



Fifteen new records of Batoids (Elasmobranchii) from waters off Andaman and Nicobar Islands, India

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Original Article

Abstract

Marine waters of Andaman and Nicobar Islands, India in the tropical Indian Ocean, is a poorly explored high faunal diverse region. The present study documents new records of batoids from the region, identified during the fishery and diversity monitoring surveys conducted during November 2016 to June 2019 at different fish landing centers of Andaman and Nicobar Islands. Fifteen elasmobranch species including 2 wedgefishes, 1 skate and 12 rays were identified and confirmed as new reports for the region. Results of this study indicate that the elasmobranch diversity, especially batoid diversity of Andaman and Nicobar Islands are poorly documented and future systematic surveys including that of deeper reef habitat may help to explore the diversity in the region.

Keywords: *Batoids, new records, bycatch, Andaman Nicobar Islands, India, Eastern Indian Ocean, Elasmobranchs*

Introduction

The Andaman and Nicobar group of Islands, India consists of 572 islands, islets and rocky outcrops located between 14°N and 6.5°N latitude in the south-eastern part of the Bay of Bengal in the northern Indian Ocean, occupying an area of 47,000 sq. km. The islands are fragmented by straits and channels of varying widths and depths. (www.andaman.gov.in)

In India, elasmobranchs are landed as target or bycatch in commercial, artisanal and recreational fishing activities. For several years, India has been designated as a major elasmobranch fishing nation (Kizhakudan *et al.*, 2015). However, the catch data reported by national marine fisheries monitoring agency ICAR-CMFRI in the last few decades does not include much information on the fisheries/diversity of elasmobranchs from the Andaman & Nicobar Islands, after the closure of the CMFRI station in Andaman. The distance from mainland India (~1370 km), lack of dedicated surveys and presence of targeted fishery for elasmobranchs make the Andaman and Nicobar Islands a must-study region for elasmobranch fishery and diversity.

The recent marine fish faunal studies from the Islands (Kumar *et al.*, 2015, 2016, 2018; Pradeep *et al.*, 2016, 2017, 2018; Vinu *et al.*, 2017; Shirke *et al.*, 2017; Tyabji *et al.*, 2018)

