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First record of the pelagic stingray *Pteroplatytrygon violacea* (Bonaparte, 1832) from the Red Sea

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The pelagic stingray, *Pteroplatytrygon violacea* (Bonaparte, 1832), is the only fully pelagic member of the family Dasyatidae and is distributed across tropical and subtropical oceanic habitats worldwide. Despite its occurrence throughout the Indian Ocean and recent documentation in the eastern Mediterranean waters, the species has not previously been recorded from the adjacent Red Sea. Here we report the first confirmed record of *P. violacea* from the Red Sea (Gulf of Aqaba), based on a mature male (visually estimated ~45 cm disc width) incidentally caught by an artisanal fisher from epipelagic habitats within the territorial waters of Jordan (29.486°N, 34.965°E) on 30 May 2025. Identification was made from photographic and video evidence and is supported by a combination of morphological characters diagnostic for the species, including: uniformly dark purplish-brown to blackish coloration on both dorsal and ventral surfaces, a rhomboid disc wider than long with angular pectoral fin apices, a short and broadly rounded snout, and a single median row of small denticles on an otherwise smooth disc. Identification follows systematic exclusion of all dasyatid species currently recorded from the region based on this character combination. This record extends the known distribution of *P. violacea* into the Red Sea, raising important questions about the species' occurrence patterns in the basin and its connectivity with the Indian Ocean or Mediterranean Sea.

KEYWORDS
Batoid, biogeography, elasmobranch, epipelagic, Gulf of Aqaba, Indian Ocean, Myliobatiformes, range extension

1 Introduction

The Red Sea is both a biodiverse and biogeographically distinctive marine environment. Driven by unique biophysical processes, the Red Sea exhibits high levels of endemism and hosts over 1,200 species of fish spanning 164 families (1, 2). Despite concerted efforts to characterize bony fish (Teleost) diversity, contemporary assessments of Red Sea elasmobranch fauna lag considerably behind many other tropical systems (3, 4), especially for batoid species and pelagic environments. This is particularly evident in the Gulf of Aqaba (GoA), a narrow, deep sub-basin of the Red Sea, bordered by Egypt, Israel, Jordan, and Saudi Arabia (5–7), where elasmobranch research has focused almost entirely on sharks (8, 9).

Additionally, the GoA's physical features, such as near-shore bathypelagic depths (maximum ~1,800 m) and dynamic water mixing through the Straits of Tiran, could be linked to important habitats for regional elasmobranch populations, yet remain largely uninvestigated (10). Within this system, the Jordanian coastline in particular, comprising approximately 27 km of the GoA's eastern shore, has received disproportionately little attention in elasmobranch science relative to its neighbouring countries (4, 7, 11).

Elasmobranchs persist as one of the most threatened vertebrate groups globally, with oceanic sharks and rays having declined by an estimated 71% since 1970, driven primarily by overfishing and bycatch mortality (12, 13). Rays are particularly vulnerable to harvest owing to their life history characteristics, including slow growth, late maturity, and low fecundity, which limit their capacity for population recovery (13). In the Red Sea, elasmobranch populations have undergone substantial declines, yet baseline data on species diversity, distribution, and abundance remain severely lacking across much of the basin (14, 15). While regional survey efforts are expanding, contemporary records of new elasmobranch species found in the Red Sea continue to be documented (16–19).

The pelagic stingray, *Pteroplatytrygon violacea* (Bonaparte, 1832), is the sole obligate pelagic member of the family Dasyatidae and one of the most widely distributed elasmobranchs across tropical and subtropical oceans globally (20). Unlike all other dasyatid rays, *P. violacea* inhabits the epipelagic zone of open ocean waters, and is captured worldwide as bycatch in pelagic longline and hook-and-line fisheries (21). Its known distribution spans the Atlantic, Pacific, and Indian Oceans, with records from the Arabian Sea and western Indian Ocean representing the nearest confirmed occurrences to the Red Sea basin (22–24). In recent decades, documented occurrences in the Mediterranean Sea, including from Turkey (25), Egypt (26), Albania (27), and Cyprus (28), demonstrate the species' capacity to occupy high-salinity, semi-enclosed marine systems similar to the Red Sea. Despite this broad distribution, the species has not previously been recorded from the Red Sea or GoA (1).

Here we report the first confirmed record of *P. violacea* from the Red Sea, based on a mature male captured in the northern GoA of Jordan. This record extends the known range of the species into the Red Sea basin and underscores the value of opportunistic records in advancing our understanding of elasmobranch diversity in data-deficient regions.

