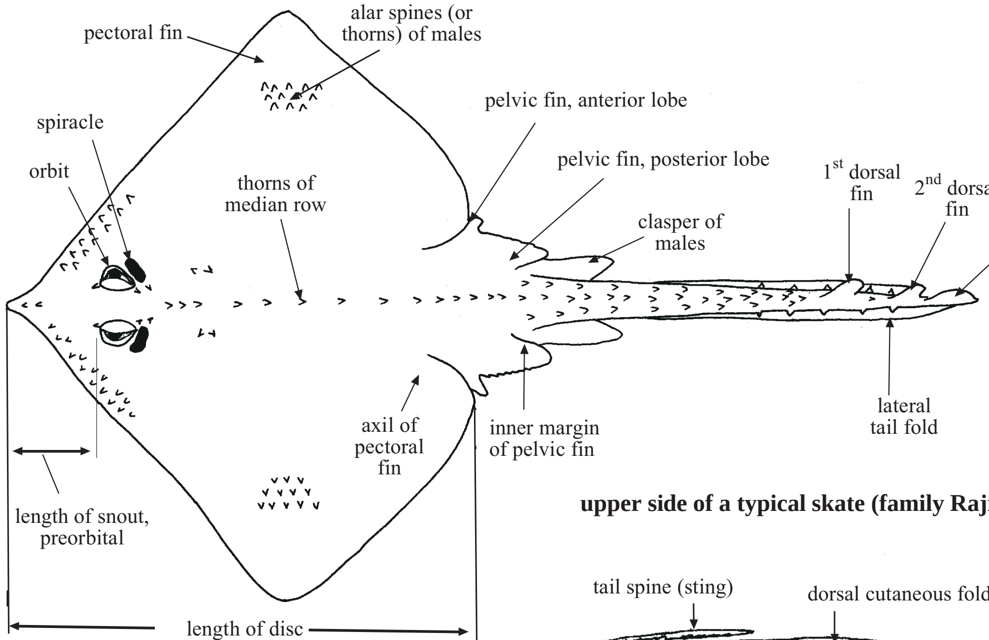
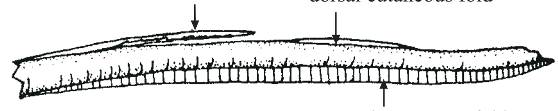
BATOID FISHES

TECHNICAL TERMS AND MEASUREMENTS

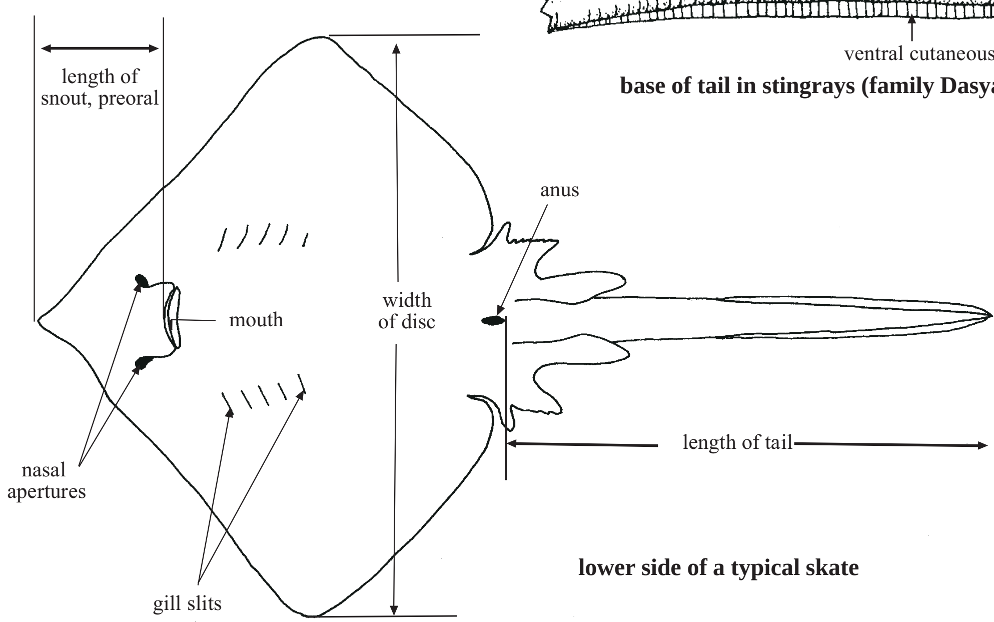
(straight-line distances)



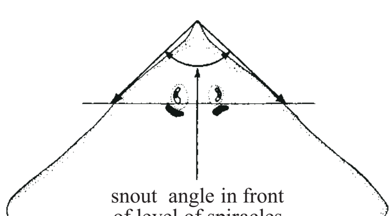
upper side of a typical skate (family Rajidae)



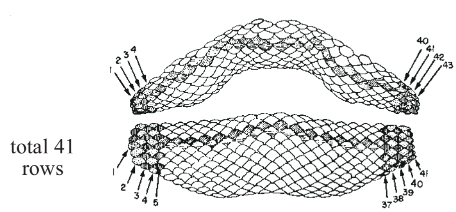
base of tail in stingrays (family Dasyatidae)



lower side of a typical skate



anterior part of disc of a skate



teeth of a stingray (arrows indicate method of counting pavement pattern in batoids)

GENERAL REMARKS

by L.J.V. Compagno

Batoid fishes or rays include a variety of more or less depressed fishes that differ from the closely related sharks (from which they are derived) in having ventral gill openings (or gill slits) and pectoral fins enlarged and fused to the sides of the head over the gill openings. The conjoined head, pectoral fins, and body form a wedge-shaped, circular, oval, or rhomboidal disc which is more or less delimited from the tail. Batoids have eyes and well-developed spiracles usually present on the dorsal surface of the head, but these are secondarily lateral on some more pelagic rays, and eyes are vestigial in a few blind electric rays. The tail and caudal fin are well developed in some rays and serve to propel the animal by lateral undulations. In skates and stingrays the tail and caudal fin are variably reduced and lose their locomotor function; the enlarged pectoral fins allow the ray to swim by sine-wave undulations or dorsoventral flapping. There are usually 5 pairs of gill openings, rarely 6 (sixgill stingray, *Hexatrygon bickelli*, family Hexatrygonidae). The mouth and nostrils are usually ventral or subterminal on the head, but terminal in *Manta*. Many batoids have 2 dorsal fins (never with spines on their front edges in living species), but some stingrays, skates, and torpedo rays have a single dorsal fin or none; an anal fin is always absent. The teeth on the jaws are set in transverse rows and are constantly replaced from inside the mouth; some rays have these laterally fused to form large tooth plates. Rays vary from being more or less covered by small (occasionally enlarged) tooth-like placoid scales or dermal denticles to completely lacking external denticles; many species have enlarged thorns or bucklers on their dorsal surfaces.

