

## Taxonomy of Wedgefishes and Guitarfishes in Indian Waters



### Introduction

Interest in elasmobranch biodiversity and taxonomy has grown in recent years (since 2000). Recognizing the importance of accurate species-level taxonomy in biodiversity studies, fisheries management, to understand the composition, now additional efforts have been included in fisheries monitoring. Fisheries scientists are ever more keenly aware of the need for accurate species-level assessments of catches to manage fisheries effectively. Finally, conservation biologists are beginning to recognize how critically important it is to have an accurate understanding of species compositions based on careful taxonomy to prioritize and manage units of biodiversity for conservation (Naylor et al., 2012). The Cartilaginous fishes, consisting of sharks, rays and chimeras belongs to class Chondrichthyes. Today, more than 1,400 species live in the seas and freshwater and estuarine systems of the world. In India, the Chondrichthyes are represented by around 160 species under 67 genera, 28 families and 10 Orders in the Indian region (Kizhakudan et al., 2015). The Bar coding of elasmobranchs is standard for molecular identification of species. Unfortunately, some of the specimens from which tissue samples are derived are misidentified when collected, and because there is no expertly curated reference dataset against which to compare sequences, many are added to GenBank with their original incorrectly assigned identities. Therefore, the combination of molecular and the classical taxonomy (based on morphology) of elasmobranchs is essential to conduct the phylogenetic analysis and avoids incorrect phylogenetic inferences. Globally, 536 shark species, 611 rays and 52 chimeras were assessed by International Union for Conservation of Nature (IUCN) Red List assessment process. Now, 391 (32.6%) species are threatened with extinction. Overfishing is the universal threat affecting all 391 threatened species and is the sole threat for 67.3% of species and interacts with three other threats for the remaining third: loss and degradation of habitat (31.2% of threatened species), climate change (10.2%), and pollution (6.9%). Species are disproportionately threatened in tropical and subtropical coastal waters (Dulvy et al., 2021). Elasmobranchs are characterized by a life-history of slow growth, late maturity, and low fecundity, making them extremely susceptible to population decline from overexploitation.

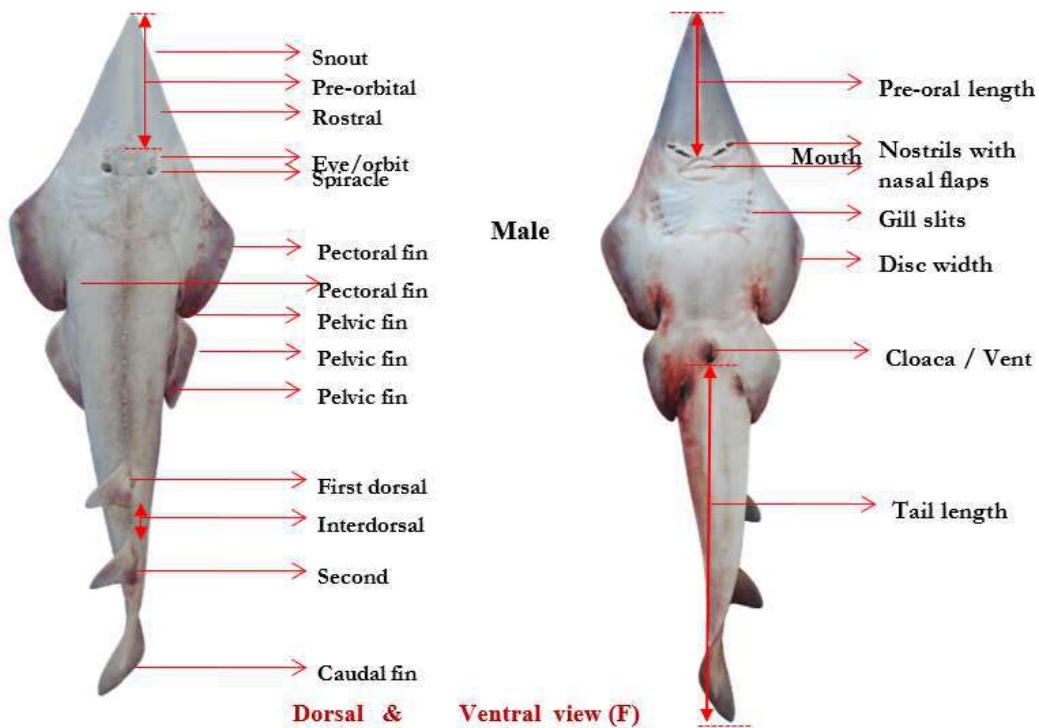
As part of conservation programme in India, ten species of sharks and rays, including *Rhincodon typus* (Whale shark), *Anoxypristis cuspidata* (Knifetooth sawfish), *Carcharhinus hemiodon* (Pondicherry shark), *Glyphis gangeticus* (Gangetic shark), *G. glyphis* (Speartooth shark), *Himantura fluviatilis* (Ganges stingray), *Pristis microdon* (= *P. pristis*) (Freshwater sawfish), *P. zijsron* (Green sawfish), *Rhynchobatus djiddensis* (Giant guitarfish), and

