

Note on some Batoid fishes (Elasmobranchii: Rhinidae, Rhynchobatidae, Rhinobatidae, Glaucostegidae and Dasyatidae) from the southeastern Arabian Sea

G. B. Purushottama^{1*}, Sujitha Thomas¹, K. M. Rajesh¹, G. D. Nataraja¹, C. G. Ulvekar¹, Shoba Joe Kizhakudan², Prathibha Rohit¹ and P. U. Zacharia³

¹Mangalore Regional Centre of ICAR-Central Marine Fisheries Research Institute, Mangaluru-575 001, Karnataka

²Madras Regional Station of ICAR-Central Marine Fisheries Research Institute, Chennai-600 028, Tamil Nadu

³ICAR-Central Marine Fisheries Research Institute, Kochi-682 018, Kerala

*Email: puru44@gmail.com

Abstract

Batoid fishes representing families Rhinidae, Rhinobatidae, Glaucostegidae (Order: Rhinopristiformes) and Dasyatidae (Myliobatiformes), with limited information available from southeastern Arabian Sea off Karnataka coast are described. The distribution of five Rhino rays viz., *Rhynchobatus australiae*, *Rhynchobatus laevis*, *Rhinobatos punctifer*, *Glaucostegus granulatus*, *Rhinobatos lionotus* and twelve sting rays such as *Himantura leoparda*, *Himantura undulata*, *Himantura tutul*, *Maculabatis arabica*, *Neotrygon indica*, *Pastinachus ater*, *Pastinachus gracilicaudus*, *Pteroplatytrygon violacea*, *Pateobatis fai*, *Pateobatis bleekeri*, *Taeniurops meyeri* and *Urogymnus asperrimus* is reported. Further, based on spotting patterns recorded on dorsal surface and contour of ocellae, five morphotypes of *Himantura leoparda*, and two of *Himantura tutul* are illustrated. Observations on six species (*Rhinobatos punctifer*, *Rhinobatos lionotus*, *Himantura undulata*, *Himantura tutul*, *Neotrygon indica* and *Pastinachus gracilicaudus*) is given.

Key words: Batoid fishes, Wedgefish, Guitarfish, Stingrays, Arabian Sea, India

Introduction

Chondrichthyes, which includes batoids (648), sharks (511) and chimaeras (49), represent c. 3.5% of the modern fish fauna across the globe (Weigmann, 2016). Elasmobranchs are characterized by a life-history of long life span, slow growth, late maturity and low fecundity, making them highly vulnerable in the marine ecosystem. Dulvy *et al.*, 2014 reported that of 1041 species of global elasmobranchs assessed, ~17% of shark and ray species remain listed as Critically Endangered, Endangered and Vulnerable, 13% as Near Threatened, 47% as Data Deficient and 23% as Least Concern categories of the IUCN's Red List of Threatened Species. In Karnataka, elasmobranchs

are mostly landed as incidental or as by-catch in multiday trawlers, tuna long liners, seines and gillnetters. Fishing in the rocky patches of seamount areas off Karnataka coast has resulted in landings of many lesser-known fishes in the region. These seamount areas vary in size and occur from 43 to 2300 m depth. The operational range of fishing along Karnataka coast in the seamount area is 43-200 m. The use of novel fishing methods with large meshed knotted monofilament gillnets and hooks & lines deployed from mechanized trawlers in recent years in these rocky patches and reefs along Karnataka coast resulted in landings of several rare and poorly known species (Rohit *et al.*, 2021). The present study describes some of the batoid species which were, hitherto, poorly known from the southeastern

Arabian Sea off Karnataka, and which were recorded on various occasions during 2019–2021 period.

Methodology

Samples were collected from landings of trawl net, hook & line, tuna longlines, seine and gill nets at Mangaluru (12° 51' 10.8" N, 74° 49' 58.8" E) and Malpe (13° 20' 49.2" N, 74° 42' 3.6" E) fisheries harbours in Karnataka, during 2019–2021. Weekly samplings undertaken at Mangaluru and Malpe Fisheries Harbours, between 05:00 and 10:00 Indian Standard Time (UTC+5.30). All specimens were identified following Last *et al.* (2016) and Kizhakudan *et al.* (2018). Morphological measurements (disc width (DW) for batoids and total length (TL) (for Wedgefish & Guitarfish) were taken to the nearest mm, and sex and maturity stages were recorded.