Male batoids have cylindrical copulatory organs or claspers on their pelvic fins, used for internal fertilization of eggs in females; skates (about 46% of living species of batoids) deposit eggs on the bottom, which are inside rectangular capsules of a horn-like material (oviparity); the remainder are livebearers with varied modes of reproduction. Live-bearing batoids do not have yolk-sac placentas, as do certain sharks, nor do they practice uterine cannibalism. Some live-bearing batoids, including the sawfishes and guitarfishes, are like many ovoviviparous sharks in that their fetuses derive nutriment primarily from the contents of their yolk sacs. Fetuses of stingrays and their relatives tend to exhaust their yolk early in development and subsist on histotroph or “uterine milk” secreted by the mother’s uterus until they are born.

Mature batoids vary in total length from about 5 to 6 cm wide and about 10 cm long (dwarf electric rays of the family Narkidae) to at least 6.1 m wide (*Manta*, family Mobulidae) and 6 to 7 or more metres long (some species of *Pristis*, family Pristidae), and range in weight from 10 to 20 g to between 1 to 3 t. Most batoids are of small or moderate size, below 1 m long and 60 cm wide.

All batoids are predators, but usually have small grasping or crushing teeth and tend to take relatively small prey. These range from planktonic animals and benthic invertebrates to small to moderately large bony fishes, other chondrichthyans, and cephalopods. No rays have developed large cutting teeth as in many sharks, and none can dismember large marine vertebrates. Some electric rays of the family Torpedinidae use their electric organs to stun large fishes, which they swallow whole, while sawfishes kill small fishes with their rostral saws and suck them in with their bellows-like mouths. Batoids are primarily marine, but many species can tolerate fluctuating salinities in estuaries and shallow bays and may travel into fresh water to a greater or lesser extent. A variety of stingrays (Dasyatidae and Potamotrygonidae) live only in fresh water while other stingrays and some sawfishes (family Pristidae) are euryhaline and readily live in fresh water and the sea. Some sawfishes readily penetrate fresh water and breed in it. Batoids are widely distributed in all oceans, from the tropics to the Arctic and the Antarctic continent. They occur close inshore on reefs, off beaches, in shallow, enclosed bays and lagoons, and in rivers and lakes to the lower continental slopes and the abyssal plains. Most batoids are found on or near the bottom in proximity to land masses, but a few species including some devil rays (family Mobulidae) and the pelagic stingray (*Dasyatis violacea*) occur in the high seas in the epipelagic zone. There are no known mesopelagic or bathypelagic batoids that live in the ocean basins below the sunlit epipelagic zone. Batoids are diverse in shallow continental waters of tropical and warm-temperate seas, cold temperate to boreal waters, and on the upper continental and to a lesser extent insular slopes, but are less diverse at great depths (below 1 500 to 2 000 m), off oceanic islands, and in the open ocean. The richest batoid faunas occur in the Indo-West Pacific from South Africa and the Red Sea to Australia and Japan. Many batoids are social animals, occuring in small to huge groups, and some species are migratory.

The Western Central Pacific (Fishing Area 71 and the southwestern part of Fishing Area 77) has one of the most diverse batoid faunas in the world, including approximately 19 families, 37 genera, and between 126 and 142 species. Worldwide, there are 20 families, 65 genera, and between 507 and 621 species of batoids (estimate as of 16 August 1998). Many genera and families of batoids are poorly known and require further taxonomic study. Many species of batoids are endemic to the area and have restricted ranges within it, while several species are known from a few museum specimens only. A wealth of new batoid species have been revealed in deep-water, offshore continental, and even inshore habitats in the past 40 years (many of which are still undescribed). Undoubtedly more new species and many records of described species will be discovered with further collecting in poorly known parts of the area. Knowledge of the coastal batoid fauna of Area 71 beyond Australia is sketchy at best, and many maritime countries need further surveys to determine which species occur there. The deep-water batoid fauna is very poorly known in the Western Central Pacific, except for off northern Australia and a few other localities (such as New Caledonia) where systematic deep-water exploration for fisheries resources is proceeding apace. Basic knowledge of the biology of many species is often very deficient or entirely lacking, and can be supplemented by new information gathered by fisheries workers in the area.

Batoids are either harmless or minimally harmful to people. Injuries from stingray stingers are relatively common, probably more so than shark bite injuries, and result when bathers or swimmers step on or otherwise contact resting stingrays. Stingrays and related batoids with stings on their tails are not aggressive and lash their tails in defense only when contacted or constrained, and measures can be taken to minimise the risk of such injuries by not stepping on or otherwise physically contacting the rays. Stingrays and large sawfishes are a hazard to fishermen that have to remove them from nets and other fishing gear. Some batoids pose a problem to mariculture operations for shellfish by raiding the beds en masse and decimating them, which is dealt with either by netting the rays (anti-predator control similar to meshing of sharks) or building ray-proof fences around shellfish beds. Electric rays can shock fishermen, bathers, swimmers, divers, or unwary beachcombers, and large skates and eagle rays can deliver painful bites when molested.

As with sharks, rays face problems of overexploitation from burgeoning fisheries driven by the expanding human population. Rays are similar to sharks in having a life history strategy (long lives, long maturation times, and low fecundity, plus relatively large size) that make them very vulnerable to overexploitation. A few targeted or bycatch batoid fisheries had suddenly collapsed after recruitment had been impaired by overexploitation of the breeding stocks. Only in the past 5 years has there been widespread concern about world trends in fisheries for sharks, but this has extended to batoids only during the last few years. Fresh-water stingrays with limited geographic ranges face major problems from habitat degradation and exploitation, while the euryhaline sawfishes have apparently declined catastrophically in many areas during the last 4 decades. After the Second World War, world fisheries for chondrichthyan fishes increased about 3.5 times in reported catches to FAO, which has not kept pace with the approximately fivefold increases in total fisheries worldwide. Much of the catch of batoids and other chondrichthyans is as bycatches of fisheries driven by larger catches of exploitation-resistant bony fishes with far higher fecundity. World catches of cartilaginous fishes reported to FAO have nearly levelled off in the 10-year period 1985 to 1995 to about 730 000 t, which may indicate that there is little scope for further increases in catches. Few batoids have been accorded protection so far, though some, including fresh-water stingrays and sawfishes, may require international agreements, including CITES listings, to help to reverse current declining trends in their numbers.

