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INFORMATION AVAILABLE ON MOBULID RAYS IN THE ATLANTIC OCEAN AND THE NEED FOR CONSERVATION

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SUMMARY

In 2023, ICCAT adopted Recommendation 23-14 on Mobulid rays. The Commission decided that a retention prohibition would not enter into force unless the SCRS provided information to confirm that these species were of conservation concern. This document provides background information on Mobulid rays life history and interaction with fisheries. These species represent a taxon of greatest biological vulnerability and conservation concern. Although they are impacted by multiple anthropogenic activities, target fisheries and bycatch pose the greatest threat to mobulid populations. Despite international recognition and conservation efforts, limited data availability hampers effective management strategies. Concerted action is needed, such as management measures in RFMOs, to address the impact of fisheries on mobulids and ensure their long-term persistence. This document aims to help SCRS to make a recommendation to the Commission in this regard.

RÉSUMÉ

En 2023, l'ICCAT a adopté la Recommandation 23-14 sur les raies mobulidées. La Commission a décidé qu'une interdiction de rétention n'entrerait en vigueur que si le SCRS fournissait des informations confirmant que ces espèces sont préoccupantes du point de vue de la conservation. Ce document fournit des informations générales sur le cycle de vie des raies mobulidées et leur interaction avec les pêcheries. Ces espèces représentent un taxon de la plus grande vulnérabilité biologique et de la plus grande préoccupation en matière de conservation. Bien qu'elles soient touchées par de multiples activités anthropiques, les pêches ciblées et les prises accessoires constituent la plus grande menace pour les populations de mobulidés. Malgré la reconnaissance internationale et les efforts de conservation, la disponibilité limitée des données empêche la mise en place de stratégies de gestion efficaces. Une action concertée est nécessaire, telle que des mesures de gestion au sein des ORGP, pour remédier à l'impact des pêcheries sur les mobulidés et assurer leur persistance à long terme. Ce document vise à aider le SCRS à formuler une recommandation à la Commission à cet égard.

RESUMEN

En 2023, ICCAT adoptó la Recomendación 23-14 sobre rayas mobúlidas. La Comisión decidió que la prohibición de retención no entraría en vigor a menos que el SCRS facilitara información que confirmara que estas especies eran de interés para la conservación. Este documento proporciona información general sobre el ciclo biológico de las rayas Mobulidae y su interacción con la pesca. Estas especies representan un taxón de gran vulnerabilidad biológica y preocupación por su conservación. Aunque sufren el impacto de múltiples actividades antropogénicas, la pesca selectiva y las capturas fortuitas suponen la mayor amenaza para las poblaciones de mobúlidos. A pesar del reconocimiento internacional y de los esfuerzos de conservación, la limitada disponibilidad de datos dificulta la aplicación de estrategias de ordenación eficaces. Es necesaria una acción concertada, como medidas de ordenación en las OROP, para abordar el impacto de la pesca sobre los mobúlidos y garantizar su persistencia a largo plazo. Este documento pretende ayudar al SCRS a formular una recomendación a la Comisión en este sentido.

KEYWORDS

Mobulid rays, Conservation, Bycatch

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1. Introduction

In 2023, ICCAT adopted the *Recommendation by ICCAT on Mobulid Rays (Family Mobulidae) Caught in Association with ICCAT Fisheries* (Rec. 23-14). The Recommendation's prohibition on retention will not enter into force unless the SCRS provides guidance as follows:

> *8. The SCRS shall, in 2024, review existing data and information relating to the life history and conservation status of mobulid rays, and confirm whether they meet the definition of being a taxon of the greatest biological vulnerability and conservation concern for which there are very few data. Should this be the case, the SCRS shall advise on the appropriateness of applying precautionary management measures such as a prohibition on retention. The SCRS may also identify options for future research and data collection, as well as advise on other mitigation measures.*

This document intends to inform the SCRS with relevant information to reach a decision for an appropriate response.

