

The role of fishing industry towards improving bycatch mitigation and management

Miguel HERRERA & Alexandra MAUFROY



The context

- The industry shall participate to the decision-making process:
- Assist to the evaluation of impacts (data collection)

SCRS/2019/166

INTRODUCING A PROCESS TO ASSESS THE CONTRIBUTION OF PURSE SEINE FISHERIES TO INCIDENTAL CATCHES OF ENDANGERED, THREATENED AND PROTECTED SPECIES IN THE AREA OF COMPETENCE OF ICCAT

A. García-Horcojuelo¹, J.C. Báez², M. Herrera³, Ana Justel⁴, I. Mouiz⁵, Hilario Munuá⁶, J. Ruiz³

SUMMARY

This document presents the work that a panel of scientists is conducting to attempt producing estimates of levels of key bycatch species by ICCAT fisheries. It follows up on previous work conducted in the Indian Ocean, which led to the publication of estimates of catch of endangered, threatened and protected species (ETPP) by IOTC fisheries, including sharks, marine turtles and marine mammals. However, the paucity of the data that ICCAT fisheries produce on bycatch and the fact that ICCAT's standards for the dissemination of observer data have been hampering attempts to use this information to produce estimates. The authors propose some actions that the ICCAT could contemplate to assist them in this work. They also recall that in 2016 the Commission requested the SCRS to evaluate the contribution of bycatches and discards to the overall catches in ICCAT tropical tuna fisheries. Address the fact that the SCRS will not be able to respond to this request unless CPC Compliance with the existing provisions improves and ICCAT revises its requirements concerning observer coverage and data dissemination standards for bycatch stocks.

Joint t-RFMO By-catch WG
December 11, 2019 (2:42 PM)

Doc. No. BYC-29/2019

Original: English

REVIEWS OF BYCATCH SPECIES CAUGHT BY THE SIOTI FLEET, CODES OF PRACTICE AND OTHER GUIDANCE FOR REDUCING BYCATCH MORTALITY. REPORT TO THE SUSTAINABLE INDIAN OCEAN TUNA INITIATIVE

Poisson, F., Gilman, E., Seret, B., and Fowler, S.¹

The Sustainable Indian Ocean Tuna Initiative (SIOTI) is a large-scale Fisheries Improvement Project (FIP) comprising the major purse seine fleets and tuna processors operating in the Indian Ocean Tuna Commission (IOTC) Area of Competence. The FIP is supported by the Government of the Seychelles and WWF through a formal Memorandum of Understanding (October 2016) and an agreement between 17 industry partners (March 2017). The SIOTI FIP goal is to support improvement in the management of Indian Ocean tuna fisheries so that consumers can in the future be assured that the purse-seine tuna they purchase has been harvested sustainably. The ultimate aim is to meet the highest standards of sustainable fishing, such as the Marine Stewardship Council (MSC) standard.

Joint t-RFMO Bycatch WG
December 11, 2019 (2:56 PM)

Doc. No. BYC-24/2019

Original: English

COUNTING SHARKS INCIDENTALLY CAPTURED BY TROPICAL TUNA PURSE SEINE VESSELS- EASIER SAID THAN DONE!

Jeffrey Muir¹, Fabien Forget², David Itano³, Melanie Hutchinsout⁴, John D Filmer⁵, Igor Saneristobal⁶, Uduane Martinez⁷, Kim Holland⁸, Victor Restrepo⁹, Laurent Dagorn²,

Recording bycatch is important to evaluate the impact of fisheries on the ecosystem. In the tropical tuna purse seine fishery, IRFMOs coordinate scientific observer programs to monitor fishing activities and record bycatch. While considerable efforts have been made by IRFMOs to increase observer coverage and to promote the use of technology (i.e. Electronic Monitoring) to aid the acquisition of bycatch, the accuracy and uncertainty of these methods is poorly documented. The silky (*Carcharhinus falciformis*) and the oceanic whitetip (*Carcharhinus longimanus*) are the primary elasmobranch bycatch in the global tuna purse seine fishery. We use shark count data acquired by scientists during the scientific cruises onboard purse seiners in the western central Pacific, Atlantic and Indian Oceans to assess accuracy of onboard observer and electronic monitoring systems. Generally, the results of this study shows that sharks counts at the set level were underestimated by both onboard observer and electronic monitoring systems.

IOTC-2018-WPDCS14-26

Assessing the Contribution of Purse Seine Fisheries to Overall Levels of Bycatch in the Indian Ocean

Alberto García¹ & Miguel Herrera²

Abstract

Principle 2 of the Fishery Improvement Project run by the Producers' Organization OPAGAC contains actions intended to assess the environmental impacts of OPAGAC's purse seine fleet in the three oceans, which include the evaluation of the contribution of purse seine fisheries to overall levels of bycatch mortality in the Indian Ocean with a focus on endangered, threatened and protected species. This study represents a first attempt at evaluating impacts in the Indian Ocean in recent years. A broad and diverse range of fisheries operate in the Indian Ocean for which, in addition, data on bycatch are very poor quality or completely lacking. This study used a wide range of data sources to produce estimates for the major bycatch stocks identified by the IOTC, including sharks, marine turtles and marine mammals. According to the estimates from this study the purse seine fishery in the Indian Ocean is responsible for just 0.15% of the fishing mortality of sharks, 0.16% of whale sharks, nil of marine mammals, and 0.3% of marine turtles. By species, the silky shark is the most important bycatch species for purse seiners, although levels of fishing mortality are still very low, at 1.3% of the total. On the contrary, gillnet, driftnet, fresh-tuna and deep-freezing longline fisheries are responsible for most of the bycatch mortality of the

Joint t-RFMO By-catch WG
December 11, 2019 (2:39 PM)

Doc. No. BYC-21/2019

Original: English

DIALOGUE BETWEEN RESEARCH AND FISHING INDUSTRY TOWARDS IMPROVING SCIENTIFIC OBSERVATIONS OF BYCATCH: THE CASE OF THE FRENCH AND ITALIAN TROPICAL TUNA PURSE SEINE FLEET IN THE ATLANTIC AND INDIAN OCEANS

Alexandra Moufry¹, Antoine Bonnioux², Emilie Moë³, Anne-Lise Vernet⁴, Aude Rolot-Stirnmann⁵, Karine Briand⁶, Philippe S. Sabarwal⁴, Pascal Bach⁴ and Michel Goujon¹

Introduction

The presence of observers onboard tropical tuna purse seiners (PS) is required for multiple reasons: scientific data collection, compliance with tuna RFMO regulations, compliance with fishing agreement obligations, compliance with certification commitments (e.g. ISSF) or monitoring of the application of Best Practices. In order to meet these multiple requirements and to improve the scientific observation of bycatch, ORTHONGEL implemented in 2013 the Common Permanent Unique Observer (COPU) pilot project (Goujon et al. 2017) with the aim of reaching an exhaustive coverage of its member fishing vessels. In 2014, as smaller vessels of the Indian Ocean could not carry observers due the lack of space onboard (piracy-protection teams are embarked since 2010), an electronic monitoring extension of the program was implemented (Electronic Eye Optimization "OEE" pilot project, Briand et al. 2017).