In the Western Central Pacific, batoid fishes are used mainly for human food; batoid meat including the “wings” of species with large pectoral discs and the carcasses of shark-like species is marketed fresh, frozen and especially dried-salted. Certain batoids including sawfish and wedgefishes contribute to the oriental market for sharkfins. Most batoids have fins that are unsuitable for this market because they lack sufficient quantities of fin rays (ceratotrichia). Batoids are also used for fishmeal, and for hides which are processed for decorative leather and abrasives. Details of utilization of batoids in the area are sketchy. The total catch of batoids reported from Fishing Area 71 is uncertain; total catches of batoids in the area in 1995 was at least 59 000 t out of 118 700 t of cartilaginous fishes (about half the catch); the actual landings of batoids in the area are doubtlessly much higher and presently with sharks declining may be 2/3 or more of the total catch. Catches of cartilaginous fishes in the section of Area 77 included in this work were relatively small and may add about 6 000 t of chondrichthyans with an unknown amount of batoids to the 1995 total. The present area had one of the 3 highest catches of cartilaginous fishes worldwide in 1995, being surpassed only by FAO Areas 51 (Western Indian Ocean, with 144 500 t) and currently is far more than Area 61 (Western North Pacific, with 73 500 t). The present area includes Indonesia, which in 1995 had the second highest cartilaginous fish catch (75 000 t) of any nation (surpassed only by India, and with Pakistan, Taiwan Province of China, the USA, and Mexico being the 4 next highest countries). Malaysia, Thailand, the Philippines, and Singapore had catches of respectively 19 100 t, 8 800 t, 9 100 t, and 400 t in 1995.

Data on gear used for catching batoids in the area is sketchy, but line gear (including pelagic longlines), fixed and floating gill nets, bottom trawls, and fixed fish traps, and purse seines are used to target batoids or take them as a bycatch. Batoids are taken in artisanal fisheries, by local inshore and offshore commercial fisheries, and by large fishing fleets in offshore waters. Stingrays (Dasyatidae) are especially important, but considerable numbers of eagle rays (Myliobatidae), butterfly rays (Gymnuridae), cownose rays (Rhinopteridae), guitarfishes (Rhinobatidae), wedgefishes (Rhinidae), and devil rays (Mobulidae) are also taken, while numbfishes (Narcinidae), sleeper rays (Narkidae), and a few other families are minor components of local catches.

KEY TO THE FAMILIES OF BATOID FISHES OCCURRING IN THE AREA

1a. Snout elongated into a long, flat rostral saw with enlarged lateral teeth (Fig. 1) . . . **Pristidae** (p. 1410)

1b. Snout short to elongated, not saw-like . . . . → **2**

2a. Free rear tips of pectoral fins anterior to pelvic-fin origins; dorsal fins large and strongly falcate; caudal fin with a strong ventral lobe (Fig. 2) . . . . **Rhinidae** (p. 1418)

2b. Free rear tips of pectoral fins opposite or posterior to pelvic-fin origins; dorsal fins, when present, rounded or angular, but not strongly falcate; caudal fin without a ventral lobe . . . . . . → **3**

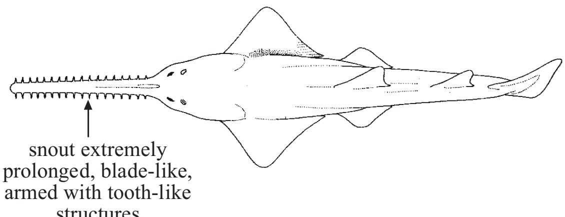


Fig. 1 Pristidae

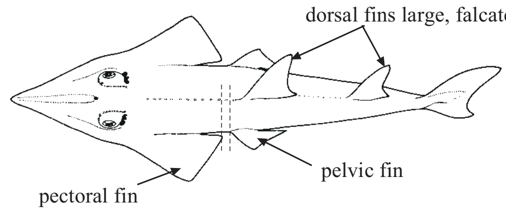


Fig. 2 Rhinidae

3a. Pelvic fins not bilobate (Fig. 3a); males without alar spines on their discs . . . . → **4**

3b. Pelvic fins strongly bilobate, with a narrow anterior lobe and broad posterior lobe (Fig. 3b); males with curved, hooked alar spines on their discs (skates) . . . . → **17**

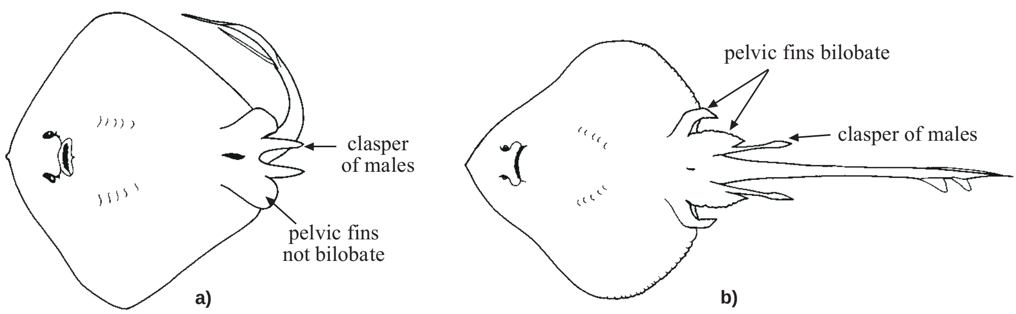


Fig. 3 ventral view of body

(after Last and Stevens, 1994)

4a. Pectoral disc thick and flabby, with a large kidney-shaped electric organ at the base of the fin radials on each side that is visible through the skin (Fig. 6); no denticles or medial thorns on dorsal surface of disc and tail, body entirely naked. . . . . → **5**