2. Life history characteristics

Species

Manta and devil rays (family *Mobulidae*, here referred to as Mobulids) are a group of slow-growing rays found globally in tropical and subtropical a waters (Couturier *et al.,* 2012). There are nine described mobulid species (two manta rays and seven devil rays), ranging widely in size from 1.1 meters (*Mobula munkiana*) to 7.1 meters (*M. birostris*) maximum disc width (Stewart *et al.,* 2018). All species are planktivorous filter-feeders, with distributions closely tied to areas of high productivity and prey availability driven by oceanographic processes (Croll *et al.,* 2012; Lezama-Ochoa *et al.,* 2020).

There are five described mobulid species with distributions that include the Atlantic Ocean, plus one putative new species in the Eastern Atlantic (**Table 1**). These are the oceanic manta ray (*M. birostris)*, Sicklefin devil ray (*M. tarapacana*), Spinetail devil ray (*M. mobular*), and the Atlantic pygmy devil ray (*M. hypostoma*). There is also a well-supported putative additional manta ray species observed in the Eastern Atlantic (*M. cf. birostris*) (Marshall *et al.,* 2009; Hinojosa-Alvarez *et al.,* 2016; Farmer *et al.,* 2022). The previously observed *M. rochebrunei* is thought to be a synonym of *M. hypostoma* (White *et al.,* 2018; Hosegood *et al.,* 2020).

Life history

Among sharks and rays, Mobulids have some of the lowest productivity rates, making them highly sensitive to overexploitation (Pardo *et al.,* 2016). This is largely due to their extremely low annual fecundity (~one pup every 1-3 years), long gestation period (~12 months) and late maturation (~three years) (Marshall and Bennett 2010; Couturier *et al.,* 2012; Deakos 2012; Pardo *et al.,* 2016; Stevens 2016). Longevity for mobulids is largely unknown, although has been estimated to at least 40 years for *M. birostris* (Stevens *et al.,*, 2018). Mobulids are considered extremely data-poor, and several important life history characteristics are missing for most species (Ward-Paige *et al.,* 2013; Pardo *et al.,* 2016).

Aggregation behavior

Mobulids have been documented forming seasonal aggregations in small and large groups around the world, with sizes ranging from a few individuals to thousands. The aggregations often relate to accessing concentrated food sources, courtship and reproduction, predator avoidance, and other functions (Bucair *et al.,* 2021; Palacios *et al.,* 2023). This aggregation behavior can make them more vulnerable to anthropogenic threats, for example to boat strikes or capture in fisheries. In some cases, hundreds of aggregating mobulids have been incidentally captured in the same fishing event (Lezama-Ochoa *et al.,* 2019). This risk is heightened for the lesser-studied and lesser-protected devil rays, which are more likely to aggregate in large numbers (Palacios *et al.,*, 2023).

Overall vulnerability

Given their highly sensitive life history characteristics, mobulids are considered among the most vulnerable elasmobranch species (Dulvy *et al.,*, 2008; Croll *et al.,*, 2016). While species-specific population estimates are not available for most mobulids, local and regional population declines have been observed for mobulids in sites around the world, with some populations exhibiting declines of over 90% (Ward-Paige *et al.,* 2013; Rohner *et al.,* 2017; Moazzam 2018).

Mobulids are impacted by multiple threats, including habitat destruction, tourism, entanglement in Abandoned, Lost or Discarded Fishing Gear (ADLFG), plastic ingestion and bioaccumulation of other pollutants, and climate change (Couturier *et al.,* 2012; Germanov *et al.,* 2018; Strike *et al.,* 2022). However targeted and bycatch fisheries capture in small- and large-scale fisheries is considered their primary threat (Croll *et al.,* 2016; Stewart *et al.,* 2018; Griffiths and Lezama-Ochoa 2021).

