

Records of rare elasmobranchs and their biological observation from the north-eastern Arabian Sea, off Mumbai

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Received 14 December 2016; revised 02 March 2017

Present study consists rare batoids from north-eastern Arabian Sea. A specimen of *Dasyatis microps* (101.0 cm DW) and *Pteroplatytrygon violacea* (49.5 cm DW) respectively were collected in a trawler, operating south off Mumbai in the Arabian Sea, north-west coast of India. The present record of these elasmobranchs from the northern Arabian Sea shows their extended range of occurrence around the Indian coast, which is earlier reported from south-east and south-west coast of India. The morphometric measurements of the specimens collected were compared with previous records. In the same fishing area, pregnant *Rhynchobatus djiddensis* (254.0 cm TL) and a juvenile *R. djiddensis* (44.0 cm TL) was also caught in shallow coastal waters at 40 m depth. Biological observations on *Dasyatis microps* and *Rhynchobatus djiddensis* also presented.

[**Keywords:** *Dasyatis microps*, *Pteroplatytrygon violacea*, *Rhynchobatus djiddensis*, pups, Arabian Sea, batoids, India]

Introduction

The family Dasyatidae comprises at least 89 described species worldwide¹ (in 9 genera. In Indian waters, about 59 species of rays have been confirmed so far, of which 31 species belong to Dasyatidae² reported that 29 of the 41 batoid species reported from the Western Indian Ocean (FAO Area 51) have been classified as either Vulnerable or Data Deficient by the IUCN.

The smalleye stingray, *Dasyatis microps* (Annandale, 1908) is a wide ranging coastal ray found in tropical and subtropical seas and inhabiting continental and insular shelves^{4,5,6}, often approaching close shallow inshore and entering enclosed bays and estuaries⁷ but Fahmi *et al.*, (2009) reported that this species may also occur in deep waters too. No specific information is available on the full depth range of this species and its preferred habitat is poorly known. The smalleye stingray is categorized as “Data Deficient” globally based on the *IUCN Red List of Threatened Species criteria*⁸. The distributional range of *D. microps* presented in Table 1.

The pelagic stingray, *Pteroplatytrygon violacea* (Bonaparte, 1832) is widespread, with an almost circum-global distribution, throughout tropical and subtropical areas of the Pacific, Atlantic and Indian Oceans. It is perhaps the only species of stingray that occurs in pelagic and oceanic waters⁹. The species is

categorized as “Least Concern” globally based on the *IUCN Red List of Threatened Species criteria*⁹.

Among Chondrichthyes, the family Rhynchobatidae (Order: Rhinopristiformes) comprises at least 62 species¹, belonging to 11 genera. Among these, the genus *Rhynchobatus* consists of large guitarfish, widely distributed in the Western Indian Ocean from the Eastern Cape Province, South Africa, to the Red Sea¹⁰. The giant guitarfish or whitespotted wedgefish, *Rhynchobatus djiddensis* (Forsskål, 1775) previously believed to occur throughout a large part of Indo-Pacific region is a species complex of at least four species¹¹ including the broadnose wedgefish, *Rhynchobatus springeri* Compagno & Last, 2010, white-spotted guitarfish or white-spotted wedgefish, *Rhynchobatus australiae* Whitley, 1939 and the smoothnose wedgefish, *Rhynchobatus laevis* (Bloch & Schneider, 1801).

R. djiddensis is categorized as “Vulnerable” globally based on the *IUCN Red List of Threatened Species criteria*¹⁰. Nevertheless, knowledge on the life history traits is still scanty in Indian waters.

Materials and Methods

During a regular survey of Sassoon Dock fish landing center, Mumbai, single specimens *Dasyatis microps* (26 April 2013), *Pteroplatytrygon violacea* (31 May 2014), and *Rhynchobatus djiddensis* (Adult

Table 1 — The historical landings and the distributional range of *D. microps* around the world oceans.

