Special Paper

Pakistan J. Sci. Ind. Res., Vol. 15, Nos. 4–5, August–October 1972

SHARKS, SKATES AND RAYS OF THE ARABIAN SEA

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(Received October 20, 1971)

Abstract. This paper is based on the study of 26 species of sharks, 3 of saw fishes, 3 of guitar fishes and many sting rays, giant rays and cow rays (class Elasmobranchii). This study included landings on the Karachi Fish Harbour, on the coasts of Sind and Mekran and on the departmental and other trawlers. Mention has been made of the byproducts produced in the Biochemical Laboratory of the P.C.S.I.R., Karachi. Although elasmobranchs have been described by many authors but the publications are scattered and many are not easily available, some have become out-of-date.

Sharks, skates and rays are elasmobranchs, defined as 'Fish-like aquatic animals generally having cartilagenous skeleton.' Elasmobranchs are found in large numbers in our seas and are generally caught by hook and line and incidentally entangled in the nets. Although some people eat meat of sharks but generally these are not consumed in Pakistan and their meat, after curing, is exported to Ceylon and other countries. The fins of sharks are exported to Burma, Singapore and Hong Kong where soup is prepared out of the gelatinous portion. The liver is boiled with water and oil thus extracted, is applied to the hulls of wooden fishing boats.

For the biologists there is great scope for working out the anatomy of elasmobranchs. A systematic study is necessary for determining the shape and size of the liver in relation to the size of fish, its feeding habits and variation in the quantity and potency of the liver oil obtained in different seasons. For the biochemist the quantity of oil extracted from the liver and estimation of vitamins A and D in relation to its weight are some of the problems. The livers of skates and rays, deficient in vitamins, can be used for extraction of oil for commercial purposes.

Sharks grow to a large size sometimes to 20 ft. A shark, called 'mhor' at Karachi (whale shark), is reported to grow to 70 ft in length and has been caught many times near the coast of West Pakistan. The teeth of sharks are of different types. Sharks possessing shearing type are dangerous. Others possess flat teeth for crushing mollusc shells and, although they are large in size, are not harmful to fishes and human beings.

The aim of this paper is to present a key for the identification of elasmobranchs for students and teachers in zoology and for research workers interested in the commercial utilisation of different organs of these fishes. The liver of sharks and some skates contain oil rich in vitamin A. During the last World War shark liver oil was extensively produced in the subcontinent for supply to the defence forces and hospitals. The shark liver oil industry, however, died down be cause of the competition from synthetic products.

The meat of small skates and rays is quite tender and good, and if prejudices against its use are removed, a very good and cheap source of protein can be made available in large quantities.

Shark can be fully utilised and no part of it is wasted if proper utilisation is made. The liver and pituitary gland are utilised for the preparation of pharmaceutical products; meat is cured or used as fresh, offal utilized for fishmeal/manure, fins cured and utilised for preparation of soup, and skin, if properly tanned, is a useful product for the manufacture of shoes, ladies' purses and other articles.

Since Day[7] has published two volumes on fishes numerous papers have been written on Indian fishes which are scattered in different publications. Herre[11] had taken up revision of the two volumes on fishes of Day and after his death this work was entrusted to Misra.[12–14] In this connection mention may also be made of the authors who have worked on the taxonomy of fishes of the Indian Ocean, adjacent seas and in the tropical Pacific Ocean. Fowler[8] and Herre[11] have described fishes from the Pacific. Blegvad[6] has reported some sharks, skates and rays which he had caught during the survey of the Iranian Gulf. Munro[16] has given accounts of sharks, skates and rays alongwith other fishes. From Pakistan names and description of elasmobranchs have been given by Qureshi[18,19] who has published account of other marine fishes found in Pakistani waters.

Work on liver oil of sharks has been done in Pakistan by a team of workers in the laboratories of the P.C.S.I.R. The processes and formulae have been sold to a firm, Pakistan Vitamin Products, Ltd., which is now operating a plant in the Fish Harbour at Karachi. Work on liver oil of 6 sharks, 3 hammerhead sharks, 2 saw fishes and 3 skates have been done. The highest potency of 72,350 vitamin A U.S.P. units/g was present in a species of hammerhead shark while in the liver of saw fishes and skates it was low. Ali *et al.*[3] have further carried out research on other fishes as well.

Furthermore, fish protein concentrate (FPC) was prepared by Haq[9] and Mehdihassan from shark meat and other fishes. It was added to wheat flour and different preparations were made. It was found that FPC was tasteless, odourless and can with advantage be added to wheat flour for preparation of

bread and biscuits and thus fortifying them easily with digestable protein.

Taxonomic studies were carried out at the Karachi Fish Harbour, on fishing launches and trawlers, at important landing centres on the Mekran coast where the catches of elasmobranchs was found to be the heaviest. Small specimens were preserved and displayed in the museum of Marine Fisheries Department but the larger ones could not be preserved.

Systematic Account

Sharks, Skates and rays are included in class Elasmobranchii. These are characterised by having cartilagenous skeleton which may sometimes be partly calcified. The skin is covered with denticles or modified scales embedded in the skin. These are absent in electric rays and eagle rays. A single nostril is present and generally five separate gill-openings on each side. Caudal fin is asymmetrical, upper lobe being the longer. Males have a pair of claspers alongside pelvic fins. Some are viviparous and others oviparous.

Class Elasmobranchii consists of two superorders which are characterised below:

(1) body cylindrical; gill-openings on side; superorder, Selachoidei; and (2) body flattened, disc-shaped; gill-openings on lower surface superorder Batoidei

Superorder Selachoidei-Sharks

Body, cylindrical; eyes, lateral; mouth, inferior; gill-openings, 5–7, on sides, slitlike. Spiracles present or absent. Two dorsal fins and an anal fin.

Key to Orders of Superorder Selachoidei

Two dorsal fins: 5 pairs of gill-openings; order Lamniformes: (i) nictitating membrane absent; suborder, *Lamnoidei*; (ii) nictitating membrane present; suborder, *Scyliorhinoidei.*

Key to the Families of Suborder Lamnoidei

(a) Nasoral grooves present; family, Orectolobidae: (b) nasoral grooves absent; (i) teeth tricuspid; caudal peduncle not keeled; family Odontaspidae; (ii) teeth not tricuspid; caudal peduncle keeled on sides; family, Lamnidae.

Family Orectolobidae

Body slender excepting *Rhincodon* which is robust. Folds on both lips. Eyes small with nictitating membrane. Viviparous and oviparous.

Key to Species. (1) Body, not massive; tail, without lateral keel; caudal pit, absent: (a) first dorsal fin behind pelvics, *Chiloscyllium griseum*; (b) first dorsal fin opposite pelvics; caudal fin long, *Stegostoma fasciatum*; (2) Body, massive; tail, with lateral keels; caudal pit, present; *Rhinocodon typus.*

1. *Chiloscyllium griseum* (Muller & Henle); Ridge-Back Cat shark.

Chiloscyllium indicum, Day, Fauna Brit. India, Fish, **1,** 34 (1889).

Hemiscyllium punctatum, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 85(1941).

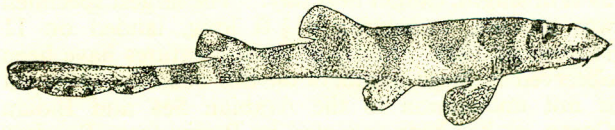
Chiloscyllium griseum, Misra, Records Ind. Mus., **57**(1–4), 81 (1949).

Body elongate. Trunk shorter than tail. Single rough ridge on back. Nasoral grooves and cirri present. Spiracles below eyes. Teeth small and triangular. The origin of first dorsal fin begins close behind base of pelvic fin.

Colour. Pale brown. Transverse, dark brown saddles on back, all broader than pale interspaces. Sometimes dorsals with dark blotches and also on paired fins. Colour varies considerably.

Distribution. Arabian Sea.

Local Names. Mangra (West Pakistan); Bambak-gorbeh (Iran).



1. *Chiloscyllium griseum* (Muller & Henle); Ridge-back Cat Shark

2. *Stegostoma fasciatum* (Hermann); Zebra Shark.

Stegostoma tigrinum, Day, Fauna Brit. India, Fish, **1,** 33 (1889)

Stegostoma fasciatum, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 100 (1941).

Stegostoma varium, Misra, Records Ind. Mus., **57** (1–4), 83 (1949).

Body long and slender; snout obtuse. Nasoral grooves and cirri present. Labial fold well-developed. First dorsal fin inserted opposite pelvic fin. Caudal fin very elongate.

Colour. Brown above, whitish below. Deep brown loops over head and body which are separated by white bands which are present on some fins also. Attains 6 ft in length.

Distribution. Arabian Sea.

Local Names. Pusuni (West Pakistan); Bambak (Iran).

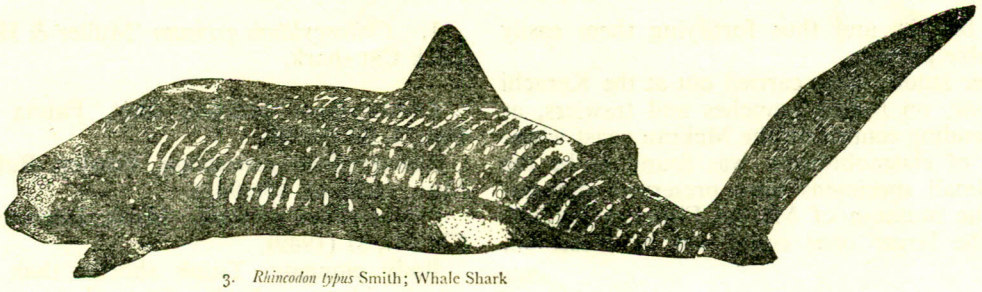
2. *Stegostoma fasciatum* (Hermann); Zebra Shark

3. *Rhincodon typus* Smith; Whale Shark.

Rhincodon typicus, Day, Fauna Brit. India, Fish, **1,** 29 (1889).

Rhineodon typus, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 166 (1941).

Body massive. Head broad and flattened. Mouth wide. Teeth very small, numerous and in bands on both jaws. In spite of its large size, it can feed only on plankton and small crustaceans which are strained through the gills and teeth. It is not a dangerous



3. *Rhincodon typus* Smith; Whale Shark

creature. Gill-openings very wide. Gill-rakers long, numerous, used as strainers.

The fish had been recorded near Karachi first by Buist in 1850, later by Ashworth in 1922, by Capt. Haygate in 1937. It has been reported by Blegvad from Iranian coast also.[6] The largest size formerly recorded from Karachi was 18 ft long. Recently, two were caught by the fishermen of Baba Island. The first one was 21 ft long, landed at Karachi on 14 October, 1949, the other was a female, measuring 39 ft in length, caught next day. The largest specimen was a male, measuring 41½ ft long, landed on 11 November 1949. Many of these creatures have been observed in large numbers on this coast in 1951. It is not uncommon in the Arabian Sea and Indian Ocean, as has been reported by Prater from Bombay and other parts of India and Ceylon. According to Norman, it attains a length of 55 ft or more and weighs several tons, according to Regan it grows to 75 ft in length and is the largest fish living.

Colour. Ground colour sandy brown with numerous pale spots on head, and series of pale spots alternating with pale vertical stripes on sides.

Its liver contains large quantity of oil. It was found to contain very low potency of vitamin A, the oil is extracted and used for smearing wooden boats. Its meat is not good and is generally thrown away. The fish is very sluggish and usually floats on the surface and is not afraid of sail boats. The fishermen use a crude harpoon to which a thick rope is attached. The harpoon is thrust in the head or body of the fish and then the rope is slackened. After struggling for many hours, it is towed to the shore.

