

UPDATE ON SHORFTIN MAKO (*ISURUS OXYRINCHUS*) FISHERY IN THE MOROCCAN ATLANTIC WATERS

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SUMMARY

As in other parts of the world, in Morocco, the shortfin mako is caught mainly as by-catch by longliners targeting swordfish in the south of the Moroccan Atlantic waters. The research activities carried out to monitor shortfin mako research program were based on biological sampling missions and onboard surveys on longline vessels targeting this species. A total of four surveys were conducted during the period from April 2018 to April 2019 and 1,366 individuals were sampled. The results of this monitoring are presented in this paper.

RÉSUMÉ

Comme dans d'autres régions du monde, au Maroc, le requin-taupe bleu est principalement capturé en tant que prise accessoire par les palangriers qui ciblent l'espadon dans les eaux de l'Atlantique sud marocain. Les activités de recherche menées pour suivre le programme de recherche sur le requin-taupe bleu se basent sur des missions d'échantillonnage biologique et des observations à bord de palangriers ciblant cette espèce. Au total, quatre prospections ont été menées d'avril 2018 à avril 2019 et 1.366 spécimens ont été échantillonnés. Les résultats de ce suivi sont présentés dans ce document.

RESUMEN

Como en otras partes del mundo, en Marruecos, el marrajo dientuso se captura principalmente como captura fortuita de los palangreros que se dirigen al pez espada en aguas meridionales del Atlántico marroquí. Las actividades de investigación llevadas a cabo para hacer un seguimiento del programa de investigación del marrajo dientuso se basaban en misiones de muestreo biológico y prospecciones a bordo de los palangreros que se dirigen a esta especie. Durante el periodo de abril de 2018 a abril de 2019 se llevaron a cabo cuatro prospecciones en total y se muestrearon 1.366 ejemplares. Los resultados de este seguimiento se presentan en este documento.

KEYWORDS

Size distribution, catches, Mean length, Mean weight, Longliners, Shortfin mako

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1. Introduction

The shortfin mako (*Isurus oxyrinchus*) is one of two species of the genus *Isurus* and one of five species of the family Lamnidae. The biological strategies of these shark species are very diverse and are adapted to the needs of their respective ecosystems where they occupy a very high position in the food chain as active predators. Based on geographic separation, genetic differences with other global populations, and the lack of evidence of structuring in the North Atlantic, Moroccan shortfin mako sharks are considered to belong to the larger North Atlantic population, which forms a single designable unit.

These species, are large pelagic sharks with a wide geographic distribution; they are found in tropical and temperate waters around the world. They have a flattened viviparity with an oophagic reproductive system, which limits their fecundity but increases the probability of survival of their young (Castro, 1983, Mollet *et al.*, 2000, Compagno, 2001). Although much uncertainty remains regarding their biology, their life history characteristics (slow growth, late maturity and small litter size) indicate that they are vulnerable to overfishing. A behavioral characteristic of these species is their tendency to separate temporally and spatially by size and/or sex during feeding, mating, gestation and birthing processes (Mollet *et al.*, 2000, 2002).

Located in the region of the Canaries ecosystem, the Moroccan Atlantic waters are considered among the most abounding in fish in the world (Aristegui *et al.*, 2009; Franchimont, 2001). Several hundreds of these fish species are exploited by Moroccan fleets operating in the Moroccan EEZ. Sharks are among the first 70 species caught as target or bycatch species.

As in the rest of the world, the shortfin Mako shark is accidentally caught by fleets targeting large tunas (Campana *et al.*, 2006; Duarte *et al.*, 2018). In fact, in Morocco, this species is mainly caught as bycatch by swordfish longline fleet operating in the south of the Atlantic coast. The vessels have an average overall length of 24 m and an average GRT of 110 tx. These fishing units use exclusively a surface longline as a fishing gear to primarily target swordfish. With their efficient refrigeration system, these longliners are able to carry out trips up to 15 days with an average duration of 10 days. For one fishing day, a single fishing operation deploys about 1,200 hooks.

This paper aims to present an updates of fishery indicators of shortfin mako (catches, effort, length frequencies) in the Moroccan Atlantic waters.

2. Material and methods

Three sources of data are used to compile results presented in this report:

- National Institute for Fisheries Research's (INRH) Biological Sampling Program: the biological sampling data collected at landing are size (total and fork length) and weight. A total 1366 SMA were collected, all measurement is made to fork length and also some individuals are measured to total length.
- Official statistics of ONP (Office National de Pêche).
- ICCAT data base.