Sl. No.	Name of author	Place	DW (cm) & Weight (kg)	Sex	Substrate and Depth
1.	Annandale, 1908	Bay of Bengal, off Chittagong, Bangladesh	195, NA	Female	NA, 17 fathoms
			195, NA	Female	NA, 24-27 fathoms
2.	Annandale, 1909	Bay of Bengal, Off Ganjam Coast, Odisha	222.5, NA	Female	NA, 24-27 fathoms
			187.5, NA	Male	NA, 24-27 fathoms
			191.25, NA	Male	NA, 24-27 fathoms
3.	Garman, 1913	Bay of Bengal	190-222, NA	NA	NA
4.	Fowler, 1941	Philippines and adjacent areas	-	-	-
		Near Ayanat, Iran	170, 75	NA	Mud, 30-50 m (~27°40' N, 52°05' E)
5.	Blegvad, 1944 and Moore, 2010	North of Qatar/NE of Bahrain	NA, 49	NA	Sand, ~20 m (~26°35' N, 51°00' E)
6.	Misra, 1947	India, Burma, and Ceylon	-	-	-
7.	Misra, 1952	India, Burma, and Ceylon	-	-	-
		Dhanushkodi, Gulf of Mannar (East coast)	205.8, NA	Female (gravid)	NA, 13 m
8.	Nair and Soundararajan, 1976	Off Madras coast (East coast)	(33.0, NA)	Embryo	NA, 18 m
			180.5, NA	Female	NA, 19 m
			163.0, NA	Male	NA, 19 m
9.	Mohsin & Ambak, 1996	Malaysia	31–55, NA	NA	NA
10.	*Ishihara <i>et al.</i> , 1998	River Ganges	-	-	-
11.	Adam, 1998	the north Malé Atoll, Maldives	156, NA	-	NA, 180 m
12.	Last & Compagno, 1999	Gulf of Thailand	-	-	-
13.	Last & Compagno, 1999	the Arafura Sea off northern Australia	-	-	-
14.	White <i>et al.</i> 2006	Indonesia	-	-	-
15.	White & Dharmadi, 2007	Indonesia	174.8, NA	-	-
		Western Indian Ocean (Tofo beach, Mozambique)	NA	NA	NA, 15-25 m (23°51'S, 35°32'E)
16.	Pierce <i>et al.</i> , 2008		200, NA	Female	Reef, 25 m (23°50'S, 35°33'E)
			150, NA	Female	
17.	Present study	Off Mumbai, Maharashtra (West coast)	101, 15	Male	** , 70 m

Abbreviations

* - Not referred in original.

** - No information available

NA – Not Available in referred literature

& Juvenile) (30 May 2015 & 05 August 2015) were landed (Figure 1). Specimens of *Pteroplatytrygon violacea*, *Rhynchobatus djiddensis* and *Dasyatis microps* were caught by a multiday demersal trawler that was out fishing for 7-14 days, operating south of Mumbai (Murud & Srivardhan) in the Arabian Sea off the north-west coast of India, Maharashtra at 40 m (shallow coastal waters) and 70 meters depth respectively. The disc width (DW) and total length (TL) to the nearest mm, total body mass (MT) to the nearest g and reproductive status of *Dasyatis microps* and *Rhynchobatus djiddensis* were recorded. The

measurement of the tail of *P. violacea* was not possible, as it was removed when landed.

Results*Dasyatis microps*

Smalleye stingray, *Dasyatis microps* identification was based on the typical diagnostic features of this species as described by Annandale (1908 & 1909), Nair & Soundararajan, 1976 and Pierce *et al.*, 2008. The identified specimen was a male of disc width (DW) 101.0 cm and weighing 15.0 kg. *Dasyatis microps* a very distinctive dasyatid with the