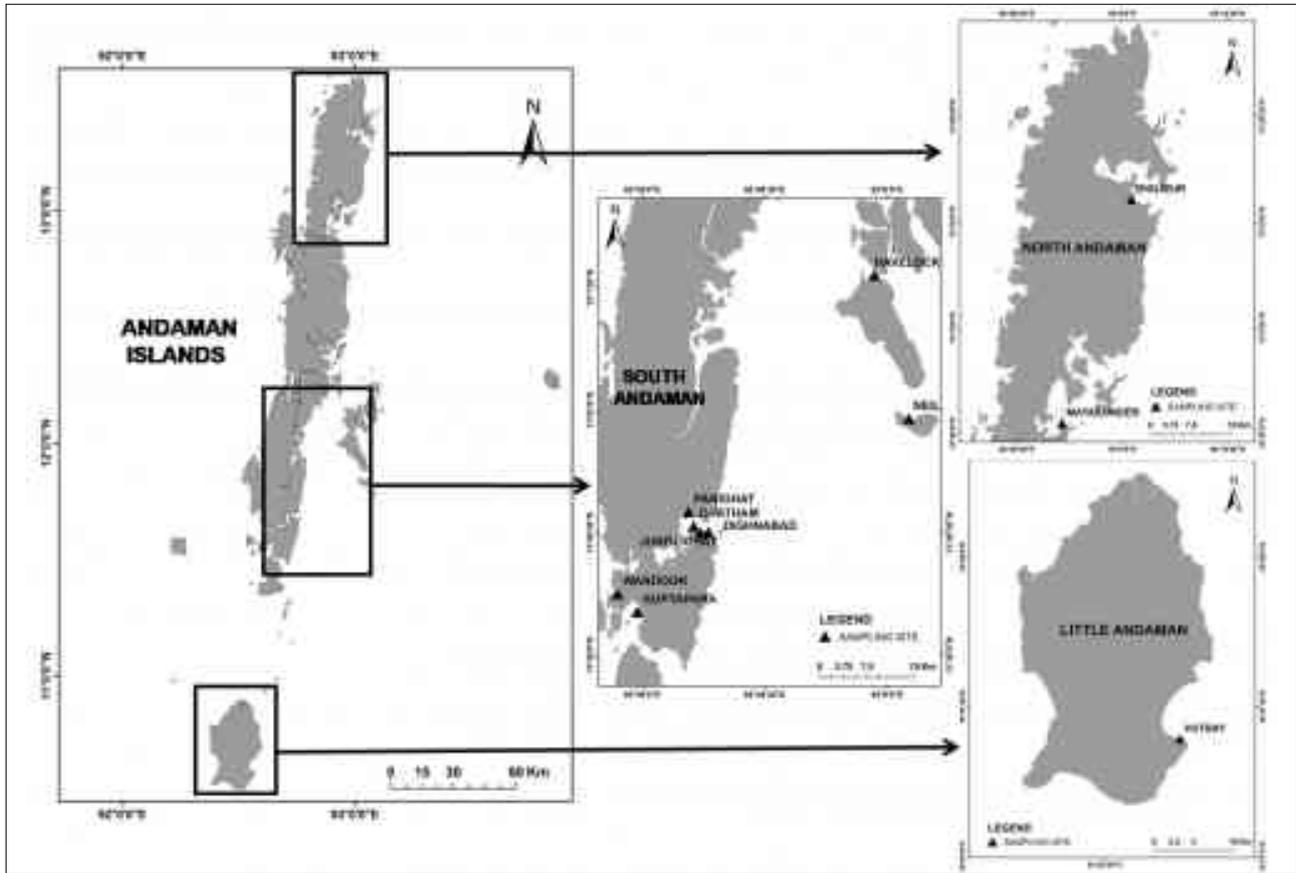


Fig. 1. Map showing the collection/observation locality

recorded higher diversity in the landings and exploratory surveys. These studies will support future fisheries management in the Islands and improve India's compliance to Convention of Biodiversity (CBD) in documenting its fauna. The present study was undertaken as a focused study on elasmobranch diversity from the region, and several species of batoids were identified as new distributional records. The diagnostic characteristics of these species are presented along with their photographs.

Material and methods

Weekly landing center/market surveys were conducted in Andaman and Nicobar Islands from November 2016 to June 2019 (Fig. 1). Samples collected and photographed during the exploratory survey of FORV *Sagar Sampada* in the waters off AN Islands, India (cruise no: 334) are also included in the present study. Species identification was carried out based on Last *et al.* (2016).

Results and discussion

During the present survey, 15 species of batoids were recorded which have not been previously reported from the Andaman and Nicobar Islands.

Systematics

Order: Rhinopristiformes

Family: Rhinidae

Rhynchobatus australiae Whitley, 1939

Bottlenose wedgefish (Fig. 2A)

Observation/materials: A single male specimen about 165 cm total length was caught as bycatch by motorized boat operated off North Sentinel Islands at 50 to 100 m depth and landed at Junglighat fish landing center, Port Blair on 9th January 2019. The specimen is not retained.

Diagnosis: *R. australiae* can be differentiated from other wedgefish species by its bottle-shaped snout, small thorns on the back and around the eyes. Dorsal surface pale grey and sparse white spots, pectoral region hind margin surrounded by multiple small white spots, three in a line above black spot. First dorsal fin origin slightly behind the pelvic fin origin, the first dorsal fin is larger than the second dorsal fin (Last *et al.*, 2016).

Remarks: Previously a single species *Rhynchobatus djiddensis* (Forskål, 1775) was listed by Rao, 2003 from Andaman waters,

which is questionable. The present study confirms the occurrence of *R. australiae* in Andaman waters and are occasionally landed as bycatch. At present quantitative abundance data is not available for *R. australiae* or any other batoids from this region, which is traded and consumed locally. The IUCN Red List of Threatened Species lists the status of *R. australiae* as Critically Endangered due to population declines and fishing pressure in the known range (Kyne *et al.*, 2019).