Given their low productivity and exposure to multiple cumulative threats, all mobulid species found in the Atlantic Ocean are considered Endangered by the IUCN Red List. They are also listed on Appendix II of the Convention for International Trade in Endangered Species (CITES) and on Appendix 1 and II of the Convention on the Conservation of Migratory Species of Wild Animals. In addition to international instruments, several countries have enacted national and state/territory laws to protect mobulids, including fishing limits or bans, domestic and international trade restrictions, and spatial protections (Lawson *et al.,* 2017; Germanov *et al.,* 2018).

3. Interaction with fisheries and available data

Given their global distribution in highly productive tropical and subtropical waters, mobulids are impacted by multiple different fishing gears that also operate in productive areas. At least thirteen fisheries in twelve countries specifically target mobulids, and mobulid bycatch has been documented in at least 30 fisheries in 23 countries (Croll *et al.,* 2016).

Artisanal fisheries

Artisanal fisheries likely capture mobulids in substantial numbers, though data collection and reporting for mobulids in these fisheries is often poor or nonexistent (Fernando and Stewart 2021; Haque *et al.,* 2021). Mobulids captured as target species and/or as bycatch are reported in many countries around the world, driving overfishing and local and regional declines and extirpation in some cases (Fernando and Stewart 2021). In small-scale fisheries, targeted fishing for mobulids is often carried out using harpoons, gillnets, and driftnets (Croll *et al.,* 2016). Bycatch of mobulids has been documented mostly in gillnets and driftnets, but also additionally occurs in trawlers, traps, and small purse seines and longlines (White *et al.,* 2006; Croll *et al.,* 2016; Moazzam 2018).

In the Atlantic Ocean, targeted capture and bycatch of mobulids has been documented in small-scale driftnet fisheries in Ghana (Debrah *et al.,* 2010) and Senegal (Couturier *et al.,* 2012), and trap fisheries in Portugal (dos Santos *et al.,* 2002). Mobulids have also been captured incidentally in small-scale gillnet and driftnet fisheries in the southeastern U.S. and the Gulf of Mexico (Carlson and Baremore 2003) and harpoon and gillnet fisheries in Brazil (Bucair *et al.,* 2021) and Venezuela (Ehemann *et al.,* 2017). However given extremely limited reporting of mobulids in small-scale fisheries globally, it is likely that they are cpatured elsewhere in the Atlantic.

Industrial fisheries

Mobulids are caught as bycatch in multiple industrial fisheries, including trawlers, gillnets, driftnets, and to a lesser extent longlines (Croll *et al.,* 2016). However, the highest reported mobulid bycatch among industrial fisheries is in tuna purse seiners, which capture an estimated 13,000 individuals per year (Hall and Roman 2013). In tuna purse seiners, catch rates tend to be higher in free swimming school sets than in fish aggregating device (FAD) sets (Restrepo *et al.,* 2019).

In the Atlantic Ocean, mobulid bycatch has been documented in industrial longline vessels in southwestern Atlantic (Mas *et al.,* 2015), in trawlers in northwest Africa (Zeeberg *et al.,* 2006; Essumang 2010) and the U.S. Gulf of Mexico (Shepherd and Myers 2005). They have also been recorded as bycatch in shark-control nets off the coast of South Africa (Sumpton *et al.,* 2011).

Bycatch of mobulids has been documented in tuna purse seine fisheries operating in the eastern Atlantic (Lezama-Ochoa *et al.*, 2020) and off the coast of West Africa (Menard 2000; Amandè *et al.*, 2008) as well as in the industrial fleets targeting tunas managed by ICCAT (see ICCAT section below). The few studies on post-release mortality for mobulids captured by purse seine vessel suggest that post-capture mortality varies substantially among mobulid species, with some species exhibiting high post-release mortality (Francis and Jones 2017).