Distribution. It has been recorded that this fish is inhabitant of the Pacific Ocean, travels from there to the Indian Ocean and Arabian Sea in search of food during winter. During February, 1961, while travelling from Gwadur to Karachi on the Departmental vessel 'Machhera', four fishes of fairly large size, swimming on the surface, were observed.

Local Names. It is known as 'mhor' or 'mhor mangra' and, owing to its feeding habits, is popularly known as 'whale shark'; Kotti-Mahi (Iran).

Family Lamnidae

No nictatating membrane. Body torpedo-shaped. Upper lobe of caudal fin enlarged. Nasoral grooves absent.

Key to Species. (1) Upper caudal lobe much enlarged, *Alopias vulpinus*; (2) upper caudal lobe not much enlarged; teeth in 24 rows above, 22 below. Lateral line with an inconspicuous ridge, *Isurus glaucus.*

4. *Alopias vulpinus* (Bennaterre); Thresher Shark.

Alopias vulpes, Day, Fauna Brit. India, Fish, **1,** 28(1889).

Alopias vulpinus, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 125 (1941).

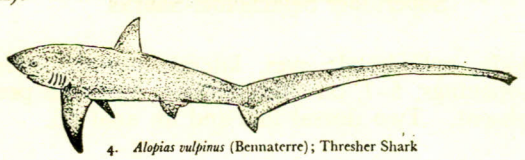
Alopias vulpinus, Misra, Records Ind. Mus., **57**(1–4), 85(1962).

Body fusiform. Tail long and used to whip the water and frighten schools of small fish on which it feeds. Second dorsal and anal fins very small. Teeth of small size, flattened, having smooth edges. First dorsal inserted above the interspace between pelvic and anal fins. Caudal very long, with a pit at its commencement. No lateral keel on tail.

Colour. Dark slaty above, white on lower surface. Attains 15 ft.

Distribution. Indian Ocean and contiguous seas.

Local Names. Manger (West Pakistan); Bambak (Iran).



4. *Alopias vulpinus* (Bennaterre); Thresher Shark

5. *Isurus glaucus* (Muller & Henle); Bluish Shark.

Lamna spallanzanii, Day, Fauna Brit. India, Fish, **1,** 26 (1889).

Isurus glaucus, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 104 (1941).

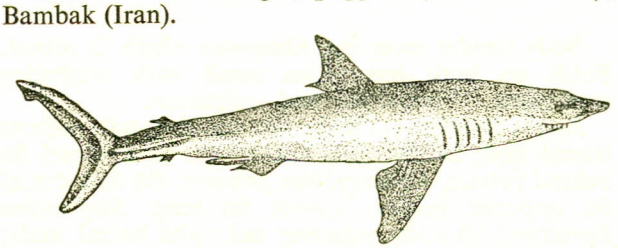
Isurus glauca, Misra, Records Ind. Mus., **57** (1–4), 86 (1962).

Body fusiform. Snout pointed. Teeth awl-shaped with sharp lateral edges. First dorsal fin larger than the second which is equal to anal. Dorsal fin situated nearer the pectoral fin than the pelvic. Upper caudal lobe longer than the lower.

Colour. Back dark bluish-brown and white on the undersurface. Attains 6 ft.

Distribution. Arabian Sea

Local Names. Manger, paggas (West Pakistan); Bambak (Iran).



5. *Isurus glaucus* (Muller & Henle); Bluish Shark

Family Odontaspidae

No nictitating membrane. Mouth wide and crescent-shaped. Teeth large, awl-shaped and with two cusps. Two spineless dorsal fins. Nasoral grooves absent.

6. *Carcharias tricuspidatus* Day; Trocuspid Shark.[7,8,15]

Odontaspis tricuspidatus, Day, Fauna Brit. India, Fish, **1,** 27 (1889).

Carcharias tricuspidatus, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 121 (1941).

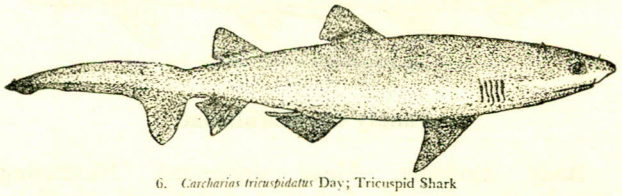
Carcharias tricuspidatus, Misra, Records Ind. Mus., **57**(1–4), 84 (1962).

Body fusiform. Snout not pointed. Trunk more than twice the tail. Spiracles small. Anal fin and caudal pit present. Teeth very large, awl-shaped, basal cusp present on either side. Pectoral reaching to below the base of the first dorsal. Second dorsal slighty in advance of anal.

Colour. Brownish above, becoming dull white beneath. Grows to a large size.

Distribution. Arabian Sea.

Local Names. Dundanee (West Pakistan); Bambak (Iran).



6. *Carcharias tricuspidatus* Day; Tricuspid Shark

Suborder *Scyliorhinoidei*

Key to Families

(a) Head with lateral (oculonarial) expansions; family Sphyrnidae; (b) head without lateral (oculonarial) expansions: (i) anal fin before second dorsal fin, family Scyliorhynidae; (ii) anal fin opposite second dorsal fin, family Carcharhinidae.

Family Sphyrnidae

Nictitating membrane present. The anterior portion of the head is broad, flattened and laterally elongated, with the eyes situated at its lateral extremities and the nostrils at its fore border. Caudal with one notch and a pit at the commencement of fin.

Key to Species. (1) Eyes and nostrils widely separated; oculonarial expansions long, *Sphyrna blochii*; (2) eyes and nostrils not widely separated, oculonarial expansions short; (a) anterior edges of oculonarial expansions straight, *Sphyrna zygaena*; (b) anterior edges of oculonarial expansions curved, *Sphyrna tudes.*

7. *Sphyrna blochii* (Cuvier); Arrow-headed Hammerhead Shark.

Zygaena blohii, Day, Fauna Brit. India, Fish, **1,** 22 (1889).

Sphyrna blochii, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 221(1941).

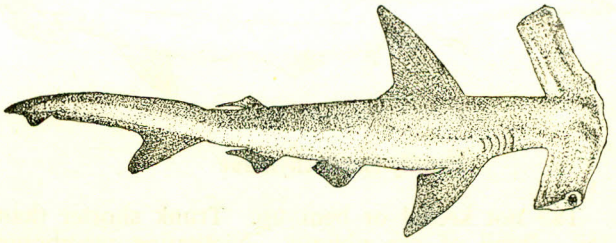
Sphyrna blochii, Misra, Records Ind. Mus., **57** (1–4), 95 (1962).

Outer narial grooves extending to about the orbit. Head expansions about twice as long as broad, the external edge nearly straight. Teeth oblique, externally notched and smooth in their extent. First dorsal fin much larger than pectoral.

Colour. Deep grey or brownish grey, lighter below. Base of second dorsal brownish grey, lighter below. Attains about 8 ft.

Distribution. Common in the Arabian Sea.

Local Name. Doka (West Pakistan).



7. *Sphyrna blochii* (Cuvier); Arrow-headed Hammerhead Shark

8. *Sphyrna zygaena* (Linnaeus); Round-headed Hammerhead Shark.

Zygaena malleus, Day, Fauna Brit. India, Fish, **1,** 22(1889).

Sphyrna zygaena, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 217 (1941).

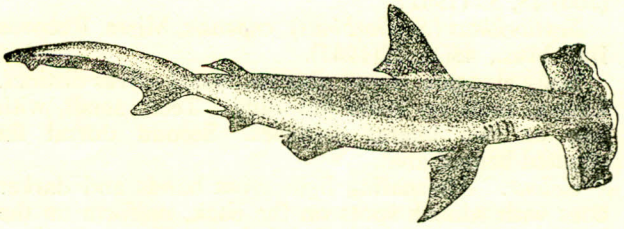
Sphyrna zygaena, Misra, Records Ind. Mus., **57** (1–4), 96 (1962).

Outer narial grooves short, inner extending more than half way to snout. Front of snout convex, without median indentation. Oculonarial expansions about 1½ times longer than wide. Teeth oblique and notched. Base of anal fin much shorter than that of pectoral, about equal to base of second dorsal.

Colour. Grey or greyish brown above, whitish below. Fins, with black tips. Grows to 14 ft in length.

Distribution. Seas of Pakistan.

Local Name. Bodher-buther (West Pakistan).



8. *Sphyrna zygaena* (Linnaeus). Round-headed Hammerhead Shark

9. *Sphyrna tudes* (Valenciennes); Squat-headed Hammerhead Shark.

Zygaena tudes, Day, Fauna Brit. India, Fish, **1,** 23(1889).

Sphyrna tudes, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 213 (1941).

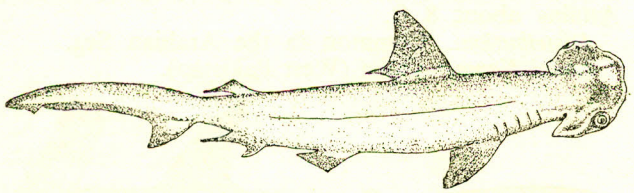
Sphyrna tudes, Misra, Records Ind. Mus., **57** (1–4), 96 (1962).

Inward extension of narial grooves absent, front margin of snout double convex, with distinct median indentations. Oculonarial expansions shorter than their width. Teeth oblique, with a notched outer edge. First dorsal fin much larger than pectoral; base of second dorsal shorter than that of anal.

Colour. Grey brown above, whitish below. Attains at least 8 ft.

Distribution. Arabian Sea and Iranian Gulf.

Local Name. Bodher-buther (West Pakistan).



9. *Sphyrna tudes* (Valenciennes); Squat-headed Hammerhead Shark

Family Scyliorhynidae

Tail not keeled or bent up. Trunk shorter than tail. Pupil of eye oblique. Nictitating membrane present. Spiracles distinct. Two spineless dorsals, first above pelvics. Caudal long, usually with basal lobe. Caudal pit present. Small sharks of warm seas.

"The egg cases are oblong and with filamentous tendrils at each corner. As expelled, two at a time, the first pair of the filaments of the egg cases are wound around a branch of seaweed or other object by female and there the egg capsule is left to its fate. The young sharks are said to hatch in six months time" (Fowler).[8]

Key to Species. (1) Light and darker bands on back, *Scyliorhinus capensis*; (2) transverse bands separated by spots and blotches, *Atelomycterus marmoratus.*

10. *Scyliorhinus capensis* (Muller & Henle); Striped Cat Shark.

Scyllium capense, Day, Fauna Brit. India, Fish, **1,** 31(1889).

Scyliorhinus capensis, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 35 (1941).

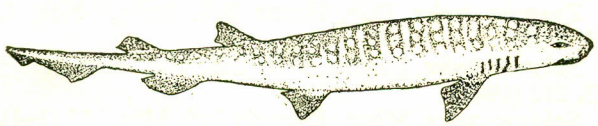
Scyliorhinus (*Scyliorhinus*) *capensis*, Misra, Records Ind. Mus., **45**(1), 12(1947).

Body elongate. Snout obstuse. Nasal valves distinct. Lateral folds on lower jaw only. Teeth small, with one or two lateral denticles. Second dorsal fin situated behind anal.

Colour. Alternating light cross bands and darker ones with whitish spots on the back, uniform on the lower surface. Attains 3–4 ft in length.

Distribution. Arabian Sea.

Local Names. Mangra (West Pakistan); Bambak (Iran).



10. *Scyliorhinus capensis* (Muller & Henle); Striped Cat Shark

11. *Atelomyceterus marmoratus* (Bennett); Marbled Cat Shark.

Scyllium marmoratum, Day, Fauna, Brit. India, Fish, **1,** 31 (1889).

Atelomycterus marmoratus, Fowler Bull. U.S. Nat. Mus., (100) **13,** 62 (1941).

