized hook measurement protocol in order to facilitate a common understanding and for compliance purposes as RFMOs consider and implement measures related to hook size.

To reduce mortality of sea turtles caught in their longline fisheries, the WCPFC, IOTC and IATTC require their members to use safe-handling and release protocols. The IATTC has produced an instructional video for fishers on how to de-hook sea turtles using de-hooking equipment and has distributed de-hooking equipment to fishers throughout the region. WCPFC, IOTC, and IATTC also require their members to disentangle sea turtles that become entangled in FADs, and the WCPFC further directs its purse seine vessels to stop net roll and disentangle sea turtles incidentally encircled during fishing operations.

3. RESEARCH AND MANAGEMENT TOOLS

3.1. Research and Management Objectives

In general, all five tuna RFMOs have encouraged their members to collect and report data on sea turtles interactions as well as to conduct experiments on sea turtle bycatch and mortality reduction. It should be noted that CCSBT has adopted a Recommendation that its membership implement the sea turtle measures of the RFMOs with which the main CCSBT fisheries overlap, notably the IOTC and WCPFC, as part of their efforts to address sea turtle bycatch. Research priorities related to addressing sea turtle bycatch within the tuna RFMOs have largely focused on mitigating sea turtle interactions in pelagic longline gear and FADs. At present, sea turtle bycatch research is largely dependent on individual countries conducting research, with little to no collaborative research efforts among RFMO members. However, the need to develop observer programs as a source of information from which to better understand and estimate sea turtle interactions with fisheries has been identified as a research and management objective by all of the five RFMOs.

3.2. Risk Assessment

ERA can assist managers in setting priorities for conservation action based upon areas of greatest need. Greatest need can be identified for species, geographic region, economic value, etc. This technique has been widely used by individual members of tuna RFMOs, and has more recently been applied by some of the RFMOs themselves. The WCPFC is currently undertaking a three-year ERA for several bycatch species, including sea turtles. CCSBT and IOTC have discussed the need for a risk assessment regarding sea turtle interactions, but have not yet undertaken one. The IOTC specifically noted that risk analysis was important given the paucity of data for sea turtle interactions in that region. CCSBT members are encouraged to undertake these assessments themselves, and at least one member is. ICCAT has conducted an ERA of all bycatch species using observer data from some of its members. However, this ERA was not specifically focused on sea turtles. At present, the IATTC has not discussed the need for ERAs for sea turtle interactions. The thoroughness of risk assessments will be dependent on the quantity and quality of the data presented to the tuna RFMOs. Moreover, since the turtle populations are widely distributed around the globe, conducting a joint risk assessment by all the tuna RFMOs would be more appropriate than carrying out an individual risk assessment. In some cases, conservation and management measures have been adopted in the absence of ERAs, such as measures taken by the IATTC and WCPFC.

3.3. Monitoring and Reporting Schemes

At-sea observation of interactions between fishing operations and bycatch species is one of the most effective ways to collect information to assess and develop methods to mitigate bycatch. Information derived from national and international observer programs has been essential to understanding sea turtle bycatch within all five tuna RFMOs. All five tuna RFMOs either require or request their members to provide information on sea turtle interactions and the implementation of their respective sea turtle measures, although without greater RFMO-wide observer coverage, much uncertainty remains regarding actual levels of sea turtle interactions and mortalities.

3.4. Periodic Technical Review and Evaluation of Effectiveness

Periodic review of conservation action and evaluation of measures are critical to ensuring that the most effective practices are being employed and that decision-making adapts with the availability of new information. Reviews of adopted measures can also be helpful in assessing potential changes to impacts on bycatch species as the characteristics and/or the extent of a fishery changes, or as new fisheries develop. Only the WCPFC and the IATTC have committed to regularly consider additional or new mitigation measures for longline and purse-seine fisheries, including as it pertains to reducing sea turtle bycatch.

