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DEVELOPMENT OF A DRAFT LIST OF RAY SPECIES UNDER THE PURVIEW OF THE IATTC

SUMMARY

Rays—batoid fishes including stingrays, skates, sawfish, guitar fish, and mobulids—are among the most widely distributed fishes in the world. Consequently, they are a common occurrence in a range of fisheries, including industrial and small-scale coastal pelagic fisheries that operate in the eastern Pacific Ocean (EPO). Like other elasmobranchs (i.e., sharks), rays are often slow-growing, long-lived, and produce offspring in low numbers and/or frequency, making them potentially vulnerable to fishing impacts. Despite the IATTC primary responsible for the sustainable management of tuna and tuna-like species, consistent with its mandate under the Antigua Convention, it has been proactive over the past two decades in developing conservation and management measures for some elasmobranchs by way of binding Resolutions. Such measures must be based on the best science available. Likewise, in 2024 the IATTC adopted in Resolution C-24-05 a list of 18 shark species "…*that shall be given priority for research*" and that the staff "…*provide recommendations to the Commission on ways to strengthen the conservation and management of sharks within IATTC fisheries*". That same year the Scientific Advisory Committee had also made a recommendation to the Commission that "…*the IATTC staff develop a draft list of ray and mobulid species under the purview of the IATTC for consideration by the EBWG and the SAC*". Analysis of catch data derived from IATTC data holdings for 7 defined industrial and pelagic fisheries in the EPO revealed interactions with 17 ray species, of which 7 species had oceanic distributions and occupied epipelagic habitats where IATTC pelagic fisheries commonly operate. The remaining 10 species, 8 of which are endemic to the EPO, predominantly occupy demersal habitats within relatively shallow neritic waters in the EPO where pelagic fisheries are unlikely to pose a significant threat to their long-term sustainability.

This paper presents for consideration by the EBWG, the SAC and the CPCs, three species lists alongside three existing species lists used for various purposes within the IATTC. The IATTC scientific staff present for consideration for adoption by the IATTC, at a minimum, a list of 7 oceanodromous and epipelagic ray species caught in the major industrial and small-scale coastal pelagic fisheries in the EPO. Of these species, 6 are mobulids already included in a current IATTC Resolution (C-15-04). Although the staff note that some of the remaining 10 species are considered by external bodies to have ecological importance, the clear separation between their nearshore demersal distribution and the predominant areas of operation of pelagic fisheries fleets far from the coast suggest that research, conservation and management efforts would be most effectively implemented by coastal States where the IATTC could cooperate in relevant research and data collection efforts wherever possible.

1. INTRODUCTION

The responsibilities of fisheries management worldwide have increasingly broadened over the past decade to consider the direct and indirect impacts of fishing that extend beyond those of target species. Although this evolution of an ecosystem approach to fisheries management (EAFM) has progressed slowly, the IATTC has been proactive in pursuing EAFM through its explicit mandate in the Antigua Convention (IATTC, 2003), which entered into force in 2010. Since this time, the IATTC has broadened its primary role of ensuring the sustainability of tuna and tuna-like species in the eastern Pacific Ocean (EPO), to also ensure the long-term sustainability of non-target species by adopting "*…as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention…*".

The conservation and management of elasmobranchs (i.e., sharks and rays) has been a major priority for the IATTC as species such as pelagic sharks and mobulid rays are commonly caught, mostly as incidental (i.e., bycatch), in a range of industrial and small-scale multi-species coastal pelagic fisheries throughout the EPO. Furthermore, elasmobranch populations are vulnerable[1] to depletion by fishing impacts as they are generally long-lived, exhibit slow growth rates and have a low reproductive capacity. The IATTC has progressively implemented conservation and management measures (CMMs) to mitigate the potential negative effects of impacts from tuna and tuna-like fishing on key elasmobranchs species by implementing retention bans of sharks (C-05-03, C-16-04, C-11-10, C-19-05, C-21-06) and mobulid rays (C-15-04), prohibiting setting on whale sharks (C-19-06), or to promote handling practices that maximize the post-release survival of sharks (C-16-05, C-24-05).

Until recently, there has been no prescriptive list of elasmobranch species explicitly included in an IATTC Resolution (C-24-05). As a result, the IATTC staff have proactively undertaken various assessments of elasmobranch species to guide management and research. For example, in 2022 the IATTC scientific staff conducted a comprehensive vulnerability assessment for 49 shark species recorded to have interacted with the pelagic fisheries (industrial longline and purse-seine; small scale coastal longline and gillnet) in the EPO (SAC-13-11) using the Ecological Assessment of the Sustainable Impacts of Fisheries (EASI-Fish) methodology developed by IATTC staff in 2018 to specifically assess data-limited species and fisheries

[1] Unless specified otherwise, including but not limited to citations to vulnerability assessments and any qualitative/quantitative scores (e.g., BYC-10 INF-B; SAC-13-11; SAC-14-12), the staff's definition of "vulnerable species" refers to the species that, in the *sensu latu*, and due to their low-productive life-history traits (i.e. K species in r/K selection theory), are more vulnerable to the impacts of fisheries and other anthropogenic activities on these species or their habitat and ecosystem. This includes the marine mammals, seabirds, sea turtles and the elasmobranchs.