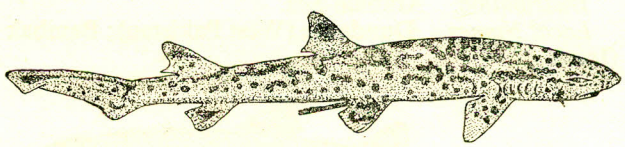
Atelomycterus marmoratum, Misra, Records Ind. Mus., **57**(1–4), 86(1962).

Body elongate and slender. Eyes large, with nictitating membrane. Spiracles behind eyes. Lateral folds around mouth angles. Teeth small, tricuspid. Base of second dorsal fin equal to that of anal, situated a little behind it.

Colour. Light brownish, lower surface whitish. Colour varies considerably with age. Transverse bands of brown on back separated by white blotches and spots which change with the age and remain as brown and white spots on the body. Attains 2–3 ft in length.

Distribution. Arabian Sea.

Local Names. Mangra (West Pakistan); Bambak (Iran).



11. *Atelomycterus marmoratus* (Bennett); Marbled Cat Shark

Family Carcharhinidae

Body elongate. Head depressed. Nictitating membrane present. Spiracles small or obsolete. Two spineless dorsal fins. First dorsal fin before pelvics. Caudal pit usually present. No keel on caudal peduncle.

Key to Species. (1) Teeth compressed, triangular. A single series functional.

(A) Spiracles absent: teeth without swollen bases: (a) labial fold extending to upper jaw, *Scoliodon walbeehmi*; (b) labial fold not extending to upper jaw, second dorsal fin posterior to base of anal, *Scoliodon sorrakowah*; second dorsal fin end of base of anal, *Scoliodon palasorrah.*

(2) Teeth serrated at bases only, snout pointed. Labial folds present, *Hypoprion hemiodon.*

(3) Teeth with roughened edges, serrated at bases and cusps (in the upper jaw):

(a) Second dorsal fin smaller than anal. Second dorsal and anal origins opposite; brown above; *Carcharhinus limbatus*; (ii) second dorsal origin behind anal origin; grey above; *C. sorrah.* (b) Second dorsal fin and anal subequal: (i) all fins tipped with black; *C. melanopterus*; (ii) brown. Fins grey; *C. menisorrah*; (iii) grey. Deep black spots at lower end of caudal; *C. bleekeri*; (iv) fawn. Fins with whitish edges; *C. dussumieri.* (c) Second dorsal fin larger than anal; Snout obtuse. Fawn dorsally; *C. ellioti.*

(B) Spiracles present: (a) Teeth articulated only in upper jaw. Black spots on body and tail; (i) teeth serrated only in upper jaw. Dark brown with grey fins; *Hemigaleus balfouri*; (ii) teeth serrated in both

jaws. Black spots on body and tail; *Galeocerodo cuvieri*. (b) Teeth in bands on pavement. More than one series functional: (i) subcaudal produced. Cinnamon brown, *Triaenodon obesus*; (ii) subcaudal not produced; grey brown, sometimes with white spots on the body; *Myrmillo manazo*.

12. *Scoliodon walbeehmi* (Bleeker); Walbeeham's Dog Fish.

Carcharias walbeehmi, Day, Fauna Brit. India, Fish, **1**, 10(1889).

Scoliodon walbeehmi, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 134 (1941).

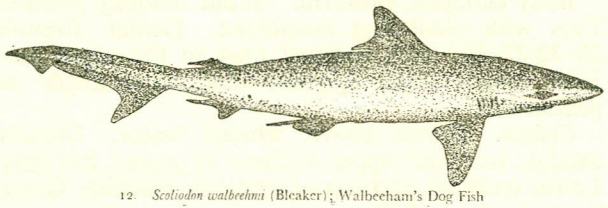
Scooliodon walbeehmi, Misra, Records Ind. Mus., **57** (1–4), 89 (1962).

Body elongated and slender. Snout pointed. Head depressed, labial fold only on the lower jaw. Teeth 24–28 in each jaw. First dorsal opposite inner hind angle of pectorals. Second dorsal inserted nearly opposite hind basal end of anal.

Colour. Grey to brownish above, whitish below. First dorsal fin greyish. Attains 4 ft.

Distribution. Arabian Sea.

Local Names. Kamot (West Pakistan); Bambak (Iran).



12. *Scoliodon walbeehmi* (Bleaker); Walbeeham's Dog Fish

13. *Scoliodon sorrakowah* (Cuvier); Yellow Dog Fish.

Carcharias laticaudus, Day, Fauna Brit. India, Fish, **1**, 9(1889).

Scoliodon sorrakowah, Fowler, Bull U.S. Nat. Mus., (100) **13**, 140(1941).

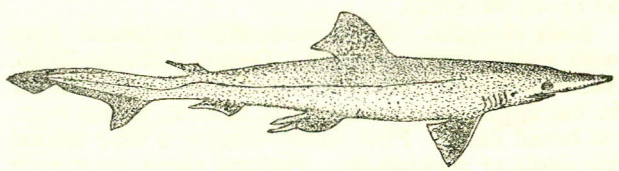
Scoliodon sorrakowah, Misra, Records Ind. Mus., **57** (1–4), 88(1962).

Body enlongate. Snout pointed. Labial fold only in the lower jaw. Teeth upper 22 rows, lower 23 rows, all oblique and with swollen bases with smooth edges. First dorsal fin origin close behind end of pectoral. Second dorsal origin over last fourth of anal base.

Colour. Upper surface and back dull yellow, with slight grey tinge, lower surface cream colour. Fins dull brownish. Grows to about 2 ft in length.

Distribution. Indian Ocean and contiguous seas.

Local Names. Dandanee (West Pakistan); Bambak (Iran).



13. *Scoliodon sorrakowah* (Cuvier); Yellow Dog Fish

14. *Scoliodon palasorrah* (Cuvier); Grey Dog Fish

Carcharias acutus, Day, Fauna Brit. India, Fish, **1**, 10 (1889).

Scoliodon acutus, Fowler, J. Bombay Nat. Hist. Soc., **32**, 253 (1941).

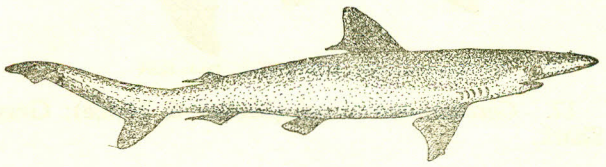
Scoliodon palasorrah, Misra, Records Ind. Mus., **57** (1–4), 87(1962).

Body elongated and slender. Snout long and pointed. Head depressed. Labial fold on lower jaw. Spiracles absent. 25–26 outwardly inclined triangular teeth in each jaw. First dorsal base near pelvic than pectoral. Second dorsal origin above middle or hind end of anal base.

Colour. Reddish brown above, whitish below. Pectorals and pelvics with light margins. Attains 4 ft.

Distribution. Arabian Sea.

Local Names. Mangra (West Pakistan); Bambak (Iran).



14. *Scoliodon palasorrah* (Cuvier); Grey Dog Fish

15. *Hypoprion hemiodon* (Muller & Hanle); Round-nose Dog Fish.

Carcharias hemiodon, Day, Fauna Brit. India, Fish., **1**, 12(1889).

Hypoprion hemiodon, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 46 (1941).

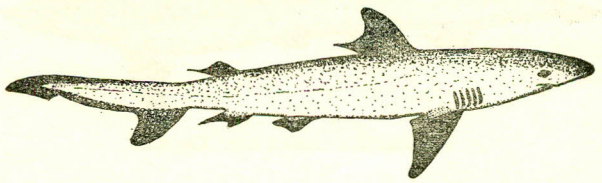
Hypoprion hemiodon, Misra, Records Ind. Mus., **57** (1–4), 89 (1962).

Body elongate and fusiform. Snout rounded. Eyes with nictitating membrane. Labial fold not present. Teeth smooth, 29–32 rows in the upper and 27–29 in the lower jaw. First dorsal close behind pectoral. Second dorsal origin a little behind anal origin.

Colour. Gray brown above, becoming whitish below. Attains 3 ft.

Distribution. Seas of Pakistan.

Local Names. Mangra (West Pakistan); Bambak (Iran).



15. *Hypoprion hemiodon* (Muller & Henle); Round-nose Dog Fish

16. *Carcharhinus limbatus* (Muller & Hanle); Brown Shark

Carcharias limbatus, Day, Fauna Brit. India, Fish, **1**, 17 (1889).

Eulamia limbata, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 150 (1941).

Carcharhinus limbatus, Misra, Records Ind. Mus., **57** (1–4), 92 (1962).

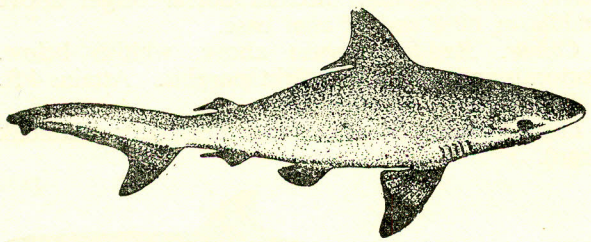
Body elongate and fusiform. Trunk shorter than tail. Snout pointed. Eyes with nictitating membrane. Spiracle absent. Teeth in 34 rows in the

upper and 31 in the lower jaw, serrated in the upper but nonserrated below. First dorsal origin over or little before inner pectoral angle.

Colour. Brown above, whitish below. In immature specimens tips of first dorsal, pectoral and subcaudal black. Sometimes second dorsal and anal are also black tipped. Attains at least 6 ft.

Distribution. Arabian Sea and Indian Ocean.

Local Names. Paggas, Mayyach (West Pakistan); Bambak (Iran).



16. *Carcharhinus limbatus* (Muller & Henle); Brown Shark

17. *Carcharhinus sorrah* (Muller & Henle); Gray Shark.

Carcharias sorrah, Day, Fauna Brit. India, Fish, **1,** 12 (1889).

Eulamia Sorrah, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 156 (1941).

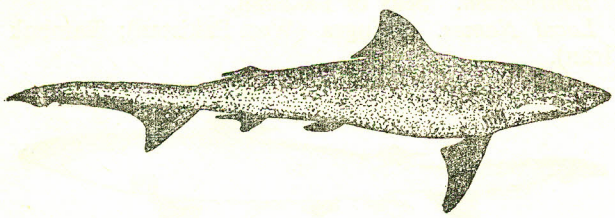
Carcharhinus sorrah, Misra, Records Ind. Mus., **57** (1–4), 93 (1961).

Body elongate and fusiform. Trunk shorter than tail. Snout moderately obtuse. Eyes with nictitating membrane. Teeth in 25 rows in each jaw, serrated. First dorsal origin opposite inner end of pectoral angle.

Colour. Body gray brown above, whitish below. Sometimes lower caudal lobe and pectoral with black extremities. Grows to more than 4 ft in length.

Distribution. Coast of West Pakistan.

Local Names. Kamot (West Pakistan); Bambak (Iran).



17. *Carcharhinus sorrah* (Muller & Henle); Grey Shark

18. *Carcharhinus melanopterus* (Quoy & a Gaimard); Black Shark.

Carcharias melanopterus, Day, Fauna Brit. India Fish, **1,** 14 (1889).

Eulamia melanoptera, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 158 (1941).

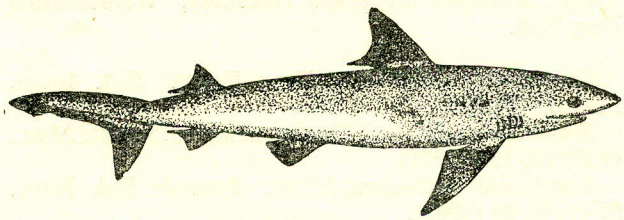
Carcharhinus melanopterus, Misra, Records Ind. Mus., **57** (1–4), 92(1962).