Order: Rhinopristiformes

Family: Glaucostegidae

Glaucostegus typus (Anonymous [Bennett], 1830)

Giant shovelnose ray (Fig. 2B)

Observation/materials: A single mature male specimen *G. typus* measuring 195 cm total length was caught in motorized boat and landed at Junglighat fish landing center on 28th December 2017. The specimen is not retained.

Diagnosis: *G. typus* is a large batoid with a flattened, spade to wedge-shaped disc. Pelvic fins situated laterally posterior to disc. First dorsal fin and second dorsal fin separated and almost equal sized, first dorsal fin situated far behind tip of the pelvic fin. Dorsal profile uniformly yellowish to greyish brown; snout region is whitish or translucent (Last *et al.*, 2016).

Remarks: Previously, two species under the genus *Glaucostegus* i.e. *Glaucostegus granulatus* (Cuvier, 1829) and *Glaucostegus thouin* (Anonymous [Lacepède], 1798) were reported by Rao (2003) and Rajan *et al.* (2013) from Andaman and Nicobar Islands. The current observation confirmed the occurrence of *G. typus* in the region. Giant guitarfishes are caught occasionally as bycatch of artisanal GN/HL and trawl fisheries in Andaman. The IUCN Red List of Threatened Species lists the status of *G. typus* as Critically Endangered (Kyne *et al.*, 2019).

Order: Rajiformes

Family: Rajidae

Orbiraja cf. powelli (Alcock, 1898)

Indian ring Skate (Fig. 2C)

Observation/materials: Retained a female specimen (44.5 cm TL) was caught as bycatch in a deep-sea shrimp trawl and landed at Junglighat fish landing center.

Diagnosis: *O. cf. powelli* is a medium sized skate with a rhombic disc, moderately elongated snout with firm rostral cartilage. Eyes small with incomplete rosette of orbital thorns. Dorsal profile is brown with two large pectoral ocelli prominent on the dorsal surface.

Remarks: Detailed examination and molecular analysis of

O. cf. powelli is under progress for further clarification on its taxonomic status based on the specimen collected. The color pattern and some morphometric features show clear variation from the materials identified as *O. powelli* collected from off Tuticorin, Tamil Nadu (Bineesh *et al.*, 2016).

Order: Myliobatiformes

Family: Hexatrygonidae

Hexatrygon bickelli Heemstra & Smith, 1980

Sixgill stingray (Fig. 2D)

Observation/materials: A single female specimen (68 cm TL) of Sixgill stingray, *H. bickelli* was caught during an exploratory survey by FORV *Sagar Sampada* from Nicobar Islands (Cruise 334, leg II; Image by Sumod K.S.)

Diagnosis: *H. bickelli* is a rare deepwater stingray characterized by triangular shaped long snout with broad base, entire body smooth, lack of denticles, flabby heart shaped disc, short tail, 1-2 caudal stings and small pelvic fins. Disc deeply concave behind eyes, apex broadly rounded and posteriorly convex. Six pair of gill slits situated on the ventral region of the head. Eyes widely separated. Dorsal profile of disc pale pinkish to reddish in color, posteriorly slight dark, snout whitish or translucent, ventrally white (Last *et al.*, 2016).

Remarks: Several species have been described under the family based on the relative snout length and shape, however, currently all were considered as synonyms of *H. bickelli*. So far, single species under this family is known to be valid and distributed in Indo-Pacific, South Africa to Hawaii at depth ranges from 360-1120 m. Previous literature does not include the report of *H. bickelli* from Andaman and Nicobar waters. However, the current observation confirmed its presence in the region. The IUCN Red List of Threatened Species lists the status of *H. bickelli* as Least Concern (Mc Cormack *et al.*, 2015).

