



An updated checklist of Indian batoids with new distributional records and conservation status

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Abstract

The present paper is an attempt to provide new information on taxonomy, current distribution, and conservation status of batoids in India. This study is based on the landing site surveys conducted during the years 2017-2022 at major fish landing centres across India. The present study updated the checklist of Indian batoids to 77 valid species. They were caught in commercial and artisanal fisheries of India and several of them were caught as bycatch. Among the deep water batoids, *Dipturus* spp, *Torpedo* spp. and the Dark blind ray *Benthobatis moresbyi* were frequently observed in the deepwater trawl bycatch. Distributions of batoids were highly variable along the Indian coasts. Landing centre survey shows that distribution of *Stripenose guitarfish Acroteriobatus variegatus* is restricted to southern coast of India. Similarly Smoothback guitarfish *Rhinobatos lionotus* is restricted to east coast of India from Kilakarai, Tamil Nadu to Hoogly, West Bengal. In addition, distributional ranges of several batoid species in Indian waters were extended; Brown sting ray *Bathytoshia lata* and Smalleye stingray *Megatrygon microps* are new record to Andaman and Nicobar Islands. Indian Guitarfishes and Wedgefishes are declining drastically due to fishing pressure and habitat destruction, 21% of the species is Vulnerable and 19% are Endangered, 16% are Critically Endangered, and 7% Near Threatened respectively.

Keywords: Rhinopristiformes, species composition, diversity, Indian EEZ, Conservation

Introduction

Skates, rays and guitar fishes collectively known as batoids and they are a significant group of cartilaginous fishes essential for maintaining the balance and health of marine ecosystems (Last *et al.*, 2016). They are commonly caught as bycatch in many parts of the world, especially in trawlers, and they may include commercial and non-commercial species (Blaber *et al.*, 2009; White *et al.*, 2019). Batoid fishes are exploited as targeted and bycatch in its commercial, artisanal and recreational fishing activities of India. Being a leading elasmobranch fishing nation, high fishing pressure over the years as caused steady decline in the population of several batoid fishes in Indian waters (Dulvy *et al.*, 2008; Kyne, 2016; Jabado *et al.*, 2017). Characteristics like low fecundity,

later maturity and slow growth efficiency make them highly susceptible to population decline (Jabado, 2019).

Akhilesh *et al.* (2014) carried out an extensive study on Indian elasmobranchs and listed 227 species reported from Indian waters based on the literature survey and listed 169 species as valid from India comprising 79 batoids, 88 sharks and 2 chimaeras (Akhilesh *et al.*, 2023). Kizhakkudan *et al.* (2018) provided an updated list of Indian batoids with updated nomenclature details. However several species mentioned in that checklist have questionable identity and requires immediate validation to address the taxonomic confusion. Present study was carried out to rationalize the valid species of batoids in Indian waters and to map the distribution patterns of commercially important batoid species.

Material and Methods

An extensive survey was conducted throughout the major fish landing centres of India including Andaman and Nicobar Islands during the period 2017-2022. Gear wise landings and species composition of batoids were recorded from each centre. Smaller samples are collected from the bycatch or trash and preserved in 10% formalin after taking tissue samples for molecular identification. Larger samples are identified from the harbour and not. Species identification was carried out based on Last *et al.* (2016). The conservation status of these species follows IUCN Red list data (2022) (<https://www.iucnredlist.org/>).

Results and discussion

Distribution

Distributions of batoids in Indian waters are highly variable and requires species specific management plans as it differs with gears and regions. Present study observed 53 species of batoids belonging to 17 families. Updated checklist of Indian batoids was provided in Table 1. The Short-tail sting ray *Bathytoshia lata* (Garman, 1880) (Figure 1) and Small-eye stingray *Megatrygon microps* (Annandale, 1908) (Figure 2) are new record to Andaman and Nicobar Islands.