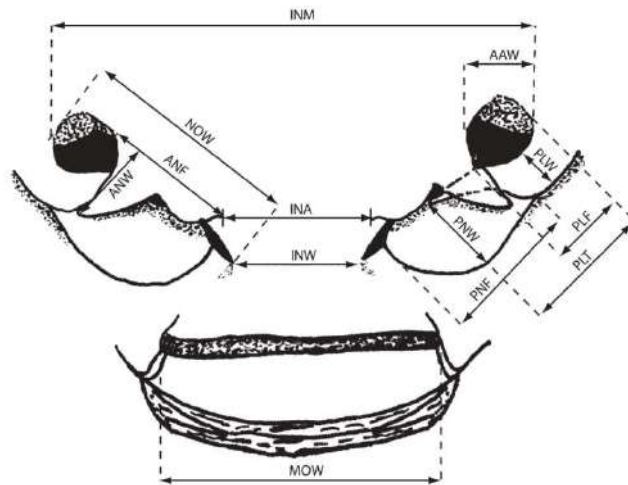
*Urogymnus asperrimus* (Porcupine ray) were listed under Schedule-I Part 2(A) of the Indian Wildlife (Protection) Act, 1972 during 2001.

### Classification of shark-like batoids

Sixty-three species from five families are recognized within the order Rhinopristiformes: the sawfishes (Pristidae), wedgefishes (Rhinidae), giant guitarfishes (Glaucostegidae), guitarfishes (Rhinobatidae), and banjo rays (Trygonorrhinidae). Their flattened body is perfectly adapted for life on the seabed, either swimming close to the bottom or resting and lying concealed within the sediments. Of these five families, only the Rhinobatidae is not inferred to be monophyletic. The classical and molecular taxonomy confirmed the family Pristidae (sawfishes) as monophyletic. Rhina forms a strongly supported monophyletic group with *Rhynchobatus*, which we recognize as a family level grouping, the Rhinidae. Members of the genus *Glaucostegus* all formed a strongly supported group in the tree, now recognized as the family Glaucostegidae. Finally, the Trygonorrhinidae, comprising the genera *Trygonorrhina*, *Aptychotrema*, and *Zapteryx* (previously included in the family Rhinobatidae) is strongly forms the basal group within Rhinopristiformes (Last et al., 2016).