Order: Myliobatiformes

Family: Dasyatidae

Himantura leoparda Manjaji-Matsumoto & Last, 2008

Leopard whiplay (Fig. 2E)

Observation/materials: *H. leoparda* was commonly observed in the local fish market/landing center of the Andaman and Nicobar Islands caught in gillnet/ hook and lines along with grouper and carangids by motorized boats. Mature male individuals having size ranges of 88-114 cm DW and mature female with size ranges 96-122 cm DW were observed in the catches of trawlers operated at depth ranges 10-30 m. Complexity in species-specific identification has led to misidentification of this species as *H. uarnak* in the landings for a long time.

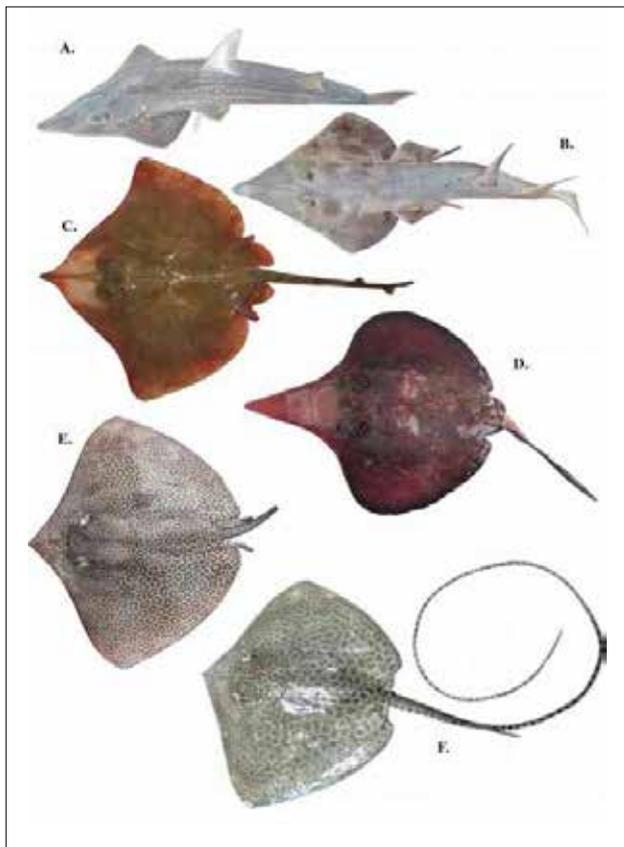


Fig. 2. *R. australiae* (A); *G. typus* (B); *O. cf. powelli* (C); *H. bickelli* (D); *H. leoparda* (E); *H. undulata* (F)

Diagnosis: *H. leoparda* is characterized by a dorsal surface with a dense pattern of dark medium-sized rings (bigger on the mid-disc than the edge). Snout broadly pointed, weakly rhombic shaped disc with skirt-shaped nasal curtain and well-developed band of denticles in adults, whip-like tail without skin folds (Last *et al.*, 2016).

Remarks: Recent literature revealed that under the genus *Himantura* four species described and a single species i.e. *Himantura uarnak* (Gmelin, 1789) was recorded from Andaman and Nicobar Islands by Rao (2003). However, the present study confirmed the occurrence of *H. leoparda* in this region. It is widely distributed in Indo-West Pacific, from South Africa to eastern Australia and Japan. The IUCN Red List of Threatened Species lists the status of *H. leoparda* as Vulnerable (Rigby and Moore, 2016).

Order: Myliobatiformes
 Family: Dasyatidae
Himantura undulata (Bleeker, 1852)
 Honeycomb whipray (Fig 2F)

Observation/materials: *H. undulata* was observed occasionally in the landings of Andaman and Nicobar Islands. There were

four mature male Individuals having size ranges of 84-120 cm DW and five mature female with size ranges 92-126 cm DW caught by gillnet/hook & lines by motorized boat on 14th June 2019 operated at depth ranges 10-30 m.