Body elongate and fusiform. Trunk shorter than tail. Snout bluntly rounded. Eye with nictitating membrane. Teeth in about 26–28 rows in the jaws, serrated. First dorsal origin opposite inner end of depressed pectoral angle.

Colour. Brown or bluish grey above, becoming dull whitish beneath. All fins tipped with black. Attains large size. I have observed one on Hawke's Bay 18 ft in length.

Distribution. Seas of Pakistan.

Local Name. Kanatyan (West Pakistan); Bambak (Iran).



18. *Carcharhinus melanopterus* (Quoy & Gaimard); Black Shark

19. *Carcharhinus menisorrah* (Muller & Henle); Grey-finned Shark.

Carcharias menisorrah, Day, Fauna Brit. India, Fish, **1,** 16(1889).

Eulamia menisorrah, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 161 (1941).

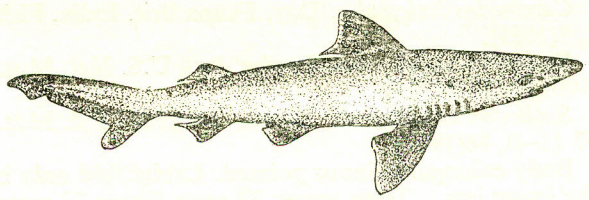
Carcharhinus menisorrah, Misra, Records Ind. Mus., **57** (1–4), 9(1962).

Body elongate, fusiform. Snout obtusely pointed. Eyes with nictitating membrane. Dental formula 28–32/27–28; teeth serrated only in the upper jaw. First dorsal origin opposite hind inner angle of pectoral fin.

Colour. Brown above, whitish below. Dorsals, caudal, anal and upper surfaces of paired fins grey. Lower terminal portions of pectorals blackish. Grows to more than 10 ft.

Distribution. Arabian Sea, common near Karachi.

Local Names. Gussi (West Pakistan); Bambak (Iran).



19. *Carcharhinus menisorrah* (Muller & Henle); Grey-finned Shark

20. *Carcharhinus bleekeri* (Dumeril); Black-spot Shark.

Carcharias bleekeri, Day, Fauna Brit. India, Fish, **1,** 15 (1889).

Eulamia spallanzani, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 163(1941).

Carcharhinus bleekeri, Misra, Records Ind. Mus., **57** (1–4), 90 (1962).

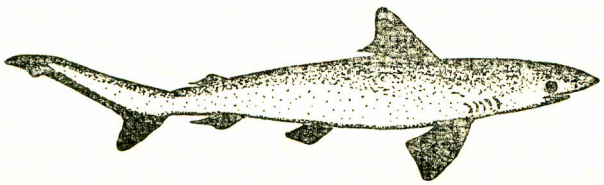
Body elongate. Snout moderately produced. Eyes with nictitating membrane. Dental formula 29/26. Teeth triangular with a slightly notched outer border in the upper jaw. Lower teeth narrow, nearly erect, on broad bases. First dorsal situated a little behind the angle of pectoral fin. Pectoral about twice wide as long.

Colour. Grey or brown above, whitish below. Deep black spots at lower end of pectoral. End of

subcaudal with deep black margin. Attains more than 6 ft.

Distribution. Pakistan waters.

Local Names. Paggas; mangra (West Pakistan), Bambak (Iran).



20. *Carcharhinus bleekeri* (Dumeril); Black-spot Shark

21. *Carcharinus dussumieri*, (Muller & Henle); White Cheek Shark.

Carcharias dussumieri, Day, Fauna Brit. India, Fish, **1**, 13 (1889).

Eulamia dussumieri, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 164 (1941).

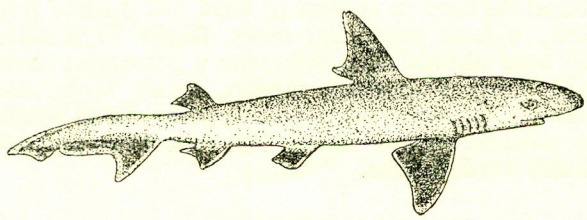
Carcharhinus dussumieri, Misra, Records Ind. Mus., **57** (1–4), 90 (1962).

Body elongate and fusiform. Trunk longer than tail. Snout blunt. Eyes with nictitating membrane. Teeth in 24–25 rows in jaws, serrated, upper traingular with attenuated cusps, all cusps inclined towards side of jaws. First dorsal origin a little behind inner angle of pectoral.

Colour. Upper surface grey or fawn, whitish underneath. White on side of head. All fins greyish with whitish edges. Attains more than 6 ft.

Distribution. Pakistan Seas.

Local Names. Musi (West Pakistan); Bambak (Iran).



21. *Carcharhinus dussumieri* (Muller & Henle); White-cheeked Shark

22. *Carcharhinus ellioti* (Day); Elliot's Shark.

Carcharias ellioti, Day, Fauna Brit. India, Fish, **1**, 16 (1889).

Eulamia ellioti, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 175 (1941).

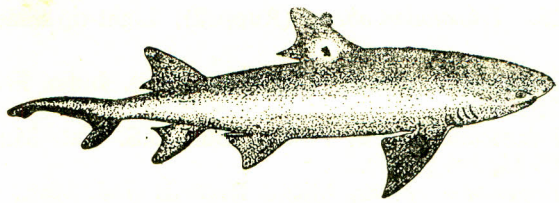
Carcharhinus ellioti, Misra, Records Ind. Mus., **45** (1), 17(1962).

Body fusiform, trunk longer than tail. Snout rounded. Eyes with nictitating membrane. Teeth in 24–26 rows above and 30–34 below. Upper teeth triangular without notch or basal enlargement but coarsely serrated. Lower teeth obliquely erect, awl-like. First dorsal inserted little behind inner pectoral angle. Pectorals broad.

Colour. Fawn colour above, whitish below. Attains 6 ft.

Distribution. Coast of Karachi and Irainan Gulf.

Local Names. Dandan (West Pakistan); Bambak (Iran).



22. *Carcharhinus ellioti* (Day), Elliot's Shark

23. *Hemigaleus balfouri* (Day); Balfour's Shark.

Hemigaleus balfouri, Day, Fauna Brit. India, Fish, **1**, 18 (1889).

Hemigaleus balfouri, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 184 (1941).

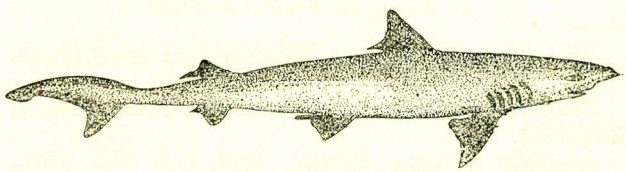
Hemigaleus balfouri, Misra, Records Ind. Mus., **45** (1), 20 (1947).

Body slender and elongate. Snout pointed. Nictitating membrane and labial folds present. Minute spiracles behind eyes. Teeth dimorphous: upper inclined with denticles on basal part of outer edge, lower erect and smooth, first dorsal situated about midway opposite the bases of pectoral and pelvic.

Colour. Dark brown. Fins grey, second dorsal with dark summit. Attains about 3 ft.

Distribution. West coast of Pakistan.

Local Names. Lon (West Pakistan); Bambak (Iran).



23 *Hemigaleus balfouri* (Day); Balfour's Shark

24. *Galeocerdo cuvieri* (Le Seur); Tiger Shark.

Galeocerdo rayneri, Day, Fauna Brit. India, Fish, **1**, 21(1889).

Galeocerdo cuvieri, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 186 (1941).

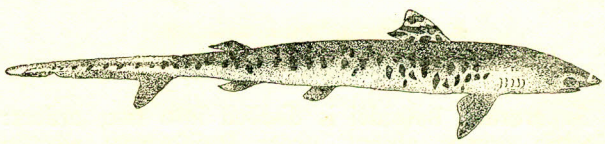
Galeocerdo arcticus, Misra, Records Ind. Mus., **57** (1–4), 94 (1962).

Body elongate. Head depressed. Snout short and rounded. Eyes with nictitating membrane. Labial folds on both jaws. Teeth large, flat, triangular and serrated on both edges. Origin of first dorsal fin a short distance behind base of the pectoral.

Colour. Dark grey above, white beneath; cheeks and lower surface of the snout yellowish. Large black spots on the body and tail portion with vertical bars. Fins grey, first dorsal with vertical bands. Grows to a large size.

Distribution. Indian Ocean and contiguous seas.

Local Names. Kari (West Pakistan); Bambak (Iran).



24 *Galeocerdo cuvieri* (Le Seur), Tiger Shark

25. *Triaenodon obesus* (Ruppell); Light-tip Shark.

Triaenodon obtusus, Day, Fauna Brit. India, Fish, **1,** 25 (1889).

Triaenodon obesus, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 194 (1941).

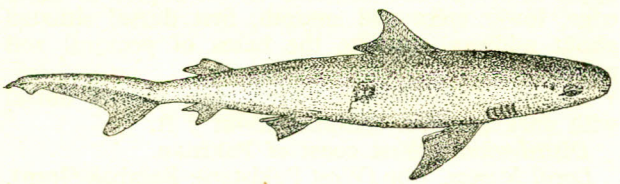
Triaenodon obesus, Misra, Records Ind. Mus., **45** (1), 22(1947).

Body elongate. Snout short and rounded. Eyes with nictitating membrane. Labial fold short. Teeth minute, numerous in both jaws, with central and lateral cusps. First dorsal fin commences behind the inner angle of pectoral, second dorsal short, situated above the anal. Subcaudal produced.

Colour. Light cinnamon brown, paler below. Fins dark terminally but tips of dorsal and caudal paler than rest of fins. Grows to more than 3 ft in length.

Distribution. Arabian Sea.

Local Names. Lon (West Pakistan); Bambak (Iran).



25 *Triaenodon obesus* (Ruppell), Light-tip Shark

26. *Myrmillo manazo* (Bleeker); Gummy Shark.

Mustelus manazo, Day, Fauna Brit. India, Fish, **1,** 24 (1889).

Mustelus manazo, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 206 (1941).

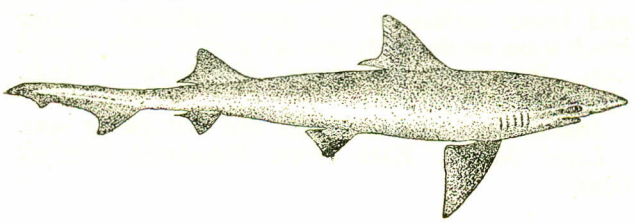
Myrmillo manazo, Misra, Records Ind. Mus., **45** (1); 22(1947).

Body elongate and fusiform. Snout pointed, long. A well-developed labial fold at each angle of the mouth. Spiracles behind eyes. Teeth pavement-like and smooth in both jaws. First dorsal origin opposite inner angle of pectoral. Second dorsal origin a little ahead of anal.

Colour. Grey brown above, whitish below, sometimes white spots are present over upper surface of the body. Grows to 6 ft in length.

Distribution. Arabian Sea.

Local Names. Mangra, paggas (West Pakistan), Bambak (Iran).



26 *Myrmillo manazo* (Bleeker); Gummy Shark

Superorder Batoidei

Superorder Batoidei is divided into two orders: electric organs absent, order Rajiformes; electric organs present, order Torpediniformes.

Order Rajiformes: Skates, Saw Fishes and Rays

Body typically disklike, wide, flat, edges of disk usually formed by expanded pectorals. Eyes and mouth inferior. Gill-openings 5, inferior, slitlike. Spiracles present. Dorsal fins, when present, placed on tail, no anal fin. Pectorals with long basal and many radial cartilages. Caudal small or absent, tail comparatively slender.