Joint t-RFMO By-catch WG
December 11, 2019 (2:50 PM)

Doc. No. BYC-12/2019

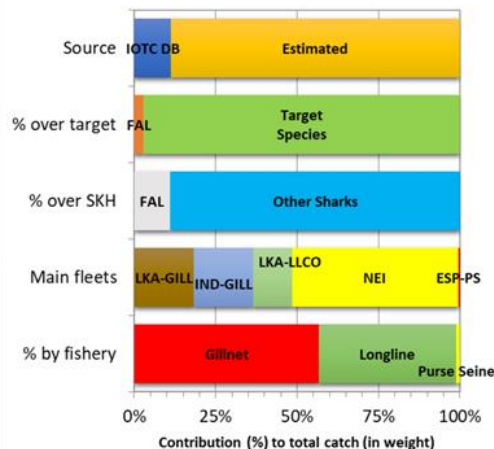
Original: English

SHARK BY-CATCH TREND OF SPANISH PURSE SEINERS INDUSTRIAL FISHERIES TARGETING TROPICAL TUNA AROUND AFRICA: AN OVERVIEW

José Carlos Báez¹, Pedro Pascual², María Lourdes Ramos³ and Francisco Abascal⁴

The Spanish Institute of Oceanography (IEO) observers on board commercial purse seiner freezer vessels from Indian Ocean follows a scientific programme, implementing the EU Fishing Data Collection Programme (PNDB) (Parliament and Council Regulation (EU) No 2017/1004 of 17 May 2017). The data collection and processing methodology is common for the Atlantic and Indian oceans. The main aim of the scientific observer programme is obtaining direct information on catches and discards of target and by-catch species (e.g. catch and by-catch species, number of individuals, size, and other biological data). In the present study, we used data recorded by IEO from 2003 to 2018 from the above-mentioned programme.

Carcharhinus falciformis



Joint t-RFMO By-catch WG
December 12, 2019 (3:31 PM)

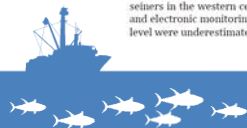
Doc. No. BYC-28/2019

Original: Spanish

INVENTORY OF SOURCES OF DATA IN GUATEMALA ON SHARK FISHERIES OPERATING IN THE EASTERN PACIFIC OCEAN

Carlos Francisco Marín Arriola¹, Carlos Alejandro Tejeda Velázquez², Salvador Súa³

The Directorate of Regulation of Fisheries and Aquaculture (DIPESCA) is the authority in Guatemala responsible for administering national aquatic resources, promoting their sustainable use, and monitoring administration of regulations and laws. The Guatemalan General Law on Fisheries and Aquaculture (Decree No. 80-2002) classifies fishing vessels by Gross Registered Tonnage (GRT), as follows: large-scale commercial (30.1-150 GRT); medium-scale commercial (2-30 GRT); small-scale commercial (1-1.99 GRT); artisanal (0.46-0.99 GRT). Guatemala currently has 31 medium and large-scale shrimp vessels, three large-scale tuna purse seiners, 18 medium-scale longliners, 5 small-scale gillnet/longline vessels, and 4,866 small-scale artisanal vessels operating in the EPO. According to OSPESCA (2010), Guatemalan fisheries employ a total of 18,600 fishers, almost half of whom operate in the Pacific. In the Guatemalan EEZ, sharks are caught mainly by pangas in the small-scale artisanal fisheries and by small-scale vessels targeting sharks, but as bycatch in artisanal gillnet fisheries (Ruano et al. 2007). About 30 shark species are caught in these fisheries, mainly species belonging to the orders Carcharhiniformes, Lamniformes and Rajiformes (Calderín-Solis 2014). Additionally, about 200 artisanal longliners target shark in the Guatemalan EEZ (PROBIOOMA 2009). Sharks are also targeted by medium-scale industrial longliners. This fishery is fairly recent, having started



The context

- The industry shall participate to the decision-making process:
- Assist research and adoption of regulations & mitigation measures

Joint t-RFMO By-catch WG
December 11, 2019 (2:49 PM)

Doc. No. BYC-11/2019

Original: English

UNDERSTANDING THE SKIPPER EFFECT IN THE BLUE SHARK BY-CATCH FROM MEDITERRANEAN SEA

David Maciá¹, José Carlos Báez², Carla Martín-Toledano³, José María Ortiz de Urbina⁴,
Salvador García-Barcelona⁵ & Juan Antonio Cantifas⁶

It is widely accepted that there is a pattern effect to determine the bycatch of some species. In this context, blue shark bycatch in traditional Spanish longline home-base targeting swordfish fisheries (LLHB) from Mediterranean Sea are concentrated on certain vessels, fishing areas (for example Alboran Sea) and periods of the year. The main aim of this study is to analyze the technical, socioeconomic and environmental factors to determine what of them better explain the incidental capture of blue sharks in surface LLHB from Western Mediterranean Sea. For this study, we used scientific observer data provided for the IEO onboard observer program during the period 2008-2014. We present different GLM models between by-catches CPUE, and different explanatory variables. Present results conclude that the main variables involved in the blue shark bycatch in surface LLHB from Western Mediterranean Sea are fundamentally technical and socioeconomic variables. Thus, in ports close to areas of concentration of blue sharks, a part of the surface LLHB fleet target blue shark, even though the economic profit is lower than in periods targeting swordfish, because the expenses in fuel, bait and insurance social of the crew (also there is a smaller number of crew) are smallest. Current results could help to us for advised in improving the management of this fishery.

Joint t-RFMO By-catch WG
December 11, 2019 (2:38 PM)

Doc. No. BYC-19/2019

Original: English

FISHING ON FADS WITHOUT KILLING SILKY SHARKS: WHERE ARE WE AND WHAT SHOULD WE DO?

Laurent Dagorn¹, Fabien Forget¹, John D Filmlter², Jeffrey Muir³, Melanie Hutchinson⁴, David Itano⁵, Igor San Cristóbal⁶, Kim Holland⁷, Manuela Capello⁸, Gail Moreno⁹, Hilario Murua⁹, Victor Restrepo⁹

Tropical tuna and silky sharks swim in the same waters, which explains why silky shark is frequently caught incidentally by tropical tuna purse seiners. Reducing catches of silky sharks by purse seiners is a key element towards the sustainability of the fishery. Ten years of research have allowed to test several options to reduce the fisheries-induced mortality of silky sharks: some did not show significant results while others proved to be effective and ended in advice for mitigation measures.

The research result with the main impact has been the discovery of ghost fishing due to sharks becoming entangled in nets hanging under Fish Aggregating Devices (FADs). Following this key finding, RFMOs have adopted measures for Non-Entangling FADs in order to eliminate this mortality.

Joint t-RFMO By-catch WG
December 11, 2019 (2:46 PM)

Doc. No. BYC-06/2019

Original: English

THE EFFECT OF LIGHTSTICK COLOR IN PELAGIC LONGLINE FISHERIES

André S. Afonso¹, Bruno Mourato², Filipo H. V. Hazin³

Improving the selectivity of the fishing gear is one of the most promising strategies to mitigate impacts produced by longline fisheries upon by-catch species. Light lures have recently become widespread in pelagic longline fisheries because they increase the catchability of target species such as swordfish (*Xiphus gladius*) and tunas. However, there is an overall lack of knowledge about their effect upon the incidence of by-catch species. Here, we used Bayesian generalized linear models through the Integrated Nested Laplace Approximation (INLA) approach to investigate how the catchability of target and by-catch species could be enhanced in a pelagic longline equipped with lightsticks of three different colors (green, white and blue).