Diagnosis: *H. undulata* can be differentiated from *H. leoparda* by the larger dark rings and reticulations on the dorsal surface and pearl shaped (rather than heart-shaped) thorns of the mid-disc (Last *et al.*, 2016).

Remarks: Complexity in species-specific identification of genus *Himantura*, look like species possibly led to continued misidentification as *H. leoparda* and *H. uarnak* in the fishery. *H. uarnak* (Gmelin, 1789) was recorded from Andaman and Nicobar Islands by Rao (2003). However, the present study confirmed the occurrence of *H. undulata* in this region. It is distributed in Indo-West Pacific, from India to Java and Borneo. The IUCN Red List of Threatened Species lists the status of *H. undulata* as Vulnerable (Rigby, 2012)

Order: Myliobatiformes
 Family: Dasyatidae
Neotrygon cf. caeruleopunctata Last, White and Seret, 2016
 Bluespotted maskray (Fig. 3G-H)

Observation/materials: *N. cf. caeruleopunctata* was observed commonly in the local fish markets in the Andaman and Nicobar Islands. This species caught in gillnet along with carangids and grouper fishes and also by trawl catches. The size range of mature male was 19-28 cm DW and female was 18.5-29 cm DW.

Diagnosis: *N. cf. caeruleopunctata* is characterized by pale greenish brown dorsal surface with many small to medium sized blue ocelli (pale blue covered by darker blue outside).

Remarks: This species from the Andaman Islands was earlier reported as *Neotrygon kuhlii* by several authors (Rao, 2003, Rajan *et al.*, 2012, 2013). Detailed studies on the blue spotted stingrays are needed in India to explore the actual diversity.

Order: Myliobatiformes
 Family: Dasyatidae
Pastinachus ater (Macleay, 1883)
 Broad cowtail ray (Fig 3J)

Observation/materials: *P. ater* was occasionally observed at Junglighat fish landing center, Port Blair caught in gillnet that targeting groupers and snappers and also caught by commercial trawler in coastal waters. The size range of male was 34-79 cm DW and female was 42-168 cm DW. Often misidentified as lookalike species *Pastinachus sephen*.

Diagnosis: *P. ateris* characterized morphologically with flat denticles forming a wide band on the central disc. Band of denticles is band distinct but less dense towards outer pectoral fin. Dorsal profile uniform dark greyish brown to black; long blackish tail with well-developed ventral tail fold by the filament (Last *et al.*, 2016).

Remarks: Rajan *et al.* (2013) previously recorded *P. sephen* from the Andaman Islands. The present study documents a new record of *P. ater* from the region. The distribution includes Indo-West Pacific from Madagascar to New Caledonia. The IUCN Red List of Threatened Species lists the status of *P. ater* as Least Concern (Morgan *et al.*, 2016).

Order: Myliobatiformes

Family: Dasyatidae

Pateobatis jenkinsii (Annandale, 1909)

Jenkins' whipray (Fig. 3I)

Observation/materials: *P. jenkinsii* was commonly observed at fish landing centers around the Andaman and Nicobar Islands. This species caught in bottom set gillnet along with other rays *P. fai*, *H. uarnak* and *H. undulata* and also as bycatch in trawl fishery. The size range of mature male was 78-110 cm DW and female was 88-138 cm DW.

Diagnosis: This species is characterized by a broad rhombic disc, nasal curtain skirt-shaped, a row of enlarged thorny denticles along the mid-disc and tail. Dorsal profile yellowish brown, ventrally white; tail blackish beyond the sting in colour (Last *et al.*, 2016).

Remarks: *P. jenkinsii* was mostly observed in the landings along with another commonly landed Pink whipray. Distribution pattern includes Indo-Pacific from South Africa to New Guinea, north to the Philippines. The IUCN Red List of Threatened Species list the status of *P. jenkinsii* as Vulnerable (Manjaji *et al.*, 2016)

Order: Myliobatiformes

Family: Dasyatidae

Pateobatis fai (Jordan & Seale, 1906)

Pink whipray (Fig. 3K)

Observation/materials: *P. fai* are commonly landed in Andaman and Nicobar Islands. This species caught in bottom set gillnet along with other rays *P. jenkinsii*, *H. uarnak* and *H. undulata* and also as bycatch in trawl fishery. The observed male individuals having size ranges 92-124 cm DW and female with size ranges 98-134 cm DW were caught by gill nets operated at depth ranges 20-50 m.

