

# Catch and bycatch in the pelagic longline fishery around Mayotte (NE Mozambique Channel), July 2009-September 2010

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## Abstract

Bycatch in the pelagic longline fishery around Mayotte has been investigated from July 2009 to September 2010. As the longline fishery will expand around Mayotte, the Shark Research Group (French NGO) in collaboration with the “Exploited Marine Ecosystems” team of IRD (Institut de Recherche pour le Développement) based in La Reunion, set up an observer program to assess catch characteristics in the pelagic longline fishery around Mayotte, from 2009 to 2010. Data were collected on “Mtwaro I”, an 8-m longline fishing boat based in Mayotte and operating over the insular slope around the island. The vessel does short cruises of one day and deploys 500 hooks per set during nighttime. Data were collected for 29 longline sets. A total of 818 individuals belonging to 23 different species were recorded. The largest proportion of catches concerns targeted species, primarily swordfish (37.5%), then tunas (31.3%). Sharks represented 20.3% of catches. Four loggerhead turtles (*Caretta caretta*) were caught alive and released. One false killer whale (*Pseudorca crassidens*) has been caught alive and released.

## Introduction

Bycatch is a major problem in oceanic fisheries, including longlining. Main bycatch in pelagic longline fisheries are sea turtles and sharks. However, other species are also involved, such as sailfish, marlins, dolphin fish, pomfrets and lancetfish. In the western Indian Ocean, little is known in the extent of bycatch in the longline fishery. No published information is currently available in the Mozambique Channel.

On the island of Mayotte, there is a small-scale longline fishery, consisting in small boats (3 active boats, no longer than 10 meters). However, local authorities plan to extend the fishery with new boats in the next few years, as coastal/lagunal fish resources are declining around Mayotte and on adjacent reef banks (Iris, Zélée and Geyser). As the longline fishery is expanding around Mayotte (two new vessels in 2011-2012), the Shark Research Group (French NGO) in collaboration with the “Exploited Marine Ecosystems” team of IRD (Institut de Recherche pour le Développement) based in La Reunion, set up an observer program to assess catch characteristics in the pelagic longline fishery around Mayotte, from 2009 to 2010. This project also aimed to assess the level of depredation by sharks and marine mammals. In this report, we briefly describe the bycatch information, collected between July 2009 and September 2010, in the pelagic longline fishery based on the island of Mayotte (NE Mozambique Channel).

## Materials and methods

### Study area

Mayotte is located in the north-eastern Mozambique Channel (45°10'E, 12°50'S), between eastern Africa and Madagascar. It is the eastern most island of the Comoros archipelago, but is under French administration. The island has a volcanic origin, has a surface of 366 km<sup>2</sup> and a surrounding lagoon of around 1,500 km<sup>2</sup> (average depth of 20 m, maximum depth of 90 m), delimited by a 197 km long barrier reef. The insular slope is very steep and contains many submarine canyons and seamounts (Audru *et al.*, 2006).

### What is considered as bycatch around Mayotte?

Targeted species around Mayotte include mostly the swordfish (*Xiphias gladius*) and tunas (*Thunnus* sp.). However, most of other fish species are also sold, such as sailfish (*Istiophorus platypterus*), dolphin fish (*Coryphaena hippurus*) and marlins (*Makaira* sp.). Sharks are not targeted around Mayotte, even for the fin trade. They are all considered as bycatch, as generally discarded. However, for both the short-finned mako shark (*Isurus oxyrinchus*) and the pelagic sting ray (*Dasyatis violacea*), the meat is generally sold on local markets. Other rare bycatch include marine mammals and sea turtles.