Species composition

Poorly known batoids of seventeen described species, representing four families and eleven genera were examined. Details of species composition, and male and female size ranges are presented in Table 1. Overall, the most abundant species in landings by number were *Pteroplatytrygon violacea* (24%) followed by *Neotrygon indica* (~18%), *Maculabatis arabica* & *Pateobatis bleekeri* (10.2% each), *Pateobatis fai* (~9.0%) and *Rhynchobatus australiae* & *Urogymnus asperrimus* (6.2% each), comprising 82% of specimens recorded. The remaining species each accounted between 0.9% and 2.7% (Fig. 1).

Rhynchobatus australiae (Bottlenose wedgefish) (Fig. 2A)

Five males (94.2–140 cm TL) and two females (119.5–178 cm TL) of Bottlenose wedgefish, *R. australiae* were recorded at Malpe Fisheries Harbour, Karnataka, India *R.*

australiae is large sized wedgefish with bottle-shaped snout and attains 300 cm TL. *The IUCN Red List of Threatened Species* assessed the species as Critically Endangered (CR).

Rhynchobatus laevis (Smoothnose wedgefish) (Fig. 2B)

A female specimen of *Rhynchobatus laevis* of 270 cm TL was recorded at the Mangaluru Fisheries Harbour. The specimen was landed by trawl net, operating over sandy bottom in <35 m water depth. *Rhynchobatus laevis* is clearly identifiable based on the prominent black spot on each pectoral fin surrounded by 4–5 white spots (Fig. 3), spiracle with two skin folds, outer slightly larger than inner, pre-dorsal spot pattern not reaching to midline between pectoral marking and attains 300 cm TL. *The IUCN Red List of Threatened Species* assessed the species as Critically Endangered (CR).

Rhinobatos punctifer (Spotted guitarfish) (Fig. 2C)

The spotted guitarfish was recorded for the first time from Mangaluru and Malpe Fisheries Harbours, with observation of two males (69.0–71.0 cm TL) and two females (91–108 cm TL). The maximum size reported in the literature was 90.0 cm TL. The present study recorded the maximum length of 108 cm TL. *The IUCN Red List of Threatened Species* assessed the species as Near Threatened (NT).

Rhinobatos lionotus (Smoothback guitarfish) (Fig. 2D)

A female Smoothback Guitarfish, *Rhinobatos lionotus* of 105 cm TL was recorded at the Malpe Fisheries Harbour. The maximum size reported in the literature was 85.0 cm TL while the present study recorded 108 cm TL. Previously, the Smoothback guitarfish distribution was reported from the Bay of Bengal, east coast of India. The specimen reported here has

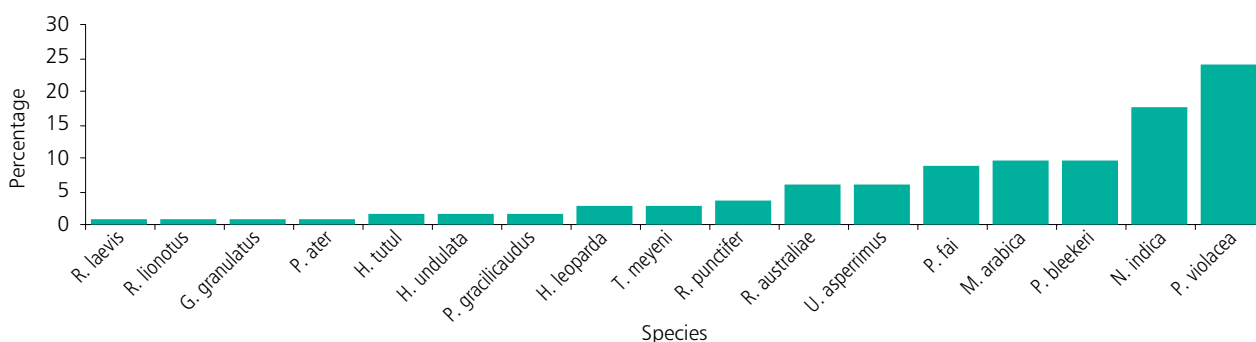


Fig. 1. Species abundance of batoids landed off Karnataka Coast, India.