following morphological characters: very broad disc, snout rounded with tip projecting slightly; spiracles large. Dorsal surface of the disc was medium brownish to pinkish brown in colour, with a longitudinal row of large whitish spots on either side of the disc (Figure 2A). The tail is similar in colour to the dorsal disc basally, becomes much darker towards the spine, and is almost blackish distally. Ventral surface is almost uniformly white, with very light dusky margins along the anterior and posterior margins of the disc (Figure 2B). Basal part of the ventral tail is much paler than the dorsally, but darker than the ventral surface of the disc, and is almost blackish distally. The detailed morphometric measurements of *D. microps* are presented in Table 2. The male specimen was cut opened, the weight of stomach with the contents was 33.6 g, and the stomach fullness was observed to be $\frac{1}{4}$. A semi digested *Nemipterus* spp. weighing 17.2 g was found in the stomach. Clasper external edge length and clasper internal edge length were 3.9 cm and 5.0 cm respectively, and semi-calcified state of claspers indicated that the specimen was a maturing male. The

liver colour was pinkish and the length and mass were 29.0 cm and 2.0 kg respectively.

Pteroplatytrygon violacea

Pelagic stingray, *Pteroplatytrygon violacea* identification was based on the diagnostic features of this species as described by **Carpenter & Niem, 1999**. The identified specimen was a male of disc width 49.5 cm and weighing 1.8 kg. *P. violacea* is identified by its dark coloration on the dorsal and ventral surfaces and characteristically broad wedge-shaped disc (Figure 3A & 3B). Snout is very small and the tail has a membranous fold on the ventral surface underneath the spine. Morphometric characteristics of the present specimen matches with the representative described from the North Sea by Ellis (2007), Arabian Sea (Off Cochin) by Akhilesh

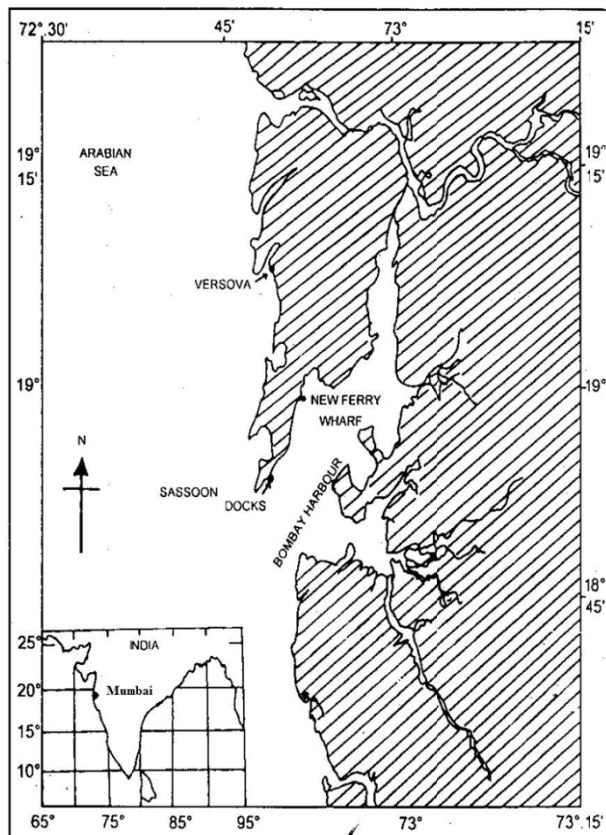


Fig. 1 — Map of the region depicting the location (Sassoon Docks) where batoid fish were landed.



A.



B.

Fig. 2 — *Dasyatis microps*, male 101.0 cm DW: A) dorsal view and B) ventral view.

et al., 2008, Zacharia *et al.*, 2011 and Kannan *et al.*, 2013 (Table 3).

In India, *P. violacea* has been reported previously by Jayaprakash *et al.* (2006) from the shelf-break area (500-1000m depth) in the southwest coast (Lat. 9°-16° and Long. 72°-75°46), Akhilesh *et al.* (2008) observed the mature male specimen in by-catch from a tuna gillnetter, which operated at a depth of about 150 m off Cochin, Somvanshi *et al.* (2009) reported the distribution of *P. violacea* to cover entire Indian EEZ (Arabian Sea (6°-22° N), Bay of Bengal (10-19° N) & Andaman and Nicobar waters (5°-14° N) from long liner data. Zacharia *et al.* (2011) and Kannan *et al.* (2013) reported the species from Gulf of Mannar and off Tuticorin, southern-east coast of India.