Joint t-RFMO By-catch WG
December 11, 2019 (2:40 PM)

Doc. No. BYC-22/2019

Original: English

PREDICTING HOTSPOTS OF THE MAIN BYCATCH SPECIES OF TUNA PURSE SEINE FISHERIES IN THE ATLANTIC AND INDIAN OCEANS

Laura Manacci¹, Fabien Forget¹, Mariana Truassos Tolotti², Pascal Bach³, Nicolas Béz⁴, Hervé Denarac⁵, David Kaplan⁶, Philippe S. Sabarwal⁶, Monique Simier⁶, Manuela Capello⁸, Laurent Dagorn⁹

Five species dominate the composition of bycatch in tropical tuna purse seine fisheries: the dolphinfish, rainbow runner, silky shark, spotted oceanic triggerfish, and waloo. Elucidating species-habitat relationships across species and oceans is crucial to design fisheries management strategies that efficiently reduce bycatch. We used data collected within French fisheries observer programs to predict hotspots for the top five bycatch species as well as the spatio-temporal overlap with fishing effort at the basin scale in the Atlantic and Indian oceans. For each species and ocean, we built a generalized additive model relating bycatch per floating object fishing set to habitat covariates. Estimated relationships were geographically extrapolated to derive predictions of multispecies bycatch hotspots at the basin scale. Bycatch hotspots were then overlapped with the multi-flag purse seine fishing effort available from RFMOs. Species-habitat relationships vary between oceans and species. In the Atlantic, bycatch hotspots were predicted throughout subtropical waters with little overlap between species. In the Indian Ocean, major bycatch hotspots were predicted in northern waters for four species. The overlap of hotspots with the core fishing effort was substantial year-round in the Atlantic and in the second half of the year in the Indian Ocean. Dissimilar

Joint t-RFMO By-catch WG
December 11, 2019 (2:38 PM)

Doc. No. BYC-18/2019

Original: English

BEHAVIOR OF SILKY SHARKS AND OCEANIC WHITE TIP SHARKS IN RELATION TO FLOATING OBJECTS: IMPLICATIONS FOR SHARK CONSERVATION

Laurent Dagorn¹, Fabien Forget¹, Manuela Capello⁸, Mariana Truassos-Tolotti², John D Filmlter², Jeffrey Muir³, Melanie Hutchinson⁴, David Itano⁵, Jean-Louis Denabuourg⁶, Kim Holland⁷, Victor Restrepo⁹

Silky and oceanic white tip sharks are the two main species caught incidentally by tropical tuna purse seiners, usually when they are associated with floating objects. Knowing their behavior in relation to these objects is therefore a necessity in order to understand their accessibility and their vulnerability to tropical tuna purse seiners, and develop comprehensive conservation strategies.

In this presentation, we will review current knowledge to address the four following questions for each of the two species in the Indian and Atlantic oceans, using data from observers and electronic tagging:

- How many floating objects are occupied by sharks?
- How many sharks are usually found per floating object?
- How long do sharks stay associated to floating objects?
- Where do sharks go?

Implications of these results in terms of fisheries management regarding shark conservation are discussed.

Joint t-RFMO By-catch WG
December 11, 2019 (2:51 PM)

Doc. No. BYC-13/2019

Original: English

FORECASTING OCEANIC WHITETIP SHARK POTENTIAL GLOBAL DISTRIBUTION IN A CONTEXT OF CLIMATIC CHANGE

José Carlos Báez¹, Ana Marcia Barbosa², María Lourdes Ramos³, Pedro Pascual⁴, Jon Ruiz⁵, Philippe S. Sabarwal⁶, Mariana Tolotti², Pascal Bach³, Hilario Murua⁹ & Francisco Abascal¹⁰

The oceanic whitetip shark (*Carcharhinus longimanus*) is an endangered marine shark species which can be adversely affected by the fishing activities of the industrial purse seine fleet targeting tropical tuna. The EU purse seiner is operating around all the tropical Ocean areas. We analyzed and modeled the spatial distribution and environmental preferences of oceanic whitetip shark based on presence and absence data from observer data.

Joint t-RFMO By-catch WG
December 12, 2019 (3:31 PM)

Doc. No. BYC-28/2019

Original: Spanish

INVENTORY OF SOURCES OF DATA IN GUATEMALA ON SHARK FISHERIES OPERATING IN THE EASTERN PACIFIC OCEAN

Carlos Francisco Marín Arriola¹, Carlos Alejandro Tejeda Veldsquez², Salvador Sliu³

The Directorate of Regulation of Fisheries and Aquaculture (DIPESCA) is the authority in Guatemala responsible for administering national aquatic resources, promoting their sustainable use, and monitoring administration of regulations and laws. The Guatemalan General Law on Fisheries and Aquaculture (Decree No. 80-2002) classifies fishing vessels by Gross Registered Tonnage (GRT), as follows: large-scale commercial (30.1-150 GRT); medium-scale commercial (2-30 GRT); small-scale commercial (1-1.99 GRT); artisanal (0.46-0.99 GRT). Guatemala currently has 31 medium and large-scale shrimp vessels, three large-scale tuna purse seiners, 19 medium-scale longliners, 5 small-scale gillnet/longline vessels, and 1,960 small-scale artisanal vessels operating in the EPO. According to OSPESCA (2010), Guatemalan fisheries employ a total of 18,600 fishers, almost half of whom operate in the Pacific. In the Guatemalan EEZ, sharks are caught mainly by pangas in the small-scale artisanal fisheries and by small-scale vessels targeting sharks, but as bycatch in artisanal gillnet fisheries (Ruano *et al.* 2007). About 30 shark species are caught in these fisheries, mainly species belonging to the orders Carcharhiniformes, Lamniformes and Rajiformes (Calderón-Solis 2014). Additionally, about 200 artisanal longliners target shark in the Guatemalan EEZ (PROBIOMA 2009). Sharks are also targeted by medium-scale industrial longliners. This fishery is fairly recent, having started



The context

- The industry shall participate to the decision-making process:
 - Drive implementation

Joint t-RFMO By-catch WG
December 11, 2019 (2:38 PM)

Doc. No. BYC-19/2019

Original: English

FISHING ON FADS WITHOUT KILLING SILKY SHARKS: WHERE ARE WE AND WHAT SHOULD WE DO?

Laurent Dagorn¹, Fabien Forget¹, John D Filmlalter², Jeffrey Muir³, Melanie Hutchinson³, David Itano⁴, Igor Sancristobal⁵, Kim Holland³, Manuela Capello¹, Gala Moreno⁶, Hilario Murua⁶, Victor Restrepo⁶

Tropical tuna and silky sharks swim in the same waters, which explains why silky shark is frequently caught incidentally by tropical tuna purse seiners. Reducing catches of silky sharks by purse seiners is a key element towards the sustainability of the fishery. Ten years of research have allowed to test several options to reduce the fisheries-induced mortality of silky sharks: some did not show significant results while others proved to be effective and ended in advice for mitigation measures.

The research result with the main impact has been the discovery of ghost fishing due to sharks becoming entangled in nets hanging under Fish Aggregating Devices (FADs). Following this key finding, RFMOs have adopted measures for Non-Entangling FADs in order to eliminate this mortality.

Joint t-RFMO By-catch WG
December 11, 2019 (2:41 PM)

Doc. No. BYC-25/2019

Original: English

MITIGATION ACTIONS ON SPANISH TROPICAL TUNA PURSE SEINER FISHERY

Grande M¹, Ruiz J.², Jefferson M.², Zudaire I.¹, Goñi, N.¹, Arregui, I.¹, Ferarios, J.M.², Ramos L.³, Báez J.C.³, Moreno G.⁴, Murua H.⁴, Santiago, J.²

About half of the tropical tuna caught worldwide annually is fished by purse seiners, mainly using fish aggregating devices (FADs). Even though this fishing technique increases sets success, these devices are also controversial due to their potential impacts on the marine ecosystem. In order to mitigate and reduce the effects of the purse seiner fishery on non-target species, the two Spanish tuna purse seiner associations (ANABAC and OPAGAC), collaborating with scientists, are performing specific actions for reducing bycatch mortality levels. This document summarizes the main actions conducted at global scale in Spanish tropical tuna purse seine fishery.