(Griffiths et al., 2019). Subsequently, more focused assessments have been undertaken on elasmobranchs perceived by CPCs to be key species based on their high prevalence in catches, such as silky (BYC-11 INF-B) and hammerhead sharks (SAC-14-12), or their high conservation status, such as the spinetail manta (Griffiths and Lezama-Ochoa, 2021).

In 2023, the IATTC adopted Resolution C-23-07, which in part, sought to formalize a list of shark species to be considered under the purview of the IATTC (Article 13). The IATTC staff undertook an assessment of the 49 shark species included in SAC-13-11 and recommended a potential list of species (SAC-15-09) from which 18 species were subsequently adopted by the Commission at its 102nd meeting in 2024 (C-24-05). However, of the extant 1,226 species of elasmobranchs worldwide, more than half (633 species) are rays—batoid fishes including stingrays, skates, sawfish, guitar fish, and mobulids—that are among the most widely distributed fishes in the world, occupying freshwater rivers to the open ocean. As such, rays are a common occurrence in the catches of a range of fisheries across their wide geographic distribution, including industrial and small-scale coastal pelagic fisheries that operate in open ocean and neritic habitats of the eastern Pacific Ocean. Like sharks, rays are often slow-growing, long-lived, and produce offspring in low numbers and/or frequency, making them potentially vulnerable to fishing impacts. Therefore, maintaining the momentum in elasmobranch conservation in 2024, IATTC's Scientific Advisory Committee made a recommendation to the Commission that "*…the IATTC staff develop a draft list of ray and mobulid species under the purview of the IATTC for consideration by the EBWG and the SAC*".

Therefore, the aim of this paper was to identify all ray species—batoid fishes including stingrays, skates, sawfish, guitar fish, and mobulid rays—that have been recorded as interacting with pelagic fisheries in the IATTC convention area and analyze their ecological traits and existing conservation classifications to present options of species lists and discuss the implications for adopting such a list..

2. METHODS

2.1 Scope of the assessment

The current assessment is confined to the Antigua Convention Area in the EPO (the region from the coast of the Americas to 150°W between 50°S and 50°N) and includes reported or observed data for the period 1994–2024 for both industrial tuna fisheries (i.e., purse-seine and longline) and small-scale coastal fisheries (i.e., surface-set gillnet and longline) that target or catch incidentally tuna and tuna-like species. Given that all fisheries included in the assessment were not strictly tuna fisheries, they were collectively referred to as "pelagic fisheries". The assessment includes all species recorded in at least one interaction in the available datasets pertaining to the pelagic fisheries and therefore the list of species was considered comprehensive for developing a proposed list(s) of species under the purview of the IATTC.

The industrial fisheries included the fishery by large-scale tuna longline fishing vessels (LSTLFVs) (herein called the "industrial longline fishery") and two purse-seine fisheries (Class 6 with a carrying capacity >363 metric tons (t) and Classes 1–5 ≤363 t). The data for these fisheries were obtained from vessel logbooks or collected by onboard scientific observers, or submitted to the IATTC by its Members under Resolutions C-03-05 and C-19-08 and described in Document SAC-08-07b. Specifically, the industrial longline fishery data were derived from vessels >24 m length overall (LOA) included in the IATTC Regional Vessel Register that are authorized to fish for tuna and tuna-like species, which primarily provide monthly reports of catch and fishing effort at a resolution of at least 5° x 5°—although a few CPCs submit data at 1° x 1°—and from national scientific observer programs that monitor at least 5% of the fishing effort by LSTLFVs >20 m LOA first required under Resolution C-11-08 and later replaced by Resolution C-19-08.

Ray interaction data for the fishery by Class 6 purse-seine vessels were collected by the onboard observer

program administered by the IATTC for the Agreement on the International Dolphin Conservation Program (AIDCP) and National Programs, which covered 100% of the fishing effort. This fishery comprises three distinct sub-fisheries based on set type: i) sets associated with natural or artificial floating objects (OBJ), ii) sets associated with dolphins (DEL), and iii) sets on schools of tuna that are neither associated with dolphins or floating objects (NOA). Data consisted of ray species caught by the purse-seine gear and predominately recorded on the dedicated 'rays form' by observers.