These are mostly bottom fishes, coming to the surface at times. Skates are gregarious and usually eat oysters and other animals living at the bottom of the sea. Rays habitually remain at the bottom and sometimes conceal themselves in the sand and mud for capturing their prey. The meat of skates is white and that of rays reddish. It is quite tasty but, owing to the local prejudice, is not eaten in Pakistan. In cured condition the meat of skates and rays is exported to foreign countries. The liver contains oil which is deficient in vitamin A and used for protection of the hulls of wooden boats.

Day has briefly given an account of the egg cases in which the faetus of rays develop. 'The thin horny cases, inside which are faetal rays, are more quadrangular in form and comparatively smaller than what observed among the sharks, such cases have a horn-like projection from each corner.'

Key to Families of Rajiformes

(a) Disk narrow and elongate: (i) rostrum much produced and saw-like, family, Pristidae; (ii) rostrum very short and not saw-like, family Rhinobatidae.

(b) Disk broad and expanded; tail whip-like, dorsal reduced to spines; (i) head not distinct from disk; without prominent snout, family Trygonidae; (ii) head distinct from disk, with a prominent snout, with horn-like cephalic flippers, family Mobulidae; (iii) without horn-like cephalic flippers. Head bilobed or notched between rostral fins; rostral fins separate, family Myliobatidae.

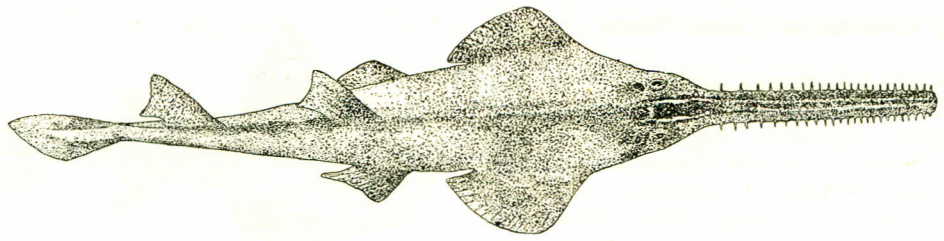
Family Pristidae

Body elongate, moderately depressed, flattened below. Eyes without nictitating membrane. Snout extended in long, flattened blade, each side of which row of strong teeth are present. Spiracles present. Dorsal large, without spines. Caudal well-developed. Viviparous.

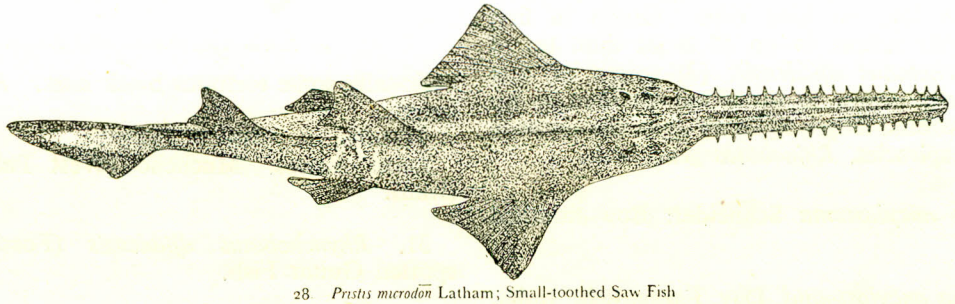
Key to the Species. (1) Subcaudal lobe absent; rostral, teeth 23–28 on each side, *Pristis zijsron.* (2) Subcaudal lobe present: (a) subcaudal lobe small; rostral teeth 17–22 on each side, *Pristis microdon*; (b) subcaudal lobe prominent, rostal teeth 23–25 on each side, *Pristis cuspidatus.*

27. *Pristis zijsron* (Bleeker); Green Saw Fish.

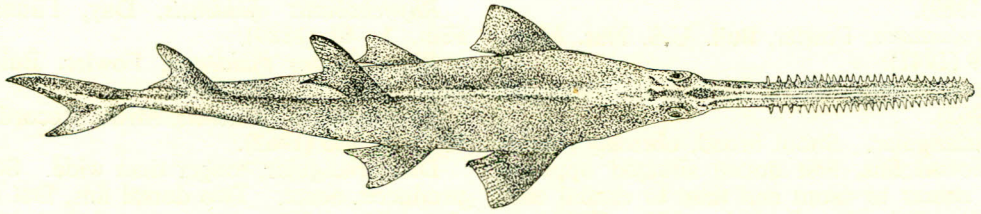
Pristis zysron, Day, Fauna Brit. India, Fish, **1,** 38 (1889).



27 *Pristis zysron* (Bleeker); Green Saw Fish



28 *Pristis microdon* Latham; Small-toothed Saw Fish



29. *Pristis cuspidatus* Latham; Pointed Saw Fish

Pristis zysron, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 293 (1941).

Pristis zysron, Misra, Records Ind. Mus., **45** (1), 30 (1947).

Body elongate. Rostrum long, teeth 23–28 on each side. Eyes without nictitating membrane. Spiracles inclined. Denticles along medican keels and back. Subcaudal without lobe. Origin of first dorsal behind pelvic origin.

Colour. Greenish grey becoming yellowish on sides, whitish below. Dorsal yellowish grey. Attains a large size.

Distribution. Arabian Sea.

Local Names. Liaro (West Pakistan); Teegh-mahee-arreh (Iran).

28. *Pristis microdon* Latham; Small-toothed Saw Fish.

Pristis perotteti, Day, Fauna Brit. India, Fish, **1,** 38(1889).

Pristis microdon, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 295 (1941).

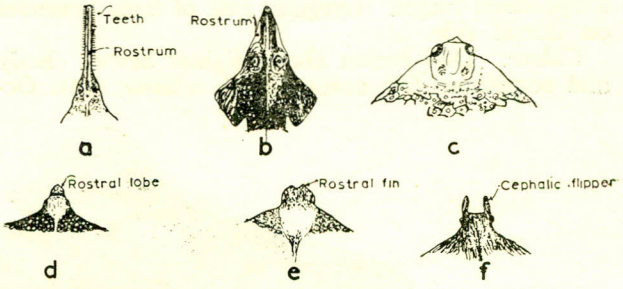
Pristis microdon, Misra, Records Ind. Mus., **57** (1–4), 102(1962).

Body elongate, depressed. Rostrum moderately long, teeth 17–22 on either side. About 70 series of small, blunt teeth in each jaw. Spiracles present. First dorsal before pelvic base.

Colour. Reddish or greyish brown above, white on abdominal surface. Attains more than 10 ft in length.

Distribution. Iranian Gulf and Arabian Sea.

Local Name. Liaro (West Pakistan); Teegh-mahee-arrah (Iran).



(*a*) Rostrum of saw fish (family Pristidae), (*b*) head of skate (family Rhinobatidae), (*c*) head of bull ray, (*d*) of eagle ray (family Myliobatidae), (*e*) of cow ray (family Rhinopteridae), (*f*) head of devil ray (family Mobulidae).

29. *Pristis cuspidatus* Latham; Pointed Saw Fish.

Pristis cuspidatus, Day, Fauna Brit. India, Fish, **1,** 37 (1889).

Pristis cuspidatus, Misra, Records Ind. Mus., **57** (1–4), 102(1962).

Body elongate, slender. Rostrum long, tapering gradually, with 23 or more teeth on either side. Spiracles present. About 62 series of teeth in jaws. Skin smooth. First dorsal inserted behind pelvic base.

Colour. Dark drab or neutral grey above, whitish below. Borders of fins and lateral fold of tail whitish. Attains a large size.

Distribution. Arabian Sea.

Local Names. Liaro (West Pakistan); Mahee-arredar (Iran).

Family Rhinobatidae (Guitar Fishes)

Body depressed, disk passing gradually into a long, depressed tail. Snout produced. Teeth in pavement, small, numerous. Spiracles large. Skin without conspicuous spines. Two well-developed dorsals. Caudal moderate or small. Viviparous.

Key to the Species. (1) Snout blunt, broad and rounded. Spiracles without fold on hind edge, *Rhina ancylostoma*; (2) snout triangularly pointed; spiracles with fold on hind edge. Origin of first dorsal distinctly nearer to tip of snout than tip of caudal, *Rhynchobatus djiddensis*; (3) origin of first dorsal distinctly nearer to tip of caudal than to tip of snout, preorbital length $3\frac{1}{2}$ to $3\frac{2}{3}$ times the distance between the spiracles, *Rhinobatos granulatus*.

30. *Rhina ancylostoma* Schneider; Bow-mouthed Guitar Fish.

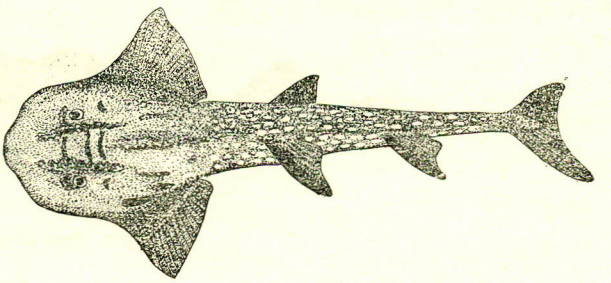
Rhychobatus ancylostomus, Day, Fauna Brit. India, Fish, **1,** 41 (1889).

Rhina ancylostoma, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 299 (1941).

Rhina ancylostomus, Misra, Records Ind. Mus., **57** (1–4), 99 (1962).

Disk subtriangular. Snout broad, obtusely rounded. Two dorsal fins, first dorsal situated opposite pelvics and nearer to snout end than to caudal end. Anal absent. Spiracles behind eyes. Teeth in 77–75 rows, obtusely rounded, each with several longitudinal ridges. Irregular row of large tubercles on dorsal side.

Colour. Dull brown above, lighter below. Body and sometimes fins covered with whitish dots. Occasionally some tortuous black lines. Attains 8 ft in length.



30. *Rhina ancylostoma* Schneider; Bow-mouthed Guitar Fish

Distribution. Seas of Pakistan.

Local Names. Muchcho (West Pakistan); Soos (Iran).

31. *Rhynchobatus djiddensis* (Forskal); White-spotted Guitar Fish.

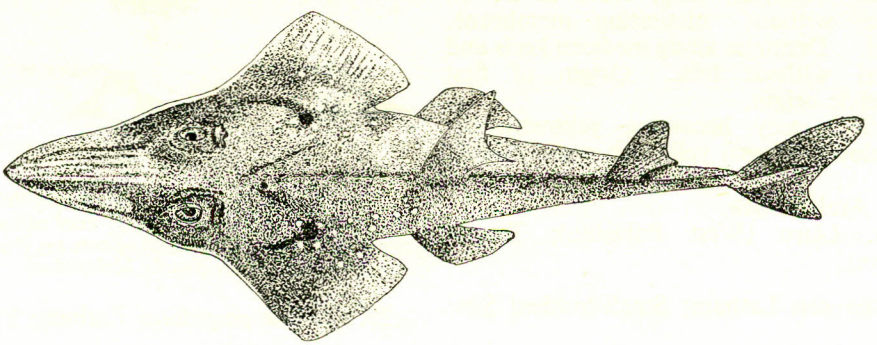
Rhynchobatus djiddensis, Day, Fauna Brit. India, Fish, **1,** 40 (1889).

Rhynchobatus djiddensis, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 300 (1941).

