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Batoid fishes off Visakhapatnam, north east coast of India

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Abstract

Demersal trawl by-catch in the North Andhra coastal waters includes skates and rays. They are particularly sensitive to heavy fishing and are unavoidable components in the by-catch. The life history of the skates and rays makes them vulnerable to over exploitation. Provided key to thirty three species of skates and rays (Super order Batoidei) belonging to families Rynchobatidae, Rhinobatidae, Dasyatidae, Gymnuridae, Myliobatidae, Mobulidae, Torpedinidae and Narkidae, represented in the catches of the fishing area, latitudes 15°N - 21°N; longitudes 80°E - 88°E of the north east coast of Inida.

Introduction

Skates and rays formed an important component of the catches off Visakhapatnam, north east coast of India. Very rich grounds have been observed. Potential yield was estimated as 4,386 tonnes (Ruben *et. al* 1989). They are sensitive to heavy fishing and are an unavoidable by-catch. The habitat and life history make them vulnerable to over exploitation. The elasmobranchs contitute 1.2 to 1.5% by weight in the demersal trawl catch. Long lines and bottom set gillnets are also used to exploit the resource. The slow growing and or low fecund groups such as lobsters, sharks, skates, rays and catfishes are showing signs of vulnerability. (Devaraj and Vivekanandan, 1999).

With the introduction of motorization of the country crafts and mechanized trawlers during 70's and 80's, the fishing patterns have changed and trawlers are landing more skates, rays and small sized sharks. An improved version of hooks and lines and gillnets with large mesh size are also used to capture large pelagics including sharks and rays. These modern fishing crafts covering vast areas have started fishing on a commercial scale in the area (latitudes 15°-21°N; longitudes 80° - 88°E) from the late seventies.

Management measures are essential to ensure their long term conservation and sustainable production. Complete and reliable statistics on catch and fishing effort should be maintained and disseminated so that species wise conservation measures could be taken up. The present paper provides key to identification of order, family, genus and species of skates and rays represented in the catches off Visakhapatnam.

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Material and methods

Samples were collected from fish land-

ing centres and the fisheries harbour of Visakhapatnam once in a week from October 1999 to November 2000. Larger specimens landed were identified in the field iteself with the help of photographs taken. Most of the descriptions follow the taxonomical characters described by Misra (1969), Lindberg and Legeza (1967), Smith and Heemstra (1986), Talwar and Kacker (1984), Talwar and Jhingran (1991) and other standard fish taxonomic books. Numerous synonyms have been omitted as these are available from standard works. Only the name of the author and year of first record of each species are given.

A total of 33 species of skates and rays (Table 1) have been identified. The species of family Pristidae was represented by *Pristis cuspidatus* Latham, 1794 and measured 205 cm in total length.

Key to batoid fishes represented in the catches

Super order Batoidei: Body disc-like, wide and flat. Gill openings on ventral surface of body. Anterior margin of pectoral fin joining with sides of body or head before gill openings. Anal fin absent. Dorsal fins if present, placed towards posterior region. Upper rim of orbit fused with eyes (no free eyelid).

Order Rajiformes: No electric organs between head and pectoral fins. Preorbital cartilages not enlarged.

Key to families of order Rajiformes

1. Snout projecting forward, forming a narrow blade which bears on each edge a single row of large tooth like structures

Pristidae

2. Snout not very elongated, nor forming a narrow blade. Tail sector so stout it is continuous with anterior part of the body and cannot be marked off.

A. Disc longer than wide, posterior margin of pectoral considerably anterior to origin of ventrals. Origin of first dorsal above or slightly anterior to base of ventrals. Spiracle large and close to eye. Caudal axis moderately raised, caudal markedly bilobed, more or less lunate, both lobes pointed.

Rhynchobatidae

B. Posterior margin of pectoral reaching origin of ventrals. Origin of first dorsal considerably behind end of ventral rays. Caudal not bilobed, not lunate, caudal axis not raised.

Rhinobatidae

3. Tail region narrow, thin, in many cases extremely thin, it is completely marked off from anterior part of body, dorsal and caudal, if present, not supported distally by horny rays.

A. Anterior margins of pectorals continuous along sides of head, not form separate cephalic fins or rostral lobes. Eyes and spiracles on top of head.

a) Disc not more than 1.3 times as broad as long; tail from center of cloaca to tip equal or longer than breadth of disc. On dorsal side of body small tubercles/prickles present/absent. No distinct dorsal fin; transverse fringed curtain on roof of mouth; floor of mouth with several fleshy papillae.