The study area is the southern Moroccan Atlantic, located between Cap Boujdour (26°00 N) and Cap Blanc (20°46 N) (**Figure 1**).

3. Results

3.1. Catch data analysis

The analysis of shortfin mako catches and investigations in Morocco show that more than 91% of catches are made as bycatch in the longline fishery targeting swordfish in the Atlantic. Minor catches occurred in the PS fishery (**Figure 2**).

In 2021, the longliners operating in the south of Morocco, recorded 91.062 T of shortfin mako, thus shows a decrease of -40.81%, comparing to 2020 (153.8 T).

The annual catches, showed a huge increase between 2010 and 2013 (+215.47%), then, they decreased by -48.93%, in 2014. The catches increased again by 74.8% in 2015, then they fluctuated around an average of 146 tons. Since 2018, the catches have decreased with continuous trend until 2021 (**Figure 3**).

3.2. Fishing effort

In the Atlantic, the fishing effort exerted by the longline fleet exploiting shortfin mako sharks increased significantly (71%) between 2010 and 2011, from 476 fishing days to 1,699 days.

This effort then more or less stabilized until 2015, before decreasing by 25% between 2016 and 2017, and then increasing to a maximum of 2015 fishing days in 2019 (**Figure 4**). In 2021, the fishing effort decreased by -27.3% compared to 2020. It's it is important to highlight that the total effort is directed mainly towards the swordfish.

3.3. Nominal CPUE

Catch per unit effort (CPUE) is an indicator that provides information on the status of the stocks under certain conditions. In the case of the shortfin mako shark, a species that is generally not targeted and impacted by the fishing strategies adopted by the vessels as well as the management measures applied to the species and other species caught in association, the behavior of the CPUEs should be considered with caution.

This being said, the annual monitoring of catches per unit effort of the refrigerated longliners of Dakhla, shows that this index oscillates between a maximum recorded in 2010, with 189 kg/trip, and a minimum observed in 2014, with 97 kg per trip. The overall trend, with the exception of the fall in 2014, tends towards stability between 2010 and 2017 and a decrease observed from 2018 to 2021 (**Figure 5**). This decrease would reflect the worst status of this stock.

3.4. Size distribution:

The analysis of size distribution of the Longliners catches in 2021, shows a dominance of sizes between 70 and 135 cm, which represents 73.6% of the total catches. Several cohorts are caught. Sizes over 200 cm represent only 3.8% of the total catches (**Figure 6**).

4. Conclusions

Analysis of the exploitation and biological indicators of the shortfin mako caught in the south Atlantic of Morocco, showed that:

- Almost all by catches of this species are made by longliners using LL-SWO as fishing gear;
- A decrease recorded in the fishing effort, catches and cpue in the last 5 years;
- The sizes between 70 and 135 cm FL dominate largely catches (73.6%);
- The decreasing trend in cpue and the dominance juveniles in catches confirm the bad status of the stock.

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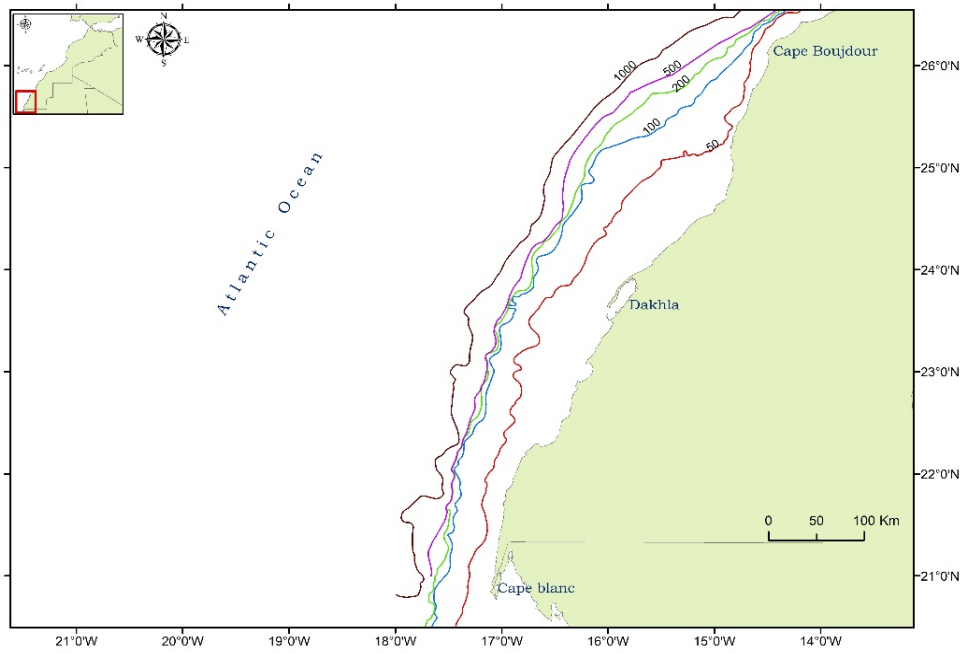