### Technical terms and field identification characters





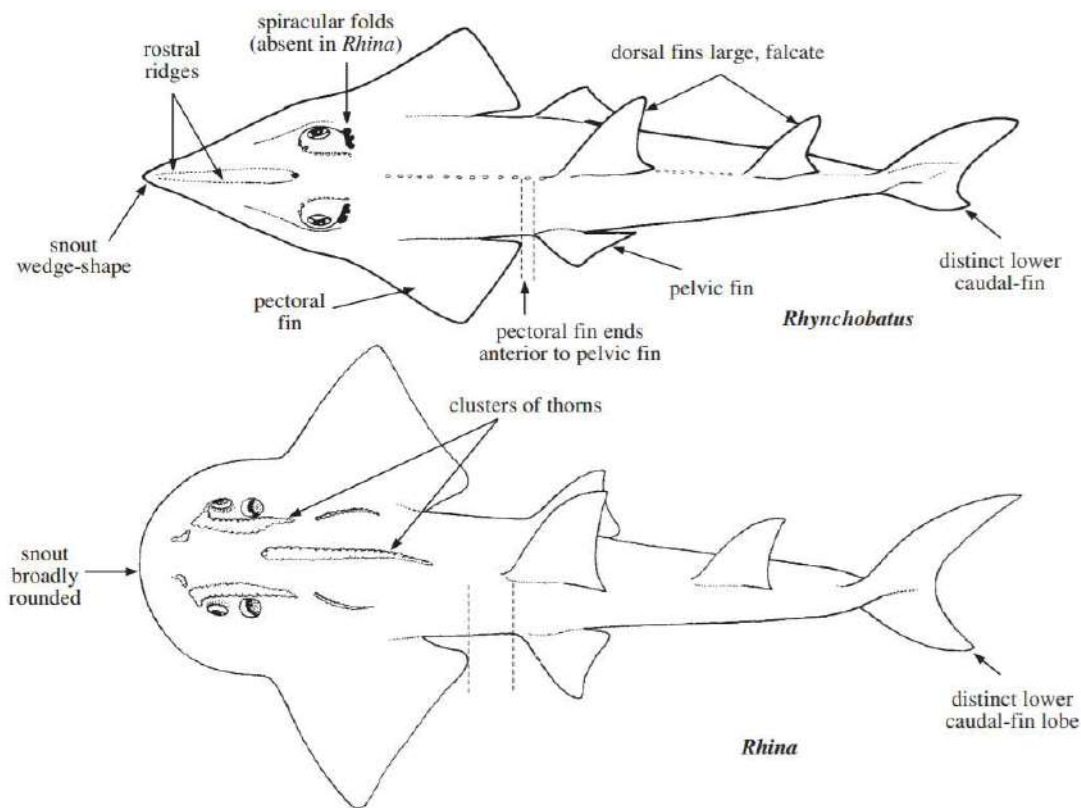
Ventral view (M)

#### Measurements of the oronasal region of the genus *Rhinobatos*.

AAW, anterior aperture width; ANF, anterior nasal-flap base length; ANW, anterior nasal-flap base width; INA, distance between insertions of anterior nasal flaps; INM, distance between lateral margins of anterior apertures; INW, internarial distance; MOW, mouth width; NOW, nostril length; PLF, posterolateral nasal-flap anterior exposed base length; PLT, posterolateral nasal-flap total length; PLW, posterolateral nasal-flap width; PNF, posterior nasal-flap base length; PNW, posterior nasal-flap width (Source: Last et al., 2004)

#### Wedgefishes (Family Rhinidae)

Wedgefishes are medium to large, shark-like rays with a variably depressed trunk, weakly formed disc, and a head either thickened and broadly domed, or flattened wedge-shaped or rounded. Pectoral fins are triangular and join the body behind eye level. The nostrils are long and narrow, and usually lie oblique to a small horizontal mouth with rounded to oval teeth that lack distinct cusps. The anterior nasal flaps are poorly developed and do not form a nasal curtain. The spiracles are large with 0–3 skin folds along their hind margin. A robust tail is slightly longer than the disc, and has two upright dorsal fins (the first above the pelvic fins), and a well-developed bilobed caudal fin with a strongly concave posterior margin. Its pelvic fins are moderately sized, angular and are not divided into two lobes. The skin is covered with minute denticles and there is a variably developed series of thorns along the dorsal mid-line, and usually 2–3 short series on each shoulder. Dorsal surface mainly yellowish to greyish brown and white ventrally. Often with rows of white spots or ocelli, and often a black blotch on each pectoral fin (pectoral marking) that is variably surrounded by white spots (marking generally most obvious in young). The undersurface of the snout can have a blackish marking. The family now includes 10 valid species from 3 genera: *Rhina*, *Rhynchobatus* and *Rhynchorhina*, is most diverse in the Indo-West Pacific. Historically, the genera *Rhina* and *Rhynchobatus* have been either placed together in the Rhinidae or assigned to separate families. However, recent molecular research has provided evidence that they belong to the same family (Rhinidae), including the newly named genus *Rhynchorhina* which is based on an unusual Eastern Atlantic species having a wedge-shaped body with a rounded snout. Wedgefishes are amongst the bulkiest of all bottom-dwelling rays, and some species reach in excess of 3 m in length (Last et al. 2016).