Other purse-seine vessels that operate in the EPO range from small vessels (Classes 1–2) that are generally confined to coastal areas, to larger commercial vessels (Classes 3–5) that frequently fish at a great distance from the coast. The AIDCP does not require these smaller vessels to carry an observer, except in specific situations. However, the Tuna Conservation Group (TUNACONS)—a consortium of Ecuadorian tuna fishing companies—has voluntarily deployed observers on their vessels since 2018, with coverage being 34% of the total number of trips reported for all Class 1–5 vessels in the EPO in 2022–2024 (IATTC, unpublished data). The IATTC scientific staff analyzed the data collected to date by TUNACONS and determined that, overall, it is representative of the fleet in terms of gear characteristics, target catch composition, catch composition of some key non-target species and spatio-temporal distribution of effort (DAT-02-02). Therefore, these data were included and considered to represent the minimum catch by the fishery. Copies of logbook entries summarizing the fishing activities of Class 1–5 vessels were available via collection by IATTC field staff at various landing ports. The fishery comprising Class 1–5 vessels can also be separated on the same set type as the Class 6 fleet, except Class 1–5 vessels (i.e., <363 mt) are not permitted to make DEL sets (AIDCP, 2017).

In contrast to the industrial purse-seine and longline fisheries in the EPO, the catch of rays by the numerous small-scale coastal fleets that operate closer to the coast in the EPO is generally poorly documented by national fisheries agencies, but have been shown to be heavily impacted by coastal gillnet and longline fisheries (Smith et al., 2009; Cartamil et al., 2011; Martínez-Ortiz et al., 2015; Alfaro-Cordova et al., 2017, SAC-11-13). Since these fisheries interact with many of the ray species most frequently encountered by industrial fleets (e.g., pelagic stingray, mobulids), it was considered necessary to include these small-scale coastal fisheries in the assessment as separate pelagic fisheries.

Reasonably detailed catch data for small-scale coastal longline vessels throughout Central America was available from IATTC's long-term research program that examined the effects of different hook types on bycatch rates, in part reported by Andraka et al. (2013). Some additional species-specific information was available from published scientific papers (Martínez-Ortiz et al., 2015) and reports (*e.g.*, Ayala et al., 2008; Martínez et al., 2017), although the incidence of ray interactions from these sources was very low.

In some coastal States in the EPO there is often not a clear distinction between small-scale coastal and industrial vessels, as the former are often multi-gear (longline and gillnets) and multi-species, shifting their target among tuna, billfish, sharks and dorado on a seasonal basis (Martínez-Ortiz et al., 2015; Siu and Aires-da-Silva, 2016). Although some of these vessels can reach offshore waters at a greater distance from the coast (*e.g.*, medium and large-scale fleets), the majority are less than 12-15 m LOA (generally called "pangas") (EMS-02-02; SAC-16-09) and are more coastal in their operation. Because catch data for these domestic fleets were not available by vessel size, these fleets were aggregated as the "small-scale coastal fishery".

Most coastal States have some form of a landings fishing inspection program conducted mainly for compliance purposes (Siu and Aires-da-Silva, 2016). Unfortunately, observer coverage of these fleets is extremely low, and data are very limited for scientific purposes. However, pilot sampling programs are currently being developed (SAC-15-10) or completed (SAC-11-13) by the IATTC for the coastal nation fleets and available data that could be attributed to a specific fishery (either longline or gillnet) was utilized (e.g., Lennert-Cody et al., 2022).

A detailed description of the datasets included in this assessment is provided in Table 1.

2.2 Species interactions

The assessment included all ray species recorded to have interacted with 7 pelagic fisheries in the EPO using all data held in the IATTC databases. Specifically, these fisheries were:

- Industrial longline
- Purse-seine Class 6 vessels: DEL, NOA, OBJ sets
- Purse-seine Class 1–5 vessels: NOA, OBJ sets
- Small-scale coastal longline and gillnet multi-gear fishery

Assessment tools that can be used to prioritize species of potential concern (e.g., EASI-Fish) or assess stock status (stock assessment models) require detailed species-specific information on biological productivity. Therefore, a requirement of these tools is to include only species—as opposed to taxonomic aggregations such as "Rays, nei"—in assessments given the often-high divergence in the ecology and life histories of even closely related species. Although there are many records in the data sources used where catches were reported as taxonomic aggregations, these were required to be omitted from the assessment.

To facilitate the process for determining which ray species could be given priority in terms of research similar to what has been agreed to for sharks in resolution C-24-05, the current assessment follows that of the shark species list determination in 2024 (specifications for data provision under resolution C-03-05, and 2) the list of key species recommended by the staff and participants of IATTC's workshop on improvements in data collection and provision in the industrial longline fishery undertaken in 2023 (WS-DAT-01-Report, SAC-16 INF-O).