4b. Pectoral disc thick basally, flat peripherally, usually not flabby and without electric organs; denticles and usually medial thorns present on dorsal surface of disc and tail, ventral surface variably denticulate or naked . . . . → **8**

5a. Mouth broadly arcuate, without labial folds and cartilages at ends (Fig. 4a, b); 2 dorsal fins, the first much larger than the second . . . . → **6**

5b. Mouth nearly transverse, with strong labial folds and cartilages at corners (Fig. 4c); 2, a single, or no dorsal fins, the first about as large as the second when 2 are present . . . . → **7**

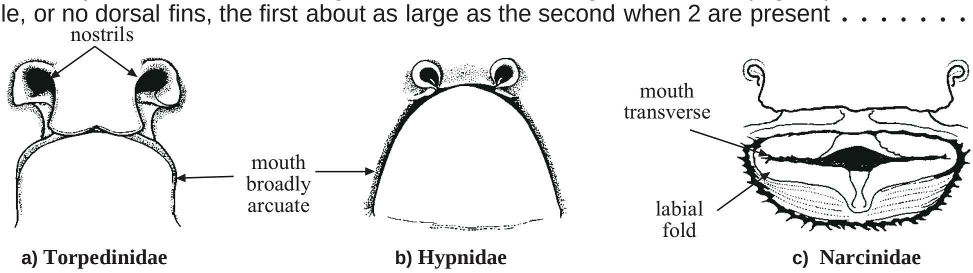


Fig. 4 region of nostrils and mouth

6a. Disc longitudinally pear-shaped; tail greatly reduced, caudal fin about as high as dorsal fins (Fig. 5) . . . . **Hypnidae** (p. 1447)

6b. Disc truncate anteriorly, transversely elliptical, not pear-shaped; tail not greatly reduced, caudal fin much higher than dorsal fin (Fig. 6) . . . . **Torpedinidae** (p. 1449)

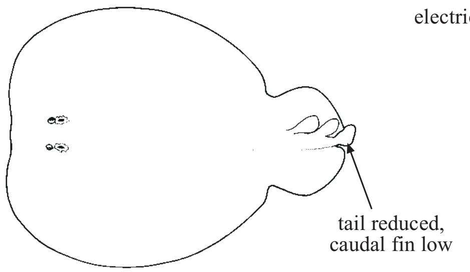


Fig. 5 Hypnidae

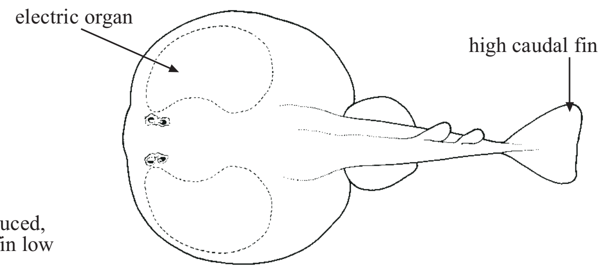


Fig. 6 Torpedinidae

7a. Snout with a broad, stiff, shovel-shaped rostral cartilage, readily felt by palpitation of the snout; a deep groove around mouth (Fig. 7a); teeth extending onto outer surfaces of upper and lower jaws in most species (Fig. 7a); 2 dorsal fins present (Fig. 7b) . . . . . . **Narcinidae** (p. 1434)

7b. Snout with a narrow, rod-shaped rostral cartilage; a shallow groove around mouth (Fig 8a); teeth not extending onto outer surfaces of upper and lower jaws; genera in the area with a single dorsal fin (*Narke*) or none (*Temera*) (Fig. 8b) . . . . **Narkidae** (p. 1443)

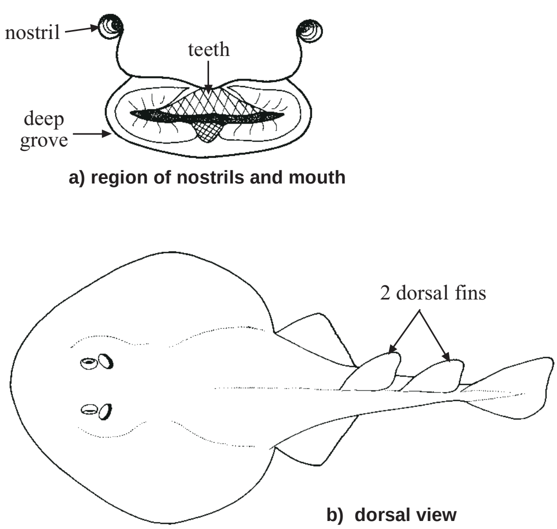


Fig. 7 Narcinidae

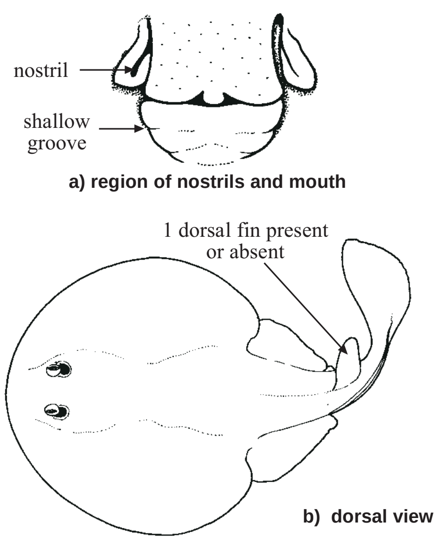


Fig. 8 Narkidae

8a. Tail very thick and massive, with 2 large dorsal fins and a large caudal fin; no sting or stinging spine on tail (Figs 9 and 10) . . . . **→ 9**

8b. Tail more or less attenuated and slender, with 1 small to moderate-sized dorsal fin or none; a small caudal fin present and well developed, or variably reduced or absent; usually a sting present on tail (absent in *Urogymnus*, *Aetomylaeus*, and some members of Gymnuridae and Mobulidae) . . . . **→ 10**

9a. Disc narrow and wedge-shaped anteriorly; midback and tail with a row of small and often blunt thorns, and with a few additional thorns often present on scapular area (= shoulder region) (Fig. 9) . . . . **Rhinobatidae** (p. 1423)

9b. Disc broad and rounded; tail and scapular area of disc with strong sharp thorns (Fig. 10) . . . . **Platyrhinidae** (p. 1431)