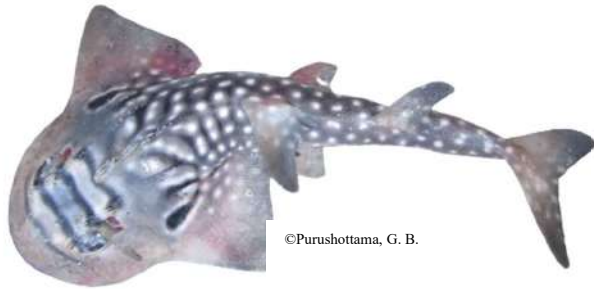


(Source: FAO, 1999)

- ***Rhina* Bloch & Schneider, 1801**
  - *Rhina ancylostoma* Bloch & Schneider, 1801 (Shark ray)
  
- ***Rhynchobatus* Müller & Henle, 1837**
  - *Rhynchobatus australiae* Whitley, 1939 (Bottlenose wedgefisch)
  - *Rhynchobatus cooki* Last, Kyne & Compagno, 2016 (Roughnose wedgefisch)
  - *Rhynchobatus djiddensis* (Forsskål, 1775) (Whitespotted wedgefisch)
  - *Rhynchobatus immaculatus* Last, Ho & Chen, 2013 (Taiwanese wedgefisch)
  - *Rhynchobatus laevis* (Bloch & Schneider, 1801) (Smoothnose wedgefisch)
  - *Rhynchobatus luebberti* Ehrenbaum, 1915 (African wedgefisch)
  - *Rhynchobatus mononoke* Koeda, Itou, Yamada & Motomura, 2020 (Japanese wedgefisch)
  - *Rhynchobatus palpebratus* Compagno & Last, 2008 (Eyebrow wedgefisch)
  - *Rhynchobatus springeri* Compagno & Last, 2010 (Broadnose wedgefisch)
  
- ***Rhynchorhina* Séret & Naylor, 2016**
  - *Rhynchorhina mauritaniensis* Séret & Naylor, 2016 (False shark ray)

***Rhina ancylostoma* Bloch & Schneider, 1801 (Shark ray)**

Shark like ray with a large and heavy body, ridges of large thorns on head region, snout broadly rounded and distinct from pectorals, first dorsal-fin origin slightly anterior to pelvic-fin origin, caudal fin lunate, upper and lower lobes almost symmetrical, dorsal colour bluish grey/brown, white ventrally; numerous white spots dorsally on fins, body and tail; dark bands between eyes and spiracles. Young ones brightly coloured, Maximum size: 270



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cm

**A.** *Rhina ancylostoma* (Adult)



**B.** *Rhina ancylostoma* (Juvenile)

***Rhynchobatus australiae* Whitley, 1939 (Bottlenose wedgefish)**

Large sized wedgefish with bottle-shaped snout, first dorsal-fin falcate, origin slightly posterior to pelvic-fin origin, black spot on each pectoral fin in juveniles, becoming faint or absent in large adults, a line of 3 white spots usually anterior to black pectoral spot, 2 white spots seen below, caudal fin deeply concave, colour pale grey to yellowish, Maximum size: 300 cm TL.

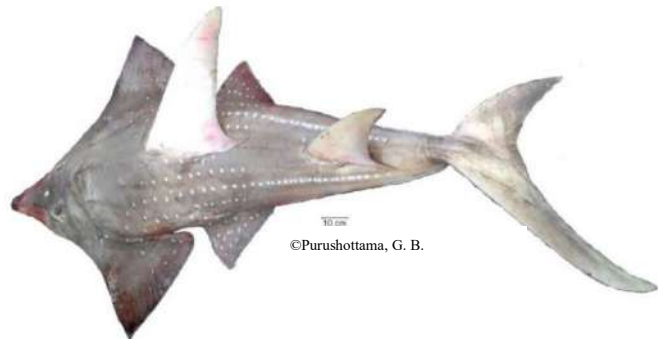


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***Rhynchobatus laevis* (Bloch & Schneider, 1801) (Smoothnose wedgefish)**

Large sized wedgefish with bottle-shaped snout, prominent black spot on each pectoral fin surrounded by 4-5 white spots, spiracle with two skin folds, outer slightly larger than inner, pre-dorsal spot pattern not reaching to midline between pectoral marking, greyish dorsally in young, brown in adults, white ventrally, Maximum size: 300 cm TL.