Figure 1. Location of the study area between Cap Boujdour (26°00 N) and Cap Blanc (20°46 N).

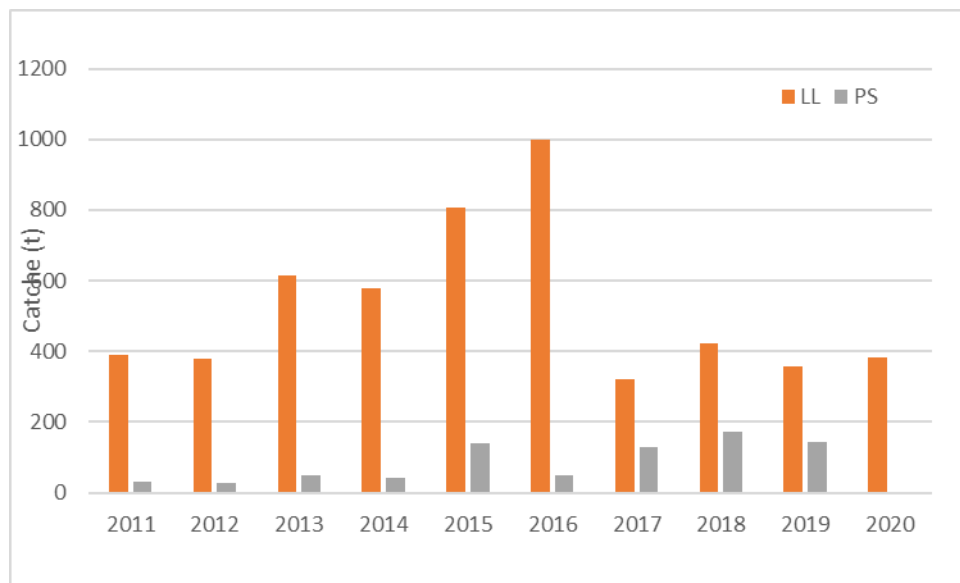


Figure 2. Yearly evolution of SMA catches (TM) made in Moroccan waters by gear during 2011-2020 period (ICCAT data base).

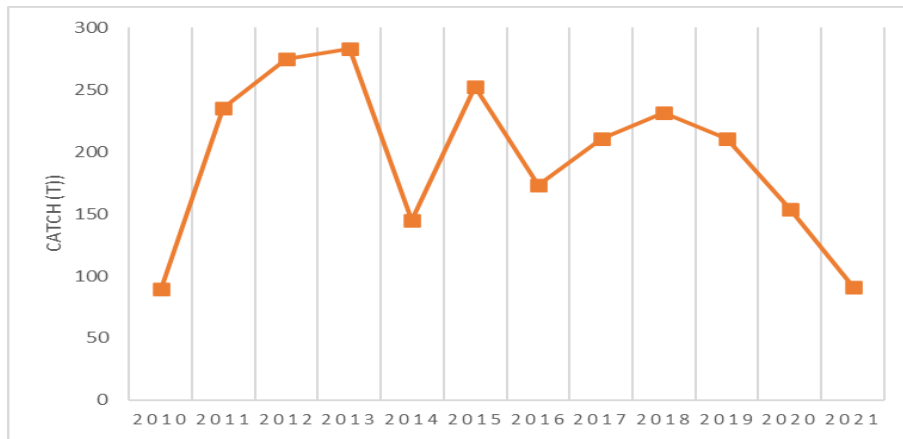


Figure 3. Yearly evolution of SMA catches (T) made by Moroccan Longliners during 2010-2021 period.