Rhynchobatus djiddensis

Whitespotted wedgefish, *Rhynchobatus djiddensis* was identified based on the diagnostic features of this

Table 2 — Morphometric measurements (in cm) of *Dasyatis microps* (Annandale, 1908) recorded from Sassoon Dock fish landing centre, north-west coast of India, off Mumbai.

Morphometric	Measurement (in cm)
Total Length	152.0
Disc Length	66.0
Disc width	101.0
Inter-orbital space	8.3
Inter spiracular space	11.0
Eye length	2.6
Spiracle length	6.0
Pre-orbital length	18.2
Pre-nasal length	16.2
Pre-oral length	20.1
Inter-narial space	7.9
Mouth width	7.4
Space between first branchial slits	18.5
Space between fifth branchial slits	14.6
Branchial basket length	13.5
Branchial basket width	25.0
Pelvic fin length	16.7
Pelvic fin width	11.8
Clasper external edge length	3.9
Clasper internal edge length	5.0
Cloaca to tail tip	86.2
Tail width (Maxi.)	7.2
Snout to cloaca	61.5
Pectoral axil to posterior edge of pelvic fin	16.8
Cloaca to sting	41.0
Snout to maximum disc width	44.2
I st branchial slit width	3.1
III rd branchial slit width	3.2
V th branchial slit width	2.3

species as described by Compagno (1986). The color underneath is white and overall dark grayish or olive-green above (Figure 4A & Figure 4B) and large individuals lack the distinct white spots of the closely related white-spotted guitarfish (though some white-spotted guitarfish are essentially unspotted too), snout pointed and lower caudal lobe short. Biological information on the species is limited. The specimen from Mumbai was a gravid female of total length 254.0 cm and weighing 50.0 kg containing seven pups in its uterus, in which 3 pups were in the left lobe and 4 in the right lobe (Figure 4C). The total length of the embryo ranged between 21.0 cm to 22.0 cm. Yolk sac of the embryo was measuring 8.0-8.5 cm in diameter



A.



B.

Fig. 3 — *Pteroplatytrygon violacea*, male 49.5 cm DW: A) dorsal view and B) ventral view.

Table 3 — Morphometric comparison (in cm) of *Pteroplatytrygon violacea* (Bonaparte, 1832) captured off Mumbai with specimen from North Sea (Ellis, 2007), Off Cochin (Akhilesh *et al.*, 2008), Off Tuticorin (Zacharia *et al.*, 2011) and Off Tuticorin (Kannan *et al.*, 2013) respectively.

Dimension	North Sea	Arabian Sea (Off Cochin)	Gulf of Mannar (Off Tuticorin)	Gulf of Mannar (Off Tuticorin)	Arabian Sea (Off Mumbai) Present study
Total length	: 99.50	102.00	91.00	100	--
Disc width	: 42.00	46.08	51.43	44.9	49.50
Disc length	: 33.70	34.31	41.43	34.41	36.1
Pre-orbital length	: 5.30	5.49	4.51	7.1	6.91
Length of the eye	: 1.60	1.57	3.14	2.11	1.65
Inter-orbital distance	: 4.10	6.57	5.27	3.82	6.42
Pre-spiracular distance	: 6.90	7.35	6.59	9.23	8.7
Length of the spiracle	: 2.20	2.55	3.19	2.63	2.70
Inter-spiracular distance	: 7.70	7.65	8.02	7.57	8.12
Pre-narial length	: 4.80	5.10	4.51	5.44	4.96
Inter-narial length	: 4.20	4.41	4.29	4.56	4.59
Pre-oral distance	: 6.30	6.27	6.03	6.59	6.70
Mouth width	: 4.90	5.39	5.38	5.15	5.17
Interspace first gill slit	: 8.50	8.82	11.10	8.79	9.00
Interspace fifth gill slit	: 6.00	6.47	8.68	5.85	6.37
Snout to first gill opening	: 10.80	11.37	10.77	12.3	12.30
Snout to fifth gill opening	: 15.70	16.57	16.26	16.19	18.10
Snout to cloaca (anterior) distance	: 29.60	29.90	32.09	29.39	32.00
Cloaca (anterior) to end of the tail	: 71.40	70.10	57.14	69.01	-
External clasper length	: 5.50	6.18	-	7.7	6.30
Sex	: Male	Male	Female	Male	Male

and the cord lengths ranged from 6.0 to 6.5 cm (Figure 4D). Out of seven pups four were male and remaining three were female. Overall sex ratio was 1:0.75 (male to female). The stomach fullness was observed to be empty. The juvenile (male) landed measured 44.0 cm and weighed 300 g.