Diagnosis: *P. fai* is a large sized ray, and is characterized by a broad rhombic disc, uniformly pinkish colour dorsally. No

extended band of denticles in the dorsal disc. No bands on tail, post spine tail blackish (Last *et al.*, 2016).

Remarks: *P. fai* is a common species in the fishery landing. The IUCN Red List of Threatened Species list the status of *P. fai* as Vulnerable (Manjaji *et al.*, 2016).

Order: Myliobatiformes

Family: Dasyatidae

Urogymnus asperrimus (Bloch & Schneider, 1801)

Porcupine whipray (Fig 3L)

Observation/materials: The porcupine whipray is a reef-associated ray, uncommon in the fisheries. One mature male and a female measuring 76 and 90 cm DW respectively were accidentally caught and landed at Junglighat landing center on 21.02.2016 and 17.03.2018.

Diagnosis: This species is characterized by a sub-circular disc with extremely rough and prickly dorsal surface. Tail slender, almost equal to disc length and cylindrical in cross section and tapering to the end of the tail, makes this species very distinct from all other stingrays (Last *et al.*, 2016).

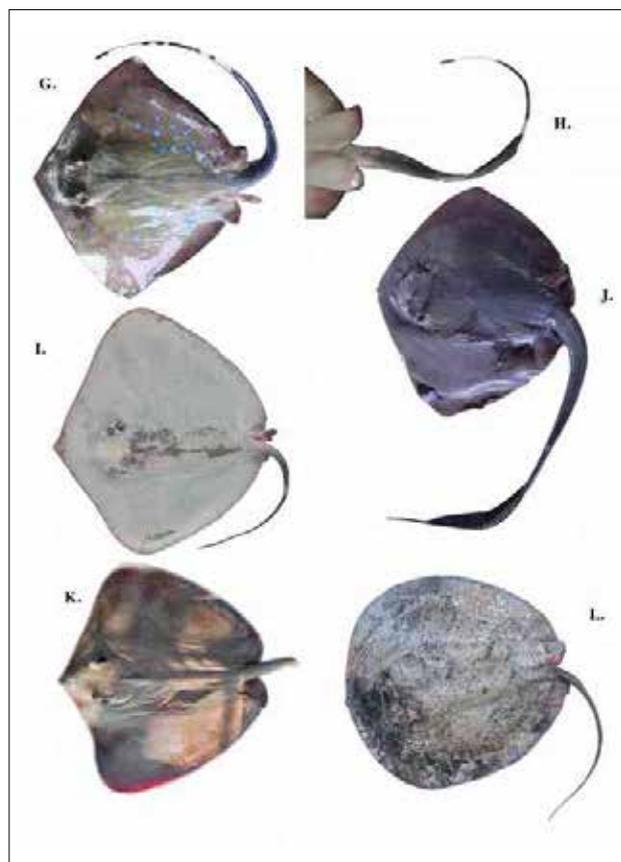


Fig. 3. *N. cf. caeruleopunctata* (G-H); *P. jenkinsii* (I); *P. ater* (K); *P. fai* (K); *U. asperrimus* (L)

Remarks: This species was protected under the Indian Wildlife (Protection) Act 1972, Schedule-I-Part-II (A) - Fishes. There are no previous reports of *U. asperimus* from the Andaman and Nicobar region (Rao, 2003; Rajan *et al.*, 2012, 2013). Hence, the current report is the first time from this region. The species is reported to have a widespread distribution in the Indo-West Pacific and Eastern Atlantic. The IUCN Red List of Threatened Species lists the status of *U. asperimus* as Vulnerable (Chin and Compagno, 2016).