Order: Myliobatiformes

Family: Dasyatidae

Bathytoshia lata (Garman, 1880)

Brown sting ray (Figure 1)

Observation/materials. (Not retained) A single male specimen about 122 cm DW were landed as bycatch caught in motorized boat operated off Little Andaman Islands at 50 to 100 m depth and landed at Junglighat fish landing center on 29th December 2019.

Diagnosis: Huge plain coloured ray with characteristic broad and rhombic disc, sharp thorns over disc and tail, elongate and gently tapering tail to caudal sting. Snout short and broadly triangular, tip extended slightly, anterior margin weakly undulate. Eyes very small, length of orbit and spiracle 2.2 in snout length; inter orbital space broad 4.5 times of orbit length. Mouth broad with 4 oral papillae; labial furrows weak and lower jaw weakly convex. Body granular with denser coverage of large thorns centrally. Body uniform greyish brown without diagonal row of white pores on disc. Tail dark before sting and white base ventrally. Ventral surface entirely white.

Order: Myliobatiformes

Family: Dasyatidae

Megatrygon microps (Annandale, 1908)

Smalleye stingray (Figure 2)

Observation/materials. (Not retained) A single female specimen about 122 cm DW were landed as bycatch caught in motorized boat operated off North Sentinel Islands at 50 to 100 m depth and landed at Junglighat fish landing center on 23rd February 2018

Diagnosis: Disc very broad (width more than 1.4 times disc length); outer angles more than 90°; snout rounded, with tip projecting slightly; spiracles large; mouth large, with 5 papillae; disc with numerous stellate-based, enlarged denticles, mostly around snout; tail almost as long as disc, basal portion broad and flat, distal portion slender and round, tapering rapidly beyond sting; ventral cutaneous fold on tail thick and low, originating below spine base; base of tail with enlarged denticles; dorsal surface whitish brown, eyes dark; ventral surface pale (Garman, 1913; Nair & Soundararajan, 1976; Last *et al.*, 2016).



Figure1. *Bathytoshia lata* (Garman, 1880) landed at Junglighat, South Andaman Islands



Figure2. *Megatrygon microps* (Annandale, 1908) landed at Junglighat, South Andaman Islands

Geographic distributional range of several species of batoids were extended during the present study: Short tail whip ray *Maculabatis bineeshi* Manjaji-Matsumoto & Last, 2016, Oman numb fish *Narcine atzi* Carvalho & Randall, 2003 and Bigeye numb fish *Narcine oculifera* Carvalho, Compagno & Mee, 2002 were observed in the batoid landings at Tuticorin, Tamil Nadu; Tonkin numb fish *Narcine prodorsalis* Bessednov, 1966 at Chennai, Tamil Nadu. Granulated guitarfish *Glaucostegus granulatus*, Widenose guitarfish *Glaucostegus obstusus* (Müller & Henle, 1841), Giant shovelnose ray *Glaucostegus typus* (Anonymous [Bennett], 1830), Smoothnose wedgefish *Rhynchobatus laevis* (Bloch & Schneider, 1801) and Bowmouth guitarfish *Rhina ancylostomus* Bloch & Schneider, 1801 are the major species of guitarfishes and wedgefishes contributing to batoids fishery of India and they have wide distribution in both coasts.

Smoothnose wedgefish *Rhynchobatus laevis* (Bloch & Schneider, 1801) is common to West coast of India and they have a distribution from Veraval, Gujarat to Mangalore, Karnataka. However they are not recorded from observed in Southern coasts of India. Bottlenose wedgefish *Rhynchobatus australiae* Whitley, 1939 have wide distribution in West coast of India; they contribute

to commercial batoid fishery of Gujarat, Karnataka, Kerala and Andaman and Nicobar Islands. In contrast Smoothback guitarfish *Rhinobatos lionotus* Norman, 1926 is restricted to East coast of India; they have recorded from Kilakarai, Tamil Nadu to Hoogly, West Bengal, but not recorded from both the island groups of India. Annandale's guitarfish *Rhinobatos annandalei* Norman, 1926 is known all along Indian main land (Kizhakkudan *et al.*, 2018). However during the present study it was observed only from Tuticorin, Tamil Nadu to entire west coast. Similarly, Stripenose guitarfish *Acroteriobatus variegatus* (Nair & Lal Mohan, 1973) is also recorded only from Southern coasts of India.

