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## **Preliminary results of data mining for oceanic whitetip sharks and the effectiveness of resolution 13/06**

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# 1 Introduction

This paper outlines the data mining exercise currently being done to collect data on fisheries with oceanic whitetip shark (*Carcharhinus longimanus*, OCS) bycatch for the analysis of the effectiveness of the CMM 13/06 a summary of which reads “CPCs shall prohibit, as an interim pilot measure, all fishing vessels..... to retain onboard, tranship, land or store any part or whole carcass of oceanic whitetip sharks....”(para. 3). This is in effect, a retention ban on oceanic whitetip sharks. However, as also stated in (para 3) “the provisions of this measure do not apply to artisanal fisheries operating exclusively in their respective Exclusive Economic Zone (EEZ) for the purpose of local consumption.”.

## 2 Data availability

Available catch data for sharks at species level that has been submitted to the IOTC databases is limited in a historical context, and recent data may not reflect the combined catch from all fisheries. Data on oceanic whitetip shark include the following:

- **Nominal Catch Data:** This data set is total catch data submitted by IOTC members stratified by East and West Indian Ocean. Nominal catches are requested to be reported on a species-specific level, but sharks are often aggregated in the sharks-nei (*not elsewhere reported*) category. Reported species-specific OCS nominal catch is dominated by gillnet fisheries, sometimes operated jointly with longlines (Figure 1). Peak reported catch occurred in the late 1990’s, since that time there has been a decline, corresponding with the decline in Sri Lanka’s shark fisheries (Figure 2). The countries reporting nominal catch (retained) of OCS since 2014 include; India, Iran, Maldives, Seychelles, Sri Lanka, Tanzania.
- **Nominal Catch and Effort data:** This data set is stratified by gear type (surface, coastal, longline), and area (5° by 5° for longline and 1° by 1° for surface fisheries) and is submitted by IOTC members where the data is available. This data set indicates that the first reported catches of OCS are in 1998. In fact few fleets are actually reporting nominal catch and effort data. There is no catch and effort data on OCS in the surface fishery or coastal fishery catch and effort databases, however OCS catch is reported in the longline catch and effort data base. Only five countries have ever reported catch of OCS in the nominal catch and effort database, and of those, only 2 have reported catch more than once. The NCE –LL database indicates 2 and 81 records of OCS catch in 2014 and 2015 respectively (Figure 3). This data totals 2 and nearly 68MT in 2014 and 2015 respectively (Figure 4). It should be noted, however, the retention ban in effect since 2013 in waters outside coastal EEZs
- **Discard Data**  
Discard data was historically submitted through national reports and by skippers (via logbooks), more recently from observer programs, this data is quite limited showing a low level of observed discards (Table 1). Discard data collected by observers is considered the most reliable (left hand side Table 1), discard levels monitored by the vessel skipper indicate an increase in two orders of magnitude since the CMM went into effect (right hand side Table 1). It should be

noted that this information is not considered complete, but rather a picture into the specific fisheries reporting discards.

Table 1: Discard Information on OCS based on observer data and skipper reported/WP papers.

Observer Data					Skipper Reported/WP Papers				
Year	Number of Reports	OCS #	MT	KG	Year	Number of Reports	OCS #	MT	KG
2000	-	-	-	-	2000	1	23	-	-
2001	-	-	-	-	2001	-	-	-	-
2002	-	-	-	-	2002	2	4	-	-
2003	-	-	-	-	2003	-	-	-	-
2004	-	-	-	-	2004	-	-	-	-
2005	-	-	-	-	2005	1	0	-	-
2006	-	-	-	-	2006	1	2	-	-
2007	1	85	-	-	2007	1	14	-	-
2008	1	19	-	-	2008	1	4	-	-
2009	1	66	-	-	2009	1	10	-	-
2010	-	-	-	-	2010	4	30	-	-
2011	1	51	-	-	2011	2	8	-	-
2012	2	135	-	-	2012	3	4	-	979
2013	1	388	-	-	2013	3	3	-	-
2014	1	14	-	205	2014	98	1655	-	-
2015	1	14	2	-	2015	8	2391	-	-