Thakurdas *et al.* (2011) reported two female specimens measuring 225.0 cm and 230.0 cm in total length (TL) at New Ferry Wharf fish landing Centre, Mumbai. The details of former specimen as follows: the total length of embryos ranged between 27.9–29.0 cm, weighing 290–330 g and their yolk sac of embryo and cord length was 8.2–8.8 cm in diameter and 6.5–7.2 cm respectively. The litter size observed was 7 (Right lobe-4 and Left lobe-3) with two females and five males. Sex ratio was 1:0.4 (Female to male).

The latter specimen with nine embryos (Right lobe-5 and Left lobe-4) with five females and four males measuring 28.6–30.0 cm in total length (TL), weighing 305–350 g and their yolk sac of embryo and cord length was 8.4–9.3 cm in diameter 6.2–7.8 cm respectively. Sex ratio was (1:1.25). Overall sex ratio

was 1:0.77 for the sixteen litters observed in two females.

Discussion

The rare records of *Dasyatis microps*, *Pteroplatytrygon violacea* and *Rhynchobatus djiddensis* from the north-west coast of India, off Mumbai, are giving the account of overall picture of wide geographic distributional range of these species. *D. microps* categorized as “data deficient” in IUCN Red List category due to its rarity and absence of biological/population information to assess the status⁸. With the available specimen, gut content and maturity stage has been recorded as maturing male and major diet of the species was *Nemipterus* spp.

In the last few years, the distributional range of *P. violacea* has also been reported from very shallow waters, close to shore in pair-trawl fishing boats that have been operated between 15 and 50 m deep along the central coast of São Paulo State, Brazil²⁴. Recently, Vêras *et al.* (2014) given insights into the reproductive biology of Pelagic stingray as size at