3. RESULTS

3.1 Ray interactions recorded in EPO pelagic fisheries

In total, 17 ray species were recorded in available datasets to have interactions with the 7 specified pelagic fisheries in the EPO for the period 1994–2024. The full list of species and the number of fishing events from which they were recorded in each fishery is shown in Table 2.

These species can be broadly separated into two main groups based on their ecological and habitat traits (Table 3), that contribute to their relative susceptibility to interactions with pelagic fishing fleets as shown in the number of sets where interactions were recorded. These were: i) species with a predominantly oceanic distribution that occupy epipelagic waters, and ii) species with a neritic distribution that have a predominantly demersal distribution.

A total of 7 species were exclusively oceanodromous, or at least spent a significant proportion of their life history in oceanic waters, and exclusively occupy epipelagic waters where the tuna fisheries operate (Table 3). This group included 6 species of mobulids and the pelagic stingray (*Pteroplatytrygon violacea*), with the latter species being the most commonly recorded ray species across all industrial and small-scale coastal fisheries, but particularly in the industrial longline fishery (Table 2). In contrast, the mobulids, particularly *Mobula mobular*, *M. thurstoni*, and *M. tarapacana*, were most commonly recorded from Class 6 purse-seine DEL and NOA sets and to a lesser extent in OBJ sets. In contrast, only 16 interactions with these species were recorded for Class 1–5 purse-seine vessels, which may be a result of lower observer coverage or the lack of reporting of these species in fisheries logbooks. There was only a single interaction recorded with *M. alfredi*, which was in the industrial longline fishery.

Of the 7 oceanodromous species, all have cosmopolitan distributions with the exception of *M. munkiana*, which is endemic to the EPO. With regards to conservation status of the 7 species, only the 6 mobulid species have special conservation interests, being included in IATTC Resolution C-15-04.

Of the 10 ray species having predominantly neritic distributions, all species are endemic to the EPO with the exception of *Aetobatus narinari* and *Bathyraja violacea*. With respect to their vertical distributions, 8 species occupy demersal habitats, while only 2 species, *A. narinari* and *Rhinoptera steindachneri* have a benthopelagic distribution that may result in some exposure to pelagic fishing gears. However, all 10 neritic species were caught infrequently in the 7 pelagic fisheries, with the most prominent species, *Pseudobatos leucorhynchus* and *R. steindachneri*, being recorded on 30 and 28 occasions, respectively, over the 30-year assessment period. None of these species are currently included in IATTC Resolutions..

3.2 Options for an interim list of ray species under the purview of the IATTC

In providing options for the IATTC Members to consider as an interim list of ray species that could come under the purview of the IATTC, a similar hierarchical approach as the 2024 shark species assessment (SAC-15-09) was taken, which vary the numbers and compositions of species at each stage in the process (Table 4). In contrast to the 2024 shark list assessment, the current assessment for rays did not provide alternative species lists depending on whether the IATTC Members include under its purview both industrial fisheries and the numerous small scale coastal fleets that deploy pelagic gears. This is because the Antigua Convention is concerned only with those vessels fishing for tuna and tuna-like species, rather than including some fisheries based on vessel size and fishing mode. Therefore, the most precautionary approach would be to include all 17 species (List A) documented to interact with EPO tuna fisheries. If the Members chose to exclude neritic species with demersal distributions and consider only oceanodromous and epipelagic species that overlap with the primary fishing grounds of vessels that fish for tuna and tuna-like species at significant distance from the coast, and listed in existing IATTC regulations, the list could be refined to 7 species—*P. violacea* and 6 species of mobulids (List B) (Table 4).

3.3 Comparisons with existing IATTC ray species lists

The species composition of Lists A and B (Table 4) developed from the complete list of 17 ray species showed many similarities with the two existing IATTC species lists . The 8 species listed in both IATTC SAC-16 INF-O and the list of species included in the annual memorandum circulated to CPCs by the IATTC Director pertaining to specifications for data provision under resolution C-03-05 were identical and each include most species in Lists B and C. The main difference is that the two IATTC lists include two additional species—*Dasyatis brevis and Hypanus longus*—that have neritic distributions and occupy demersal habitats (Table 4). It is important to note however, that these two additional species were not explicitly listed in these lists, but are included under IATTC reporting requirements for dasyatids.

In contrast to the 2024 shark assessment where a potential list of species was compared to those listed in Annex I of UNCLOS, no comparisons were possible in the current assessment since no ray species are considered by UNCLOS as being highly migratory.