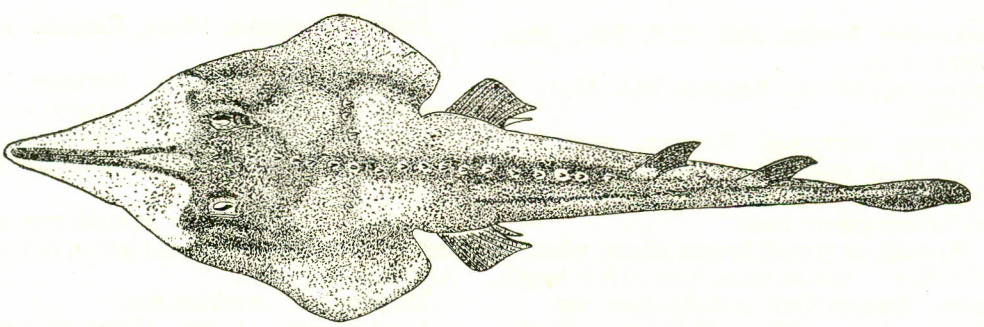
Rhynchobatus djiddensis, Misra, Records Ind. Mus., **57** (1–4), 100 (1962).

Disk triangular, longer than wide. Snout, narrow produced, acute. Two dorsal fins, first dorsal opposite pelvics, nearer to snout end than to caudal end. Anal absent. Row of small tubercles along each supraorbital ridge and on back. Teeth blunt, about 40 rows in each jaw.

Colour. Grey above, undersurface whitish. Round black spots posteriorly on scapular region. Body



31 *Rhynchobatus djiddensis* (Forskal); White-spotted Guitar Fish



32 *Rhinobatos granulatus* Cuvier Granulated Guitar Fish

covered with white spots and ocelli. Attains about 10 ft.

Distribution. Indian Ocean and contiguous seas.

Local Names. Muchcho (West Pakistan); Soos (Iran).

32. *Rhinobatus granulatus* Cuvier; Granulated Guitar Fish.

Rhinobatus granulatus, Day, Fauna Brit. India, Fish, **1**, 42(1889).

Rhinobatus granulatus, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 315(1941).

Rhinobatus granulatus, Misra, Records Ind. Mus., **57** (1–4), 97 (1962).

Disk triangular, longer than wide. Snout long and pointed. Two dorsal fins, first dorsal fin situated far behind pelvics, nearer to caudal end than to snout end. Anal absent. Preorbital length $3\frac{1}{2}$ to $3\frac{2}{3}$ times the distance between the spiracles. Teeth in 53–60 rows, smooth, rhomboid. Row of supraorbital tubercles present.

Colour. Brown above, white below. Each side of rostral cartilages and snout buff. Dorsals and caudal greyish. Attains 6 ft.

Distribution. Ceylon and Pakistan.

Local Names. Kair (West Pakistan); Soos (Iran).

Family Dasytidae

Body, head, and pectorals depressed, forming wide disk. Tail distinct from disk, narrow and tapering, usually with serrated spine. Gill-openings narrow. Spiracles large, close behind eyes

(A) Disk quadrangular. Tail somewhat round, with serrated spine.

(a) *Himantura.* Tail without keels or folds; disk broader than long. Tail 3 times body or more: (i) brown, with dark spots, *Dasyatis* (*Himantura*) *uarnak*; (ii) brown, with lighter spots, *Dasyatis* (*Himantura*) *gerrardi*; (iii) dark brown, undersurface dark brown, *Dasyatis* (*Himantura*) *bleekeri.*

(b) *Pastinachus.* Cutaneous fold on tail below; disk broader than long. Tail more than twice disk length. Brown, tail blackish, *Dasyatis* (*Pastinachus*) *sephen.*

(c) *Amphotistius.* A cutaneous fold below and another above tail. Disk broader than long: (i) tail twice disk length; oral papillae 2; brown with black-edged blue spots, *Dasyatis* (*Amphotistius*) *kuhlii*; (ii) tail twice disk length; no oral papillae; brown, yellowish to reddish, *Dasyatis* (*Amphotistius*) *zugei*; (iii) tail less than twice disk length; reddish brown, yellow spotted, *Dasyatis* (*Amphotistius*) *imbricata.*

(B) Disk circular. Tail without serrated spine, *Urogymnus africanus.*

(C) Disk broader than long. Tail short, without spine

Gymnura. No dorsal fin. Tail without spine. Tail less than half as long as body, *Gymnura* (*Gymnura*) *micrura.*

33. *Dasyatis* (*Himantura*) *uarnak* (Forskal); Banded Whiptail Sting Ray.

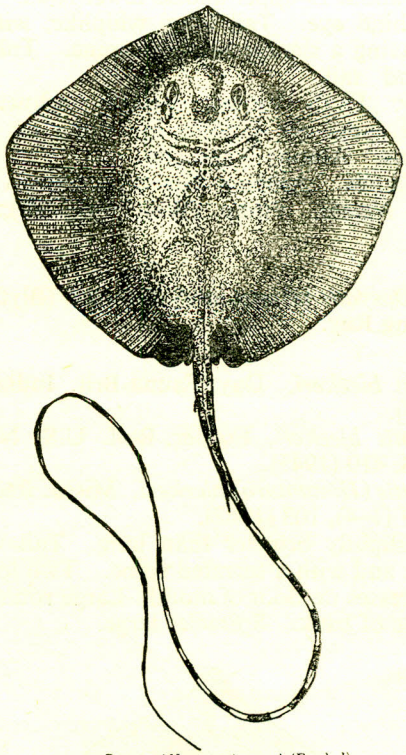
Trygon uarnak, Day, Fauna Brit. India, Fish, **1**, 53 (1889).

Dasyatis uarnak, Herre, Mem. Ind. Mus., **13**, 333(1941).

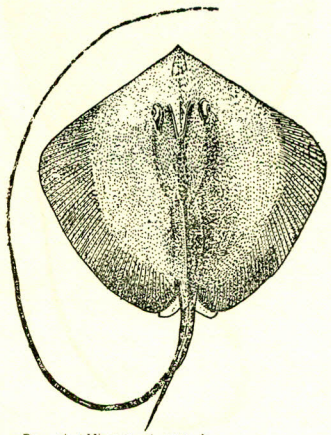
Dasyatis (*Himantura*) *uarnak*, Misra, Records Ind. Mus., **57** (1–4), 103 (1962).

Disk about as wide as long. Snout pointed. Tail three to four times length of body, devoid of filament. Teeth in 25–28 rows in jaws. Spiracles large. Skin smooth, a few tubercles on occiput and middle of back. Dorsal and anal fins absent; tail with a serrated spine.

Colour. Varies with age, in adult generally dark brown above, whitish below. Sometimes dark spots or meshwork pattern on back. Tail white with blackish blue bands. Attains 5 ft across disk.



33. *Dasyatis* (*Himantura*) *uarnak* (Forskal); Banded whiptail Sting Ray



34. *Dasyatis* (*Himantura*) *gerrardi* (Gray), Gerrard's Sting Ray

Distribution. Indian Ocean and contiguous seas.
Local Names. Achopitan (West Pakistan); Logmeh (Iran).

34. *Dasyatis* (*Himantura*) *gerrardi* (Gray) Gerrard's Sting Ray.

Trygon gerrardii, Annandale, Mem. Ind. Mus., **2,** 24 (1909).
Dasyatis gerrardi, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 409 (1941).
Dasyatis (*Himantura*) *gerrardi*, Misra, Records Ind. Mus., **45** (1), 103 (1947).

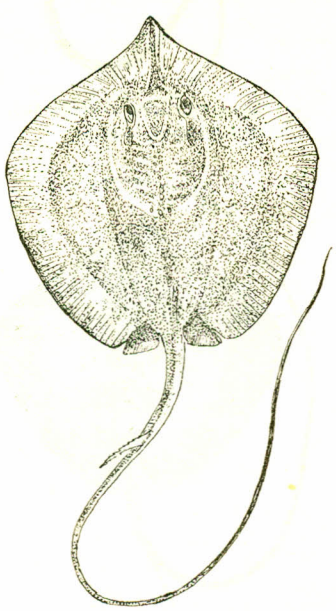
Disk as broad as long. Snout a little projecting. Teeth in about 13 upper and 23 lower rows. Spiracles close behind eye. Tail long, whiplike, without any folds, having a slender serrated spine. Tubercles on back and tail.

Colour. Drab brown, whitish below. Cream-coloured spots are present in young on disk and pelvic fins. Attains large size.
Distribution. Arabian Sea and Iranian Gulf.
Local Names. Pittan (West Pakistan); Logmeh (Iran).

35. *Dasyatis* (*Himantura*) *bleekeri* (Blyth); Bleeker's Sting Ray.

Trygon bleekeri, Day, Fauna Brit. India, Fish, **1,** 54 (1889).
Dasyatis bleekeri, Fowler, Bull. U.S. Nat. Mus., (100), **13,** 410 (1941).
Dasyatis (*Himantura*) *bleekeri*, Misra. Records Ind. Mus., **57** (1–4), 103 (1962).

Disk slightly broader than long. Tail very long, whiplike and with a serrated spine. Two long finger-like processes on floor of mouth. Large round tubercle in middle of back. Spiracles large.



35. *Dasyatis* (*Himantura*) *bleekeri* (Blyth), Bleeker's Sting Ray

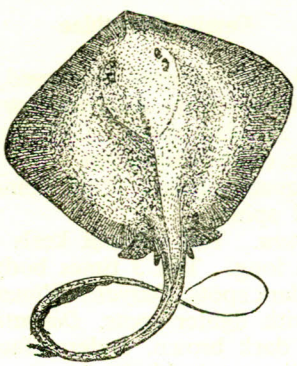
Colour. Dark brown above, white below. Under-surface with dark brown margins increasing in area with age. Attains 4 ft or more.
Distribution. Seas of Pakistan.
Local Names. Pitan (West Pakistan); Logmeh (Iran).

36. *Dasyatis* (*Pastinachus*) *sephen* (Forskal); Cow-tail Ray.

Trygon sephen, Day, Fauna Brit. India, Fish, **1,** 50 (1889).
Dasyatis sephen, Fowler, J. Bombay Nat. Hist. Soc., **33,** 102(1928).
Dasyatis (*Pastinachus*) *sephen*, Misra, Records Ind. Mus., **57** (1–4), 104(1962).

Disk broader than long. Snout slightly pointed. Teeth in 40–44 rows in jaws. Tail long, with cutaneous fold below and with a serrated spine. Disk with one or two central tubercles. No dorsal or caudal fins.

Colour. Brown above, undersurface whitish. Tail dusky terminally.
Distribution. Arabian Sea.
Local Names. Pitan (West Pakistan); Logmeh (Iran).



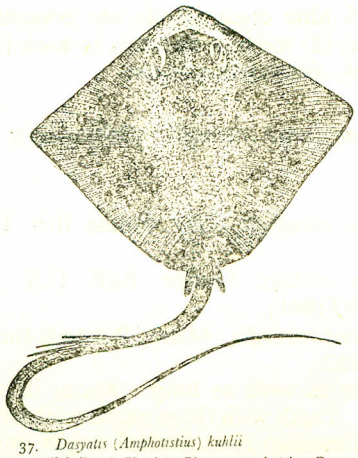
36. *Dasyatis* (*Pastinachus*) *sephen* (Forskal); Cowtail Ray

37. *Dasyatis* (*Amphotistius*) *kuhlii* (Muller & Henle); Blue-spotted Sting Ray.

Trygon kuhlii, Day, Fauna Brit. India, Fish, **1,** 52 (1889).
Dasyatis kuhlii, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 124(1941).
Dasyatis (*Amphotistius*) *kuhlii*, Misra, Records Ind. Mus., **57** (1–4), 105 (1962).

Disk broader than long, kite shaped. Snout not protruding. Oral papillae 2. Teeth in 25–30 rows in jaws. Spiracles large. Tail with cutaneous folds above and below and having serrated spines. Tail longer, than disk. Skin smooth.