**B. *Rhynchobatus laevis* (Sub-adult)**



**Guitarfishes (Rhinobatidae)**

Guitarfishes, otherwise known as shovelnose rays, are small to large rays. They have a flattened wedge- or shovel-shaped disc with a strongly depressed trunk. The snout is often elongate and its tip varies from narrowly pointed to broadly rounded. Eyes and spiracles vary from medium to large, the latter with 1–2 variably developed folds. Nostrils rather short and very oblique with fewer than 68 lamellae. All species lack a nasal curtain, and the anterior nasal flaps are often broad and joined posteriorly to either close to the inner edge of the nostril or slightly within the interspace between the nostrils. Mouth profile is straight. The skin is usually covered with fine denticles (sometimes partly naked), and small thorns and thornlets are variably developed in a row along dorsal mid-line of body, in small patches near eyes, and on shoulder and snout. Long-based pelvic fins are positioned laterally and posteriorly to the disc. Two upright or tilted dorsal fins are well separated, with the first positioned well to slightly behind rear tips of the pelvic fins. The small caudal fin lacks an obvious ventral lobe. Dorsal coloration varies from plain (usually greyish or brownish) to having a strong pattern of lines, bars, spots and/or blotches. The cranium and rostral cartilage are not usually sharply demarcated at their edges with the snout. The undersurface is usually white but a black blotch is often present on the snout. Until recently, the family Rhinobatidae included the giant guitarfishes (Glaucostegidae) and banjo rays (Trygonorrhinidae) but recent molecular analyses have shown that members of these three groups are distinct from each other. Guitarfishes, as defined herein, are provisionally represented by 3 genera (*Acroteriobatus*, *Rhinobatos* and *Pseudobatos*) and 31 valid species. However, based on mitochondrial DNA sequence comparisons, the amphi-American genus (*Pseudobatos*) is strongly divergent from the other genera and may belong within a separate family. Guitarfishes occur in all warm temperate and tropical oceans, inshore to well offshore on continental and insular shelves and slopes, to depths of at least 400 m. None of the species occurs in freshwater. As bottom-dwellers, they usually rest on, or lie partly concealed within soft mud or sandy sediments, rather than swimming actively in mid-water. Viviparous

(aplacental) producing litters of up to 16 young. They feed mainly on small benthic invertebrates and fishes (Last et al., 2016).

- **Genus *Acroteriobatus* Giltay, 1928**

- *Acroteriobatus andysabini* (2021) (Malagasy blue-spotted guitarfish)
- *Acroteriobatus annulatus* (Müller & Henle, 1841) (Lesser guitarfish)
- *Acroteriobatus blochii* (Müller & Henle, 1841) (Bluntnose guitarfish)
- *Acroteriobatus leucospilus* (Norman, 1926) (Grayspotted guitarfish)
- *Acroteriobatus ocellatus* (Norman, 1926) (Speckled guitarfish)
- *Acroteriobatus omanensis* Last, Hendsen & Naylor, 2016 (Oman guitarfish)
- *Acroteriobatus salalah* (Randall & Compagno, 1995) (Salalah guitarfish)
- *Acroteriobatus stehmanni* (Weigmann, Ebert & Séret, 2021) (Socotra blue-spotted guitarfish)
- *Acroteriobatus variegatus* (Nair & Lal Mohan, 1973) (Stripenose guitarfish)
- *Acroteriobatus zanzibarensis* (Norman, 1926) (Zanzibar guitarfish)

- **Genus *Pseudobatos* Last, Seret, and Naylor, 2016**

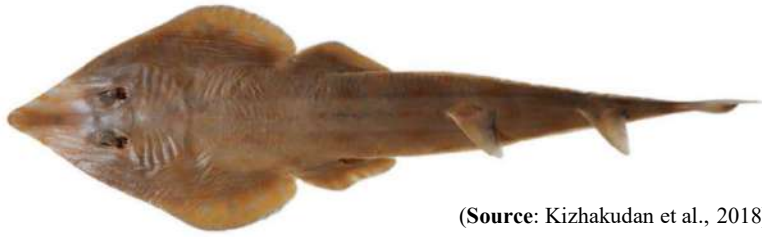
- *Pseudobatos buthi* Rutledge, 2019 (Spadenose guitarfish)
- *Pseudobatos glaucostigmus* (Jordan & Gilbert, 1883) (Speckled guitarfish)
- *Pseudobatos horkelii* (Müller & Henle, 1841) (Brazilian guitarfish)
- *Pseudobatos lentiginosus* (Garman, 1880) (Atlantic guitarfish)
- *Pseudobatos leucorhynchus* (Günther, 1867) (Whitesnout guitarfish)
- *Pseudobatos percellens* (Walbaum, 1792) (Chola guitarfish)
- *Pseudobatos planiceps* (Garman, 1880) (Pacific guitarfish)
- *Pseudobatos prahli* (Acero & Franke, 1995) (Gorgona guitarfish)
- *Pseudobatos productus* (Ayres, 1854) (Shovelnose guitarfish)