### Data collection

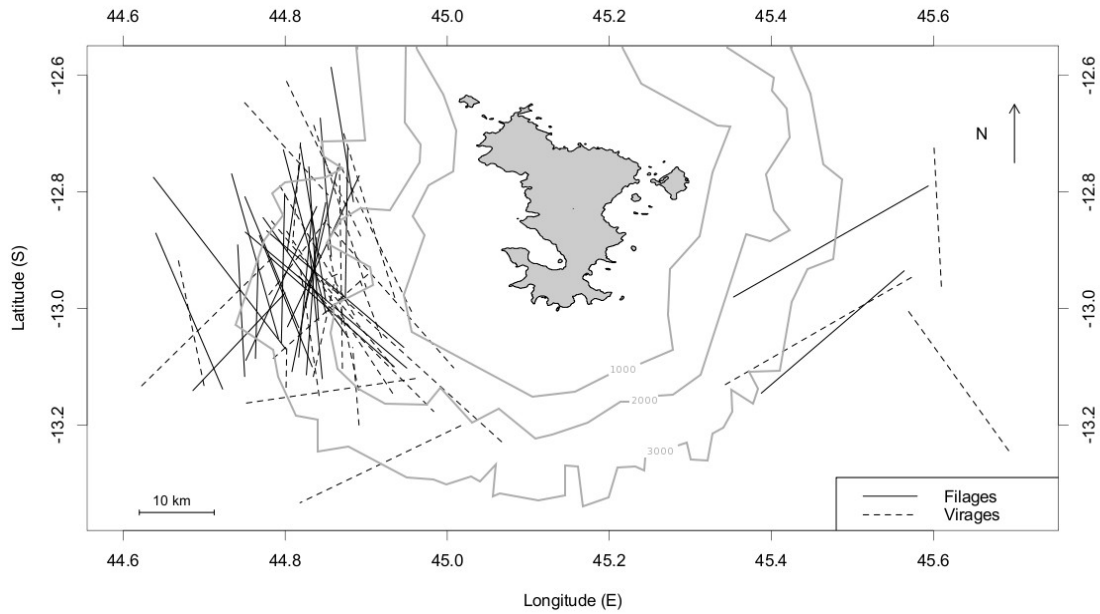
Data were collected on “Mtwaro I”, an 8-m longline fishing boat based in Mayotte and operating over the insular slope around the island. The vessel is equipped with a spool of a capacity of 35 miles for the storage of a nylon monofilament mainline with a diameter of 3.6 mm. The vessel has short cruises of one day and deploys 500 hooks per set during nighttime. The monofilament branchline has a length of 25 miles and is equipped with a xxx hook type at its extremity. Squid is the only bait used.

A dedicated observer recorded the data using standard templates developed by IRD (Bach *et al.*, 2008). Data recorded include geographical positions of the set (start and end), date and time for setting and hauling, number of hooks deployed, the species name of individuals caught and some information of the status of individuals (kept on board or released, alive or dead, ...). For most of the catches, standard measurements (fork length) were taken, sexed and sampled for biological and ecological studies.

## Results

### Effort

Overall, data were collected during 29 longline sets, from July 2009 to September 2010. 27 sets were made in west, and 2 on the east (Figure 1). The average soak time of the pelagic longline was 11 hours (SD=1.7). The total fishing effort observed is 14,112 hooks with an average of 488 hooks per set.



*Figure 1: Spatial distribution of longline sets off Mayotte from July 2009 to September 2010. (Continuous line: setting, dashed line: hauling)*

#### Catches

A total of 818 individuals belonging to 23 different species were recorded. Several individuals have not been identified: one marlin and one shark. The largest proportion of catches concerns targeted species, especially the swordfish (37.5%) and tunas (31.3%). Sharks represent 20.3% of catches, mostly represented by the silky shark (*Carcharhinus falciformis*) and the blue shark (*Prionace glauca*) (Table 1).

Four loggerhead turtles (*Caretta caretta*) were caught alive (0.5% of all captures), and released (3 without and 1 with the hook). One false killer whale (*Pseudorca crassidens*) has been caught alive, and released with the hook and a part of the branchline (Figure 2).

Overall, targeted species represented 68.8% of all catches and non-targeted species reached a proportion of 31.2%, including essentially sharks (65.1%).

Table 1: Details of targeted and non-targeted species caught from July 2009 to September 2009 (29 trips).

| Species (in order of occurrence)                          | Number | %     |
|---|--------|-------|
| Swordfish ( <i>Xiphias gladius</i> )                      | 307    | 37.6% |
| Bigeye tuna ( <i>Thunnus obesus</i> )                     | 171    | 21%   |
| Silky shark ( <i>Carcharhinus falciformis</i> )           | 72     | 8.9%  |
| Blue Shark ( <i>Prionace glauca</i> )                     | 60     | 7.3%  |
| Yellowfin tuna ( <i>Thunnus albacares</i> )               | 47     | 5.7%  |
| Albacore tuna ( <i>Thunnus alalunga</i> )                 | 38     | 4.6%  |
| Pelagic sting ray ( <i>Dasyatis violacea</i> )            | 35     | 4.3%  |
| Scalloped hammerhead shark ( <i>Sphyrna lewini</i> )      | 16     | 2%    |
| Oceanic whitetip shark ( <i>Carcharhinus longimanus</i> ) | 14     | 1.7%  |
| Barracuda ( <i>Sphyrna barracuda</i> )                    | 13     | 1.6%  |
| Sailfish ( <i>Istiophorus platypterus</i> )               | 11     | 1.3%  |
| Dolphin fish ( <i>Coryphaena hippurus</i> )               | 8      | 1%    |
| Long snouted lancetfish ( <i>Alepisaurus ferox</i> )      | 6      | 0.7%  |
| Loggerhead turtle ( <i>Caretta caretta</i> )              | 4      | 0.5%  |
| Oilfish ( <i>Ruvettus pretiosus</i> )                     | 3      | 0.4%  |
| Striped marlin ( <i>Tetrapturus audax</i> )               | 3      | 0.4%  |
| Mako ( <i>Isurus oxyrinchus</i> )                         | 2      | 0.2%  |
| False killer whale ( <i>Pseudorca crassidens</i> )        | 1      | 0.1%  |
| Shark (unknown species)                                   | 1      | 0.1%  |
| Rainbow runner ( <i>Elagatis bipinnulata</i> )            | 1      | 0.1%  |
| Grey reef shark ( <i>Carcharhinus amblyrhynchos</i> )     | 1      | 0.1%  |
| Black marlin ( <i>Makaira indica</i> )                    | 1      | 0.1%  |
| Blue marlin ( <i>Makaira nigricans</i> )                  | 1      | 0.1%  |
| Jack ( <i>Caranx sp.</i> )                                | 1      | 0.1%  |
| Marlin (unknown species)                                  | 1      | 0.1%  |