2 Methods

On 30 May 2025, a single stingray was incidentally captured by a local fisher using hook and line in the northern GoA, Jordanian waters (29.486°N, 34.965°E; Figure 1). Photographic and video records of the specimen were taken at the time of capture and post-landing (Supplementary Material 1). Morphological identification was based on these photographic records, and comparison with the fisher's hands and body proportions was used to visually determine approximate disc width. No voucher material or tissue samples were retained.

Identification was made by comparing observed morphological characters against published descriptions of *P. violacea* and congener species recorded from the Red Sea and adjacent waters (20), in addition to dichotomous keys for the family Dasyatidae (20, 29). The absence of *P. violacea* from the Red Sea was confirmed through the most recent regional checklist and a targeted review of the primary elasmobranch literature (1).

To contextualise the record within the known global distribution of the species, occurrence data were downloaded from the Global Biodiversity Information Facility (30) and the Ocean Biodiversity Information System (31). Records were quality-filtered prior to mapping to remove occurrences lacking coordinate data, those flagged as on-land by OBIS, and those with confirmed coordinate-country mismatches in GBIF, comprising 5,911 and 4,685 clean records respectively. The filtered datasets were supplemented with occurrence localities from published first-record papers not captured in biodiversity databases (22–24, 26, 27, 32). All occurrence data were mapped in QGIS 3.36, where the extent was restricted to the Indian Ocean and Mediterranean Sea to focus on the biogeographically relevant distribution context of the present record.

3 Results

The collected specimen was a mature male, confirmed by the presence of fully developed calcified claspers (Figure 2A). Prior to capture, the animal was observed swimming at the surface in the upper water column.

Distinguishing morphological characteristics identify the captured specimen as *P. violacea* (Table 1). The pectoral disc was rhomboid, disc width exceeding disc length, with angular pectoral fin apices (Figure 2A). The anterior disc margin was uniformly convex and the preorbital snout was short and broadly rounded, projecting only slightly beyond the anterior disc margin when viewed from above (Figure 2A). Dorsal surface colouration was uniformly dark purplish-brown to blackish, without any prominent markings. The ventral surface was similarly dark, appearing slightly paler than the dorsal surface but lacking the pale to white coloration typical of most dasyatid batoids (Figure 2B). A single median row of small, low denticles was present along the vertebral midline of the disc (Figure 2C), with no additional denticle patches or prominent tubercles elsewhere on the disc surface. The eyes were not elevated above the dorsal surface of the head, and were a comparable diameter to that of the spiracle. The tail base was slender with no dorsal caudal fin fold apparent; the caudal spine had been excised prior to photographic documentation.

Formal disc width measurement was not possible, but was visually estimated to be an approximate value of ~ 45 cm, consistent with the mature male status confirmed by clasper development, given published maturity thresholds of ~ 41 cm disc width for male *P. violacea* (33). Additionally, sparse dermal denticles were visible across the broad dorsal disc surface (Figure 2C), a character noted by previous authors as being associated with mature individuals in this species (26).

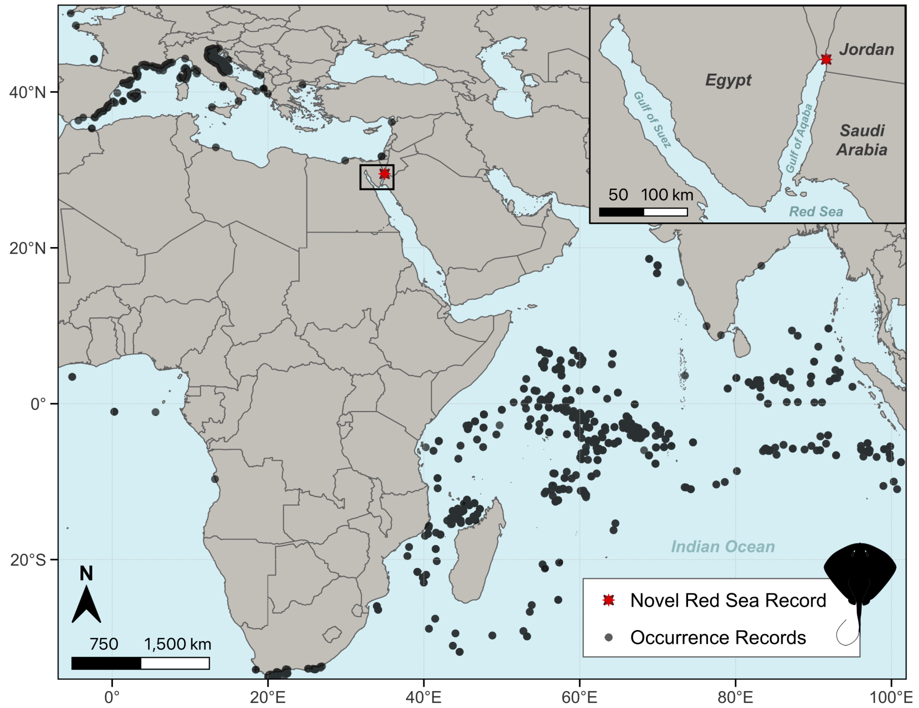

FIGURE 1
Distribution of *Pteroplatytrygon violacea* occurrence records from the Indian Ocean and Mediterranean Sea. Red star denotes the first confirmed record of *P. violacea* from the Red Sea (present study). Source: Silhouette derived from PhyloPic.org, available under CC0 license.