Colour. Grey, with black or blue and white spots on dorsal surface. Tail tip black. Attains about 2 ft across the disk.
Distribution. Seas of Pakistan.
Local Names. Chitti-pitan (West Pakistan); Logmeh (Iran).



37. *Dasyatis (Amphotistius) kuhlii* (Muller & Henle), Blue-spotted Sting Ray

38. *Dasyatis* (*Amphotistius*) *zugei* (Muller & Henle); Stellate Sting Ray.

Trygon zugei, Day, Fauna Brit. India, Fish, **1**, 52 (1889).

Dasyatis zugei, Fowler, J. Bombay Nat. Hist. Soc., **33**, 102(1928).

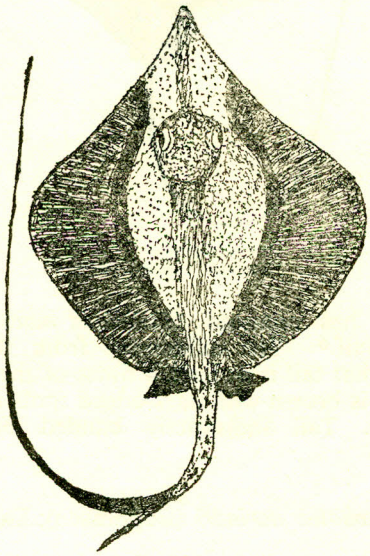
Dasyatis (*Amphotistius*) *zugei*, Misra, Records Ind. Mus., **45** (1), 37(1947).

Disk as long as wide. No oral papillae. Snout much produced. Tail about twice the length of disk with a cutaneous fold above and below. Dorsal fin as median cutaneous keel, behind dorsal spine on tail. Teeth in 24 rows in jaws. Spiracles large. Skin smooth, large tubercles in median series, smaller ones on tail.

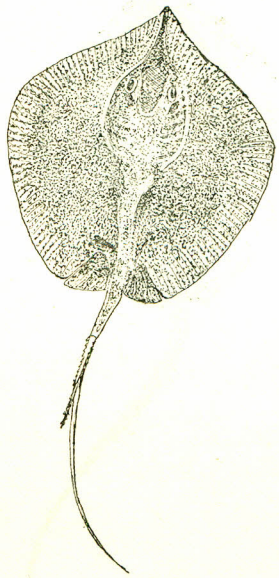
Colour. Brown above paler marginally, under surface of body whitish. Tail with dorsal and cutaneous folds dusky brown. Attains 3 ft across the disk.

Distriubtion. Indian Ocean and contiguous seas.

Local Names. Pitan (West Pakistan); Logmeh (Iran).



38. *Dasyatis (Amphotistius) zugei* (Muller & Henle), Stellate Sting Ray



39. *Dasyatis (Amphotistius) imbricata* Schneider); Sclav Sting Ray

39. *Dasyatis* (*Amphotistius*) *imbricata* (Schneider). Scaly Sting Ray.

Trygon walga, Day, Fauna Brit. India, Fish, **1**, 55 (1889).

Dasyatis imbricatus, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 434. (1941)

Dasyatis (*Amphotistius*) *imbricata*, Misra, Records Ind. Mus., **57**(1–4), 38 (1962).

Disk nearly as wide as long. Oral papillae 2, snout sharply pointed. Teeth in about 32 rows in each jaw. Spiracle as large as eye. Tail without folds, a little longer than disk and with a spine.

Colour. Reddish brown above with yellowish spots. White below. Attains about 1 ft in length.

Distribution. Arabian Sea.

Local Names. Kuthi (West Pakistan); Logmeh (Iran).

40. *Urogymnus africanus* (Schneider); Thorny Ray.

Urogymnus asperrimus, Day, Fauna Brit. India, Fish, **1**, 20 (1889).

Urogymnus africanus, Fowler, Bull. U.S. Nat. Mus., (100) **13**, 438 (1941).

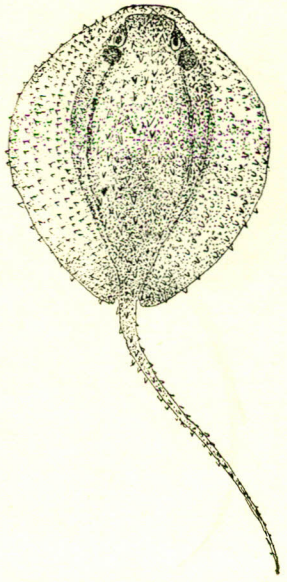
Urogymnus africanus, Misra, Records Ind. Mus., **45** (1), 37 (1947).

Disk oval. Snout rounded. Oral papillae 3–5. Teeth blunt, broader than long, in 48 rows. Spiracles larger than eyes. Tail long, tapering, with narrow fold below according to age, without spine. Back covered with osseous tubercles and spinigerous bucklers, making an excessively rough skin.

Colour. Blackish brown or bluish, with tubercles yellowish. Grows to at least 3 ft accross the disk.

Distribution. Seas of Pakistan.

Local Names. Pitan (West Pakistan); Logmeh (Iran).



40 *Urogymnus africanus* (Schneider); Thorny Ray

41. *Gymnura* (*Gymnura*) *micrura* (Schlegel); Short-tailed Butterfly Ray.

Pteroplatea micrura, Lloyd, Records Ind. Mus., **1,** 220 (1908).

Gymnura micrura, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 455 (1941).

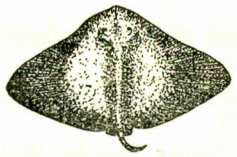
Gymnura (*Gymnura*) *micrura*, Misra, Records Ind. Mus., **45**(1), 38 (1947).

Disk width about 1½ times length. Snout slightly protruding. Spiracles large, broad. Tail slenderly conic, tapers to rather firm point, less than half length of disk. No caudal spine.

Colour. Back uniform blackish brown. Tail with broadly blackish saddles above, below whitish. Attains about 1½ ft across the disk.

Distribution. Arabian Sea.

Local Names. Thappa (West Pakistan); Kaffer (Iran).



41 *Gymnura* (*Gymnura*) *micrura* (Schlegel), Short-tailed Butterfly Ray

Family Myliobatidae

Body, head and pectoral fins form lozenge-shaped disk. Tail long, whiplike, with or without spine. Eyes prominent, lateral. Teeth angular, broad, flat, tassellated. Spiracles large, behind eyes. Cranium prominent. Pair of rostral fins, joined in front of snout, either separated from pectorals or connected with them at side of head.

Key to Species. Snout in single lobe; pelvis arched: (1) teeth in more than 3 rows in each jaw: no caudal spine. Dorsal origin opposite ends of ventral bases. Sometimes 5 blue cross bands are present, *Aetomylaeus nichofii*; (2) teeth in one row in each jaw; caudal spine present, *Aetobatus narinari.*

42. *Aetomylaeus nichofii.* (Schneider); Nieuhof's Bull Ray.

Myliobatis nieuhofii, Day, Fauna Brit. India, Fish, **1,** 58 (1889).

Aetomylus nichofi, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 469 (1941).

Aetomylaeus nichofii, Misra, Records Ind. Mus., 57 (1–4), 39 (1962).

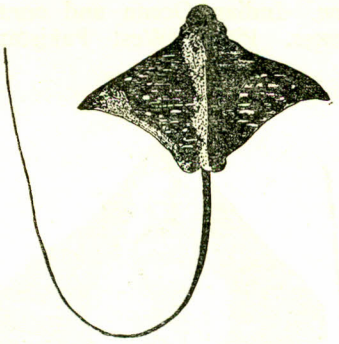
Disk twice as wide as long. Snout in single lobe, prominent. Teeth with three narrow lateral rows each side of wide median row. Dorsal origin opposite ends of pelvic bases. Spiracles large. Skin smooth. Tail very long, whiplike, without spine.

Colour. Back dark brown anteriorly with 3–5 transverse or horizontal grey bands; posterior with large, close-set rounded greyish blotches. Attains very large size and weighs several tons. On 5th April, 1949 I saw a specimen of an 'Eagle Ray' at Ormara Beach, caught by fishermen.

Only the anterior portion was left, the wings were cut off; the breadth of the disk as such measured 8.5 ft across, and from the description of the fishermen it seemed to be *Aetomylaeus nichofii.* It was lying on the beach in shallow water and was with difficulty dragged out of water by 10 fishermen for being photographed. It is much dreaded owing to its large size and because of the damage it causes to the net when entangled.

Distribution. Coasts of Pakistan and Iran.

Local Names. Karunj (West Pakistan); Ramek (Iran).



42 *Aetomylaeus nichofii* (Schneider), Nieuhof's Bull Ray

Blegvad has reported *Myliobatis maculatus* from Iranian Gulf.[6] The difference from the former species is that tail is at least 4 times of the body and the colour is brown with dark-edged spots of whitish posteriorly. Tail indistinctly banded brown and darker.

43. *Aetobatus narinari* (Euphrasen); Eagle Ray.

Aetobatus narinari, Day, Fauna Brit. India, Fish, **1,** 59 (1889).

Aetobatus narinari, Annandale, Mem. Ind. Mus., **3,** 4(1910).

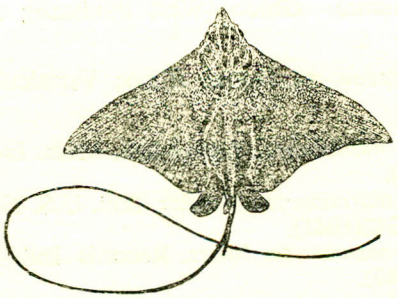
Aetobatus flagellum, Misra, Records Ind. Mus., **57** (1–4), 108(1962).

Disk about twice wide as long. Snout forms a frontal lobe. Teeth in a single series of wide, flat lower pavement projecting slightly. Wide pointed wings. Spiracles large. Dorsal fin present, anal absent. Tail more than 4 times body length, with a single spine. Skin smooth.

Colour. Body brown or olive brown. Scattered white, creamy or grey-white spots over last half of the disk. Few spots may extend on front of back, on pelvics and base of tail. Attains very large size.

Distribution. Pakistan Seas.

Local Names. Kadukoto (West Pakistan); Logmeh (Iran).



43. *Aetobatus narinari* (Euphrasen), Eagle Ray

Family Rhinopteridae

Body, head, and pectorals formed as wide lozenge-shaped disk. Tail long, whiplike, with serrated spine. Head divided into two rounded lobes by deep median notch. Teeth grinder-like, pair of rostral fins, not joined with pectorals. Spiracles large. Dorsal fin above basal front of tail.

44. *Rhinoptera javanica* (Muller & Henle); Javanese Cow Ray.

Rhinoptera javanica, Day, Fauna Brit. India, Fish, **1,** 61 (1889).

Rhinoptera javanica, Fowler, Bull. U.S. Nat. Mus., (100) **3,** 476 (1941).

Rhinoptera javanica, Misra, Records Ind. Mus., **57** (1–4), 109 (1962).

Disk breadth less than twice its length. Head divided into two rounded lobes by deep median notch. Teeth in flattened pavement, 7 rows in each jaw. Spiracles large, close behind eyes. Dorsal fin at basal part of tail. Tail very long, whiplike, with a serrated spine. Skin smooth.