- **Transshipment data:** This data set has two components the at sea transshipment data which 100% observer coverage, and the port based data. Often shark products have been processed making the identification and enumeration of sharks to species difficult or impossible. In this data set OCS occurs only in 2011 & 2012, therefore no information regarding the effectiveness or compliance with CMM 13-06 is available from this dataset.
- **Data submitted in response to IOTC data call 2016/076 and as part of the data mining workshop.** All CPCs were requested to provide data to improve the status of information for populations of oceanic whitetip shark and CITES-listed hammerhead sharks, namely *Sphyrna lewini*, *S. mokarran* and *S. zygaena* in the IOTC area. This data call covered all fisheries and extended from 1980-2015 (Annex 1).
  - **INDONESIA.** Observer data from the Indonesian Research Institute for Tuna Fisheries (RITF) was submitted dating from 2006 to 2015. This information contains set by set information and identifies most sharks to species, however OCS were unobserved in this fishery during this time period. Summaries of additional data from the WWF Indonesia observer program indicated that only 8 out of nearly 14,000 sharks identified to species were OCS, this data set is from 2006-2014, though the dates of capture and fate of the sharks were not reported. This dataset is limited to only four landing sites and is likely not representative of the Indonesian fishery as a whole, which is large and contains a variety of gears.
  - **I.R. of IRAN.** Ratio based estimates of total shark catch from Iran are available prior to 1997, while reported catch of all sharks is available from 1997-2015. Catch records (from 1997-2015) of sharks indicate that the overall shark fishery lands approximately

11,000 MT/year and this amount comprises between 2% & 3% of the total (target +shark) landings. There exists data on shark catch by species from the tuna fleet in 2015 only. This data indicated that 118 tons of OCS were caught, comprising 0.005% of the total catch.

- **SEYCHELLES.** Catch records from the semi-industrial and industrial fisheries in the Seychelles indicate that 46 OCS were observed between 2009 and 2013 in the industrial fleet and 1.8 tons was landed in the semi –industrial fleet in 2013. Additional data from 2014-2015 is currently being processed.
- **KENYA.** The shark fishery data in Kenya is based on the artisanal, recreational and longline fisheries. Currently there is one Kenyan flagged longliner which is subject to 100% observer coverage as of 2015. There is no data on OCS catch in any of these fisheries since 2010
- **TANZANIA.** Data from Tanzania (mainland and Zanzibar) indicate that between approximately 2800 and 4000 MT of sharks are landed annually. No species level data exists for sharks.
- **PAKISTAN.** Estimates of OCS landings in Pakistan are based on extrapolation from total reported shark landings. This extrapolation is based on observer data from WWF Pakistan (2013-2016) which indicates that the catch is predominantly in the gillnet fisheries with some in the longline fishery.
- **SRI LANKA.** The majority of the shark landings in Sri Lanka originate as by-catch from offshore tuna long-line fishery and gillnet fishery. Estimates of OCS catch in the Sri Lankan longline fishery range from 41 to 453 MT over the time frame 2005-2014. These estimates are based on the observed catch composition of sharks in the 2012/2013 fishing season (which showed OCS as 2% of the overall shark landings), and the annual ratio of sharks to total landings.

### **Information on the efficiency of the no-retention measure**

Studies of the at-vessel mortality (Coelho, 2016) indicate that the overall at-haulback mortality for oceanic whitetip sharks was estimated at 50.0% in the Portuguese longline fishery. This fishery targets swordfish in the southwest and more recently the southeast region of the Indian Ocean, pelagic sharks are an important component of the fishery. Previously reported estimates of at-haulback are from the Atlantic and smaller (34%). This study also found that specimen size is significant for the odds of at-haulback mortality, with mortality decreasing as specimen size increases. This study provides important information about on aspect of the no-retention measures currently in place for oceanic whitetip sharks in the Indian Ocean. The author of the study cautioned that there was no information on the post-release mortality of the sharks released and that this study was concentrated on only one fishery and fleet.

### 3 Discussion

In general there is limited data on the catch, retention and mortality of OCS in the Indian Ocean. Data on OCS in the region are limited by the lack of full compliance with the IOTC data reporting measures on reporting sharks to species at the regional (Indian Ocean) level. Lack of observer programs and reporting mechanisms for sub-regional trade further compound the difficulty of assessing catch rates and trends. Artisanal fisheries (within the EEZ and for domestic consumption) are exempt from the CMM, yet likely interact with the same stock as the pelagic fisheries. Understanding the degree to which these fisheries interact with OCS is complicated by the same data deficiencies as the industrial fisheries, especially lack of identification of many retained sharks to species level.