4. DISCUSSION

Tuna fisheries tend to be overlooked as significant mortality sources for rays. This is probably due to most batoid fishes having neritic distributions and occupying demersal or benthic habitats that are beyond the influence of most tuna fishery effort and/or effective fishing depths of the gear and are therefore caught infrequently. However, as with most elasmobranchs, rays are generally slow-growing, long-lived and have low reproductive potential and therefore, even reasonably low levels of mortality by fishing may have a significant negative impact on long-term population sustainability of some species (Dulvy et al., 2017; Pacoureau et al., 2021). Unfortunately, given that ray species are bycatch in tuna fisheries and have low economic value, their interactions are often poorly recorded in fisher-reported catch logs, if at all (Heidrich et al., 2022; Cronin et al., 2023). Consequently, increased efforts must be made to better understand potential fishing impacts on these species and proceed with appropriate assessment and management, where required.

Given that neither the Antigua Convention or IATTC Resolutions include a prescriptive list of target or non-target species under the purview of the IATTC, a first step in the process for nominating ray species is to determine which species incur ongoing interactions with tuna fisheries in the EPO or share the same habitat and ecosystem, and to ascertain whether the impacts on any of these species may potentially contravene Article VII 1(f) of the Antigua Convention that aims to maintain "…*populations of such species above levels at which their reproductive may become seriously threatened*".

To make this determination of impacted species a precautionary approach is required in light of the severe data deficiencies for the majority of ray species interacting with pelagic fisheries in the EPO. However, using best available empirical and expert knowledge a pragmatic approach to species selection is to focus primarily on which species have an ecological niche that is clearly encompassed by the horizontal and vertical dimensional environmental envelope occupied by EPO pelagic fisheries that increase their interaction rates and hence, their susceptivity to direct and indirect fishery impacts. Although the boundary of the IATTC Convention Area extends to the coasts of the Americas, a significant area of neritic habitat in the EPO is not fished by vessels that fish for tuna and tuna-like species, which primarily target these species in the epipelagic waters at significant distances from the coast. As such, the IATTC staff has approached this issue based on the presumption that the impacts of tuna fishing vessels on ray species that are primarily distributed across the neritic regime and occupy demersal and benthic habitats is likely minimal and therefore, that it would not be appropriate to include these species among those that are considered asunder the direct purview of the IATTC. Given that other international bodies have identified some of these species as needing conservation and management efforts as a matter of priority, this does not prejudge action by these bodies or others at the regional or global levels, including the adoption of the measures that they would deem appropriate regional or international bodies. The list of species developed from data holdings of the IATTC is comprehensive and compliments recent published lists of ray species interacting with industrial and small-scale coastal pelagic fisheries within coastal States of the EPO (Morales-Saldaña et al., 2025). The ray species included in the current assessment could be separated into two groups based on their ecological traits as: i) oceanodromous species occupying epipelagic waters, and ii) neritic species occupying demersal habitats.

Oceanodromous species

The oceanodromous group, composed of 7 species, is of most relevance to the IATTC since their three-dimensional distributions closely overlap with those of fisheries targeting tuna and tuna-like species in the EPO. The pelagic stingray (*Pteroplatytrygon violacea*) was by far the most commonly recorded ray species across all industrial and small-scale coastal fisheries, but particularly in the industrial longline fishery where effort extends throughout tropical and temperate waters of the EPO and overlaps where this cosmopolitan species is distributed (Last et al., 2016). The species is among the most productive of all dasyatid rays being relatively fast-growing, short-lived (10 years), early to maturity, and producing 4–13 pups per year (Neer, 2008), and for which no conventional stock assessment exists, although is listed as "Least Concern" by the IUCN Red List of Threatened Species.

The remaining 6 species of the oceanodromous group are all mobulids, a unique suite of pelagic batoids comprising only 8 species worldwide (White et al., 2017). All six species recorded from EPO tuna fisheries can be considered oceanodromous and epipelagic as they are commonly recorded on the high seas as bycatch in industrial purse-seine fisheries. The most commonly encountered species, *M. mobular*, *M. thurstoni*, *M. tarapacana* and *M. birostris*, were recorded in sets associated with dolphins (DEL) or free swimming schools of tunas (NOA) and to a far lesser extent in floating-object sets (OBJ), possibly indicating mobulids do not actively associate with floating objects in the EPO. In contrast, comparatively few interactions were recorded in the industrial longline fishery, mainly with *M. mobular* and *M. birostris*, where animals are generally foul hooked or entangled in the branchlines rather than being hooked after

taking a bait (see Mas et al., 2015) since mobulids are planktivorous (Couturier et al., 2012).