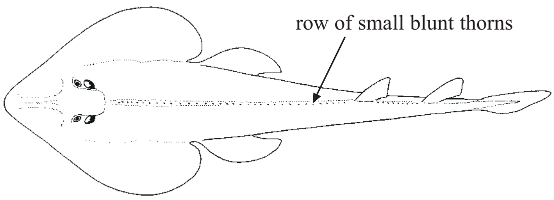


Fig. 9 Rhinobatidae

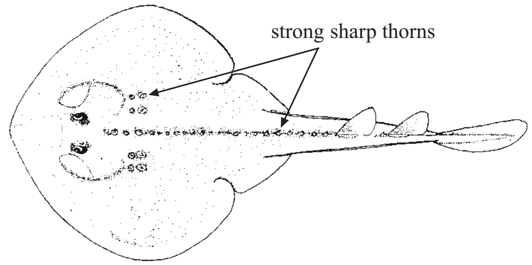


Fig. 10 Platyrhinidae

10a. Head not elevated and laterally demarked from disc by a deep notch; eyes dorsolateral on head, well medial from edge of disc; snout not differentiated into separate rostral or cephalic fins; dorsal fin either absent or small and well behind pelvic-fin bases . . . . → **11**

10b. Head elevated and laterally demarked from disc; eyes lateral on head; anterior part of pectoral fins formed as a separate rostral fin or paired cephalic fins or horns; dorsal fin moderately large, close to or over pelvic-fin bases . . . . → **15**

11a. Six pairs of gill openings (Fig. 11a); spiracles well separated from eyes (Fig. 11b) . . . . **Hexatrygonidae** (p. 1477)

11b. Five pairs of gill openings; spiracles close to eyes . . . . → **12**

12a. Disc broad and laterally expanded, rhomboidal and at least 1.6 times as wide as long (Fig. 12) . . . . **Gymnuridae** (p. 1506)

12b. Disc not greatly expanded, diamond-shaped or rounded, but not rhomboidal, usually less than 1.3 times as wide as long . . . . → **13**

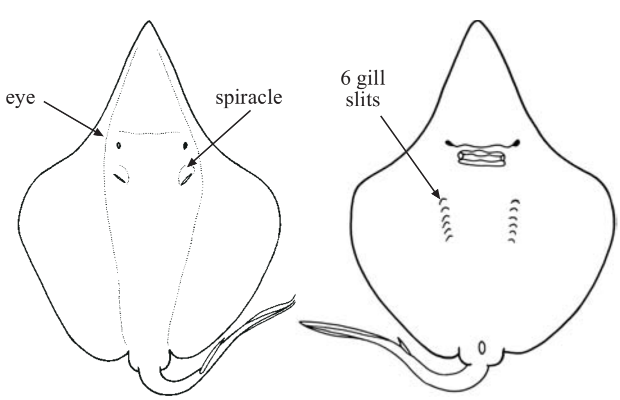


Fig. 11 Hexatrygonidae

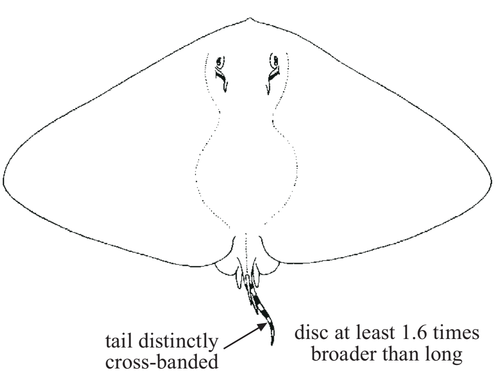


Fig. 12 Gymnuridae

13a. Caudal fin absent or reduced to dorsal and ventral longitudinal folds on midline of tail; tail more or less elongated and whip-like (Fig. 13) . . . . **Dasyatidae** (p. 1479)

13b. A small but well-developed caudal fin present; tail relatively short and not whip-like. . . . . → **14**

14a. Preorbital length of snout over 6 times orbit diameter; nasal curtain short and broad, not overlapping mouth; floor of mouth without lobate papillae; adults attaining nearly 3 m in length (Fig. 14) . . . . **Plesiobatidae** (p. 1467)

14b. Preorbital length of snout much less than 6 times orbit diameter; nasal curtain longer and narrow, overlaps mouth; floor of mouth with lobate papillae; adults to less than 1 m in length (Fig. 15) . . **Urolophidae** (p. 1469)

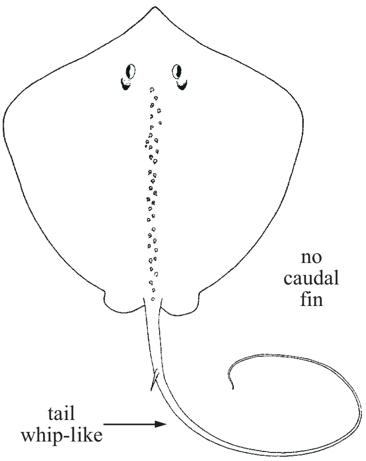


Fig. 13 Dasyatidae

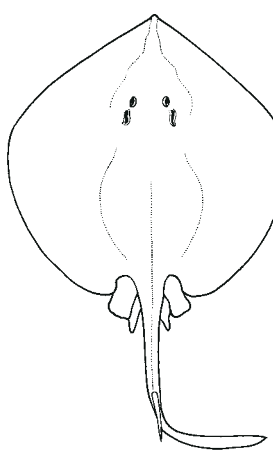


Fig. 14 Plesiobatidae

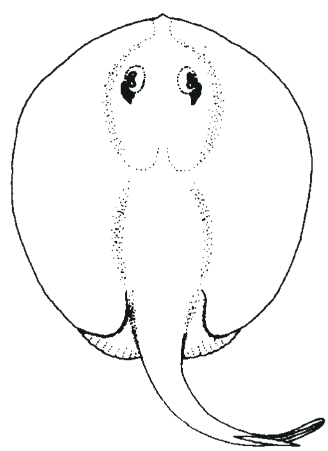


Fig. 15 Urolophidae

15a. Snout formed into prehensile, elongated, bilobate cephalic fins, laterally based on head; mouth very large, jaws weak and transversely expanded, with very small cuspidate or hexagonal teeth; gills with filter plates (Fig. 16) . . . . **Mobulidae** (p. 1524)