During the present study, potential nursery grounds of four species of batoids namely *G. typus*, *G. obstusus*, *R. australiae* and *A. variegatus* were recorded (Figure 6). *G. typus* have good nursery grounds throughout Andaman and Nicobar Islands and off Chennai, Tamil Nadu. Large number of juveniles of *G. obstusus* was recorded from Central West coast of India and off Kerala. In addition they have good nursery ground off, Odisha. Nursery ground of *R. australiae* was recorded only in North Andaman, Andaman and Nicobar Islands. Whereas nursery ground of *A. variegatus* has been located in south east coast of India.

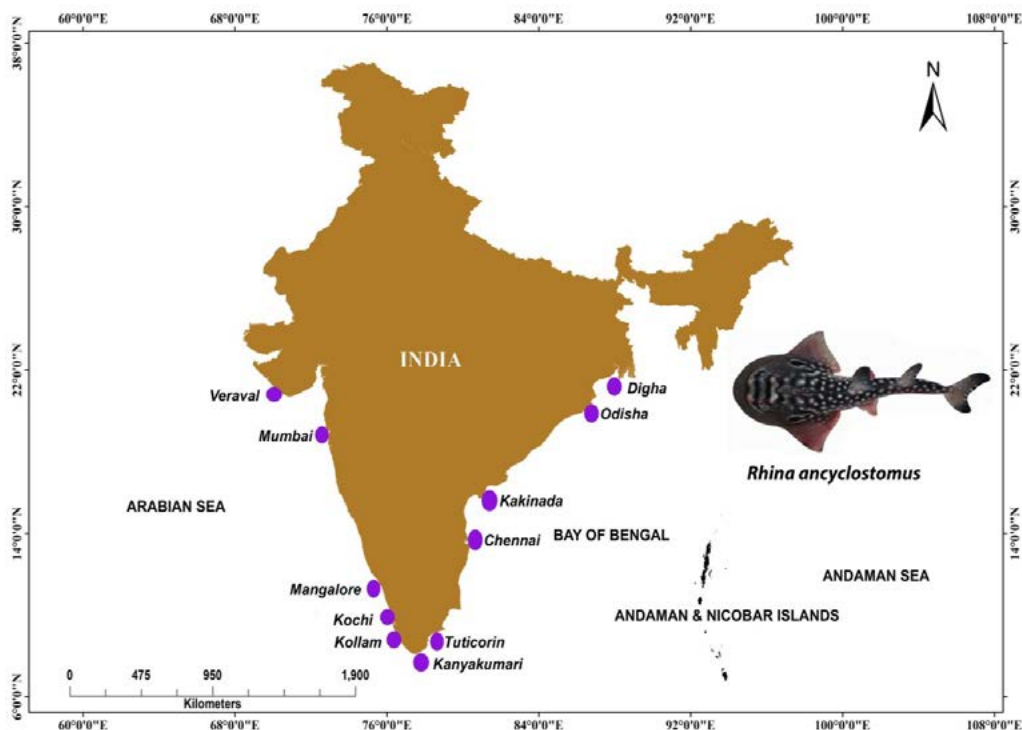


Figure3 Map showing distribution of *Rhina ancylostomus* in Indian waters

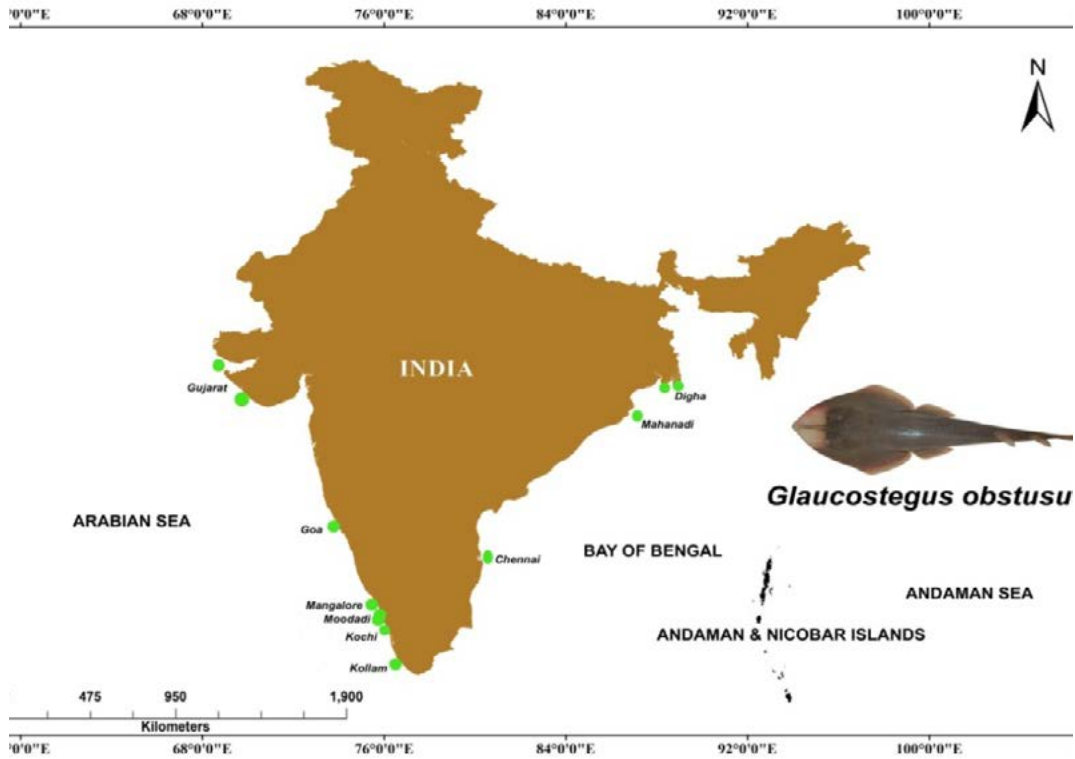


Figure4 Map showing distribution of *Glaucostegus obtusus* in Indian waters

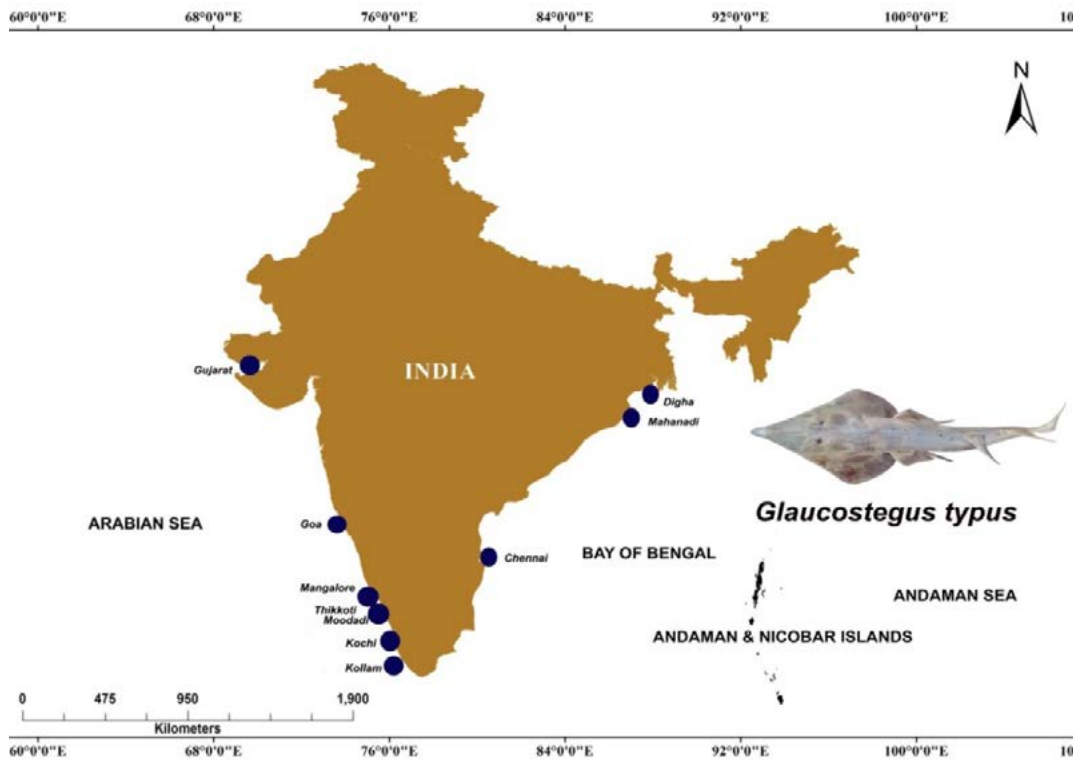