Although the 6 mobulid species are widely distributed in epipelagic waters across the EPO, some of these species, such as *Mobula alfredi* and *M. munkiana*, tend to be more prevalent in the waters around atolls, oceanic islands, seamounts and coastal reefs as adults. It is important to note however, that most of the 6 recorded mobulid species appear to use shallow coastal waters for mating and pupping as adults (Notarbartolo-di-Sciara, 1988; Palacios et al., 2023) and as nursery areas as juveniles (Palacios et al., 2021; Porsiel et al., 2021; González-Pestana, 2022). As such, these species are highly susceptible to fishing impacts across their entire geographic ranges in the EPO, from small-scale coastal fisheries where they are caught primarily in gillnet fisheries for their gill plates and/or meat (O'Malley et al., 2017; Palacios et al., 2024; Rojas-Perea et al., 2024), to the open ocean where they are incidentally caught by industrial fisheries (Hall and Roman, 2013; Lezama-Ochoa et al., 2019). Although no formal population assessment exist for these species to date, this susceptibility to fishery impacts and documented population declines for some species has resulted in the determination of the 6 mobulids as "Endangered" or "Vulnerable" by the IUCN Red List of Threatened Species (IUCN, 2024) and their inclusion in Appendix II of the Convention on International Trade in Endangered Species (CITES) (CITES, 2016). Similar conservation concerns by the IATTC formed the impetus for the proactive implementation of conservation and management measures for all mobulid rays since 2015 (C-15-04) that prohibit retention and recommend prompt release using best handling practices in all industrial fisheries, although small scale coastal fisheries are exempt where mobulids are utilized exclusively for domestic consumption.

Neritic species

Of the 17 species included in the current assessment, 10 were considered to have neritic distributions that would reduce their susceptibility to tuna fisheries that generally fish a significant distance from the coast. However, of these species, only the Pacific cownose ray (*Rhinoptera steindachneri*) and the spotted eagle ray (*Aetobatus narinari*) have a benthopelagic distribution that would potentially result in an interaction with pelagic gear that might occasionally overlap with the geographic distribution of these species. *R. steindachneri* has certainly been recorded in the catches of industrial purse-seine fisheries but the low incidence of interactions (caught in 28 sets over 30 years) indicates that pelagic fisheries do not pose a credible threat to the sustainability of this species. As with other species, there is no formal stock assessment available, and the IUCN classifies this species as "Least Concern". In contrast, *A. narinari*, for which formal assessments are also lacking, is classified as "Endangered" by the IUCN Red List, primarily a result of its high catches in small-scale gillnet fisheries through its range. However, it is important to note that through molecular analyses undertaken in 2019 (Sales et al., 2019) it was confirmed that this species exclusively occurs in the Atlantic ocean and constitutes a mis-identification of the morphologically similar *A. laticeps*. Nonetheless, this species has been recorded on only 10 occasions from smal-scale coastal fisheries in the EPO and therefore is likely to be rarely impacted by EPO tuna fisheries, and consequently, has a lower conservation classification by the IUCN ("Vulnerable") than *A. narinari*.

The remaining 15 species having neritic distributions are considered to have a very low susceptibility to tuna fisheries in the EPO due to their preferred demersal habitats that would likely place them below the maximum effective fishing depth of the gears when deployed across the traditional fishing grounds far from the coast. Although eight of these species are endemic to the EPO, none have a significant number of recorded interactions, are formally assessed and are of significant conservation concern to the IUCN (i.e., "Endangered" or "Critically Endangered") nor are listed in CITES Appendix II. As such, the long-term sustainability of these species is unlikely threatened by tuna fisheries in the EPO.

5. CONCLUSIONS AND RECOMMENDATIONS

Contrary to the 2024 assessment for sharks to facilitate the development of a list of species to come under the purview of the IATTC, the process to develop a similar list for rays was comparatively straightforward. This is due to the clear distinction between species documented as interacting with EPO fisheries as being oceanodromous and occupying epipelagic waters where tuna fishing primarily occurs, or neritic and preferring demersal habitats where the propensity for fishery interactions is significantly reduced.

Given the clear overlap in the habitats fished by tuna fisheries and those of the 6 mobulid species and *P. violacea,* as well the ongoing conservation and management efforts by the IATTC to reduce fishery impacts on mobulids (i.e., Resolution C-15-04), the IATTC staff recommends that:

At a minimum, the 7 ray species in List B of SAC-16-08 be considered as the list of ray species to be under the purview of the IATTC.

This list is precautionary in the sense that all EPO pelagic fisheries (i.e., industrial and small-scale coastal) are included—irrespective of whether or not the IATTC includes in the future other species of rays caught or impacted by small scale coastal fisheries under its purview. This list is also practical in that it is restricted to species that are oceanodromous and epipelagic, or at least spend a reasonable proportion of their time in these habitats where they are susceptible to capture by pelagic fishing gears. Furthermore, List B includes all species, except *D. brevis and H. longus,* developed by independent means through stakeholder engagement such as the list of key species revised by the staff based on input from participants of IATTC's workshop on improvements in data collection and provision in the industrial longline fishery and small purse seine fishery undertaken in 2023 and 2025 (SAC-16 INF-O), and the species listed in the annual memorandum circulated to CPCs by the IATTC Director (Specifications for data provision under resolution C-03-05). However, the staff does not recommend the explicit inclusion of *D. brevis and D. longa*, since these species were present in the latter two lists as they require the inclusion of all *Dasyatis* spp., which is a precautionary reporting request by the IATTC staff to ensure the most commonly caught ray species *P. violacea*—also a dasyatid species—is included as it is often not recorded to species.