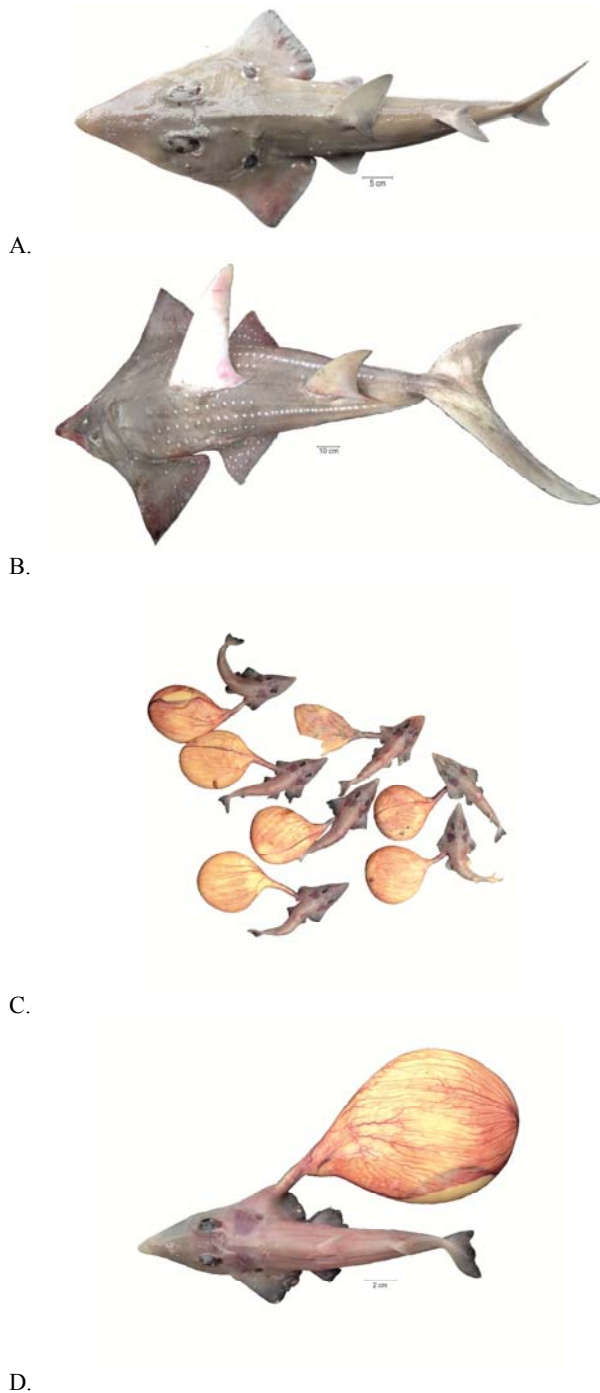


Fig. 4 — A) *Rhynchobatus djiddensis* (Juvenile) Male 44.0 cm B) Female 254.0 cm C) Embryos recovered from pregnant female D) Embryo with yolk sac attached to body

first maturity was estimated at ~48.0 cm disc width (DW) for females and ~41.0 cm DW for males. Ovarian fecundity was 1 to 17 follicles per female and the uterine fecundity of embryos in pregnant females in ranged from 1 to 5 embryos but no information mentioned on food and feeding behaviour. V eras

et al. (2009) observed amphipods, decapods, teleosts and pteropods in the stomach of *P. violacea*. In the present study, the gut was cut opened to analysis; it is found that traces of digested crustaceans in the stomach. However, Somvanshi *et al.* (2009) observed that *P. violacea* feeds on jellyfish, oceanic squids, crabs, pelagic shrimps, euphausiids and finfish in Indian waters. Lipej *et al.* (2013) reported that majority of stomachs found with teleost fish, cephalopods (anchovy, cuttlefish and red band fish) and a few specimens of crustaceans in Adriatic Sea.

The biological observations recorded in the present study for the vulnerable and poorly known *Rhynchobatus djiddensis* increased the understanding of the species fecundity and reproductive mode. Present study suggests that *R. djiddensis* is an aplacental viviparous, with low fecundity three to five pups/litter which is similar to earlier records of van der Elst, 1988 and Thakurdas *et al.* 2011. Raje, 2006 observed the dominance of teleosts in the stomach of *R. djiddensis* off Mumbai waters.

The total number of chondrichthyan species reported to be 156 in Indian water including the sandbar shark, *Carcharhinus plumbeus* (Nardo, 1827) recently reported from Gujarat^{2, 30}. Among known rays species from India (59) thirty one are dasytids and is listed in the recent comprehensive review of chondrichthyan diversity in Indian waters². The new distribution range extensions and possible new species in batoids as suggested by Bineesh *et al.* (2016) makes Indian waters a possible elasmobranch biodiversity hotspot with many habitats warranting further studies. The present records fill the gap on the occurrence and the known distributional range of the three species in north-eastern Arabian Sea, off Mumbai. More biological data is required to fully understand the natural history traits and ecology of these species in Indian waters.

Conclusion

The Chondrichthyan fishes include all the species of sharks and batoid fishes, their distribution, habitat, biology, life history characteristics and the status fisheries is poorly documented and many are of conservation concern. In this study, the presence of rays, *Dasyatis microps*, *Pteroplatytrygon violacea* and guitarfish, *Rhynchobatus djiddensis* in north-west coast of India (Off Mumbai, Maharashtra) confirm the extended distributional range and latitudinal diversity around Indian Coast. Diet of *Dasyatis microps* observed was *Nemipterus* spp. in the stomach and

semi-calcified claspers indicated that the specimen was a maturing. The uterine fecundity observed was seven in *R. djiddensis*. More research on the diversity of elasmobranchs improves our understanding on biodiversity, biology and life history traits in Indian waters.

Acknowledgement

Authors are grateful to the Director, ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Kochi for support.

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