Figure5 Map showing distribution of *Glaucostegus typus* in Indian waters

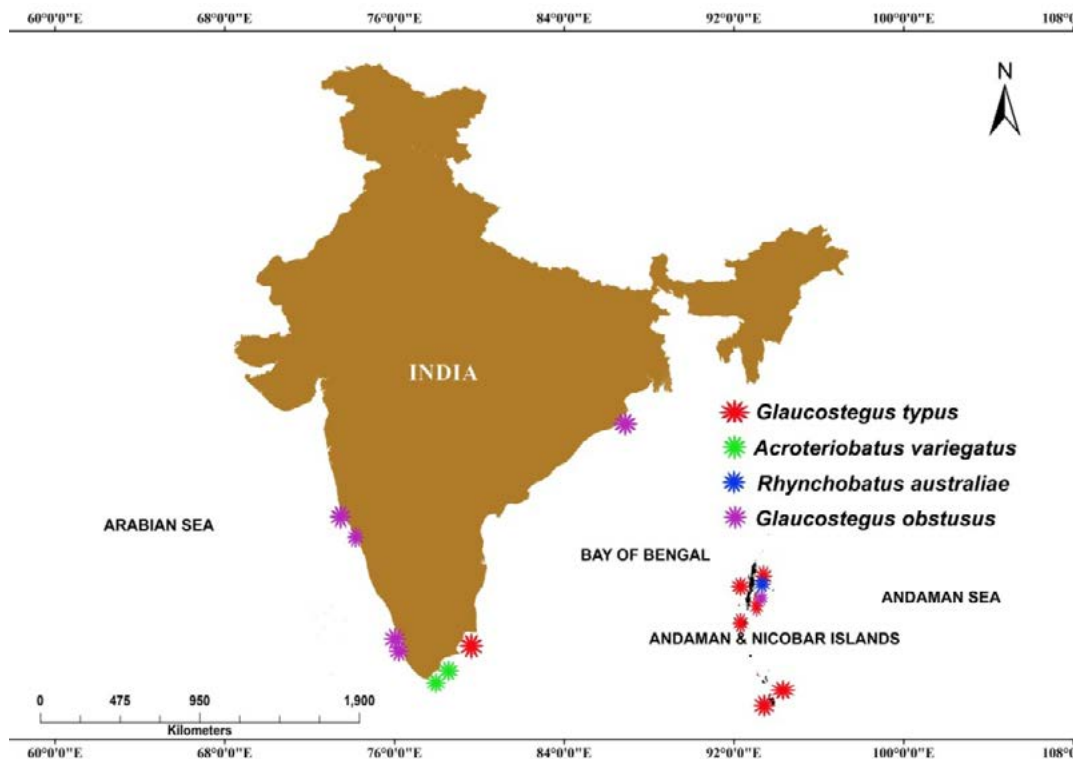


Figure 6 Potential nursery grounds of batoid fishes in Indian waters

Discussion

Batoids are one of the most vulnerable groups of fishes due to their biological characteristics and these apex predators are under intensive fishing pressure and decline of their stocks are a global concern (Stevens *et al.*, 2000; Dulvy *et al.*, 2014). During the present study 77 species of batoids were recorded across Indian coasts, of them 21% of the species are Vulnerable and 19% are Endangered and Data Deficient respectively. Remaining 16% are Critically Endangered, 9% are not evaluated and Least Concern and 7% Near Threatened respectively. Due to the close morphological features between the species within a family, several Indian records of batoids are misidentification and a detailed taxonomic review of Indian batoids is need