In 2012 the purse seiners associations established a Code of Good Practices (CGP) for the application of sustainable fishing practices. The aim of this agreement is to maximize survival of sensitive species incidentally caught (i.e., elasmobranchs, sea turtles and since 2019 cetaceans) and prevent passive ghost fishing by using non-entangling FADs. The CGP defines a set of good practices including: (i) the use of non-



The context

- The industry shall participate to the decision-making process:
 - Assist to the evaluation of effectiveness and review of measures

Joint t-RFMO By-catch WG
December 12, 2019 (12:15 PM)

Doc. No. BYC-08/2019

Original: English

QUANTIFYING POST-RELEASE MORTALITY RATES OF SHARKS INCIDENTALLY CAPTURED IN PACIFIC TUNA LONGLINE FISHERIES AND IDENTIFYING HANDLING PRACTICES TO IMPROVE SURVIVORSHIP

Melanie Hutchinson¹, Keith Bigelow², Daniel Fuller³, Kurt Schaefer³

Longline fisheries have the largest impact on pelagic shark populations due to the scale and magnitude of fishing effort around the globe. As some shark population assessments have shown declines due to overfishing, finding strategies that can reduce this impact are increasingly important. In many regions, sharks are typically discarded at sea due to low market value or conservation and management measures (CMMs) banning the retention of some species (e.g., *Carcharhinus falciformis* [IATTC; C-16-06 purse seine fishery only, WCPFC; CMM-2013-08], *C. longimanus* [IATTC; C-11-10, WCPFC; 2011-04]). Thus, understanding post-release fate and the identification of handling practices that can improve post-release survival are paramount to the development, implementation, and review of effective conservation management strategies.

Joint t-RFMO By-catch WG
December 11, 2019 (2:48 PM)

Doc. No. BYC-09/2019

Original: English

ASSESSING THE EFFICACY OF BEST HANDLING AND DISCARD PRACTICES FOR INCIDENTAL ELASMOBRANCHS CAPTURED IN A TROPICAL TUNA PURSE SEINE FISHERY

Melanie Hutchinson¹, Robert Bauer², Alfredo Barrio³, Alexander Salgado⁴, Laurent Dagorn⁵, Fabien Forget⁵, Gala Moreno⁴

Mobulid rays (*Mobula* spp.) and whale sharks (*Rhincodon typus*) are sometimes incidentally captured in purse seine fisheries targeting tropical tuna. These species are particularly vulnerable to fishing related mortality impacts because of life history traits associated with slow growth and extremely low reproductive potential. Finding handling strategies that improve post-release survivorship for these species has been identified as a priority by several tuna regional fishery management organizations (RFMOs). Accordingly, several of these RFMOs have adopted recommendations for handling and discard practices to improve survival probabilities. Such guidelines are based on 'common sense' practices where post-release survival has not been validated or assessed for most species. This study presents post-release fate data from whale sharks ($n = 2$) and *M. tarapacana* ($n = 6$) that were captured, tagged, and released using the recommended best handling and discard practices during a commercial tuna purse seine trip in the eastern Atlantic Ocean. The animals were tagged with satellite linked pop-off archival tags during July of 2018. The whale sharks were found to have survived the interaction while five of the six *Mobula* died, between two and eleven days, post-release. These results indicate that reducing the impacts of commercial fishing on by-catch species is an iterative process, and the recommended handling and discard methods for *Mobula* may need to be re-assessed. Another potential mitigation action would be to identify temporal-spatial hotspots to be avoided.

Joint t-RFMO By-catch WG
December 12, 2019 (11:33 AM)

Doc. No. BYC-07/2019

Original: English

PRELIMINARY ESTIMATES OF POST-RELEASE SURVIVAL OF PORBEAGLE SHARKS (*Lamna nasus*) FOLLOWING CAPTURE AND HANDLING TECHNIQUES

Brooke N. Anderson¹, Lisa Natanson, John Carlson, Rui Coelho, Eric Cortes, Andrés Domingo, James A. Sallikowski

Understanding the fate of discarded by-catch is necessary for effective management and conservation of marine resources. For example, the northwest Atlantic population of porbeagle sharks (*Lamna nasus*) has experienced substantial declines in abundance since the early 1960s, and population trajectory models indicate human induced mortality must remain low for successful recovery to occur. However, this species remains highly susceptible to capture as by-catch in both commercial and recreational tuna fisheries (pelagic longline, rod-and-reel) in this region. Given the current management regulations for porbeagles in the northwest Atlantic (USA and Canada), retention of this species is limited and the vast majority of captured individuals are discarded. In order to gain a better understanding of the resiliency of this species to capture, handling, and release, the current study investigated the post-release survival of porbeagle

Joint t-RFMO By-catch WG
December 11, 2019 (2:42 PM)

Doc. No. BYC-29/2019

Original: English

REVIEWS OF BYCATCH SPECIES CAUGHT BY THE SIOTI FLEET, CODES OF PRACTICE AND OTHER GUIDANCE FOR REDUCING BYCATCH MORTALITY, REPORT TO THE SUSTAINABLE INDIAN OCEAN TUNA INITIATIVE

Polsson, F., Gilman, E., Seret, B., and Fowler, S.¹

The Sustainable Indian Ocean Tuna Initiative (SIOTI) is a large-scale Fisheries Improvement Project (FIP) comprising the major purse seine fleets and tuna processors operating in the Indian Ocean Tuna Commission (IOTC) Area of Competence. The FIP is supported by the Government of the Seychelles and WWF through a formal Memorandum of Understanding (October 2016) and an agreement between 17 industry partners (March 2017). The SIOTI FIP goal is to support improvement in the management of Indian Ocean tuna fisheries so that consumers can in the future be assured that the purse seine tuna they purchase has been harvested sustainably. The ultimate aim is to meet the highest standards of sustainable fishing, such as the Marine Stewardship Council (MSC) standard.

Joint t-RFMO By-catch WG
December 11, 2019 (2:37 PM)

Doc. No. BYC-16/2019

Original: English

POST-RELEASE SURVIVAL STUDIES OF PELAGIC SHARKS CAPTURED BY PELAGIC LONGLINES AND PURSE SEINERS: UPDATES FROM ONGOING ICCAT, IOTC AND WCPFC PROJECTS

Rui Coelho^{1,2,3}, Pascal Bach^{2,3,4}, Keith Bigelow⁵, Sylvain Bonhommeau⁶, John Carlson⁵, Shelley Clarke⁶, Eric Cortes⁷, Paul DeBruyn¹, Andrés Domingo⁸, Brit Finucci⁹, Malcolm Francis⁶, Fabio Hazin¹⁰, Simon Hoyle¹¹, Melanie Hutchinson¹², Ilhpo Krug¹³, Kwang-Ming Liu¹⁴, Warrick Lyon⁶, David Macias¹⁵, Sarah Martin¹, Federico Masi¹⁶, Philip Miller¹⁷, Hilario Murua¹⁸, Mike Musyl¹⁹, Lisa Natanson²⁰, Stewart Norman²⁰, Tom Peatman²¹, Evgeny V. Romanov²², Daniela Rosa²³, Philippe S. Sabarwal²⁴, Caroline Sanchez²⁵, Catarina C. Santos¹, Yasuko Semba²⁶, Charlene da Silva²⁷, Tim Sippel²⁸, Paulo Travassos²⁹, Wen-Pei Tsaï³⁰, Joseou O. Urbina³¹, Jiangfeng Zhu³²

Fisheries are one of the main sources of mortality for shark populations. Particularly for oceanic pelagic species, longline and purse seine fisheries are major fishing gears that interact with those species. As such, understanding species interactions with these fisheries is a key issue for providing scientific advice for the development of management and conservation strategies.



The context

- However, participation [or lack of it] may come in different ways:
 - Non-compliant industry:
 - Because the measures adopted cannot be properly implemented in the field (shark fin to carcass ratio; human observers on small vessels; bans on retention)
 - Because it does not have the capacity/willingness to implement such measures
 - E.g. non-compliance is not penalised due to lack of monitoring or sanction mechanisms

Joint t-RFMO By-catch WG
December 11, 2019 (2:41 PM)

Doc. No. BYC-27/2019

Original: English

BYCATCH MANAGEMENT AT TUNA RFMOs: DELAYED ACTION REQUIRES DRASTIC CHANGE

Grantly Galland,¹ Kerrilynn Miller, Jennifer Sawada

Regional fisheries management organizations (RFMOs) have a responsibility to manage bycatch, or the catch of non-target species. Fisheries managed by the tuna RFMOs incidentally catch sharks, pelagic rays, billfishes, and other species, several of which have significant economic value. This combination of interactions with fishing gear and value to fishermen has led to the depletion of several shark and billfish populations across the global ocean, while the incidental nature of the interactions often delays management action, despite clear advice from scientists on the need for steps to curb population decline.