Table 1. Summary of batoids recorded in Mangaluru and Malpe fish landing centres, Karnataka, India in 2019-2021. Size measurements are total length (TL) for wedgefish & guitarfish, and disc width (DW) for non-guitarfish batoids. 'n/a' denotes that calculations were 'not applicable' due to low sample sizes.

| Order | Family | Species Identity | Common name | Size range (cm) (Mean+SD) | Depth distribution | Remarks |
|-------------------|------------------------------------|--|------------------------------|--|---|---|
| Rhinopristiformes | Wedgefishes Family: Rhinidae | <i>Rhynchobatus australiae</i> Whitley, 1939 | Bottlenose wedgefish | 94.2 –140 (119+22.0) (♂), 119.5 –178 (♀) n/a | coastal inshore to a depth of 60 m or more (Last <i>et al.</i> , 2016) | Found in the Western Indian Ocean (WIO) off Karnataka, India. It was caught at 10-40 m depth in Multiday trawler. |
| | | <i>Rhynchobatus laevis</i> (Bloch & Schneider, 1801) | Smoothnose wedgefish | 270 (♂), n/a | 0–60 m (Weigmann, 2016), 2-50 m Purushottama <i>et al.</i> , 2020 | Found in the WIO off Karnataka, India for the first time in our observation and caught at 35 m depth in Multiday trawler. |
| | | <i>Rhinobatos punctifer</i> Compagno & Randall, 1987 | Spotted guitarfish | 69 –71 (♂) n/a, 91–108 (♀) n/a | Demersal inshore on continental shelf to 70 m depth (Last <i>et al.</i> , 2016) | Observed for the first time in the WIO off Karnataka, India. Till now the distribution range was not included from the Arabian Sea in any literature. It was caught at 20-25 m depth in trawler. |
| | | <i>Rhinobatos lionotus</i> Norman, 192 | Smoothback guitarfish | 105 (♀) n/a | Demersal inshore on the continental shelf to at least 70 m (Last <i>et al.</i> , 2016) | Found in the Eastern Indian Ocean (EIO) (Bay of Bengal) in east coast of India, it was observed in Arabian Sea for the first time. It was caught in near shore area of sandy bottom at 10-20 m depth by using the single day trawler. |
| | | <i>Glaucostegus granulatus</i> (Cuvier, 1829) | Sharpnose guitarfish | 107 (♀) n/a | Coastal to mid-continental shelf, to at least 120 m depth (Last <i>et al.</i> , 2016) | Although the species was distributed in the EIO and the WIO, it was collected for the first time in Karnataka, India. It was caught in gillnet, which was operated at 30-35 m depth in rocky area in eastern Arabian Sea. |
| Myliobatiformes | | <i>Himantura leoparda</i> Manjaji-Matsumoto & Last, 2008 | Leopard whipray | 126 (♂) n/a, 161.2 – 170 (♀) n/a | Demersal inshore on continental and insular shelves, on soft substrates to at least 70 m depth (Last <i>et al.</i> , 2016). | Out of four species complex, it is reported in the WIO off Karnataka, India for the first time. It was caught in Multiday trawler at 15-35 m depth. |
| | | <i>Himantura tutul</i> Borsa, Durand, Shen, Alyza, Solihin & Berrebi, 2013 | Fine-spotted leopard whipray | 124 (♂) n/a, 120 (♀) n/a | — | First time found in the WIO off Karnataka, India in trawler at >25 m depth and in ring seine (12 m). |
| | | <i>Himantura undulata</i> (Bleeker, 1852) | Honeycomb whipray | 121 (♂) n/a, 146 (♀) n/a | — | Found in the WIO Off Karnataka, India. Now, the latitudinal distribution range extended from east coast to west coast of India. It was caught in the multiday trawler from the depth of 40-50 m. |
| | | <i>Maculabatis arabica</i> Manjaji-Matsumoto & Last, 2016 | Arabic whipray | 17.5 –53.0 (47.0+17.0 cm DW) (♂), 54.3–70.0 (61.0+8.0 cm DW) (♀) | 15 – 29 m (Last <i>et al.</i> , 2016) | Found in the WIO Off Karnataka, India. It was caught in the multiday trawler and gillnet at 0-30 m depth. |
| | | <i>Neotrygon indica</i> Pavan-Kumar, Kumar, Pitale, Shen & Borsa, 2018 | Blue-spotted stingray | 17.5 – 53 (29.0+8.0 cm DW) (♂), 22 –32.0 (28.0+4.0 cm DW) (♀) | 0 – 170 m (Weigmann, 2011) | Earlier <i>Neotrygon kuhlii</i> , Pavankumar <i>et al.</i> , 2018 described the new species as <i>Neotrygon indica</i> from Bay of Bengal. Now, the latitudinal distribution range extended to Arabian Sea. |