Order: Myliobatiformes
Family: Myliobatidae
Aetomylaeus vespertilio (Bleeker, 1852)
Ornate eagle ray (Fig. 4O)

Observation/materials: *A. vespertilio* was observed at Junglighat fish landing center twice, two female specimens measuring 160 and 190 cm (DW) were landed on 16th January 2018 and 2nd October 2018 respectively.

Diagnosis: This species is characterized by its brown to bluish grey dorsal surface with black lines arranged transversely on anterior half of disc and open network on the posterior half (Last *et al.*, 2016).

Remarks: *A. vespertilio* is a rare species known from Indo-West Pacific, with patchy distribution in the Red Sea, Mozambique, Northern Australia and Southern China. This species has been reported in fish landings at Kochi, south west India by Bineesh *et al.* (2014). A single species, *Aetomylaeus nichofii* under the genus *Aetomylaeus* was reported in the checklist of fishes from Andaman and Nicobar Islands (Rajan *et al.*, 2013). The occurrence of *A. vespertilio* is an additional record for this region. Due to high fishing pressure level in inshore regions, *A. vespertilio* has been assessed as Endangered by the IUCN Red List of Threatened Species list (White and Kyne, 2016).

Order: Myliobatiformes
Family: Aetobatidae
Aetobatus flagellum (Bloch & Schneider, 1801)
Longheaded eagle ray (Fig. 4M-N)

Observation/materials: *A. flagellum* was occasionally observed in the landing center of the Andaman and Nicobar Islands. Four mature male Individuals having size ranges 64-84 cm DW and six mature females with size ranges 76-88 cm DW were caught by gill nets operated at depth ranges 20-50 m.

Diagnosis: Long rostral lobe and narrowly pointed, disc very broad and short. Nasal curtain large, deeply notched centrally and with a curtain-like fringe. Very long tail, 1.2-1.8 times DW (Last *et al.*, 2016).

Remarks: Though the species is mentioned to have no spots in dorsal, some, materials identified as *A. flagellum* had spots in the posterior ends, over the pelvic and both sides of tail at tail origin. *A. flagellum* has been assessed as Endangered in the IUCN Red List of Threatened Species (White, 2006).

Order: Myliobatiformes
Family: Mobulidae
Mobula kuhlii (Valenciennes, 1841)
Kuhl's devilray (Fig. 3Q)

Observation/materials: Two mature females with size ranges 178 cm DW and 182 cm DW respectively were landed on 24th January 2018 and 12th February 2018 at Junglighat landing center.

Diagnosis: Devil rays are medium to very large in size with a rhomboidal, wing-like disc which is broader than long. Dorsal profile black to greyish brown; dorsal fin plain; ventral surface is white (Last *et al.*, 2016).

Remarks: Total 3 species under the genus *Mobula* were reported from Andaman and Nicobar Islands *i.e.* *Mobula birostris*, *Mobula*