FIGURE 2
Pteroplatytrygon violacea specimen, mature male, Gulf of Aqaba, Jordan, 30 May 2025. **(A)** Dorsal view showing rhomboid-trapezoidal disc, uniformly dark coloration, and developed claspers; **(B)** ventral head showing dark colouration and mouth morphology; **(C)** close-up of midline vertebral denticle row.

4 Discussion

This record constitutes the first documented occurrence of *P. violacea* in the Red Sea (GoA), extending the known range of the species into the basin. As no voucher specimen or tissue samples were retained, the identification rests exclusively on photographic evidence and warrants careful consideration. However, the characters most diagnostic for this species, most critically the uniformly dark ventral surface, are unambiguously visible in the available photographs and collectively exclude all other dasyatid species known from the region without exception (Table 1), such that molecular or voucher confirmation, while desirable, would not alter the morphological conclusion.

The ray necessarily entered the GoA through the Straits of Tiran, the sole marine connection between the GoA and the Red Sea. The more pertinent biogeographic question concerns how the species entered the Red Sea basin itself, for which two routes are plausible: northward passage through the Bab-el-Mandeb Strait up from the Gulf of Aden (Indian Ocean), or southward transit via the Suez Canal from a Mediterranean-Atlantic population. Entry via Bab-el-Mandeb from an established Arabian Sea population appears more parsimonious, consistent with the growing evidence of pelagic megafauna connectivity between the Red Sea and Indian Ocean (34, 35, 47), and supported by confirmed records of *P. violacea* from the Arabian Sea and western Indian Ocean (19–21). The apparent absence of records from the Gulf of Aden and adjacent coastlines of Yemen, Djibouti, and Somalia cannot be interpreted as evidence against this route, given the longstanding research deficiency across this sub-region. Transit of the Suez Canal represents a less likely but still plausible alternative worth considering. While Lessepsian migration (*i.e.*, movement between the Mediterranean and Red Sea) has been documented in demersal stingray species (1, 36), the Suez Canal's shallow depth, narrow width, and reduced salinity present significant barriers to pelagic elasmobranchs, such as *P. violacea*. Both routes remain speculative in the absence of genetic or tracking data, and further records will be required before meaningful conclusions regarding source population or dispersal pathway can be made. Targeted elasmobranch surveys across the northern Red Sea and GoA waters, incorporating systematic pelagic sampling, are clearly warranted to refine regional species diversity and occurrence patterns.

The environmental conditions in the northern GoA at the time of capture are broadly consistent with the known habitat associations of *P. violacea*. Surface temperatures range from ~ 21 °C in winter to 27 °C in summer (10), well within the thermal range of ~13 to 27 °C documented for the species through pop-up satellite archival tag studies (37, 38). The present observation from the end of May coincides with the onset of summer stratification in the GoA, when the thermocline becomes well established within the upper 200 m of the water column (10), conditions broadly analogous to those associated with documented *P. violacea* occurrence in other regions (37, 39). Wind-driven Ekman upwelling along the eastern margin of the Gulf further enhances surface productivity, generating cross-gulf chlorophyll gradients and phytoplankton bloom intensities exceeding those of comparable oligotrophic regions (40); elevated chlorophyll concentrations of 0.2 to 0.35

TABLE 1 Differential diagnosis of *Pteroplatytrygon violacea* (present study) against the dasyatid ray species most likely to be confused with *P. violacea* based on disc morphology and regional co-occurrence (1, 4, 44). Diagnostic characters follow the species descriptions (20). Y, character state consistent with that observed in the examined specimen; N, character state absent or inconsistent with the examined specimen.