| Order | Family | Species Identity | Common name | Size range (cm) (Mean+SD) | Depth distribution | Remarks |
|-------|--------|---|-------------------|--|--|---|
| | | <i>Pastinachus ater</i> (Macleay, 1883) | Broad cowtail ray | 70 (♂) n/a | Demersal on continental and insular shelves (Last <i>et al.</i> , 2016) | Found in the EIO and the WIO, off Karnataka, India. It was caught in single day trawler at 20-25 m depth. |
| | | <i>Pastinachus gracilicaudus</i> Last & Manjaji-Matsumoto, 2010 | Narrowtail ray | 38.5– 70.0 (♂) n/a, 54.3 (♀) n/a | Demersal inshore on continental insular shelves (Last <i>et al.</i> , 2016) | The distribution range from EIO and WIO was unknown. Now, it was caught in gillnet and single day trawlers off Karnataka, India at 0-25 m depth. |
| | | <i>Pteroplatytrygon violacea</i> (Bonaparte, 1832) | Pelagic stingray | 41.0–63.5 (48.0+7.0) (♂), 32.0– 77.0 (♀) n/a | 1 – 381 (Mundy, 2005) | Earlier this species was reported from Arabian Sea (6°-22° N), Bay of Bengal (10-19° N) and Andaman and Nicobar waters (5°-14° N)(Somavanshi <i>et al.</i> , 2009, Purushottama <i>et al.</i> , 2018). It was caught in deep sea multiday trawlers at 50 m depth off Karnataka, India in Arabian Sea. |
| | | <i>Pateobatis fai</i> (Jordan & Seale, 1906) | Pink whipray | 86.5–115 (♂) n/a, 72.0 – 136 (92.0+21.0) (♀) | Nearshore to at least 70 m depths (Last <i>et al.</i> , 2016), 0-200 m (Fricke <i>et al.</i> , 2011) | The distribution range from EIO (Bay of Bengal) and the WIO off Karnataka, Goa and Maharashtra is confirmed from the present study. It was caught in multiday trawler, gillnets at 70-100 m depth. |
| | | <i>Pateobatis bleekeri</i> (Blyth, 1860) | Bleeker's whipray | 41.2–88.0 (63.0+17.0) (♂), 18.0–89.0 (60.0+28.0) (♀) | depths of at least 40 m (Last <i>et al.</i> , 2016) | The present study recorded the species off Karnataka, India at 40-70 m depth in trawler and gillnet. |
| | | <i>Taeniurops meyeri</i> (Müller & Henle, 1841) | Blotched stingray | 41.0 (♂) n/a , 41.0–148.5 (♀) n/a, | Mainly inshore but reported from more than 400 m depth (Last <i>et al.</i> , 2016) | Although the distribution is confirmed in the EIO and WIO, this species was landed for the first time in Karnataka, India. It was caught in multiday trawler at 100-200 m depth. |
| | | <i>Urogymnus asperimus</i> (Bloch & Schneider, 1801) | Porcupine whipray | 94-116 (♂)n/a, 84-95 (♀) n/a | 15 – 217 m (Fricke <i>et al.</i> , 2011) | Even though found in the EIO and the WIO fishing areas. The species was caught from sandy and rocky areas of 15-100 m depth in ring seine and gillnet in Karnataka. |

indicated occurrence of this species in the Arabian Sea on west coast of India as well. *The IUCN Red List of Threatened Species* assessed the species as Data Deficient (DD).

Glaucostegus granulatus (Sharpnose guitarfish) (Fig. 2E)

Granulated/Sharpnose Guitarfish, *Glaucostegus granulatus* female of 107 cm TL was recorded at the Mangaluru Fisheries Harbour. The specimen was landed by gillnet, which operated between 30 and 35 m depth in rocky area in the eastern Arabian Sea. The maximum size reported for the species globally was 229–230 cm TL. However, the maximum size of 250.5 cm TL was observed in West Bengal, east coast of India (Swatipriyanka Sen, *Pers.*

comm.). Also, the occurrence indicates the presence of this species along west coast of India.

Himantura leoparda (Leopard whiprays) (Fig. 2F a, b, c, d & e).