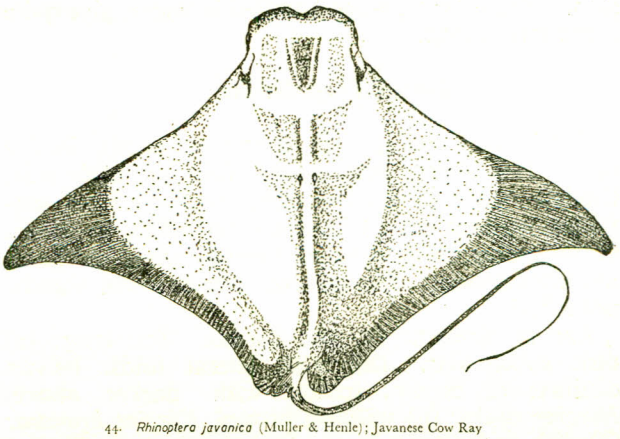
Colour. Uniform brown above, undersurface whitish. Attains about 3 ft in width.

Distribution. Pakistan, Ceylon.

Local Names. Karunj (West Pakistan); Ramek (Iran).

Family Mobulidae (Devil Rays)

Head, body and pectorals form partly rhomboid disk, wider than long. Tail slender, whiplike, without a spine. Head broad, mouth well below head. A pair of curling horn like flippers in front of head. Teeth small, in pavement. Spiracles moderate. Small triangular dorsal on tail.



44. *Rhinoptera javanica* (Muller & Henle); Javanese Cow Ray

Key to Species. Mouth inferior; teeth in both jaws or at least in upper jaw, *Mobula diabolus.*

45. *Mobula diabolus* (Shaw); Lesser Devil Ray.

Dicerobatis eregoodoo, Day, Fauna Brit. India, Fish, **1,** 473 (1889).

Mobula diabolus, Fowler, Bull. U.S. Nat. Mus., (100) **13,** 63(1941).

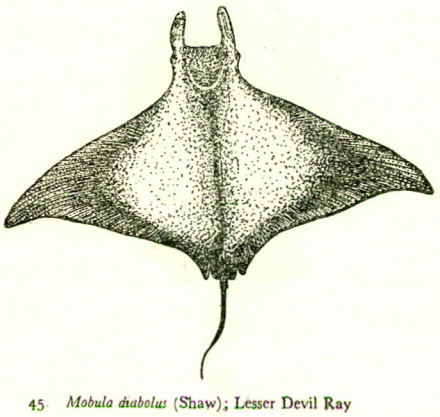
Mobula diabolus, Misra, Records Ind. Mus., **57** (1–4), 107(1962).

Disk about twice as broad as long. Mouth inferior. A pair of horn-like flippers in front of the head. Spiracles small. Tail short, with a small caudal fin at its base. No caudal spine. In each jaw 30–80 oblique rows of about 10 teeth. Feeds on small crustaceans. Skin smooth.

Colour. Brown above, paler to whitish below, with pectorals terminally little brownish. Attains a large size.

Distribution. Seas of Ceylon and Pakistan.

Local Names. Karunj (West Pakistan), Remek (Iran).



45. *Mobula diabolus* (Shaw); Lesser Devil Ray

Order Torpediniformes (Numbfish, Electric Rays)

Resembling rays but posses electric organs and a well-developed tail fin (without spine) and soft naked

skin. These fishes, when handled in water, give quite a powerful shock.

Family Torpedinidae

Head and trunk smooth, depressed, partly circular disk. Tail short, with lateral fold on each side. Electric organ of vertical cells, modified from ampullae, on each side of head and separating pectorals. Gill-openings small, between electric organs and head. Spiracles present. Dorsals two, one or none. Caudal not lobed.

Key to Species. (1) two dorsals. Tail long: (a) disk subcircular. Tail with lateral folds. Pelvics distinct; (i) brown, spotted with darker above, *Narcine timlei;* (ii) uniform brown, *Narcine brunnea;* (b) disk wider than long. Ember coloured. Zig-zag lines on back, *Torpedo marmorata.*

(2) one dorsal. Disk circular. Tail medium. Pelvics distinct from pectorals, *Narke dipterygia.*

46. *Narcine timlei* (Schneider); Spotted Electric Ray.

Narcine timlei, Day, Fauna Brit. India, Fish, **1,** 45 (1889).

Narcine timlei, Fowler, Bull. U.S. Nat. Mus., (100), **13,** 334(1941).

Narcine timlei, Misra, Records Ind. Mus., **45**(1), 44 (1947).

Disk subcircular. Caudal portion longer than disk. Spiracle large. Front nasal valves short, confluent in broad flap reaching mouth. Teeth in 23 rows above, 21 below. Two dirsal fins. First dorsal origin behind hind basal end of pelvic. Caudal rounded. Pectorals form semicircular disk.

Colour. Light brown above, with large rounded brown spots, larger than the interspaces. Spots sometimes purplish with pale edges. Dorsal and caudal edges white. Attains at least 18 in.

Distribution. Seas of Pakistan.

Local Names. Ghido (West Pakistan); Anenoo (Iran).

47. *Narcine brunnea* Annandale; Brown Electric Ray.

Narcine brunnea, Day, Fauna Brit. India, Fish, **1,** 45 (1889).

Narcine brunnea, Annandale, Mem. Ind. Mus., **2,** 335 (1909).

Narcine brunnea, Misra, Records Ind. Mus., **45**(1), 43 (1947).

Disk subcircular, shorter than tail. Tail bears two lateral folds and two dorsal fins. First dorsal inserted entirely behind pelvic. Teeth pointed with tetragonal bases. Spiracles large.

Colour. Chocolate brown round the disk. Dorsal and caudal edges with grey white. Attains about 10 in length.

Distribution. Ceylon, Pakistan.

Local Names. Ghido (West Pakistan); Annenoo (Iran).

48. *Torpedo marmorata* Risso; Vermiculate Torpedo Ray.

Torpedo marmorata, Annandale, Mem. Ind. Mus., **2,** 42(1909).

Torpedo marmemrata, Fowler, Bull. U.S. Nat. Mus., (100), **13,** 342(1941).

Torpedo marmorata, Misra, Records Ind. Mus., **45** (1), 44 (1947).

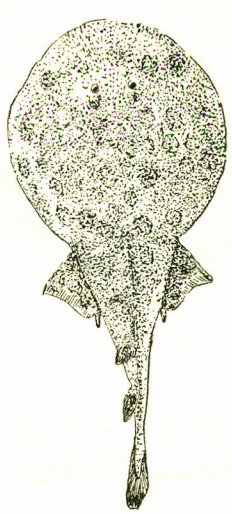
Disk wider than long, subcircular. Mouth crescentic, with longitudinal fold at each angle. Tail distinct, short, with low keel on each side. Teeth in 18 rows, small, bases wide. Spiracles behind eye. Origin of first dorsal above pelvic end. Second dorsal origin slightly behind the first. Hind caudal end not rounded.

Colour. Burnt ember colour above, light zig-zag lines, circules, and dots over the disk. Whitish below. Disk edges, pelvics and tail below mottled with dull ember and white. Attains about 10 in.

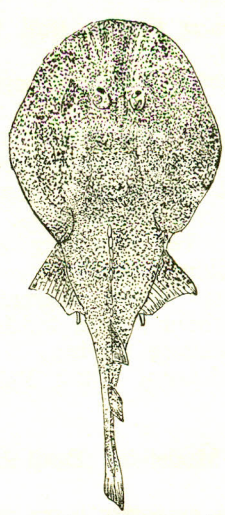
Distribution. Arabian Sea.

Local Names. Niamed (Iran); Mithan (West Pakistan).

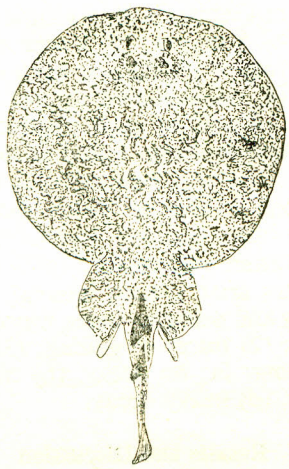
49. *Narke dipterygia* (Schneider); Numb Fish.



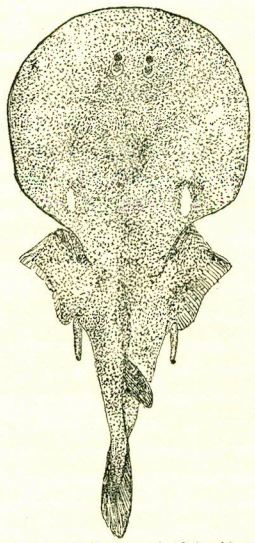
46. *Narcine timlei* (Schneider) Spotted Electric Ray



47. *Narcine brunnea* Annandale; Brown Electric Ray



48. *Torpedo marmorata* Risso, Vermiculate Torpedo Ray



49. *Narke dipterygia* (Schneider), Numb Fish

Astrape dipterygia, Day, Fauna Brit. India, Fish, **1**, 46 (1889).

Narke dipterygia, Fowler, J. Bombay Nat. Hist. Soc., **32**, 253 (1927).

Narke diptervgia, Misra, Records Ind. Mus., **45** (1), 45 (1947).

Disk almost circular. Eyes small, protruding. Mouth small. Protractile, surrounded by fold. Teeth in 15 rows in each jaw, low broad cusps. Spiracles very close to the eyes. Tail short. Skin smooth. Dorsal only one, inserted behind pelvic tips. Caudal lobe somewhat rounded.

Colour. Brown above, with several diffuse blackish cloudings medially. Dorsal and caudal brown, also upper surface of pelvics. Undersurface of body and margins of pelvics white. Attains 18 in.

Distribution. Indian Ocean and contiguous seas.

Local Names. Mithan (West Pakistan); Anenoo (Iran).

References

1. M. Ali, S.A. Haq and S. Mehdihassan, Part I. Physico-chemical constants and vitamin 'A' content of liver oil from sharks of Karachi coast. Central Laboratories, P.C.S.I.R., Karachi (1956).
2. M. Ali, S.A. Haq and Mehdihassan, Part II. Recovery of vitamin 'A' by different digestive methods, *idem*.
3. M. Ali, S.A. Haq and A.H. Khan, Pakistan J. Sci. Ind. Res., 8(2), (1965).
4. M. Ali, A.S. Alvi and M. Hanif, J. Sci. Res., **16**, (1964).
5. L.S. Berg, Trav. Inst. Zool. Acad. Sci. U.S.S.R. Lenigrad V, (1947) and translation.
6. H. Blegvad, *Fishes of Iranian Gulf* (Eimar Munksgaard, Copenhagen, 1944).
7. F. Day, Fauna Brit. India Fish., **1**, 34(1889).
8. H.W. Fowler, Bull. U.S. Nat. Mus., **13**, 100 (1941).
9. A. Haq and S. Mehdihassan, Shark meat flour, Central Laboratories, P.C.S.I.R., Karachi, 1960.
10. S.A. Haq, Protein supplementation and the fish protein concentrate (FPC) (1970). Biochemica Annual, Karachi University,
11. A.W. Herre, Check list of Philippine fishes, U.S. Fish Wildlife Ser. Research Report No. 23, 1953).
12. K.S. Misra, Records Ind. Mus., **45**(1), 1947.
13. K.S. Misra, *idem*., 49 (1), (1952).
14. K.S. Misra. An aid to the identification of the common commercial fishes of India and Pakistan; Records Ind. Mus. **57** (1–4), (1962).
15. I.S. Munro, The marine and freshwater fishes of Ceylon, Canberra, 1955.
16. M. Rahimullah Qureshi, Agr. Pakistan, 3(4), (1952).
17. M. Rahimullah Qureshi, Scientist, **1**(2–3), 1953.
18. M. Rahimullah Qureshi, Agr. Pakistan **4**(3–4), (1953).
19. M. Rahimullah Qureshi, *Marine Fishes of Karachi and the Coasts of Sind and Mekran* (Government Publications, Karachi, 1955).

For further details see the publications of Annandale *et al.* in the Mem. Indian Mus., and also of Lloyd may be referred.