Dasyatidae

Table 1 *Skates and Rays off Visakhapatnam*

Species name	No. of specimens examined	Size range (cm.)
Rhina ancylostoma Schneider, 1801	3	132-146 TL
Rhynchobatus djeddensis (Forsskal 1775)	7	32-194 TL
Rhinobatos annandalei (Norman, 1926)	3	165-205 TL
Rhinobats granulatus (Cuvier, 1829)	2	130-197 TL
Rhinobatos obtusus (Muller & Henle, 1841)	2	23, 31 TL
Rhinobatos thouiniana (Shaw, 1804)	8	28- 93 TL
Dasyatis kuhlii (Muller & Henle, 1841)	6	22- 29 DW
Dasyatis zugei (Muller & Henle, 1841)	9	13- 18 DW
Himantura bleekeri (Blyth, 1861)	15	23- 68 DW
Himantura gerrardi (Grey, 1834)	13	22- 42 DW
Himantura imbricata (Schneider, 1801)	30	6- 28 DW
Himantura jenkinsii (Annandale, 1909)	2	20, 24 DW
Himantura marginatus (Blyth, 1861)	1	102 DW
Himantura uarnak (Forsskal, 1775)	4	64- 86 DW
Himantura walga (Muller & Henle, 1841)	11	16- 46 DW
Hypolophus sephen (Forsskal, 1775)	1	122 DW
Gymnura japonica (Schlegel, 1850)	23	31- 53 DW
Gymnura poecilura (Shaw, 1804)	18	24- 48 DW
Gymnura zonurus (Bleeker, 1852)	3	17- 29 DW
Aetobatus flagellum (Bloch & Schneider, 1801)	2	79, 83 DW
Aetobatus narinari (Euphrasen, 1790)	7	65-152 DW
Aetomylaeus ocellatus (Kuhl, 1823)	1	29 DW
Aetomylaeus milvus (Valenciennes in M&H, 1841)	12	25- 38 DW
Aetomylaeus nichofii (Schneider, 1801)	20	24- 58 DW
Rhinoptera javanica Muller & Henle, 1841	3	31- 34 DW
Mobula diabolus (Shaw, 1804)	2	79- 87 DW
Torpedo fuscomaculata Peters, 1855	4	11- 22 DW
Torpedo panthera Olfers, 1831	18	12- 31 DW
Torpedo sinuspersici Olfers, 1831	5	14- 29 DW
Narcine brunnea Annandale, 1909	29	5- 10 DW
Narcine maculata (Shaw, 1804)	1	17 DW
Narcine timlei (Schneider, 1801)	1	8 DW
Narke dipterygia (Schneider, 1801)	17	3 - 9 DW

b) Disc more than 1.5 times as broad as long. Tail from centre of cloaca to tip considerably shorter than breadth of disc, with or without small dorsal fin near mid length of tail. Transverse curtain on roof of mouth smooth edged, no fleshy papillae on floor of mouth.

Gymnuridae

B. Anterior margins of pectoral deeply indented or entirely interrupted just posterior to eyes, the anterior part of head thus sharply marked off from remainder of disc; anterior sub-division of pectorals forming separate lobe or lobes. Eyes and spiracles on sides of head.

a) Anterior sub-divisions of pectoral forming one soft fleshy lobe, extending forward below front of head reminiscent of duck's bill. Teeth large, pavement like in several rows (1-7).

Myliobatidae

b) Anterior sub-divisions of pectoral forming two narrow fin like projections widely and reminiscent of ears. Teeth minute in many series.

Key to Genera of Family Rhynchobatidae

1. Snout moderately narrow, pointed; its length in front of eyes nearly as long as breadth of head at level of anterior margins of eyes, posterior margin of spiracle with two low vertical ridges. Mouth only slightly undulates, median projection of lower jaw fitting corresponding depression of upper.

Rhynchobatus Muller and Henle, 1837

The genus is represented by one species *Rhynchobatus djiddensis*(Forsskal, 1775)

2. Snout broadly round, its length in front of eyes much less than breadth of head at eyes. Posterior margin of spiracle without vertical ridges. Mouth strongly undulate, three forward projections on lower jaw alternating with two-rearward indentations on upper.

Rhina Schneider, 1801

The genus is represented by one species *Rhina ancylostoma* Schneider, 1801

Family Rhinobatidae-Guitar fishes represented by one genus *Rhinobatos* Link, 1790 (also spelt *Rhinobatus, Rhinobates* by authors).