of the hour to prevent misidentification and confusion. Many species under the genus *Brevitrygon*, *Telatrygon*, *Torpedo Aetobatus*, *Dipturus* and *Benthobatis* requires detailed taxonomic analysis to reveal the accurate species diversity of batoids in India.

Currently 77 valid species of batoids are present in Indian waters; names of several species were changed or synonymised based on the latest taxonomic works. *Torpedo zugmayeri* Engelhardt, 1912 (syn to *Torpedo sinuspersici*

Olfers, 1831); *Rhinobatus annulatus* (Müller & Henle, 1841) is restricted to South West Indian Ocean (South Africa) (Last *et al.*, 2016) and it was not recorded during the last decade from Indian waters. Hence it is omitted from the Indian records. Similarly *Dasyatis centroura* (Mitchill, 1815) (syn to *Bathytoshia centroura* (Mitchill, 1815) is also omitted from Indian batoid checklist as it is a Western Atlantic species (Last *et al.*, 2016). Further, batoids like Angel shark *Squatina squatina* (Linnaeus, 1758) and African angel shark *Squatina africana* Regan, 1908 species restricted to Mediterranean waters, Atlantic Ocean (Last *et al.*, 2016) were listed in Indian batoids. Recently, Ambily *et al.* (2018) recorded a specimen of *Squatina africana* from Indian waters based on a single specimen landed at Kochi, Kerala. However multi day liners of Indian origin operating from Northern Kerala will sail beyond Indian EEZ and may catch such species from their habitat. So both the species of *Squatina* were omitted from the updated checklist. Further studies of batoids using integrative taxonomic approach using various molecular markers, focused studies on biology, nursery grounds, critical habitat, current distribution patterns and ecology should be endorsed to strengthen the conservation and management plan of batoids in Indian waters.