3.5. Education and Training

Raising fishermen's awareness of the need for the conservation of sea turtles and their role in this conservation effort can facilitate increased compliance with any agreed-to conservation measures and can assist managers in identifying any implementation difficulties by opening a constructive dialog with fishers. Educational materials can also improve fishers' and observers' ability to identify species and describe the interaction event, as a way to improve the overall understanding of sea turtle interactions.

The WCPFC authorizes the use of funds to assist developing States and Territories in implementing the FAO Sea Turtle Guidelines, specifically for training and encouraging fishers to adopt appropriate methods and technologies to reduce interactions with sea turtles and to mitigate adverse effects of those interactions. Since 1999, the IATTC has conducted seminars for captains and their crews on the status of sea turtles and on safe-handling and release techniques for use in purse seine fisheries. Due in part to these efforts, the number of sea turtle mortalities in the IATTC purse seine fishery has dropped significantly since 2002. While not explicitly mentioned in the resolutions of the tuna RFMOs, most have provided sea turtle identification guides for their members to ensure that observer information is more accurately recorded. In some cases, safe handling and release training has been conducted with fishermen as well.

3.6. Independent Performance Reviews

Three of the five tuna RFMOs (CCSBT, ICCAT, and IOTC) have completed independent performance reviews, as called for by the UN Fish Stocks Review Conference in 2006. In all three cases, the review panels noted the need for the RFMOs to make further progress toward the application of ecosystem-based consideration, such as the adoption of conservation and management measures for non-target species and species dependent on or associated with target stocks, including with respect to data collection requirements for the catch of non-target species.

For example, the ICCAT panel urged ICCAT members to make data and scientific expertise available to the progress the work of evaluating the effect that the fisheries under the purview of ICCAT have on sea turtles. The IOTC review noted that there were no binding measures in place to reduce sea turtle bycatch. The CCSBT independent expert noted that the CCSBT had not yet taken steps to implement the FAO Sea Turtle Guidelines, although since the review the CCSBT has recommended that its members implement the guidelines, to the extent possible.

3.7. Coordination with Other Relevant RFMOs and IGOs

The convention areas of the five tuna RFMOs overlap with regional and multilateral environmental agreements. Thus, there is often overlapping responsibility with respect to bycatch species in some cases even with respect to regulation of vessels. Of the five tuna RFMOs, the IOTC works most regularly with the IOSEA. The IOSEA has an online reporting mechanism for its signatories, many of which are also IOTC or WCPFC members, which among many things tracks the implementation of the FAO Sea Turtle Guidelines. The IOSEA Secretariat has attended several of the IOTC meetings and provided to the IOTC information on sea turtle biology and interactions with fisheries. The IATTC has also been represented at the Conference of Parties and the subsidiary body meetings of the IAC.

At present, no MOUs exist between the tuna RFMOs and relevant international sea turtle agreements. The IAC, however, has directed its Secretariat to develop MOUs with relevant RFMOs. Given that the IOSEA collects information on fisheries interactions in its Signatory States and that the IAC has the authority to regulate vessels flagged by its members, there are likely opportunities for the tuna RFMOs and these agreements to work together. In addition to the regional sea turtle conservation agreements, CMS, the parent organization of the IOSEA, encourages improved gathering and reporting of bycatch information and data and calls on CMS members to implement the FAO Sea Turtle Guidelines.

Finally, IATTC, WCPFC, IOTC and CCSBT have adopted the FAO Sea Turtle Guidelines. These guidelines suggest best management practices for all gear types where sea turtles are caught, as well as highlighting the need for continued research on sea turtle bycatch mitigation.

4. INVENTORY OF EXISTING CONSERVATION MEASURES

The table below provides an inventory of the conservation measures currently in place at each of the five tuna RFMOs, demonstrating where they contain similar provisions and how they are different from one another. This table does not indicate the extent to which the measures are being implemented.