Although it is noted that some species in List A that were not included in List B have ecological importance and/or considered under some international instruments as having conservation significance, the staff considers these species to be outside the purview of the IATTC owing to their documented infrequent interactions with tuna fisheries in the EPO over the 30-year assessment period. In most cases, this is due to these species being distributed in neritic waters outside of the main tuna fishing grounds coupled with their occupation of demersal habitats that place them below the effective fishing depth of the gears used to target tuna and tuna-like species. Nonetheless, given that currently there is no international organization in the EPO with the specific responsibility of adopting measures and policies for the conservation of rays (as for instance for sea turtles with IAC and seabirds with ACAP), the staff notes that, due to their ecological importance, collaborative research and data collection efforts are warranted, to the furthest extent possible whenever conducted in a way compatible with the mandate established in the Antigua Convention and without affecting the exercise by the Commission of its functions under that Convention.

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TABLE 1. Data sources and period of coverage for pelagic fisheries data used to develop the list of impacted ray species included in the current assessment for the EPO.

Fishery	Region	Year	Comments and data source
Industrial fisheries			
Longline	IATTC Convention Area	1994–2024	Unpublished data collected in the EPO from logbooks and national observer programs submitted to the IATTC by its CPCs.
Purse-seine (Class 6)	IATTC Convention Area	2019	Unpublished data collected in the EPO by the AIDCP and National observer programs and held by the IATTC.
Purse-seine (Class 1–5)	IATTC Convention Area	2019	Unpublished data collected in the EPO from logbooks, national observer programs and the TUNACONS observer program submitted to the IATTC.
Small scale coastal fisheries			
Multi-gear (longline/gillnet)	Guatemala, El Salvador, Nicaragua, Costa Rica, Panama	2018	Oliveros-Ramos et al. (2020)
Surface-set longline	Ecuador, Panama, Costa Rica	2004–2010	Unpublished IATTC observer data.

TABLE 2. Number of sets where at least one individual ray was recorded for each species in IATTC data sources for each of the seven pelagic fisheries in the eastern Pacific Ocean. Abbreviations are purse seine (PS), Class 6 (C6), Classes 1-5 (C1-5), dolphin sets (DEL), non-associated sets (NOA) and sets on floating objects (OBJ). Species are listed in decreasing total number of observations.

Species	Common name	Industrial longline	PS-C6 (DEL)	PS-C6 (NOA)	PS-C6 (OBJ)	PS-C1-5 (NOA)	PS-C1-5 (OBJ)	Small scale coastal	Total
Pteroplatytrygon violacea	Pelagic stingray	14430	2064	1072	1816	8	14	299	19703
Mobula mobular	Spinetail manta	129	661	580	177	2		6	1555
Mobula thurstoni	Smoothtail manta	13	589	604	179	8	3	4	1400
Mobula tarapacana	Chilean devil ray		313	201	79	3			596
Mobula birostris	Giant manta	70	97	252	69			7	495
Mobula munkiana	Munk's devil ray		145	135	38			9	327
Pseudobatos leucorhynchus	Whitesnout guitarfish							30	30
Rhinoptera steindachneri	Pacific cownose ray		4	20				4	28
Hypanus longus	Longtail stingray				2			11	13
Aetobatus narinari	Spotted eagle ray							10	10
Dasyatis brevis	Whiptail stingray							7	7
Bathyraja violacea	Okhotsk skate	1							1
Styracura pacifica	Pacific whiptail stingray		1						1
Pseudobatos glaucostigma	Speckled guitarfish	1							1
Mobula alfredi	Alfred manta	1							1
Narcine entemedor	Giant electric ray	1							1
Tetronarce tremens	Chilean torpedo				1				1

TABLE 3. Ecological traits and conservation classifications of 17 ray species (listed in alphabetical order) recorded in IATTC databases as interacting with pelagic fisheries in the eastern Pacific Ocean (EPO). Conservation classifications include endemism in the EPO and presence of a species-specific IATTC resolution. Comparison of the 17 species is made with three existing species lists acknowledged by the IATTC: Annex I of Highly Migratory Species in the United Nations Convention on the Law of the Sea (UNCLOS), the annual memorandum circulated to CPCs by the IATTC Director pertaining to specifications for data provision under resolution C-03-05, and the list of key species recommended by staff and participants of IATTC's workshop on improvements in data collection and provision in the industrial longline fishery undertaken in 2025 (SAC-16 INF-O). Warmer colors imply greater relevance to pelagic fisheries and/or higher conservation status than cooler colors.