Vulnerable to overexploitation in fisheries, approximately 30 percent of shark and ray species are threatened with extinction according to the International Union for the Conservation of Nature. A recent global study shows the overlap of shark habitat and fishing effort, demonstrating that for pelagic sharks found in the high seas, there is limited spatial refuge.² Most billfish species caught in the fisheries managed by tuna RFMOs are either overfished, experiencing overfishing, or both. In some instances, fishing has resulted in depletion of shark and billfish populations by more than 90%. In many cases, the bycatch of juveniles, in particular, has contributed to declines and reduced the resiliency of some populations.

Joint t-RFMO By-catch WG
December 11, 2019 (2:39 PM)

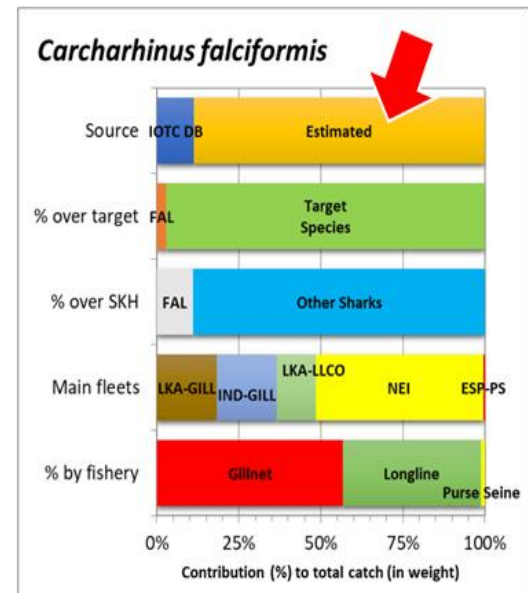
Doc. No. BYC-20/2019

Original: English

A GLIMPSE INTO THE STATUS OF ELASMOBRANCHS IN SRI LANKA

Daniel Fernando,^{1*} and Akshay Tanna,¹

Sharks (superorder: Selachii) and mobulid rays (superorder: Batoidae) are incredibly diverse, with many species having circumpolar, pelagic distributions. In Sri Lanka, while some small scale targeted deep-sea shark fisheries exist, the majority of shark and ray (including mobulid) landings are from frequent bycatch in tuna and billfish gillnet and longline fisheries. These gears are deployed by both single and multi-day vessels operating within and beyond the EEZ, and the sharks and rays are retained for their highly valued fins and gill plates that are exported, and for domestic consumption of meat. From March 2017 to October 2019, a total of 602 days of survey across 21 gillnet and longline landing sites have recorded a total of 607 silky sharks (*Carcharhinus falciformis*); 249 blue sharks (*Prionace glauca*); 44 shortfin mako sharks (*Isurus paucus*); 27 longfin mako sharks (*Isurus longimanus*); 50 scalloped hammerhead sharks (*Sphyrna tiburo*); 26 smooth hammerhead sharks (*Sphyrna zygaena*); 5 oceanic white tip sharks (*Carcharhinus longimanus*), and a total of 1,167 mobulid rays comprising 5 species. Apart from blue sharks, all are CITES Appendix II listed, with oceanic white tip sharks receiving greater protection due to non-retention measures under IOTC. Strong bias toward immature and juvenile individuals are clearly observed in some species leading to concerns of overfishing. This is further compounded by the fact that multiple nations incidentally capture these species within the Indian Ocean and throughout their global range, in addition to pressures from IUU fisheries, ghost-nets, and species vulnerability to pollutants (plastics and agricultural runoff) and



The context

- However, participation [or lack of it] may come in different ways:
 - Compliant industry:
 - It makes sure to comply with all Regulations in place (RFMO Compliance Reports)
 - Proactive Industry:
 - It identifies the issue or responds to it prior to the implementation of a measure
 - It assists the implementation of management measures and its evaluation

Joint t-RFMO By-catch WG
December 11, 2019 (2:39 PM)

Doc. No. BYC-21/2019

Original: English

DIALOGUE BETWEEN RESEARCH AND FISHING INDUSTRY TOWARDS IMPROVING SCIENTIFIC OBSERVATIONS OF BYCATCH: THE CASE OF THE FRENCH AND ITALIAN TROPICAL TUNA PURSE SEINE FLEET IN THE ATLANTIC AND INDIAN OCEANS

Alexandra Maufray¹, Antoine Bonnieux², Emille Moëc³, Anne-Lise Vernet³, Aude Reiot-Stirnermann³, Karine Briand⁴, Philippe S. Sabarros⁴, Pascal Bach⁴ and Michel Goujon⁴

Introduction

The presence of observers onboard tropical tuna purse seiners (PS) is required for multiple reasons: scientific data collection, compliance with tuna RFMO regulations, compliance with fishing agreement obligations, compliance with certification commitments (e.g. ISSF) or monitoring of the application of Best Practices. In order to meet these multiple requirements and to improve the scientific observation of bycatch, ORTHONGEL, implemented in 2013 the Common Permanent Unique Observer (OCUP) pilot project (Goujon *et al.* 2017) with the aim of reaching an exhaustive coverage of its member fishing vessels. In 2014, as smaller vessels of the Indian Ocean could not carry observers due the lack of space onboard (piracy-protection teams are embarked since 2010), an electronic monitoring extension of the program was implemented (Electronic Eye Optimization "OOE" pilot project, Briand *et al.* 2017).

Joint t-RFMO By-catch WG
December 11, 2019 (2:42 PM)

Doc. No. BYC-29/2019

Original: English

REVIEWS OF BYCATCH SPECIES CAUGHT BY THE SIOTI FLEET, CODES OF PRACTICE AND OTHER GUIDANCE FOR REDUCING BYCATCH MORTALITY. REPORT TO THE SUSTAINABLE INDIAN OCEAN TUNA INITIATIVE

Poisson, F., Gillman, E., Seret, B., and Fowler, S.¹

The Sustainable Indian Ocean Tuna Initiative (SIOTI) is a large-scale Fisheries Improvement Project (FIP) comprising the major purse seine fleets and tuna processors operating in the Indian Ocean Tuna Commission (IOTC) Area of Competence. The FIP is supported by the Government of the Seychelles and WWF through a formal Memorandum of Understanding (October 2016) and an agreement between 17 industry partners (March 2017). The SIOTI FIP goal is to support improvement in the management of Indian Ocean tuna fisheries so that consumers can in the future be assured that the purse seine tuna they purchase has been harvested sustainably. The ultimate aim is to meet the highest standards of sustainable fishing, such as the Marine Stewardship Council (MSC) standard.

Joint t-RFMO By-catch WG
December 11, 2019 (2:41 PM)

Doc. No. BYC-25/2019

Original: English

MITIGATION ACTIONS ON SPANISH TROPICAL TUNA PURSE SEINER FISHERY

Grande M.¹, Ruiz J.², Jefferson M.², Zudaire L.³, Gudi, N.⁴, Arregui, F., Ferarros, J.M.², Ramos L.³, Bóez J.C.³, Moreno G.⁴, Murua H.⁴, Santiago, J.²

About half of the tropical tuna caught worldwide annually is fished by purse seiners, mainly using fish aggregating devices (FADs). Even though this fishing technique increases sets success, these devices are also controversial due to their potential impacts on the marine ecosystem. In order to mitigate and reduce the effects of the purse seiner fishery on non-target species, the two Spanish tuna purse seiner associations (ANABAC and OPAGAC), collaborating with scientists, are performing specific actions for reducing bycatch mortality levels. This document summarizes the main actions conducted at global scale in Spanish tropical tuna purse seine fishery.