Global data availability

Despite mobulids' vulnerable conservation status, very little data exists related to their catch or bycatch in fisheries. Each of the four major tuna Regional Fisheries Management bodies includes targeted and incidentally captured elasmobranchs in their publicly available data. However, only the Indian Ocean Tuna Commission (IOTC) and ICCAT include data specific to mobulids (see ICCAT section below). In the IOTC, records exist for 213 captures, with more than half (n=125) reported by Sri Lanka (Table 2). Most (78%, n=165) of these are not identified to the species level and referred to instead as "*Manta and devil rays nei*."

Data on the international trade of mobulids is scarce. The CITES Trade Database (trade.cites.org) contains 180 records (representing 12,263 kg) for legally imported mobulids from 2014 to 2022 (**Figure 1**). Of these, 41% (n=5,100 kg) are not identified to the species level. The most imported species are *M. mobular* (26%, n=3,189 kg), *M. tarapacana* (19%, n=2,408 kg). However, it is important to note that CITES data reflects only legal trade; it is likely that illegal international trade is much higher than these data suggest (Berec *et al.*, 2018).

Despite these data gaps, recent methodological advancements have been used to estimate mobulid vulnerability and guide management in the absence of data; for example, Griffiths et al (2019) use of a spatially explicit risk assessment framework to measure cumulative impacts of fishing to *M. mobular* in the IATTC Convention area. This studied classified *M. mobular* as "most vulnerable" to purse seine and longline fisheries in the Eastern Pacific Ocean (Griffiths *et al.*, 2019).

Information available at ICCAT

Very little bycatch data for Mobulids exists in the Atlantic Ocean, and no offical estimates for the magnitude and composition of mobulid bycatch in purse seiners operating in the ICCAT Convention area. The ICCAT statistical database indicates that four of the six Atlantic species (*M. birostris, M. mobular, M. tarapacana, M. thurstoni*) have been reported as bycatch in the tuna purse seine fishery in the Atlantic (ICCAT Task 1 data, accessed March 2024). A total of 170 mobulid catch incidents, equaling 41.9 tons, were reported to ICCAT from 2015 to 2022 by nine countries (**Table 2, Figure 2**). *M. mobular* was the most frequently reported (n= 79), followed by *M. birostris* (n= 57). The highest catches were reported by France (n=66) followed by El Salvador (n=23) and Spain (n=22).

However, mobulid bycatch in ICCAT-managed tuna fisheries is likely much higher than these reports suggest, due to poor species identification, low observer coverage (especially for longline vessels), and other problems with data collection and availability for pelagic elasmobranchs in tuna fisheries (Clarke *et al.*, 2014; Forget *et al.*, 2021; Cronin *et al.*, 2022; Mucientes *et al.*, 2022).

4. Utilization

Mobulids are targeted and/or opportunistically retained in small-scale fisheries for their meat for local consumption, for use as bait, or for their skin for leather products (Ward-Paige *et al.*, 2013, Alava *et al.*,, 2002). In some cases, mobulid cartilage is used as a filler in shark fin soup (White *et al.*, 2006). Generally, mobulid meat is considered poor quality and therefore not a high-value commodity; for this reason it may be disguised under a general seafood labels in markets (Croll *et al.*, 2016, Fernando and Stewart 2021). Anecdotally, the fins may sometimes be labelled as shark fins and marketed in Asia as a delicacy (Smith 2013).

Over the last few decades, a lucrative trade for mobulid prebranchial gill plates has emerged, with demand concentrated in China and Southeast Asia, and the center of the trade thought to be in Guangzhou, China (O'Malley *et al.*, 2017). Though there is no evidence that gill plates represent have either traditional or medicinal value (Whitcraft *et al.*, 2014), proponents allege that they can provide a general health tonic that can remove toxins from the body, reduce fever, and prevent illnesses (Zhou *et al.*, 2024). Countries that are supplying the gill plate trade to the Asian market include Indonesia, Vietnam, Brazil, the Philippines, Sri Lanka, Peru, Palestine, Malaysia, Mozambique, India, and China (Alava *et al.*, 2002; Rajapackiam *et al.*, 2007; Heinrichs *et al.*, 2011; Dent and Clarke 2015; Alfaro-Cordova *et al.*, 2017; O'Malley *et al.*, 2017; Abudaya *et al.*, 2018; Bucair *et al.*, 2021; Fernando and Stewart 2021). Among international trade reflected in the CITES Trade Database, the overwhelming majority of the records represent gill plates exported from Sri Lanka to Hong Kong (**Figure 2**).