Himantura uarnak species complex comprised of at least four species: *H. uarnak*, *H. undulata*, *H. tutul*, and *H. leoparda*. A male of 126 cm DW and two females of 161.2–170 cm DW were recorded from Malpe Fisheries Harbour. The specimens were caught in gillnets and trawlers, at a depth range of 15- 35 m. The maximum size reported globally was 140 cm DW but in the present study sizes up to 170 cm DW was recorded. Distribution is currently confirmed only from the Arabian Sea, west

coast of India. *H. leoparda* is a large and uncommon whipray species of conservation concern and *The IUCN Red List of Threatened Species* assessed the species as Vulnerable (VU).

Himantura tutul (Fine-spotted leopard whipray) (Fig. 2Ga & b)

Male and female specimens in length range of 120-124 cm DW were landed by trawlers, ring seine and gillnetters operating at depth range of 12-25 m. The Malay word 'tutul' means 'spotted', referring to leopard-like markings on the dorsal surface of large specimens. The maximum size reported globally was 115 cm DW and the present reported specimen had size of 124 cm DW. Distribution is currently confirmed only from the Arabian Sea, west coast of India. *The IUCN Red List of Threatened Species* assessed the species as Not Evaluated (NE).

Himantura undulata (Honeycomb whipray) (Fig. 2H)

Male and female specimens measuring 121 cm DW and 146 cm DW were landed at Mangaluru Fisheries Harbour by trawlers operating at depth range of 40-50 m. The maximum size reported globally was 150 cm DW. The present observation confirmed the distribution in the Arabian Sea. *The IUCN Red List of Threatened Species* assessed the species as Endangered (EN).

Maculabatis arabica (Arabic whipray) (Fig. 2Ia)

Seven males [21.0 –68 cm DW (47.0+17.0 cm DW)] and three females (54.3–70.0 cm DW (61.0+8.0 cm DW)) were recorded at Malpe Fisheries Harbour. Further, juvenile of *M. arabica* was landed in cast nets (having 13.0 mm mesh size and measuring 5.0 m length and 17.0 m circumference). Characteristic whip-like tail, without skin folds and banded in young ones (Fig. 2Ib) was recorded. The maximum size reported globally was 61.0 cm DW. The present study confirmed the distribution of the species from the Arabian Sea, south-west coast of India. *The IUCN Red List of Threatened Species* assessed the species as Critically Endangered (CR).

Neotrygon indica (Indian Ocean blue-spotted maskray) (Fig. 2J)

Thirteen males [17.5 –53.0 cm DW (29.0+8.0 cm DW)] and seven females (23.0–32.0 cm DW (28.0+4.0 cm

DW)] were recorded at Malpe Fisheries Harbour. The depth of operation was around 120-150 m in the north-west coast direction in the Arabian Sea. Specimens ≥ 30 cm DW were observed to be mature. Earlier, the same species was referred as "*Neotrygon kuhlii*". However, it is currently known as *Neotrygon indica* after confirmation by molecular taxonomy (Pawan-Kumar *et al.*, 2018). *The IUCN Red List of Threatened Species* assessed the species as Not Evaluated (NE).

Pastinachus ater (Broad cowtail ray) (Fig. 2K)

A male measuring 70 cm DW was recorded at the Malpe Fisheries Harbour. The specimen was landed by the trawl net, which was operated at 20- 25 m depth, in sandy bottom. The maximum size reported globally was 200 cm DW. The present study confirms the distribution from the Arabian Sea, south-west coast of India. *The IUCN Red List of Threatened Species* assessed the species as Vulnerable (VU).

Pastinachus gracilicaudus (Narrowtail stingray) (Fig. 2L)

Two specimens a males and a female measuring 38.5-70 cm DW and 54.3 cm DW, respectively, were recorded at both landing center. These specimens were landed by trawl nets and gillnets operated at <25 m depth. *The IUCN Red List of Threatened Species* assessed the species as Endangered (EN).

Pteroplatytrygon violacea (Pelagic stingray) (Fig. 2M)

Eight males [41.0 –63.5 cm DW (48.0+7.0 cm DW)] and nineteen females (32.0–68.0 cm DW (50.0+11.0 cm DW)) were observed in the landings. These specimens were landed by the trawl nets, which operated between 100-150 m depth. The maximum size reported globally was 80 cm DW. The occurrence of pelagic stingrays has been previously reported from Arabian Sea (6°-22° N), Bay of Bengal (10°-19° N), Andaman and Nicobar waters (5°-14° N) and Maharashtra in India. *The IUCN Red List of Threatened Species* assessed the species as Least Concern (LC).