The total CPUE is 44.7 (N fish/1,000 hooks). For sharks, the CPUE reached 9.1 (Table 2). The swordfish CPUE is almost three times higher than the CPUE estimated from observer data for the pelagic longline fishery based in La Reunion island (CPUE = 6.2 fish/1000 hooks and 6,6 fish/ 1000 hooks in 2008 and 2009, respectively), (Bach et al., 2010). For tunas (yellowfin and bigeye), CPUE in Mayotte (11.9 fish/1000 hooks) reaches a similar level (12.5 fish/1000 hooks) as that recorded in 2008 by observers onboard longliners based in La Reunion island (Bach et al., 2010).

Table 2: CPUE (N individuals/1,000 hooks) for targeted species and sharks.

| Species                           | Number | CPUE (N./1000 hooks) |
|-----------------------------------|--------|----------------------|
| <i>Xiphias gladius</i>            | 307    | 16.79                |
| <i>Thunnus obesus</i>             | 171    | 9.35                 |
| <i>Carcharhinus falciformis</i>   | 72     | 3.94                 |
| <i>Prionace glauca</i>            | 60     | 3.28                 |
| <i>Thunnus albacares</i>          | 47     | 2.57                 |
| <i>Thunnus alalunga</i>           | 38     | 2.08                 |
| <i>Sphyrna lewini</i>             | 16     | 0.88                 |
| <i>Carcharhinus longimanus</i>    | 14     | 0.77                 |
| <i>Isurus oxyrinchus</i>          | 2      | 0.11                 |
| <i>Requin espèce indéterminée</i> | 1      | 0.05                 |
| <i>Carcharhinus amblyrhynchos</i> | 1      | 0.05                 |
| Total                             | 729    | 39.87                |

#### Shark survival

On a total number of 166 sharks caught during the study, 127 were discarded (76.5%). Most of them were released alive (88.2%), all others being discarded dead or kept onboard for further scientific investigations. The survival status of sharks was recorded for 137 individuals: 16.1% were observed dead and 83.9% were alive (Table 3).

Table 3: Survival of sharks.

| Species                           | Dead | Alive | % Alive |
|-----------------------------------|------|-------|---------|
| Shark (unknown species)           | 0    | 1     | 100     |
| <i>Isurus oxyrinchus</i>          | 0    | 2     | 100     |
| <i>Prionace glauca</i>            | 1    | 54    | 98.2    |
| <i>Sphyrna lewini</i>             | 2    | 14    | 87.5    |
| <i>Carcharhinus longimanus</i>    | 1    | 6     | 85.7    |
| <i>Carcharhinus falciformis</i>   | 17   | 38    | 69.1    |
| <i>Carcharhinus amblyrhynchos</i> | 1    | 0     | 0       |



Figure 2: Bycatch of a false killer whale (*Pseudorca crassidens*) in September 2010 around Mayotte.

### Conclusion

In comparison to published studies, it is clear that analyses of our dataset may be limited. In addition, data were only collected from a single fishing vessel. Some differences of catch characteristics may vary between vessels. However, this preliminary report is the only available reference on catch and bycatch in the pelagic longline fishery based on the island of Mayotte.

Next steps include:

- a detailed analysis of data (targeted and non-targeted species), in terms of occurrence and size structure
- an analysis of depredation around Mayotte, that seems to be very important for caught fishes (by false killer and short-finned pilot whales *Globicephala macrorhynchus*) as well as for baits (by spinner *Stenella longirostris* and common bottlenose dolphin *Tursiops truncatus*)
- a comparison of this dataset with a unpublished previous dataset collected between 2000 and 2003

### References

Bach P, Rabearisoa N., Filippi T., S. Hubas, 2008. The first year of SEALOR : Database of SEA-going observer surveys monitoring the local pelagic LOngline fishery based in La Reunion. IOTC/2008/WPEB/WP13, 19 p.

Bach P., Romanov E., N. Rabearisoa, T. Filippi, A. Sharp. 2010 - Note on yellowfin and bigeye catches collected during fishing and research cruises onboard pelagic longliners of the La Reunion fleet in 2008 and 2009. IOTC-2010- WPTT-11,13 p.