15b. Snout formed as a single convex or low bilobate pair of rostral fins; mouth small, jaws very stout and longitudinally expanded with large transversely expanded plate-like teeth that form a powerful crushing and grinding mill for eating shellfish; gills without filter plates . . . . → **16**

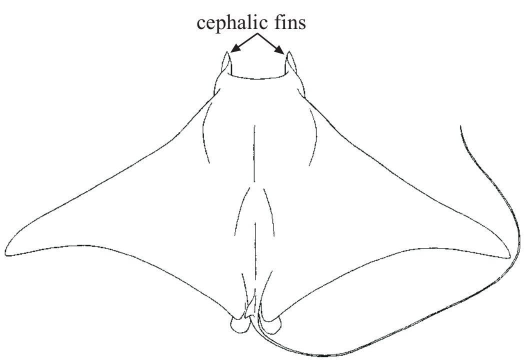


Fig. 16 Mobulidae

16a. Rostral fin single and convex; forehead rounded and not expanded anteriorly or medially notched; 1 medial row of expanded plate-like teeth in each jaw, usually with 3 rows of smaller hexagonal teeth on each side of them (except *Aetobatus*, in which the lateral teeth are lost) (Fig. 17) . . . . **Myliobatidae** (p. 1511)

16b. Rostral fin bilobate and broadly notched medially; forehead expanded anteriorly and forming a ledge over base of rostral fins, its anterior projection with a broad medial notch; 3 medial rows of expanded plate-like teeth in each jaw, usually with 2 or 3 rows of smaller hexagonal teeth on each side of them (Fig. 18) . . . . **Rhinopteridae** (p. 1520)

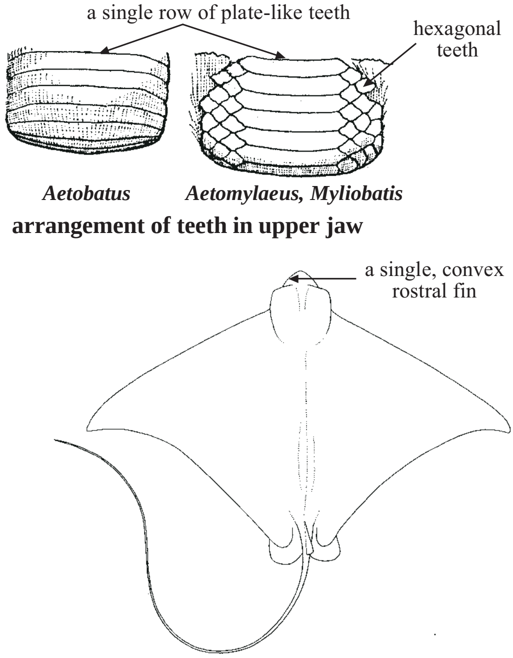


Fig. 17 Myliobatidae

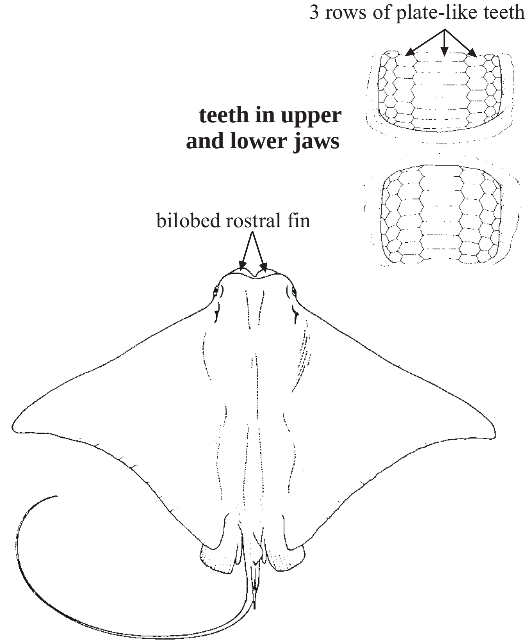


Fig. 18 Rhinopteridae

17a. Anterior and posterior lobes of pelvic fins completely separate, anterior lobe leg-like; species in the area naked except for alar spines of males, without dorsal fins and with the tail very slender and caudal fin long and low (Fig. 19) . . . . **Anacanthobatidae**

17b. Anterior and posterior lobes of pelvic fins conjoined basally, anterior lobe not leg-like; species in the area with dorsal surface of disc and tail variably covered with denticles and thorns, with 2 low dorsal fins far posterior on tail, with a short, greatly reduced caudal fin and with the tail moderately stout . . . . . . → **18**

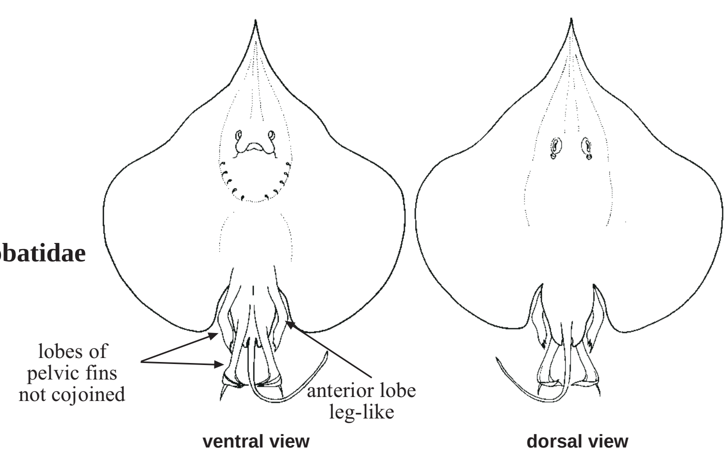


Fig. 19 Anacanthobatidae

18a. Species in the area with a reduced rostral cartilage and soft snout; basihyal cartilage of hyobranchial skeleton with lateral projections; scapulocoracoid (shoulder girdle) usually with stout or slender anterior bridge separating predorsal and ventral fenestra; clasper glans of adult males not greatly expandable, usually without rhipidion or shield; clasper ventral terminal cartilage spoon-shaped, without a sharp lateral edge and not forming an external clasper shield; clasper dorsal terminal cartilages 2 and 3 arranged in parallel (Fig. 20) . . . . **Arhynchobatidae** (p. 1457)