In 2012 the purse seiners associations established a Code of Good Practices (CGP) for the application of sustainable fishing practices. The aim of this agreement is to maximize survival of sensitive species incidentally caught (i.e. elasmobranchs, sea turtles and since 2019 cetaceans) and prevent passive ghost fishing by using non-entangling FADs. The CGP defines a set of good practices including: (i) the use of non-

Joint t-RFMO By-catch WG
December 11, 2019 (2:38 PM)

Doc. No. BYC-19/2019

Original: English

FISHING ON FADS WITHOUT KILLING SILKY SHARKS: WHERE ARE WE AND WHAT SHOULD WE DO?

Laurent Dagorn¹, Fabien Forget¹, John D Filmmalter², Jeffrey Muir³, Melanie Hutchisson³, David Itano⁴, Igor San Cristobal⁵, Kim Holland⁶, Manuela Capello⁷, Gala Moreno⁸, Hilario Murua⁹, Victor Restrepo⁸

Tropical tuna and silky sharks swim in the same waters, which explains why silky shark is frequently caught incidentally by tropical tuna purse seiners. Reducing catches of silky sharks by purse seiners is a key element towards the sustainability of the fishery. Ten years of research have allowed to test several options to reduce the fisheries-induced mortality of silky sharks: some did not show significant results while others proved to be effective and ended in advice for mitigation measures.

The research result with the main impact has been the discovery of ghost fishing due to sharks becoming entangled in nets hanging under Fish Aggregating Devices (FADs). Following this key finding, RFMOs have adopted measures for Non-Entangling FADs in order to eliminate this mortality.



A personal view to the Future

Data Collection:

- Adopt list of bycatch species for which data collection is required and minimum standards
 - Which platform and which level of aggregation
 - Does it make sense to request too much detail on logbooks when observer programmes are in place ?
 - RFMO Secretariats should receive fine-scale data from fisheries and observer programmes
- Level playing field on observer coverage
 - In line with advice, the presumed magnitude of interactions and type of activity of each fishery
 - Promote the implementation of regional observer schemes in all RFMO
 - Alternatively, independent auditing through a requirement for 100% video surveillance for main industrial/oceanic fleets (LL, PS and driftnets) as a complement to human observers [and sampling in port]
 - In the meantime ban at-sea transshipments and adopt fins-attached policies



A personal view to the Future

Management :

- Precautionary approach should apply in the adoption of measures
 - Regulations should not penalize the data rich and reward the data poor
 - Sustained non-compliance cannot be an excuse to hamper the implementation of the scientific advice
- Measures should not be adopted in lack of appropriate control mechanisms
 - Or non-compliance should be penalized
- Consultation with the industry is required at all levels to avoid failed measures
 - E.g. bans on retention of sharks will never work for artisanal fisheries (sharks are fully utilised)



Improving bycatch mitigation and management

The case of the EU PS fleet

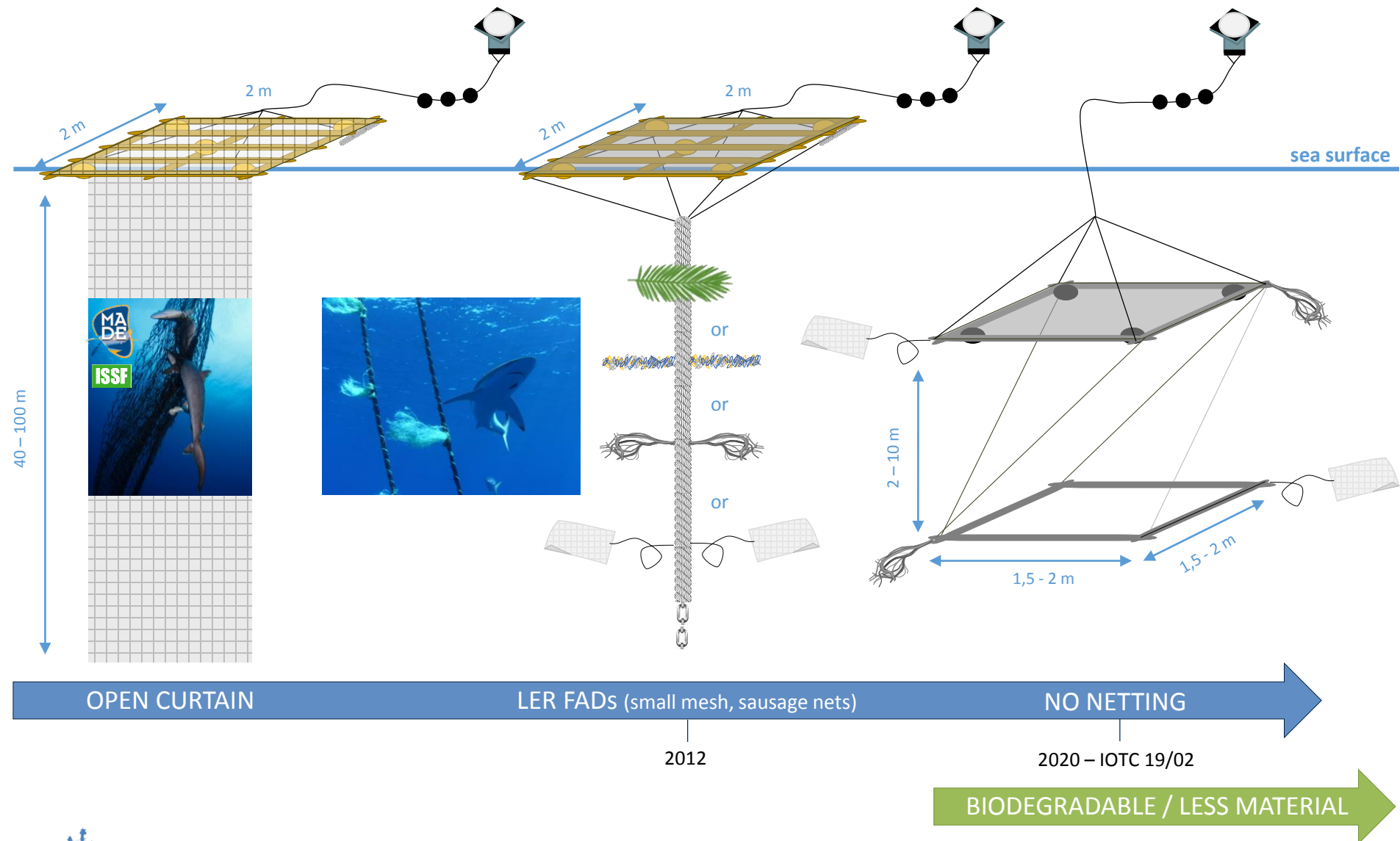


Before the fishing set

Reducing the risk of fishing sharks and rays



Eliminating shark ghost fishing with NEFAD



Eliminating shark ghost fishing with NEFAD

Non-Entangling & Biodegradable FADs GUIDE

BEST PRACTICES for fishers, RFMOs, governments & vessel owners

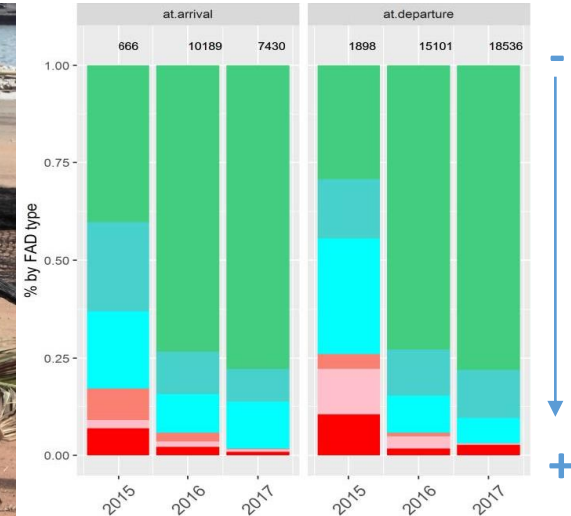
August 2019

ISSF INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION

This is the third version of the Non-Entangling & Biodegradable FADs guide, which ISSF first published in 2012 and updated in 2015.