Table 1. Updated checklist of batoids reported/listed from Indian waters

Sl No	Family	Species	IUCN Status	WPA	CITES
1	PRISTIDAE	<i>Anoxypristis cuspidata</i> (Latham, 1794)	Endangered (EN)	I	I
2		<i>Pristis clavata</i> Garman, 1906	Endangered (EN)	I	I
3		<i>Pristis pristis</i> (Linnaeus, 1758)	Critically Endangered (CR)	I	I
4		<i>Pristis zijsron</i> Bleeker, 1851	Critically Endangered (CR)	I	I
5	RHINIDAE	<i>Rhina ancylostomus</i> Bloch & Schneider, 1801	Critically Endangered (CR)	I	II
6		<i>Rhynchobatus laevis</i> (Bloch & Schneider, 1801)	Critically Endangered (CR)	I	II
7		<i>Rhynchobatus australiae</i> Whitley, 1939	Critically Endangered (CR)	I	II
8		<i>Rhynchobatus djiddensis</i> (Forsskal 1775)	Critically Endangered (CR)	I	II
9	RHINOBATIDAE	<i>Acroteriobatus variegatus</i> Nair & Lal Mohan, 1973	Critically Endangered (CR)		II
10		<i>Rhinobatos annandalei</i> Norman, 1926	Data Deficient (DD)		II
11		<i>Rhinobatos lionotus</i> Norman, 1926	Data Deficient (DD)		II
12		<i>Rhinobatos punctifer</i> Compagno & Randall, 1987	Near Threatened (NT)		II
13	GLAUCOSTEGIDAE	<i>Glaucostegus granulatus</i> (Cuvier, 1829)	Critically Endangered (CR)		II
14		<i>Glaucostegus obtusus</i> (Muller & Henle, 1840)	Critically Endangered (CR)	I	II
15		<i>Glaucostegus thouin</i> (Anonymous, 1798)	Critically Endangered (CR)	I	II
16		<i>Glaucostegus typus</i> (Anonymous [Bennett] 1830)	Critically Endangered (CR)		II
17	NARCINIDAE	<i>Benthobatis moresbyi</i> Alcock, 1898	Least Concern (LC)		
18		<i>Narcine atzi</i> Carvalho & Randall, 2003	Data Deficient (DD)		
19		<i>Narcine brevilabiata</i> Bessednov, 1966	Vulnerable (VU)		
20		<i>Narcine lingula</i> Richardson, 1840	Vulnerable (VU)		
21		<i>Narcine maculata</i> (Shaw, 1804)	Vulnerable (VU)		
22		<i>Narcine prodorsalis</i> Bessednov, 1966	Data Deficient (DD)		
23		<i>Narcine timlei</i> (Bloch & Schneider, 1801).	Data Deficient (DD)		
24	NARKIDAE	<i>Narke dipterygia</i> (Bloch & Schneider, 1801)	Data Deficient (DD)		
25	TORPEDINIDAE	<i>Torpedo panthera</i> Olfers, 1831	Data Deficient (DD)		
26		<i>Torpedo sinuspersici</i> Olfers, 1831	Data Deficient (DD)		
27	GURGESIELLIDAE	<i>Cruriraja andamanica</i> (Lloyd, 1909)	Data Deficient (DD)		
28		<i>Fenestraja mamillidens</i> (Alcock, 1889)	Least Concern (LC)		
29	RAJIDAE	<i>Dipturus johannisdavisi</i> (Alcock 1899).	Data Deficient (DD)		