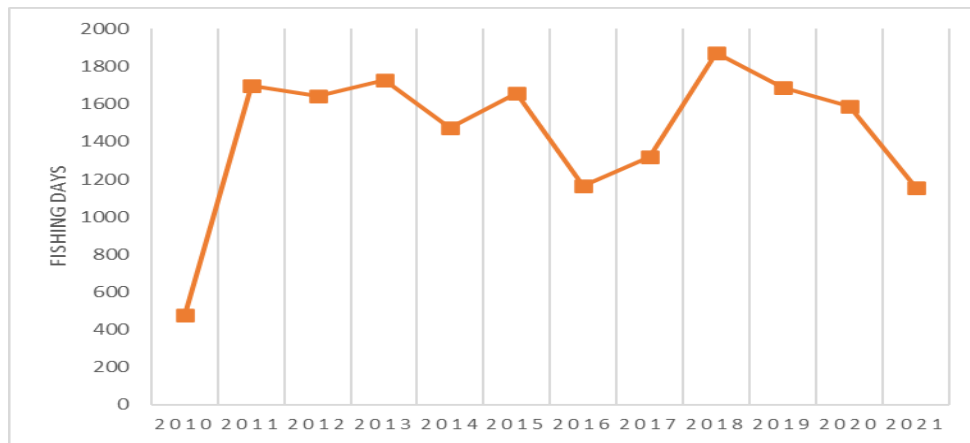


Figure 4. Annual evolution of the Moroccan Longliners fishing effort during 2010-2021 period.

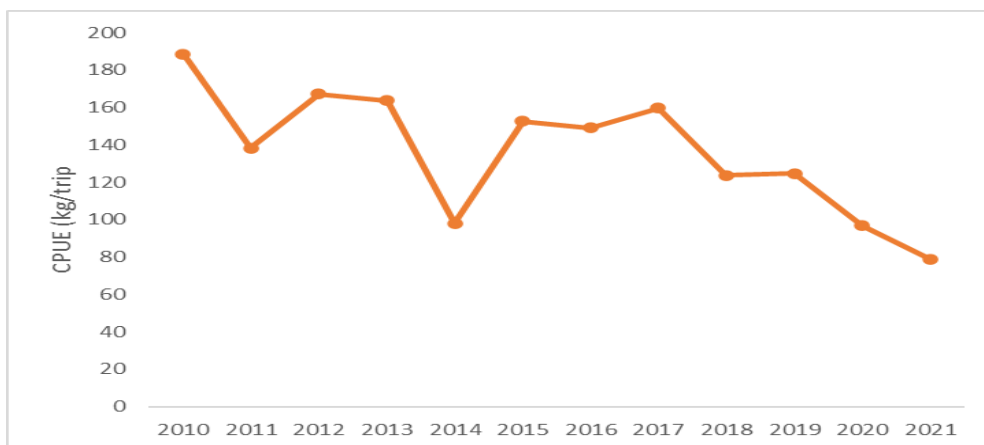


Figure 5. Annual evolution of the Moroccan Longliners CPUE during 2010-2021 period.

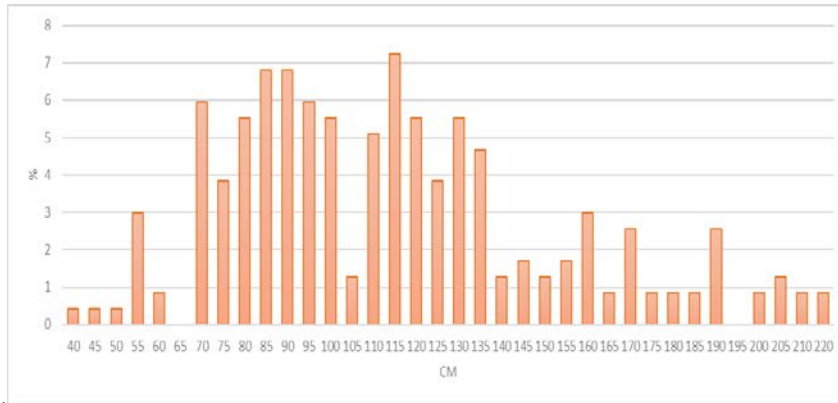


Figure 6. Size distribution of SMA catches by Longliners in 2021.