Family	Species	Geographical distribution	Habitat	Endemic to EPO	Current IATTC Resolution	UNCLOS Annex I	IATTC Memo	IATTC SAC-16 INF-O
Aetobatidae	*Aetobatus narinari*	Neritic	Benthopelagic	No	No	No	No	No
Arhynchobatidae	*Bathyraja violacea*	Neritic	Demersal	No	No	No	No	No
Dasyatidae	*Dasyatis brevis*	Neritic	Demersal	Yes	No	No	Yes	Yes
Dasyatidae	*Hypanus longus*	Neritic	Demersal	Yes	No	No	Yes	Yes
Dasyatidae	*Pteroplatytrygon violacea*	Oceanic	Pelagic	No	No	No	Yes	Yes
Mobulidae	*Mobula alfredi*	Neritic/Oceanic	Pelagic	No	Yes	No	Yes	Yes
Mobulidae	*Mobula birostris*	Neritic/Oceanic	Pelagic	No	Yes	No	Yes	Yes
Mobulidae	*Mobula mobular*	Oceanic	Pelagic	No	Yes	No	Yes	Yes
Mobulidae	*Mobula munkiana*	Oceanic	Pelagic	Yes	Yes	No	Yes	Yes
Mobulidae	*Mobula tarapacana*	Neritic/Oceanic	Pelagic	No	Yes	No	Yes	Yes
Mobulidae	*Mobula thurstoni*	Oceanic	Pelagic	No	Yes	No	Yes	Yes
Narcinidae	*Narcine entemedor*	Neritic	Demersal	Yes	No	No	No	No
Potamotrygonidae	*Styracura pacifica*	Neritic	Demersal	Yes	No	No	No	No
Rhinobatidae	*Pseudobatos glaucostigma*	Neritic	Demersal	Yes	No	No	No	No
Rhinobatidae	*Pseudobatos leucorhynchus*	Neritic	Demersal	Yes	No	No	No	No
Rhinopteridae	*Rhinoptera steindachneri*	Neritic	Benthopelagic	Yes	No	No	No	No
Torpedinidae	*Tetronarce tremens*	Neritic	Demersal	Yes	No	No	No	No

Geographical distribution: Oceanic (primarily distributed in the open ocean), neritic (distributed between the high tide mark to the continental shelf), neritic/oceanic (a primarily neritic species that spends a substantial proportion of its life in the open ocean)
Habitat: Pelagic (living close to the surface of the water), demersal (living close to the substratum), benthopelagic (living between benthic and epipelagic habitats).

TABLE 4. Table showing the composition of ray species that may come under the purview of the IATTC depending on their ecological traits compared to that of Annex I of Highly Migratory Species in the United Nations Convention on the Law of the Sea (UNCLOS), the annual memorandum circulated by the IATTC Director pertaining to specifications for data provision under resolution C-03-05, the list of key species recommended by the staff with input from participants of IATTC's workshop on improvements in data collection and provision in the industrial longline fishery undertaken in 2025 (SAC-16 INF-O).

Family	Species	Common name	List A	List B	UNCLOS Annex I	IATTC Memo	IATTC SAC-16 INF-Q
Aetobatidae	*Aetobatus narinari*	Spotted eagle ray	■				
Arhynchobatidae	*Bathyraja violacea*	Okhotsk skate	■				
Dasyatidae	*Dasyatis brevis*	Whiptail stingray	■			■	■
Dasyatidae	*Hypanus longus*	Longtail stingray	■			■	■
Dasyatidae	*Pteroplatytrygon violacea*	Pelagic stingray	■	■		■	■
Mobulidae	*Mobula alfredi*	Alfred manta	■	■		■	■
Mobulidae	*Mobula birostris*	Giant manta	■	■		■	■
Mobulidae	*Mobula mobular*	Spinetail manta	■	■		■	■
Mobulidae	*Mobula munkiana*	Munk's devil ray	■	■		■	■
Mobulidae	*Mobula tarapacana*	Chilean devil ray	■	■		■	■
Mobulidae	*Mobula thurstoni*	Smoothtail manta	■	■		■	■
Narcinidae	*Narcine entemedor*	Giant electric ray	■				
Potamotrygonidae	*Styracura pacifica*	Pacific whiptail stingray	■				
Rhinobatidae	*Pseudobatos glaucostigma*	Speckled guitarfish	■				
Rhinobatidae	*Pseudobatos leucorhynchus*	Whitesnout guitarfish	■				
Rhinopteridae	*Rhinoptera steindachneri*	Pacific cownose ray	■				
Torpedinidae	*Tetronarce tremens*	Chilean torpedo	■				
		Number of species	17	7	0	9	9