	CCSBT	IATTC	ICCAT	IOTC	WCPFC
	Recommendation to Mitigate the Impact on Ecologically Related Species (2008)	**Resolution C-07-03**	**03-11 BYC Resolution and 05-08 GEN Resolution on Circle Hooks**	**Recommendation 05/08 Resolution 09/06**	**Conservation and Management Measure 2008-03**
4.1 Binding	No	Yes	Support FAO efforts via a holistic approach	Yes	Yes
4.2 Implementation of FAO guidelines	Yes, to the extent possible	Yes, and annual reporting on progress	Longline	Yes, and shall report compliance	Yes, as appropriate
4.3 Prescribed for vessel or gear type & area of application	No	All fisheries, with specific measures for purse seine and longline vessels	No, but encourages research trials of circle hooks	Gillnet, longline, and purse seine/FADs	Purse seine and longline
4.4 Use of mitigation measures	Recommendation adopts IOTC/WCPFC measures	Yes, enhance implementation of measures already in place	No	Yes	Yes
4.5 Standards for mitigation measures	Recommendation adopts IOTC/WCPFC measures	No	Yes	Yes, will develop recommendations on mitigation measures	Yes, and shall establish and enforce operational definitions
4.6 Reporting and interaction information sharing	Yes, collect and report	Yes, in collaboration with other members	Yes, encouraged to undertake research	Yes	Yes, annual reporting
4.7 Research and review of mitigation measures	Encouraged through the Ecologically Related Species Working Group	Yes, undertake longline research and assess effects on target catch and bycatch	Yes, when feasible and appropriate, conduct impact assessment of circle hooks on discards	Yes, research on mitigation methods, gear and fishing practices, and safe handling procedures	Yes, urged to undertake research and report results
4.8 Estimation of bycatch and/or assess impacts	Yes, by the Commission or its subsidiary bodies	No	No	No	No
4.9 Review for effectiveness and revision	Yes	Yes, consider use of circle hooks and other gear modifications	Yes	Yes, annually review to strengthen efforts	Yes, annual and/or regular review and update measures, specifications, or other recommendations
4.10 Safe handling and live release	Recommendation adopts IOTC/WCPFC measures	Yes	Yes	Yes, develop guidelines	Yes
4.11 Collection and use	No	Yes, implement observer	No	Yes	No

	CCSBT	IATTC	ICCAT	IOTC	WCPFC
of observer and/or logbook data		programs where not currently being observed			
4.12 Future work by RFMO	Yes	Yes, implement observer program and consider mitigation measures	Yes, develop data collection and reporting methods	Yes, recommend mitigation measures and safe-handling and release, develop data collection standards and identification guide	Yes, mitigation and handling techniques developed and distributed by 30 June 2009
4.13 Compliance requirements	Yes, in those areas	No	No	No	Yes, shall ensure proper use of mitigation and handling techniques
4.14 Cooperation w/ other RFMOs and IGOs	Yes, required to comply with WCPFC and IOTC measures when in those areas	No	No	Yes, taking into account research and mitigation measures in other relevant organizations, particularly the IOSEA	No
4.15 Outreach and education	No	No	No	Yes, produce identification guide	Yes, ensure fishermen are aware of mitigation and handling techniques
4.16 Support for developing nations	No	No	No	Yes, encouraged to support to implement FAO Guidelines and Resolution	Yes, authorizes funds to train and encourage fishers to adopt mitigation methods
4.17 Applicability to non-commercial fisheries	No	No	Yes, encouraged to undertake research in recreational and artisanal fisheries	No	No
4.18 Socio-economic considerations	No	Yes, observer program to consider economic and practical feasibility	No	Yes, consider socio-economic factors when adopting measures	Yes, preserves rights of traditional artisanal fishers
4.19 Impacts on other species	No	Yes, in description of research trials to be conducted	Yes, regarding whether hook type can affect marlin post-release mortality	Yes, mitigation should not adversely impact other species and/or the environment	No

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