- **Genus *Rhinobatos* Linck, 1790**

- *Rhinobatos albomaculatus* Norman, 1930 (White-spotted guitarfish)
- *Rhinobatos annandalei* Norman, 1926 (Annandale's guitarfish)
- *Rhinobatos borneensis* Last, Séret & Naylor, 2016 (Borneo guitarfish)
- *Rhinobatos holcorhynchus* Norman, 1922 (Slender guitarfish)
- *Rhinobatos hynnicephalus* Richardson, 1846 (Ringstreaked guitarfish)
- *Rhinobatos irvinei* Norman, 1931 (Spineback guitarfish)
- *Rhinobatos jimbaranensis* Last, White & Fahmi, 2006 (Jimbaran shovelnose ray)
- *Rhinobatos lionotus* Norman, 1926 (Smoothback guitarfish)
- *Rhinobatos nudidorsalis* Last, Compagno & Nakaya, 2004 (Bareback shovelnose ray)
- *Rhinobatos penggali* Last, White & Fahmi, 2006 (Indonesian shovelnose ray)
- *Rhinobatos punctifer* Compagno & Randall, 1987 (Spotted guitarfish)
- *Rhinobatos rhinobatos* Linnaeus, 1758 (Common guitarfish)
- *Rhinobatos sainsburyi* Last, 2004 (Goldeneye shovelnose ray)
- *Rhinobatos schlegelii* Müller & Henle, 1841 (Brown guitarfish)
- *Rhinobatos whitei* Last, Corrigan & Naylor, 2014 (Philippine guitarfish)

***Acroteriobatus variegatus* (Nair & Lal Mohan, 1973) (Stripenose guitarfish)**

Medium-sized guitarfish with flattened, wedge-shaped disc with strongly depressed trunk and triangular snout, anterior nasal flaps extending well into internasal space (barely separated), denticles along midline of dorsal surface



(Source: Kizhakudan et al., 2018)

distinct, dorsal fins widely separated, 2.7-2.9 of first dorsal fin base, tail 1.4-1.6 times disc length, dorsal surface yellow-brown with pale blotches, snout pale translucent with yellow bars/spots, rear margin of disc yellow with bluish lines, Maximum size: 80 cm TL.

***Rhinobatos annandalei* Norman, 1926 (Annandale's guitarfish)**

Medium sized guitarfish with a broad, flattened wedge shaped disc with strongly depressed trunk and triangular snout, denticles along midline of dorsal surface and around eyes, anterior nasal flaps extending slightly into internasal space, disc broader in females than in males, dorsal fins separated by 2.2-2.4 times first dorsal fin base, tail 1.2-1.3 times disc length, body greyish-brown, with numerous round, whitish spots; white ventrally, Maximum size: 95 cm TL.



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***Rhinobatos lionotus* Norman, 1926 (smoothback guitarfish)**

Medium sized guitarfish with a broad, flattened wedge shaped disc with strongly depressed trunk, snout triangular, thin disc, 1.2-1.4 times the width, rostral ridge present, anterior nasal flaps well into internasal space, dorsal fins moderately separated by 2.4-2.8 times first dorsal base length, body greenish-brown, with numerous dark brown spots; dorsal fin margins dusky posteriorly; white ventrally, Maximum size: 85 cm TL.