FAD construction facility (French PS fleet, Abidjan)



SCGP observers (Spanish PS fleet, IO)

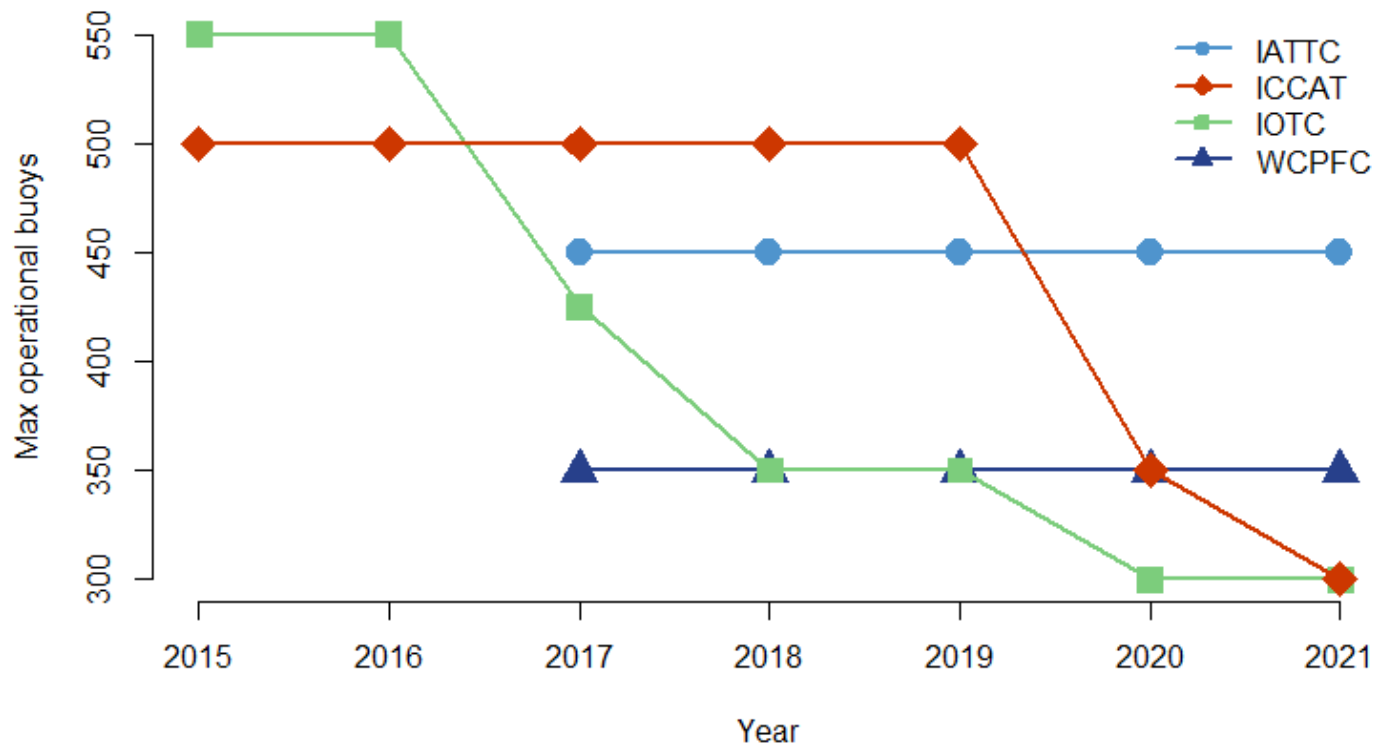
- ◆ Collaboration between fleets and scientists
- ◆ ISSF skippers' workshops / guide : solutions rapidly shared among fleets
- ◆ Verification of the use of LER/NEFADs : construction at port, ↑ observer coverage

✓ NEFADs recommended by most RFMOs

⌚ ISSF classification / fleet verification methodology to be adopted by RFMOs ?



Limiting the use of FADs



VOLUNTARY LIMITS

MANDATORY LIMITS

VERIFICATION

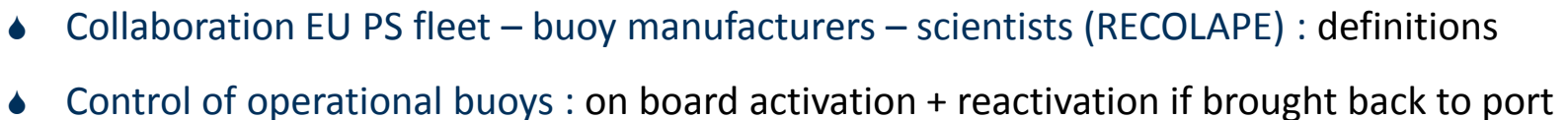
2012

2015

2020 – IOTC Res 19/02

HARMONIZATION BETWEEN RFMOs

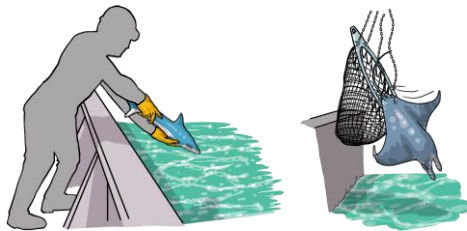




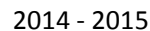
During the fishing set

Improving the survival of sharks and rays





2012



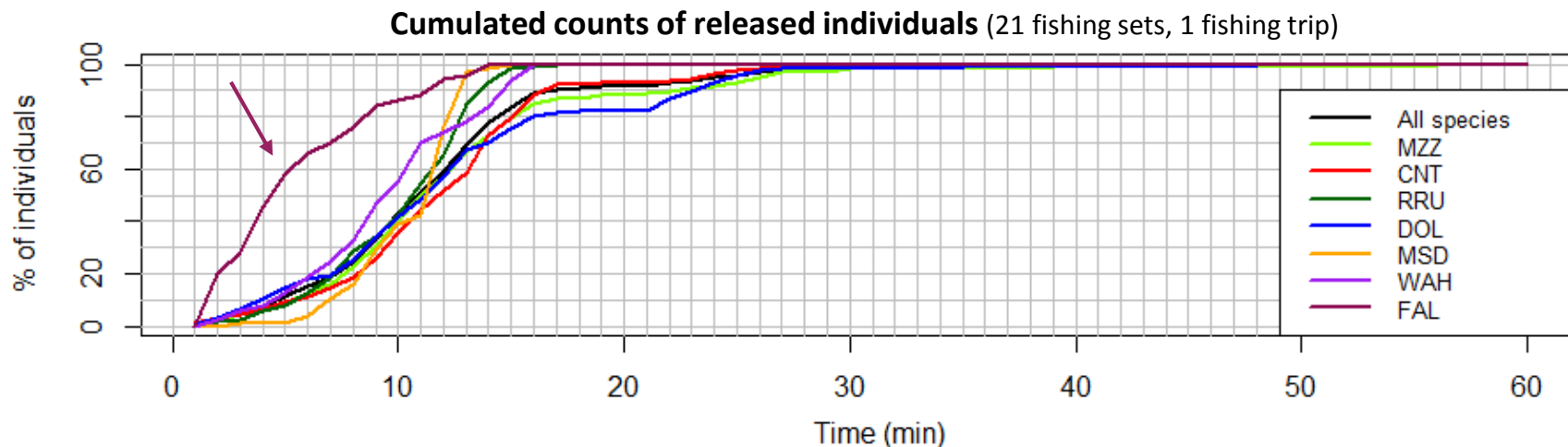
2009-2018



NEW TOOLS / NEW PRACTICES

Designing new Best Practices

Discard belt (lower deck)



Preliminary results on 21 fishing sets (EU-FR) : 80 % of FAL released in less than 6 minutes

 solution to be adopted by other PS fleets ?