Key to species of genus *Rhinobatos*

1. Anterior nasal valve extending only as far as level of inner (anterior) margin of nostril. First dorsal fin base 2.25 to 2.5 times of inter space between dorsal fins; a series of small spines on mid line or back.

Rhinobatos annandalei Norman, 1926

2. Anterior nasal valve extending on to inner margin of nostril some times meeting that of opposite side.

A. Nostril length 2 to 3 times width of mouth, about equal to internarial distance.

a) Snout very long; roastral ridges close together (almost joining throughout their length); width of mouth 2.6 to 3.25 times in snout length

R. granulatus Cuvier, 1829

b) Snout short, rostral ridges separated throughout their length; width of mouth about 1.9 times in snout length

R. obtusus Muller and Henle, 1841

B. Nostril length less than 2 times width of mouth, greater than internarial distance. Snout expanded at tip; nostril length about 1.3 times in mouth width, about 2 times in internarial distance.

R. thouiniana (Shaw, 1804)

Family Dasyatidae - Sting or whip rays represented by three genera in the catches.

Key to genera of Family Dasyatidae

1. Tail slender; whip like, generally longer than disc, lower surface of tail and posterior to spine without membranous fold.

Himantura Muller and Henle, 1841

2. Tail with longitudinal cutaneous fold, either upper or lower or both.

A) Lower surface of tail posterior to origin of spine with a longitudinal membranous fold, on both its upper and lower surfaces

Dasyatis Rafinesque, 1810

B) Cutaneous ventral fin fold on tail high and prominent, its height 2-3 times tail height over fold, teeth hexagonal with high crowns

Hypolophus Muller and Henle, 1841

Key to species of Genus *Dasyatis*

The genus is in need of thorough revision on the basis of the analysis of more material.

1. No buccal processes (papillae) on floor of mouth; tail short, less than disc length

Dasyatis zugei (Muller and Henle, 1841)

2. Two buccal processes on floor of mouth; tail long, extending length of disc.

D. kuhlii (Muller and Henle, 1841)

Key to species of genus *Himantura*

1. Two buccal processes on floor of mouth

A. Tail much longer than disc

a) Tail length more than 3 times length of disc

Himantura bleekeri (Byth, 1861)

b) Disck broader than long, tail length 2.3 times length of disc; head and centre of back with closely set rounded denticles, tail with denticles intermixed with stellate spines.

H. marginatus (Blyth, 1861)

c) Tail lengh less than 1.5 times disc length, uniform small tubercles on interorbital, interspiracle, and mid dorsal surface of disc, a series of small spines between root of tail.

H. walga (Muller & Henle, 1841)

B. Tail short, about as long as length of disc.

H. imbricata (Schneider, 1801)

2. Four or five buccal processes on floor of mouth, tail long exceeding length of disc.

A. Upper surface of disc brown with bright spotted or marbled pattern.

H. uarnak (Forsskal, 1775)

B. Upper surface of disc brown or grey, without any bright markings, at most with obscure pale spots.

a. Snout forming widely obtuse angle. Tail very long whip like 3 to 5 times the length of disc.

H. gerrardi (Grey, 1834)

b. Snout pointed, snout length 5.8 times in disc length, Tail long, cylindrical throughout, 1.4 times the length of disc.

H. jenkinsii (Annandale, 1909)

The genus *Hypolophus* is represented by one species *Hypolophus sephen* (Forsskal, 1775)

Family Gymnuridae - Butterfly rays repesented by on genus *Gymnura* van Hasselt, 1823

Key to species of genus *Gymnura*

1. A small dorsal fin (a small cutaneous fold) on tail. No tentacles behind spiracles.

Gymnura zonurus (Bleeker, 1852)

2. Dorsal fin absent.

a) Tail about as long as length of disc; no spine on tail

G. poecilura (Shaw, 1804)

b) Tail slender shorter than disc length, armed with a small week serrated spine at the proximal part.

G. japonica (Schlegel, 1850)

Family Myliobatidae - Eagle rays (warm water rays)

Key to genera of the family Myliobatidae

1. Only a single series of teeth (broad plates) in each jaw.

Aetobatus Blainville, 1816

2. Normally five or more series of teeth in each jaw (jaw central rows being plates)

A. Subrostral fin (formed by pectorals and in the form of ducks bill) connected by main portions of fins by a continuous series of radial cartilages extending along sides of head. Serrated caudal spine present.