5. Tuna RFMO conservation measures

Over the past decade, several tuna RFMOs have adopted Conservation and Management Measures (CMMs) focused on reducing the impact of bycatch on mobulids. In 2015, the Inter-American Tropical Tuna Commission (IATTC) adopted a resolution aimed at conserving mobulid rays caught alongside fisheries within the IATTC Convention Area (IATTC 2019), which is obligatory for its member states. Both the IOTC and the Western and Central Pacific Fisheries Commission (WCPFC) adopted similar measures in 2019 (IOTC 2019; WCPFC 2019). ICCAT adopted a CMM for mobulids in 2023 (ICCAT 2023). All these CMMS prohibit the retention, transshipment, or landing of mobulids caught in the Convention area (however, the ICCAT one will or will not enter into force depending on advice from the SCRS). The CMMs also require prompt release and encourage best practices for handling and release and direct contracting parties and cooperating non-contracting parties (CPCs) to implement research for mobulids, including requiring observers to record mobulid catch data and to pursue research to identify important mobulid reproduction areas that could inform future spatiotemporal management efforts.

6. Conclusions

Mobulid rays represent a taxon of greatest biological vulnerability and conservation concern. Their unique life history traits, including low productivity, slow growth, and tendency to aggregate make them exceptionally sensitive to overexploitation. Though they are impacted by multiple anthropogenic activities, target fisheries and bycatch pose the greatest threat to mobulid populations. Despite international recognition and conservation efforts, limited data availability hampers effective management strategies. While recent initiatives such as CMMs by tuna RFMOs show promise, concerted action is needed to address the impact of fisheries on mobulids and ensure their long-term persistence.

7. Recommendations

The authors strongly believe that ICCAT Rec. [23-14] should fully enter into force. For this to occur, the SCRS should respond to the Commission's questions in paragraph 8 of said Recommendation, noting that Mobulids are indeed a taxon of greatest biological vulnerability and conservation concern. Furthermore, a prohibition on retention is likely to further degrade an already data-poor situation. For this reason, it is important that the data-reporting provisions of the ICCAT Recommendation be strictly followed by CPCs.

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Table 1. Mobulid ray species with part or all of their distribution in the Atlantic Ocean. **'**ND' indicates that no data is available. **M. cf. birostris* is a putative new species that has not been scientifically described yet.

Common name	***Species***	***Distribution***	***IUCN Classification***	***Population Trend***
Oceanic manta ray	*Mobula birostris*	Global	Endangered	Decreasing
Sicklefin devil ray	*Mobula tarapacana*	Global	Endangered	Decreasing
Spinetail devil ray	*Mobula mobular*	Global	Endangered	Decreasing
Bentfin devil ray	*Mobula thurstoni*	Global	Endangered	Decreasing
Atlantic pygmy devil ray	*Mobula hypostoma*	Eastern North, Central, and South America; West Africa	Endangered	Decreasing
Putative manta ray species	*Mobula cf. birostris**	Southeast US, Gulf of Mexico Central and South America (Farmer *et al.*, 2022)	ND	ND

Table 2. Reported catches from tRFMO publicly accessible data for mobulid bycatch in fisheries. 'ND' indicates that no data is available.