The retention ban on oceanic whitetip sharks was implemented in 2013, as detailed in IOTC Resolution 13/06. The notable exceptions to this measure are artisanal fisheries operating exclusively within their respective Exclusive Economic Zone (EEZ) for the purpose of local consumption and India, who objected to the Resolution. Nevertheless, catches of oceanic whitetip sharks continue to be reported in the nominal catches for a number of fleets, including China, I.R. Iran, Maldives, Seychelles, Sri Lanka, Tanzania (and India) which have all reported catches of the species since 2014. There are a number of potential reasons for this such as (i) the reported catches are from artisanal fisheries operating in the coastal EEZs; (ii) incorrect reporting as nominal catch rather than discards and (iii) a lack of awareness of the Resolution among fishers (iv) non-compliance and enforcement issues. Given that spatial information from the catch and effort database indicates that not all of these catches are taken on the high seas, it is likely that these are not all artisanal catches.

Recently the IOTC held a workshop focused on data mining for CITES listed species in the Indian Ocean (November 2-4). Discussions suggested that lack of awareness was an issue and indicated that a number of CPCs are currently addressing this by incorporating a ban on the retention of oceanic whitetip sharks into national legislation (Sri Lanka 2015, Seychelles 2015, Pakistan 2016). This suggests that progress in adoption of the CMM is progressing, however, it may currently be too early to be able to evaluate impacts of the retention ban. Moreover, information presented at this workshop indicated that some commerce in OCS meat and fins is likely to occur as significant regional trade occurs without documentation. In practice oceanic whitetips will continue to be vulnerable to a variety of fishing gears. The number that have been reported as retained nominal catch is likely due to a delay in the adoption and of national bans on retention.

Discussions regarding the ongoing retention at the recent workshop indicated that fishermen were often reluctant to discard dead OCS, as this was perceived as wasteful. Another factor that leads to the retention of OCS included the lack enforcement regarding fisheries regulations in countries where compliance with fisheries regulations was a minor problem compared to other national concerns (i.e. security). The result of the data mining project and overall project report are due at the end of this year.

## 4 References

Coelho, R. 2016. IOTC–2016–WPEB12–26: Hooking mortality of oceanic whitetip sharks caught in a pelagic longline fishery targeting swordfish in the SW Indian Ocean: comments on the efficiency of no-retention measures (<http://www.iotc.org/sites/default/files/documents/2016/08/IOTC-2016-WPEB12-26.pdf>)

RESOLUTION 13/06 ON A SCIENTIFIC AND MANAGEMENT FRAMEWORK ON THE CONSERVATION OF SHARKS SPECIES CAUGHT IN ASSOCIATION WITH IOTC MANAGED FISHERIES  
(<http://www.iotc.org/cmm/resolution-1306-scientific-and-management-framework-conservation-sharks-species-caught>)