Releasing tools (deck)

Participation in the design of prototypes (EU-SP) : HELEA project

 solution to be shared among fleets when ready ?



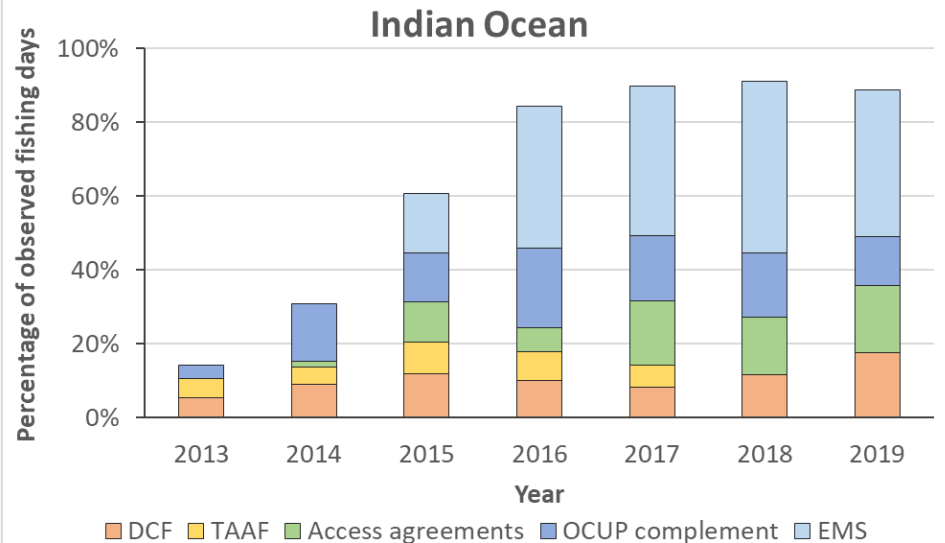
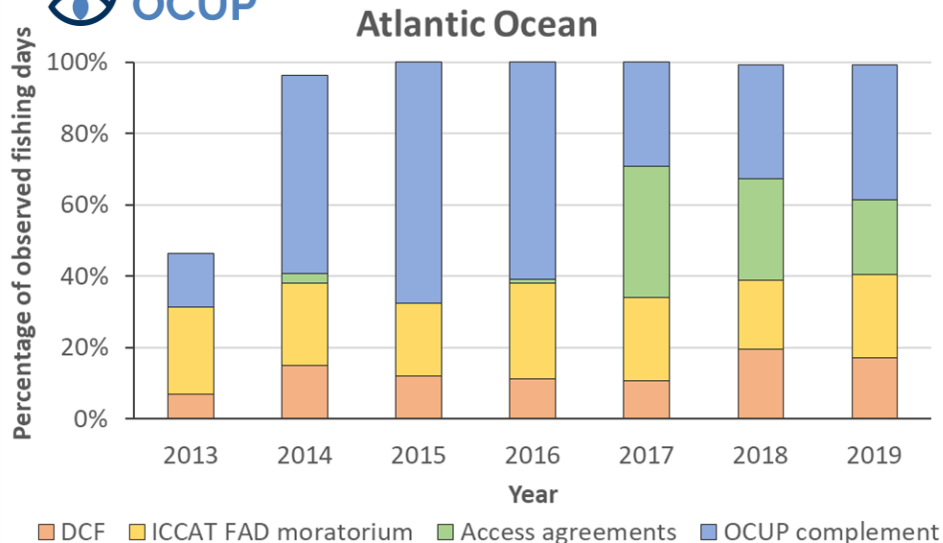
The case of the EU Purse Seine

After the fishing set

Providing scientific data on sharks and rays



Reaching a 100% observer coverage ...



ICCAT : 10 % coverage - IOTC : 5% coverage – IATTC / WCPFC : 100% coverage



voluntary increase by EU PS fleets (OCUP – FR, SCGP – SP) / ISSF PVR



collection of scientific data

MANDATORY COVERAGE

VOLUNTARY ADDITIONNAL COVERAGE

INCREASED MANDATORY COVERAGE

2012

2013 - 2017

2020 – ICCAT Rec 20-01

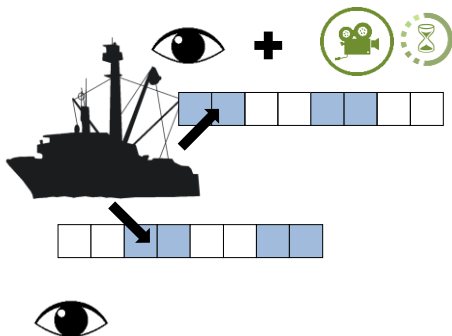
MAINTAINING DATA QUALITY



... with good quality data

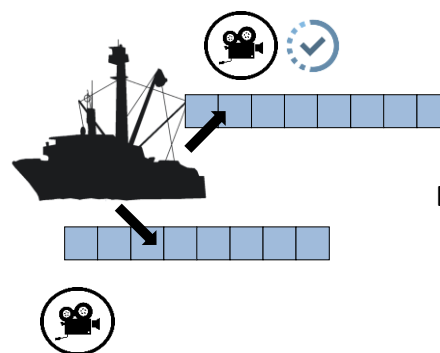
100 % coverage of the deck and the below deck

With onboard observers



Solution : combining onboard and electronic observation

With electronic observers



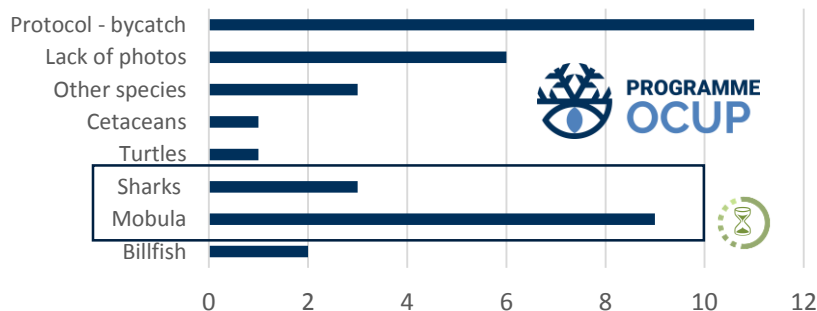
BUT



Solution : implementing EMS specific Best Practices

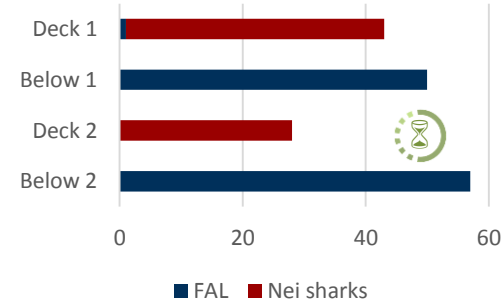
100 % correct identification of sensitive species

With onboard observers



Solution : continuous training of observers / refresher courses

With electronic observers



Solution : optimizing/improving EMS onboard each vessel



Conclusions - recommendations

① Harmonize RFMO FAD management / definitions

use ISSF classification of NEFADs, test IOTC Res 19/02 control of buoys

② Continue developing Best Practices

new tools (e.g. discard belt, handling devices for sensitive species) and new practices (e.g. cleaning EMS cameras)

③ Ensure good quality data for EMS and onboard observers

continuous training of observers, vessel specific improvement/validation of EMS, combination of onboard and EMS observation