18b. Species in the area with a stout rostral cartilage and hard snout (except *Gurgesiella sibogae*); basihyal cartilage without lateral projections; scapulocoracoid without anterior bridge; clasper glans of adult males greatly expandable, with a rhipidion and shield; clasper ventral terminal cartilage not spoon-shaped, with a sharp lateral edge that forms the shield; clasper dorsal terminal cartilages 2 and 3 arranged in series (Fig. 21) . . **Rajidae** (p. 1452)

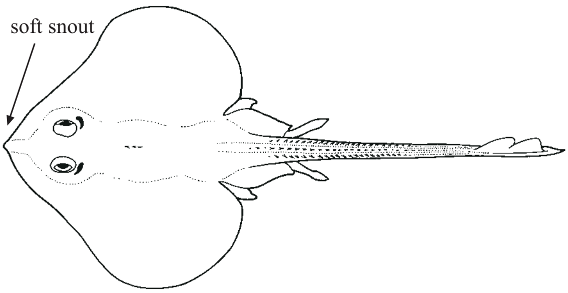


Fig. 20 Arhynchobatidae

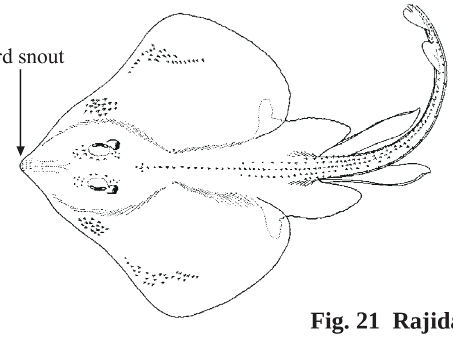


Fig. 21 Rajidae

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

(compiled by L.J.V. Compagno, P.R. Last, B. Seret, and M.R. de Carvalho)

The symbol ✦ is given when species accounts are included. A question mark indicates that presence in the area is uncertain.

Order PRISTIFORMES

PRISTIDAE: Sawfishes

✦ *Anoxypristis cuspidata* (Latham, 1794)

✦ *Pristis clavata* Garman, 1906
✦ *Pristis microdon* Latham, 1794
✦ *Pristis pectinata* Latham, 1794
✦ *Pristis zijsron* Bleeker, 1851

Order RHINOBATIFORMES

RHINIDAE (= Rhynchobatidae): Wedgefishes

✦ *Rhina ancylostoma* Bloch and Schneider, 1801

✦ *Rhynchobatus australiae* Whitley, 1939
✦ *Rhynchobatus* cf. *laevis* (Bloch and Schneider, 1801)
✦ *Rhynchobatus* sp. 1
✦ *Rhynchobatus* sp. 2

RHINOBATIDAE: Guitarfishes

✦ *Aptychotrema rostrata* (Shaw and Nodder, 1794)
✦ *Aptychotrema* sp. A. [Last and Stevens, 1994]

✦ *Rhinobatos formosensis* Norman, 1926
✦ *Rhinobatos granulatus* Cuvier, 1829
✦ *Rhinobatos halavi* (Forsskål, 1775)
✦ *Rhinobatos obtusus* Müller and Henle, 1841
✦ *Rhinobatos schlegelii* Müller and Henle, 1841
✦ *Rhinobatos thouin* (Anonymous in Lacepède, 1798)
✦ *Rhinobatos typus* Bennett, 1830
? *Rhinobatos* sp. A. [Last and Stevens, 1994]

✦ *Trygonorrhina* sp. A. [Last and Stevens, 1994]

PLATYRHINIDAE: Thornback rays
✦ *Platyrhina sinensis* (Bloch and Schneider, 1801)

NARCINIDAE: Numbfishes
✦ *Benthobatis* sp.

? *Narcine brevilabiata* Bessednov, 1966
✦ *Narcine brunnea* Annandale, 1909
✦ *Narcine indica* Henle, 1834
✦ *Narcine lingula* Richardson, 1846
✦ *Narcine maculata* (Shaw, 1804)
✦ *Narcine prodorsalis* Bessednov, 1966
✦ *Narcine timlei* (Bloch and Schneider, 1801)
✦ *Narcine* sp. A [Last and Stevens, 1994]
✦ *Narcine* sp. B [Last and Stevens, 1994]
✦ *Narcine* sp. C [Last and Stevens, 1994]
✦ *Narcine* sp. D
? *Narcine* sp. E [P. Last, photograph]

NARKIDAE: Sleeper rays
✦ *Narke dipterygia* (Bloch and Schneider, 1801)
✦ *Narke japonica* (Temminck and Schlegel, 1850)
Narke sp. (Gulf of Thailand)

✦ *Temera hardwickii* Gray, 1831

HYPNIDAE: Coffin rays
✦ *Hypnos monopterygius* (Shaw and Nodder, 1795)

TORPEDINIDAE: Torpedos
✦ *Torpedo macneilli* (Whitley, 1932)
✦ *Torpedo* sp. A. [Last and Stevens, 1994]
✦ *Torpedo* sp. (Philippines)

Order RAJIFORMES

RAJIDAE: Skates
✦ *Gurgesiella sibogae* (Weber, 1913)

Raja (Dipturus) australis Macleay, 1884
Raja (Dipturus) gigas Ishiyama, 1958
Raja (Dipturus) polyommata Ogilby, 1910
Raja (Dipturus) tengu Jordan and Fowler, 1903
Raja (Dipturus) sp. G [Last and Stevens, 1994]
Raja (Dipturus) sp. H [Last and Stevens, 1994]
✦ *Raja (Dipturus)* sp. I [Last and Stevens, 1994]
Raja (Dipturus) sp. K [Last and Stevens, 1994]
Raja (Dipturus) sp. cf. *johannisdaviesi* Alcock, 1899 [Seret] (Indonesia)
Raja (Dipturus) sp. [Seret] (Indonesia)
Raja (Dipturus) sp. [Seret] (New Caledonia)
Raja (Dipturus) sp. [Seret] (Philippines)
Raja (Okamejei) acutispina Ishiyama, 1958
✦ *Raja (Okamejei) boesemani* Ishihara, 1987
Raja (Okamejei) hollandi Jordan and Richardson, 1909
Raja (Okamejei) kenojei Müller and Henle, 1841
Raja (Okamejei) sp. [Seret] (Indonesia)
✦ *Raja (Rajella) annandalei* Weber, 1913