Pateobatis fai (Pink whipray) (Fig. 2N)

Three males (86.5 –115 cm DW) and seven females (22.0–136.0 cm DW (92.0+21.0 cm DW)) were recorded during the period. These specimens were caught in the trawl net, which operated at 100-150 m depth. The



2A. *Rhynchobatus australiae*



2B. *Rhynchobatus laevis*



2C. *Rhinobatos punctifer*



2D. *Rhinobatos lionotus*



2E. *Glaucostegus granulatus*



2Fa. *Himantura leoparda*



2Fb. *Himantura leoparda*



2Fc. *Himantura leoparda*



2Fd. *Himantura leoparda*



2Fe. *Himantura leoparda*



2Ga. *Himantura tutul*



2Gb. *Himantura tutul*



2H. *Himantura undulata*



2Ia. *Maculabatis arabica*



2Ib. *Maculabatis arabica* (juvenile)



2J. *Neotrygon indica*



2K. *Pastinachus ater*



2L. *Pastinachus gracilicaudus*



2M. *Pteroplatytrygon violacea*



2N. *Pateobatis fai*



2O. *Pateobatis bleekeri*



2P. *Taeniurops meyeri*



2Q. *Urogymnus asperrimus*

Fig. 2, The sampled species pictures of batoid fishes in eastern Arabian Sea. (A) *Rhynchobatus australiae*, (B) *Rhynchobatus laevis*, (C) *Rhinobatos punctifer*, (D) *Rhinobatos lionotus*, (E) *Glaucostegus granulatus*, (F: a, b, c, d & e) *Himantura leoparda*, (Ga & b) *Himantura tutul*, (H) *Himantura undulata*, (Ia & b) *Maculabatis arabica*, (J) *Neotrygon indica*, (K) *Pastinachus ater*, (L) *Pastinachus gracilicaudus*, (M) *Pteroplatytrygon violacea*, (N) *Pateobatis fai*, (O) *Pateobatis bleekeri*, (P) *Taeniurops meyeri* and (Q) *Urogymnus asperrimus*.



Fig. 3. Pectoral spot forms in *Rhynchobatus laevis*. A) Juvenile, B) Adult.

maximum size reported globally was 146 cm DW. *The IUCN Red List of Threatened Species* assessed the species as Vulnerable (VU).

Pateobatis bleekeri (Bleeker's whipray) (Fig. 2O)

Five males [41.2 –88.0 cm DW (63.0+17.0 cm DW)] and six females [18.0 –89.0 cm DW (60.0+28.0 cm DW)] were recorded during the period from trawlers and gillnetters operating at depth range of 40-70 m. The maximum size reported globally was 119 cm DW. *The IUCN Red List of Threatened Species* assessed the species as Endangered (EN).

Taeniurops meyeri (Round ribbontail ray) (Fig. 2P)

A single male measuring 41.0 cm DW and two females (41.0 cm DW & 148.5 cm DW) were observed in the landing centers. These specimens were landed by trawl nets operated between 100-200 m depth. The maximum size reported globally was 180 cm DW. *The IUCN Red List of Threatened Species* assessed the species as Vulnerable (VU).

Urogymnus asperimus (Porcupine whipray) (Fig. 2Q)

Three males (94-116 cm DW) and four females (84-95 cm DW) were recorded at Malpe. These specimens were caught off the north west side of the St. Mary's Island using seine or encircling nets operated between 15-20 meters depths at a distance of ~20-25 km from the coast and in other occasion these were caught in the gillnet, which were operated at <100 m depth (sea mount areas). This species is rarely landed in Karnataka and local fishermen have informed that this species strays into estuarine

waters occasionally. The maximum size reported globally was 115 cm DW but our investigation has reported a DW of 116 cm. This is protected under the Indian wildlife (Protection) Act, 1972. *The IUCN Red List of Threatened Species* assessed the species as Vulnerable (VU).

The present study describes the occurrence of many batoid species with scanty reports/publications during a literature review from the region. The species were identified using classical taxonomy relying on morphometrics. However, molecular taxonomy has been initiated to elucidate the ambiguities among the cryptic species. The reason for the sudden emergence in these species in considerable quantity could be due to the changes in the fishing pattern involving monofilament nets which are operated in almost all the rocky regions including the seamount areas which were otherwise not exploited by the regular trawlers.

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