Diagnostic character	*Pteroplatytrygon violacea* (present study)	*Himantura uarnak*	*Maculabatis ambigua*	*Pastinachus sephen*	*Pateobatis fai*	*Taeniurops meyeni*	*Urogymnus asperrimus*	*Urogymnus granulatus*
Disc rhomboid; markedly wider than long	Y	Y	Y	Y	N	N	N	N
Anterior disc margin uniformly convex	Y	N	N	N	Y	Y	Y	Y
Pectoral fin apices angular	Y	Y	Y	Y	N	N	N	N
Snout short and broadly rounded; barely projecting beyond disc margin	Y	N	N	N	Y	Y	Y	Y
Dorsal surface uniformly dark; without markings	Y	N	N	Y	N	N	N	N
Ventral surface dark; without pale or white coloration	Y	N	N	N	N	N	N	N

mg/m³ have been identified as a key habitat predictor for *P. violacea* in Pacific-wide distribution modelling (39), suggesting that the productive upwelling environment of the northern GoA may represent genuinely suitable pelagic habitat for the species. However, surface salinity in the GoA consistently ranges between 40.3 and 40.8 PSU year-round (10), substantially above the 33.0 to 34.5 psu range associated with highest occurrence probability in Pacific longline observer data (39). Nevertheless, this apparent physiological constraint is contextualised by the growing number of confirmed records of *P. violacea* from the eastern Mediterranean, where surface salinities regularly reach 38 to 39 psu (41). The expansion of confirmed records across the high-salinity eastern Mediterranean basin suggests that *P. violacea* exhibits broader salinity tolerance and that elevated salinity does not preclude occurrence in the GoA.

To our knowledge, the present record also represents only the fourth documented dasyatid species from Jordanian waters, the eighth from the GoA, and the twelfth from the Red Sea basin, based on the most recent regional checklist (1). Beyond survey deficiency, the relatively low number of dasyatid species documented from Jordanian waters may also reflect genuine ecological constraints on local species richness. Jordan's coastline drops rapidly to considerable depth with minimal shelf extent, offering little of the shallow sandy habitat that supports the majority of benthic dasyatid species in the region (42, 43). The absence of mangrove systems and limited extensive intertidal sandflats along the Jordanian and broader northern GoA coastline further limits available habitat for species such as *Himantura uarnak*, which is characteristically associated with shallow mangrove-adjacent sand flats in the wider Red Sea (44, 45). Sustained fishing pressure represents an additional factor: a historical shift from reef-associated to pelagic target species in Jordanian fisheries is indicative of reef fish depletion (46), and BRUV surveys conducted prior to the establishment of the Aqaba Marine Reserve in 2020 recorded a near-complete absence of large predatory fishes susceptible to fishery-driven declines (43). Elasmobranch diversity in the GoA is demonstrably lower than in the adjacent northern Red Sea, a pattern consistent with sustained fishing pressure across the gulf, including evidence of recruitment overfishing of sharks in Saudi Arabian waters (4, 6). The paucity of dasyatid records from Jordan therefore likely reflects a combination of restricted suitable habitat, sustained fishing pressure, and limited scientific survey effort.

Throughout its range, *P. violacea* is commonly captured and discarded in pelagic fisheries (21). The documentation of *P. violacea* in the Red Sea is significant because it indicates that undocumented and unreported catch of this species likely occurs within a basin where it was previously not known to occur. Dasyatid stingrays generally represent low-value catch in regional Red Sea fisheries (15), and *P. violacea* may be discarded at sea in many cases, reducing the likelihood of detection at landing sites or fish markets. The broader "brown ray" problem, whereby morphologically similar dark-coloured stingray species are collectively misidentified or unreported in fisheries catch records, may have further contributed to the historical absence of *P. violacea* from regional documentation, as the species' distinctive features may not be apparent to non-specialists. Further investigations are warranted to better characterize the extent to which *P. violacea* occurs within the Red Sea and is captured in regional fisheries. Systematic pelagic elasmobranch surveys and observer programmes targeting artisanal and commercial hook-and-line fisheries would significantly advance understanding of the species' occurrence and bycatch rates within the basin. To conclude, the documentation of *P. violacea* as reported in this study marks a contribution to current knowledge of Red Sea ichthyofaunal diversity and enables regional fishery managers to make more informed decisions pertaining to non-target species.

Data availability statement

Publicly available occurrence datasets analysed in this study were sourced from the Global Biodiversity Information Facility (GBIF) (doi: 10.15468/dl.akh6wt) and the Ocean Biodiversity Information System (OBIS) (https://obis.org). All data pertaining to the novel occurrence record are within the manuscript.

Ethics statement

Ethical approval was not required for the study involving animals in accordance with the local legislation and institutional requirements because the authors did not capture or handle any live animals. Individuals appearing in supplementary video and photographic material are co-authors of this manuscript and have provided informed consent for the use of their likeness in this publication.

Author contributions

AM: Visualization, Investigation, Writing – review & editing, Conceptualization, Writing – original draft. AS: Investigation, Validation, Resources, Writing – review & editing. CW: Investigation, Writing – review & editing, Validation. MS: Writing – review & editing, Investigation. CC: Resources, Validation, Writing – review & editing, Investigation.

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Conflict of interest

The authors declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frish.2026.1912042/full#supplementary-material

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