SI No	Family	Species	IUCN Status	WPA	CITES
30		<i>Dipturus springeri</i> (Wallace, 1967)	Least Concern (LC)		
31		<i>Okamejei powelli</i> (Alcock, 1898)	Data Deficient (DD)		
32	HEXATRYGONIDAE	<i>Hexatrygon bickelli</i> Heemstra & Smith, 1980	Least Concern (LC)		
33	PLESIOBATIDAE	<i>Plesiobatis daviesi</i> (Wallace, 1967)	Least Concern (LC)		
34	GYMNURIDAE	<i>Gymnura poecilura</i> (Shaw, 1804)	Near Threatened (NT)		
35		<i>Gymnura zonura</i> (Bleeker, 1852)	Vulnerable (VU)		
36		<i>Gymnura tentaculata</i> (Müller & Henle, 1841)	Data Deficient (DD)		
37	DASYATIDAE	<i>Brevitrygon imbricata</i> (Bloch & Schneider, 1801)	Data Deficient (DD)		
38		<i>Brevitrygon walga</i> (Müller & Henle, 1841)	Near Threatened (NT)		
39		<i>Hemitrygon bennetti</i> (Müller & Henle, 1841)	Vulnerable (VU)		
40		<i>Himantura leoparda</i> Manjaji-Matsumoto & Last, 2008	Vulnerable (VU)		
41		<i>Himantura marginata</i> (Blyth, 1860)	Data Deficient (DD)		
42		<i>Himantura tutul</i> Borsa, Durand, Shen, Alyza, Solihin & Berrebi, 2013	Not Evaluated		
43		<i>Himantura uarnak</i> (Forsskål, 1775)	Vulnerable (VU)		
44		<i>Himantura undulata</i> (Bleeker, 1852)	Endangered (EN)		
45		<i>Urogymnus arabica</i> Manjaji-Matsumoto & Last, 2016	Critically Endangered (CR)		
46		<i>Maculabatis bineeshi</i> Manjaji-Matsumoto & Last, 2016	Not Evaluated		
47		<i>Maculabatis gerrardi</i> (Gray, 1851)	Endangered (EN)		
48		<i>Megatrygon microps</i> (Annandale, 1908)	Data Deficient (DD)		
49		<i>Neotrygon caerulopunctatus</i> Last, White & Séret 2016	Not Evaluated		
50		<i>Neotrygon indica</i> Pavan-Kumar, Kumar, Pitale, Shen, Borsa 2018	Not Evaluated		
51		<i>Pastinachus ater</i> (Macleay, 1883)	Least Concern (LC)		
52		<i>Pastinachus gracilicaudus</i> Last & Manjaji-Matsumoto, 2010	Not Evaluated		
53		<i>Pastinachus sephen</i> (Forsskål, 1775)	Near Threatened (NT)		
54		<i>Pateobatis jenkinsii</i> (Annandale, 1909)	Vulnerable (VU)		
55		<i>Pateobatis bleekeri</i> (Blyth, 1860)	Endangered (EN)		
56		<i>Pateobatis fai</i> (Jordan & Seale, 1906)	Vulnerable (VU)		
57		<i>Pteroplatytrygon violacea</i> (Bonaparte, 1832)	Least Concern (LC)		
58		<i>Taeniura lymma</i> (Forsskål, 1775)	Near Threatened (NT)		

SI No	Family	Species	IUCN Status	WPA	CITES
59		<i>Taeniurops meyeri</i> (Müller & Henle, 1841)	Vulnerable (VU)		
60		<i>Telatrygon crozieri</i> (Blyth, 1860)	Not Evaluated		
61		<i>Urogymnus asperrimus</i> (Bloch & Schneider, 1801)	Vulnerable (VU)	I	
62		<i>Urogymnus granulatus</i> (Macleay, 1883)	Vulnerable (VU)		
63		<i>Urogymnus polylepis</i> Bleeker, 1852	Endangered (EN)	I	
64	MYLIOBATIDAE	<i>Aetomylaeus maculatus</i> (Gray, 1832)	Endangered (EN)	II	
65		<i>Aetomylaeus milvus</i> (Müller & Troschel 1841)	Endangered (EN)	II	
66		<i>Aetomylaeus nichofii</i> (Bloch & Schneider, 1801)	Vulnerable (VU)		
67		<i>Aetomylaeus vespertilio</i> (Bleeker 1851)	Endangered (EN)	II	
68	AETOBATIDAE	<i>Aetobatus flagellum</i> (Bloch & Schneider, 1801)	Endangered (EN)		
69		<i>Aetobatus ocellatus</i> (Kuhl, 1823)	Vulnerable (VU)		
70	RHINOPTERIDAE	<i>Rhinoptera javanica</i> Müller & Henle, 1841	Vulnerable (VU)		
71		<i>Rhinoptera jayakari</i> Boulenger, 1895	Not Evaluated		
72	MOBULIDAE	<i>Manta alfredi</i> (Krefft, 1868)	Vulnerable (VU)	I	II
73		<i>Manta birostris</i> (Walbaum, 1792)	Endangered (EN)	I	II
74		<i>Mobula kuhlii</i> (Müller & Henle 1841).	Endangered (EN)		II
75		<i>Mobula mobular</i> (Bonnaterre, 1788)	Endangered (EN)		II
76		<i>Mobula tarapacana</i> (Philippi 1892).	Endangered (EN)	II	II
77		<i>Mobula thurstoni</i> (Lloyd, 1908)	Endangered (EN)		II

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