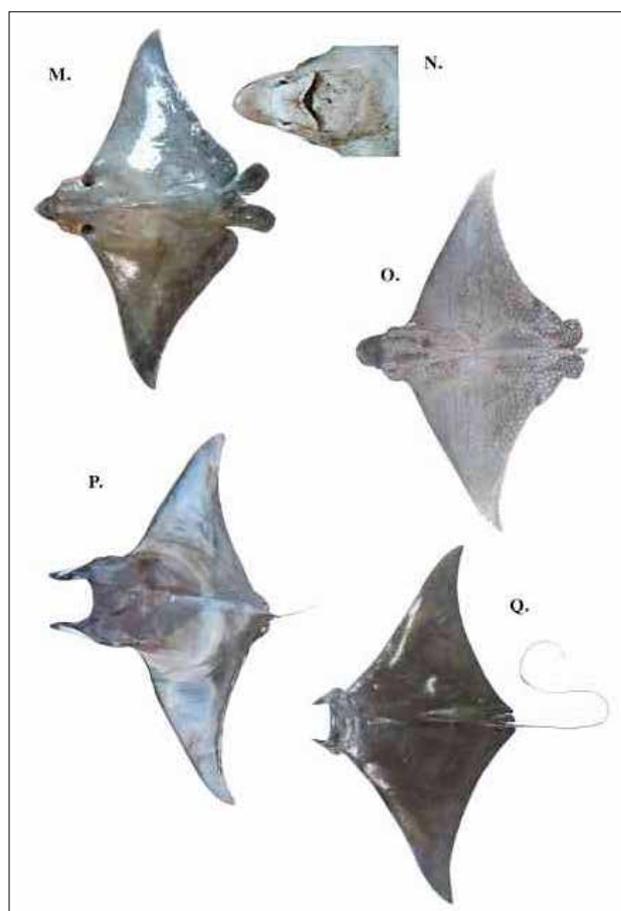


Fig. 4. *A. flagellum* (M-N); *A. vespertilio* (O); *M. tarapacana* (P); *M. kuhlii* (Q)

mobular and *Mobula thurstoni* (Rao, 2003; Rajan *et al.*, 2012; Shirke *et al.*, 2017). *M. kuhlii* was hitherto not known from the region. Thus, this is a confirmed first record of the species from this region. Distribution records for this species are known from Indo-West Pacific, from South Africa to eastern Australia. The IUCN Red List of Threatened Species list the status of *M. kuhlii* as Data Deficient (Bizzarro *et al.*, 2009).

Order: Myliobatiformes

Family: Mobulidae

Mobula tarapacana (Philippi, 1892)

Chilean devilray (Fig. 3P)

Observation/materials: The Chilean Devilray has uncommon, patchy distribution landed at Junglighat landing center on 21.02.2016 and 17.03.2018. One mature male (255 cm DW) and a female (276 cm DW) were observed.

Diagnosis: This species is medium sized with broad, subterminal mouth and elongated disc. *M. tarapacana* can be distinguished from other mobulids by its long and strongly falcate pectoral fin and strong bony ridge on the dorsal mid-line. Dorsal profile uniformly greyish in color (Last *et al.*, 2016).

Remarks: *M. tarapacana* was hitherto not reported from the region. Thus, this is the first record of the species from the region. This species have patchy distribution probably circumglobal in warm seas. The IUCN Red List of Threatened Species list the status of *M. tarapacana* as Endangered (Marshall *et al.*, 2019).

Akhilesh *et al.* (2014) indicated that certain ecosystems in Indian waters which are poorly explored for elasmobranch faunal diversity require more scientific exploration and investigations, as several unrecognized species probably occur in these areas and many species are known with misapplied names. DNA barcoding study on elasmobranchs from the commercial fishery of mainland India indicated high diversity and suggested several possible new species/records for India (Bineesh *et al.*, 2016).

Species diversity of batoids in Andaman and Nicobar has been poorly studied (Kumar *et al.*, 2018). The present study revealed new regional records of 15 batoids *i.e.* 2 wedgefishes, 1 skate and 12 rays. The diversity of elasmobranchs in the landings from this region is higher than known or expected. Earlier works on batoids in the region do not include the species reported in the recent study (Rao 2003; Akhilesh *et al.*, 2009; Rajan *et al.*, 2012, 2013; Devi and Kumaralingam 2014; Vinu *et al.*, 2017; Shirke *et al.*, 2017; Pradeep *et al.*, 2018). Herewith, we report new distributional records of *R. australiae*, *G. typus*, *O. cf. powelli*, *H. bickelli*, *H. leoparda*, *H. undulata*, *N. cf. caeruleopunctata*, *P. ater*, *P. jenkinsii*, *P. fai*, *U. asperimus*, *A. vespertilio*, *A. flagellum*, *M. kuhlii* and *M. tarapacana* from the Andaman Islands. Species

reported here as first-time reports from the region are common or occasional in the fishery landings. The absence of dedicated fisheries monitoring programs could have hindered the diversity studies on elasmobranchs in the past few decades. More detailed studies are required to understand the diversity of batoids in the region for better planning and management.

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