## 5 Figures

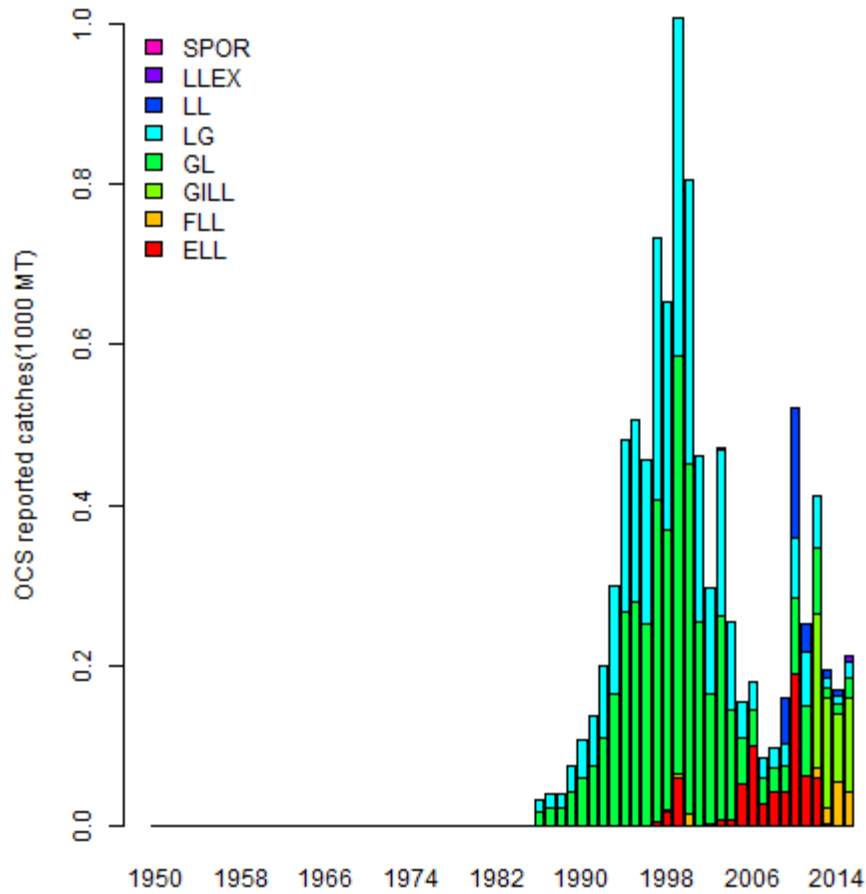


Figure 1. Nominal reported catch of OCS in MT by gear type. Note that a ban on retention of OCS has been in place since 2013, with the exception of coastal countries fishing inside their EEZs. Legend entries refer to sport fishing (SPOR), exploratory longline (LLEX), longline (LL), predominately longline combined with some gillnet (LG), predominately gillnet combined with longline (GL), gillnet (GILL), fresh longline (FLL) and longline targeting swordfish (ELL).

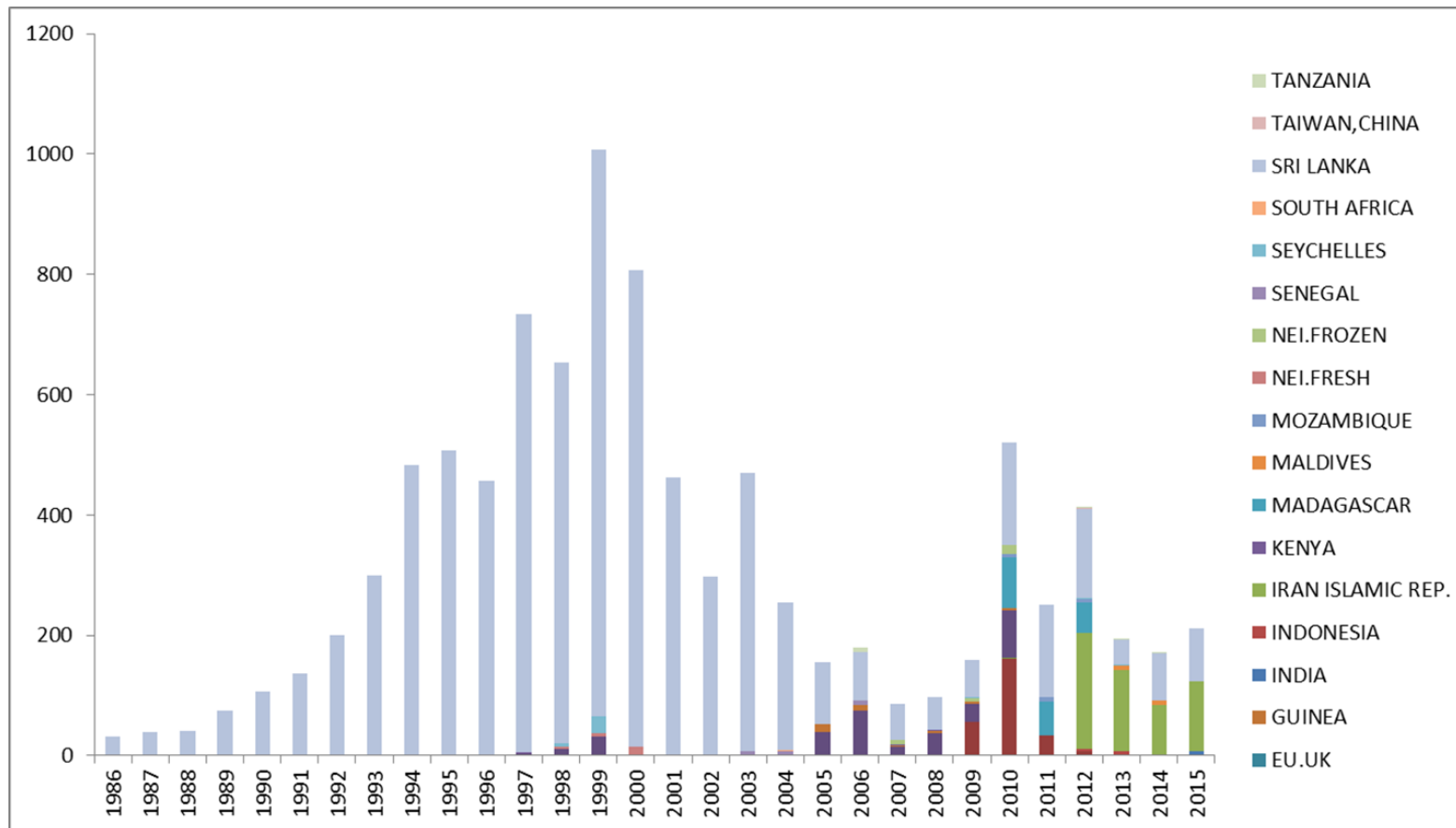


Figure 2. Reported nominal catch by year and country.