tRFMO	***Years available***	***Resolution***	***Average reported annual catch***	***Unit***	***Data source***
IATTC	ND	ND	ND	ND	IATTC Public Domain data www.iattc.org/PublicDomainData/IATTC-Catch-by-species1.htm
ICCAT	2014 -2022	species	4.6	tons	ICCAT Task 1 catch data www.iccat.int/en/accesingdb.html
IOTC	1987 - 2022	genus	5.9	tons	IOTC raw nominal catches iotc.org/meetings/18th-working-party-ecosystems-and-bycatch-wpeb18
WCPFC	ND	ND	ND	ND	WCPFC Regional Observer Programme (ROP) Database https://www.wcpfc.int/public-domain-bycatch

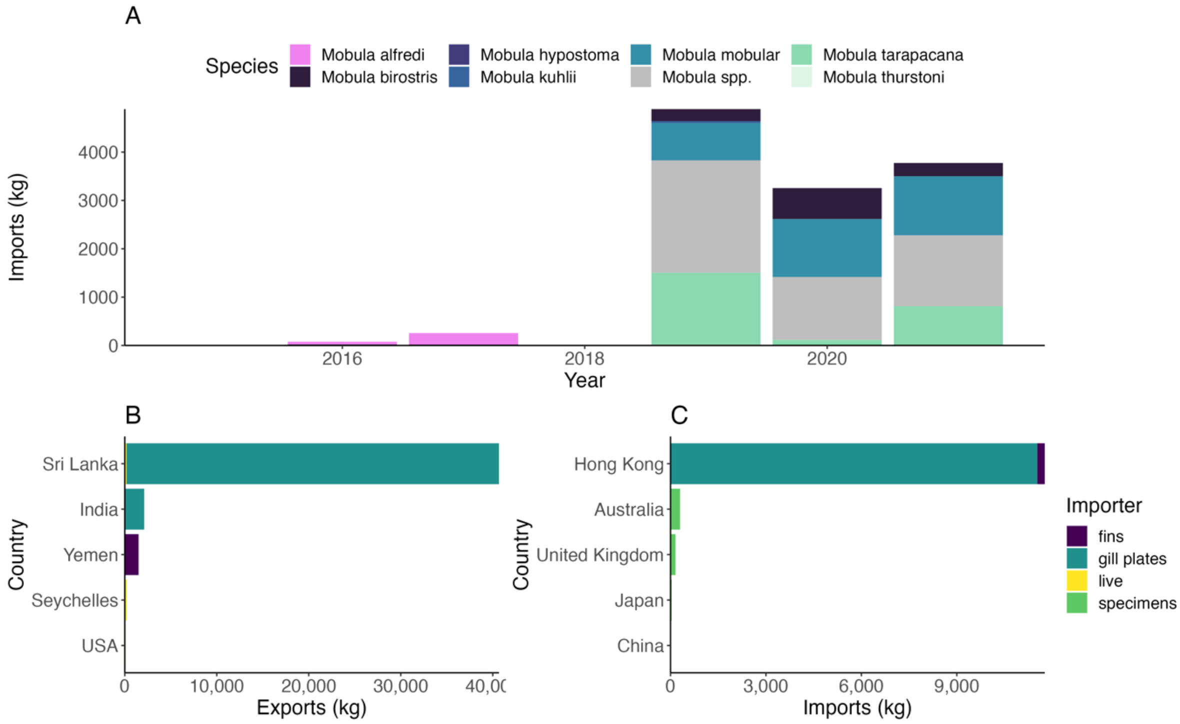

Figure 1. A) Mobulid import and export data contained in the CITES Trade Database from 2014 to 2022. B-C) Most mobulid trade using CITES permits is exported by Sri Lanka and imported by Hong Kong in the form of gill plates.