ARHYNCHOBATIDAE: Softnose skates
✦ *Notoraja ochroderma* McEachran and Last, 1994
✦ *Notoraja (Insentiraja) laxipella* Yearsley and Last, 1992
✦ *Notoraja (Insentiraja) subtilispinosa* (Stehmann, 1985)
? *Notoraja (Insentiraja)* sp. [Seret] (New Caledonia)

✦ *Pavoraja (Pavoraja)* sp. D [Last and Stevens, 1994]
✦ *Pavoraja (Pavoraja)* sp. E [Last and Stevens, 1994]
✦ *Pavoraja (Pavoraja)* sp. F [Last and Stevens, 1994]

ANACANTHOBATIDAE: Legskates
- ✦ *Anacanthobatis borneensis* Chan, 1965
- ✦ *Anacanthobatis melanosoma* (Chan, 1965)
- *Anacanthobatis nanhaiensis* (Meng and Li, 1981)
- *Anacanthobatis stenosoma* (Li and Hu, 1982)
- ✦ *Anacanthobatis* sp. A [Last and Stevens, 1994]
- ✦ *Anacanthobatis* sp. B [Last and Stevens, 1994]
- ? *Anacanthobatis* sp. C [Last] (Australia)
- ? *Anacanthobatis* sp. [Seret] (Indonesia)

Order MYLIOBATIFORMES

PLESIOBATIDAE: Giant stingarees
- ✦ *Plesiobatis daviesi* (Wallace, 1967)

UROLOPHIDAE: Stingarees
- ✦ *Trygonoptera testacea* Banks, in Müller and Henle, 1841

- ✦ *Urolophus armatus* Valenciennes, in Müller and Henle, 1841
- ✦ *Urolophus bucculentus* Macleay, 1884
- ✦ *Urolophus flavomosaicus* Last and Gomon, 1987
- ✦ *Urolophus javanicus* (Martens, 1864)
- ✦ *Urolophus kaianus* Günther, 1880
- ✦ *Urolophus sufflavus* Whitley, 1929
- ✦ *Urolophus viridis* McCulloch, 1916
- ✦ *Urolophus* sp. B [Last and Stevens, 1994]
- *Urolophus* sp. 1 [Seret] (New Caledonia)
- *Urolophus* sp. 2 [Seret] (New Caledonia)

HEXATRYGONIDAE: Sixgill stingrays
- ✦ *Hexatrygon bickelli* Heemstra and Smith, 1980

DASYATIDAE: Stingrays
- ✦ *Dasyatis akajei* (Müller and Henle, 1841)
- ✦ *Dasyatis annotata* Last, 1987
- ✦ *Dasyatis bennetti* (Müller and Henle, 1841)
- ✦ *Dasyatis brevicaudata* (Hutton, 1875)
- ✦ *Dasyatis fluviorum* Ogilby, 1908
- ✦ *Dasyatis kuhlii* (Müller and Henle, 1841)
- ✦ *Dasyatis laosensis* Roberts and Karnasuta, 1987
- ✦ *Dasyatis leylandi* Last, 1987
- ✦ *Dasyatis microps* (Annandale, 1908)
- ✦ *Dasyatis zugei* (Müller and Henle, 1841)

- ✦ *Himantura bleekeri* (Blyth, 1860)
- ✦ *Himantura chaophraya* Monkolprasit and Roberts,1990
- ✦ *Himantura fai* Jordan and Seale, 1906
- ✦ *Himantura gerrardi* (Gray, 1851)
- ✦ *Himantura granulata* (Macleay, 1883)
- ✦ *Himantura imbricata* (Bloch and Schneider, 1801)
- ✦ *Himantura jenkinsii* (Annandale, 1909)
- *Himantura krempfi* Chabanaud, 1923
- ✦ *Himantura marginata* (Blyth, 1860)
- ✦ *Himantura oxyrhynchus* (Sauvage, 1878)
- ✦ *Himantura signifer* Compagno and Roberts, 1982
- ✦ *Himantura toshi* Whitley, 1939
- ✦ *Himantura uarnak* (Forsskål, 1775)
- ✦ *Himantura undulata* (Bleeker, 1852)
- ✦ *Himantura walga* (Müller and Henle, 1841)
- ✦ *Himantura* sp. A [Last and Stevens, 1994]

- ✦ *Pastinachus sephen* (Forsskål, 1775)

- ✦ *Pteroplatytrygon violacea* (Bonaparte, 1832)

- ✦ *Taeniura lymma* (Forsskål, 1775)
- ✦ *Taeniura meyeni* Müller and Henle, 1841

- *Urogymnus asperrimus* (Bloch and Schneider, 1801)

GYMNURIDAE: Butterfly rays
- *Aetoplatea zonura* Bleeker, 1852

- *Gymnura australis* (Ramsay and Ogilby, 1885)
- *Gymnura japonica* (Schlegal, 1850)
- *Gymnura* sp. cf. *micrura* (Bloch and Schneider, 1801)
- *Gymnura poecilura* (Shaw, 1804)

MYLIOBATIDAE: Eagle rays
- *Aetobatus flagellum* (Bloch and Schneider, 1801)
- *Aetobatus narinari* (Euphrasen, 1790)
- *Aetobatus guttatus* (Shaw, 1804)

- *Aetomylaeus maculatus* (Gray, 1832)
- *Aetomylaeus milvus* (Valenciennes in Müller and Henle, 1841)
- *Aetomylaeus nichofii* (Bloch and Schneider, 1801)
- *Aetomylaeus vespertilio* (Bleeker, 1852)

- *Myliobatis australis* Macleay, 1881
- *Myliobatis hamlyni* Ogilby, 1911
- *Myliobatis tobijei* Bleeker, 1854

RHINOPTERIDAE: Cownose rays
- *Rhinoptera adspersa* Valenciennes in Müller and Henle, 1841
- *Rhinoptera javanica* Müller and Henle, 1841
- *Rhinoptera neglecta* Ogilby, 1912

MOBULIDAE: Devil rays
- *Manta birostris* (Donndorff, 1798)

- *Mobula eregoodootenkee* (Bleeker, 1852)
- *Mobula japanica* (Müller and Henle, 1841)
- *Mobula kuhlii* (Valenciennes in Müller and Henle, 1841)
- *Mobula tarapacana* (Philippi, 1892)
- *Mobula thurstoni* (Lloyd, 1908)

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