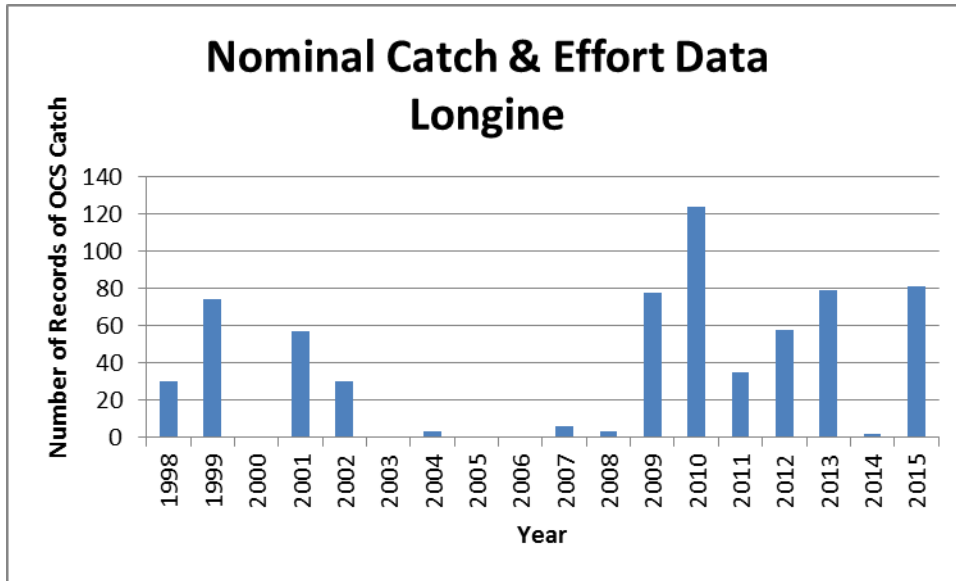


Figure 3. Number of records of OCS in the NCE-LL database.

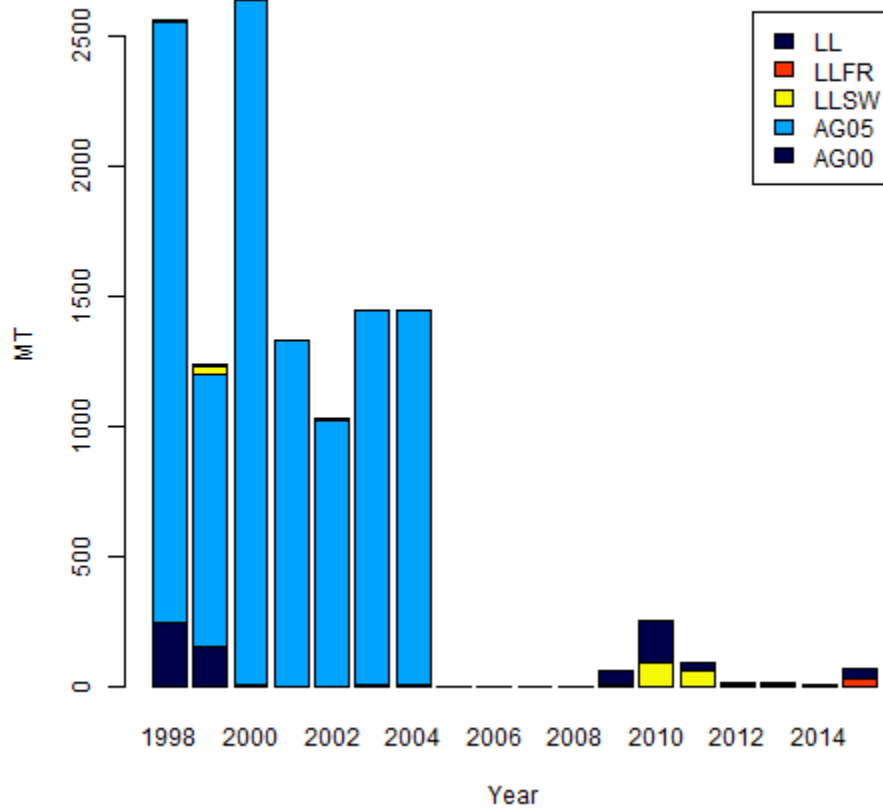


Figure 4. Reported Catch and Effort for all gears. Legend entries indicate longline (LL), drifting longline (LLFR), swordfish longline (LLSW), unidentified (AG00), and gillnet-longline combinations (AG05).