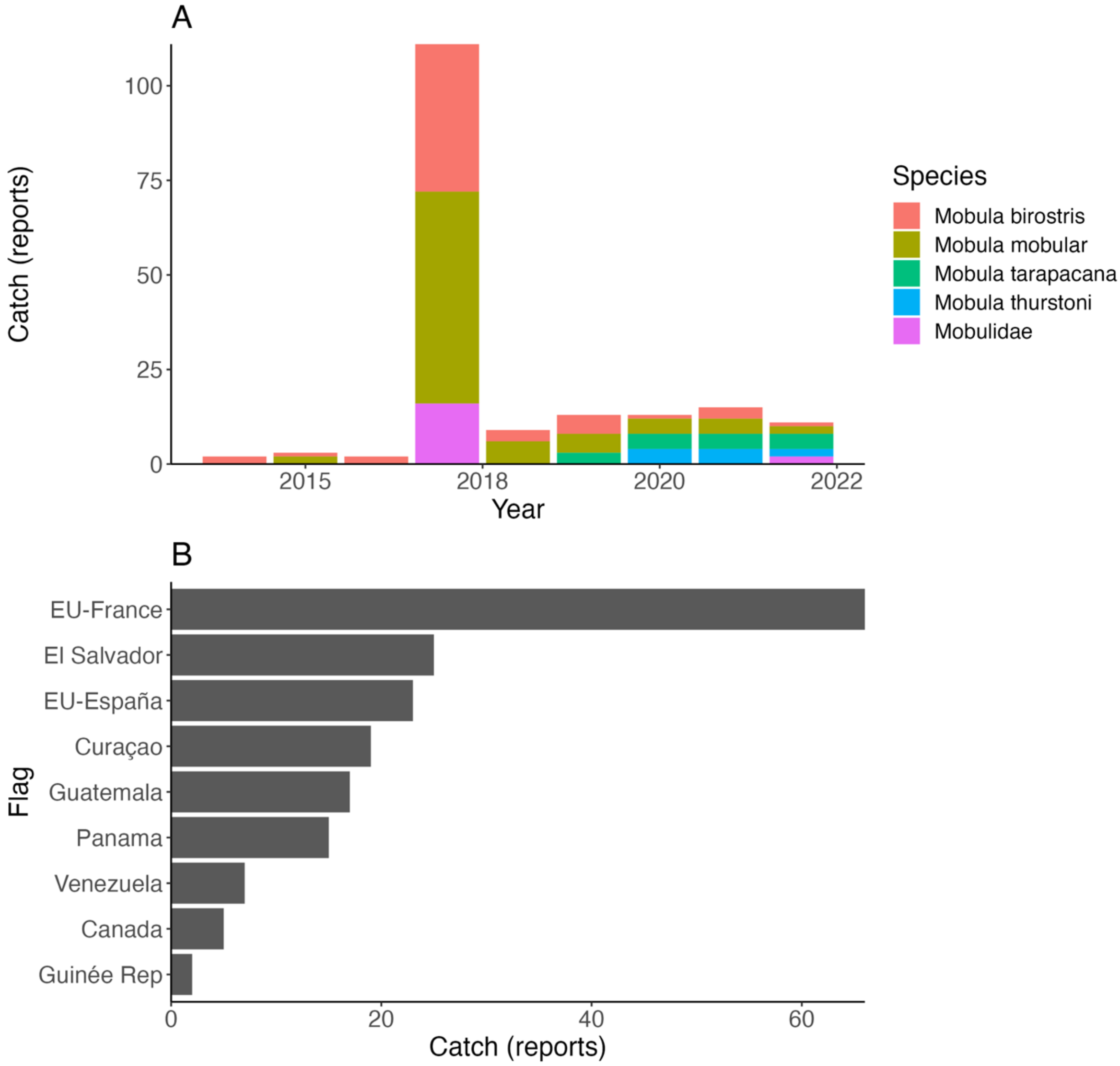

Figure 2. Mobulid catch data reported in the ICCAT grouped by A) species and B) flag of vessel. Data source is the Task 1 nominal catches of Atlantic tunas and tuna-like fish by gear, region, and flag [accessed 31 March 2024].