Rhinoptera Cuvier, 1829

B. Subrostral fin (duck's bill) entirely separated from main portions of fins along head. No serrated caudal spine.

Aetomylaeus Garman, 1908

Key to species of Genus *Aetobatus*

1. Skin smooth; tail rough in adults. Uniform dark greenish bronze color, without spots. Snout short.

Aetobatus flagellum (Schneider, 1801)

2. Body purple brown with spots; snout long, longer than broad at base.

A. narinari (Euphrasen, 1790)

3. Skin smooth, brown above with many

dark edged close set withish spots becoming smaller at disc edges.

A. ocellatus (Kuhl, 1823)

Key to species of genus *Aetomylaeus*

1. Disc twice wide as long, about five blue cross bands on disc (disappearing with age)

Aetomylaeus nichofii (Schneider, 1801)

2. Disc less than twice wide as long; green brown edge ocelli on hind part of disc

A. milvus (Valenciennes in Muller and Henle, 1841)

Genus *Rhinoptera* so far known by one species *R. javanica,* Muller and Henle, 1841

Family Mobulidae - Devil rays represented by one genus *Mobula* Refinesque, 1810 and one species *M. diabolus* (Shaw, 1804).

Order Tropediniformes - Electric rays

Batoids with pectoral fins greatly expanded and fused with head and trunk, forming a large oval disc. Electric rays are having a pair of unique, kidney shaped electric organs in front of disc, usually visible through skin as pattern of hexagonal markings. Tail thick but short, caudal fin functional in swimming. Adults viviparous. Inshore to deep-water benthic batoids. 2 families represented in the catches.

Key to families of Order Torpediniformes

1. Two dorsal fins - Torpedinidae
2. One dorsal fin - Narkidae

Key to genera of Family Torpedinidae-

1. Eyes well developed. Mouth broadly arched. Head, body and pectoral fins form a rounded soft and flabby disc; origin of first dorsal opposite pelvics.

Torpedo, Houttuyn, 1764

2. Mouth round protractile as a small tube. Origin of first dorsal distinctly behind pelvics

Narcine Henle 1834

Key to species of genus *Torpedo*

1. First dorsal base ending in front of pelvic bases. Brunt amber above with small irregular light, broken vermiculations, some circles, dots, hooks, bars or blotches crowded along disc edges, whitish below; pelvics and tail mottled dull amber.

Torpedo panthera Olfers, 1831

2. First dorsal base and pelvic bases ending even; skin smooth, rusty brown above with irregular large and small dusky spots.

T. sinuspersici Olfers, 1831

3. Margin of spiracles with short tentacles or papillae. Individual, small and widely separate spots on dorsal surface of body.

T. fuscomaculata Peters, 1855

Key to species of genus *Narcine*

1. Disc flabby, smooth, a pair of buccal processes on roof and floor of mouth; dorsal side smaller and larger dark spots on creamy background.

Narcine maculata (Shaw, 1804)

2. Disc flat, smooth, uniform brown above

N. brunnea (Annandale, 1909)

3. Body and fins reddish brown above, with numerous irregularly sized choco-

late coloured spots.

N. timlei (Schneider, 1801)

Family Narkidae is represented by one genus *Narke* Kaup, 1826 and one species *dipterygia* (Schneider, 1801):

Conclusions and discussion

Moron *et al* 1998 in his check list described 26 species of skates and rays from the west coast of Sri Lanka (Bay of Bengal). In the present paper, key to 33 species of Super order Batoidei is provided. Table 1 gives list of the species, number and length groups of the specimens observed. *Rhinobatos annandalei, R. obtusus R.thouiniana, Dasyatis zugie, Himantura bleekeri, Gymnura zonurus, G.japonica* and *Torpedo sinuspersici* are reported for the first time from Visakhapatnam Coast.

Rhinobatos granulatus (Sutti Warah - Telugu) is the most common in catches. Among the rays, the species of *Dasyatis* dominated the fishery. The dwarf ray *D.imbricata* was represented in the catches of traditional gear throughout the year which, indicated its coastal habitat. *D.bleekeri* and *D.zugie,* (smaller rays) are so far represented only in the trawl catches. Of the three species of *Aetobatus* (Eel tenkee - Telugu) *A. narinari* was represented in the catches at Visakhapatnam.

It was observed that *Aetomylaeus maculata* and *A. milvus* are same. *A. milvus* is female and *A. maculata* is male. Some more specimens have to be observed.

Regarding *A. nichofii* (Mookara tenkee, sappa thiruky - Telugu) male (*A. nichofii cornifera*) specimens differ from female (*A. nichofii nichofii*) by the presence of a horn immediately above each orbit and in having denticles on back.

After examining more male and female specimens of *Narke dipterygia* it was confirmed that *Bengalichthys impennis* Annandale, 1878 as male of former species.

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