*Rhinobatos lionotus*



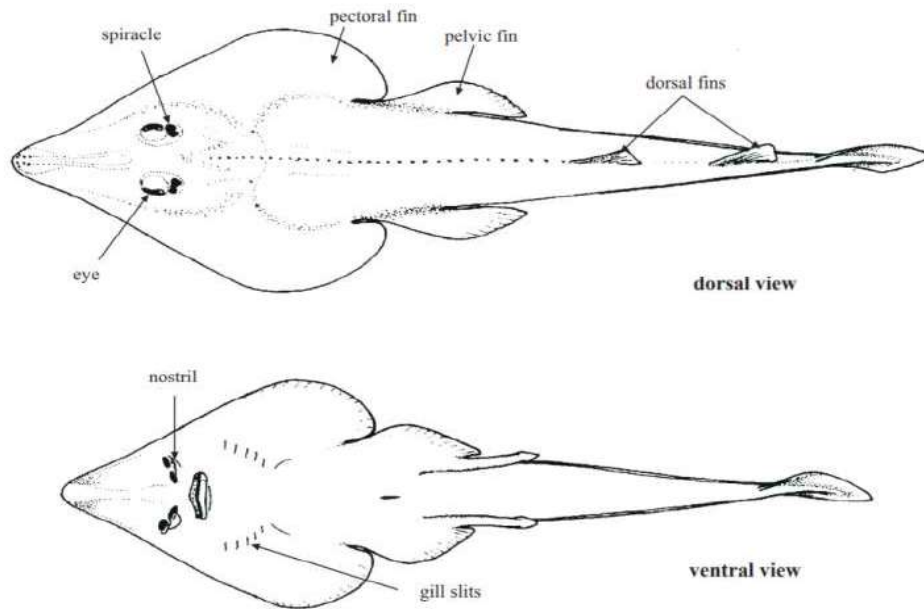
***Rhinobatos punctifer* Compagno & Randall, 1987 (spotted guitarfish)**

Medium sized guitarfish with a broadly angular wedge shaped disc with a strongly depressed trunk, triangular snout, small denticles on midline of body, anterior nasal flaps slightly into internasal space, dorsal fins widely separated, 2.4-2.5 times first dorsal fin base, tail 1.5 times disc length, dorsal surface yellow brown to greyish, often with numerous small white spots; white ventrally, Maximum size: 90 cm TL.



**Giant guitarfishes (Glaucostegidae)**

Giant guitarfishes are large to very large rays with a flattened, spade-like to wedge-shaped disc and a robust, depressed shark-like trunk. Their snout is typically long and its tip varies from being acute or bluntly rounded, to protruding forward as a large bulbous lobe. Eyes typically small and widely separated, spiracles also small with 1–2 variably developed folds. Nostrils are long and almost transverse to oblique with many lamellae (up to 94). They lack a nasal curtain and the anterior nasal flaps are relatively narrow and joined posteriorly to the inner edge of the nostril. Mouth profile is straight. The skin is covered with fine denticles, with small thorns variably confined to a row along mid-line of body, and small patches near eyes, on shoulder and sometimes on snout (often better developed in young than adults). Longbased pelvic fins are positioned laterally, posterior to the disc. Two similarly shaped, upright dorsal fins are well separated, and the first is positioned well behind the tips of the pelvic fins. A small, posteriorly directed caudal fin lacks an obvious ventral lobe typical of wedgefishes (Rhinidae). Colour is plain brownish or greyish dorsally with anterior cranium and rostral cartilage sharply demarcated from a much paler translucent snout. None of the species has spots, stripes or blotches. The undersurface is usually white but the ventral snout appears weakly translucent and its tip can have a black blotch. Giant guitarfishes were only recently recognized as a separate family, with a single genus and 6 valid species. The group was once classified with guitarfishes (Rhinobatidae) but molecular analyses have shown that they are more closely related to sawfishes (Pristidae). Giant guitarfishes are primarily inhabitants of subtropical and tropical inshore continental and insular seas of the Indo–Pacific and Eastern Atlantic, including the Mediterranean Sea. They occur in intertidal habitats and some species have been recorded from fresh and brackish waters. Bottom-dwellers, often resting on soft mud or sandy bottoms, they are also strong swimmers. All species are ovoviviparous. They feed mainly on benthic invertebrates, but their diet includes small benthic fishes. Most are large, reaching 1.7–3 m (5.6–9.8 ft) in length depending on the exact species involved, except for the small *G. obtusus* that is less than 1 m (3.3 ft) (Last et al., 2016).



(Source: FAO, 1999)

- *Glaucostegus cemiculus* (Geoffroy St. Hilaire, 1817) (Blackchin guitarfish)
- *Glaucostegus granulatus* Cuvier, 1829 (Sharpnose guitarfish)
- *Glaucostegus halavi* Forsskål, 1775 (Halavi guitarfish)
- *Glaucostegus obtusus* (Müller & Henle, 1841) (Widenose guitarfish)
- *Glaucostegus thouin* (Anonymous, 1798) (Clubnose guitarfish)
- *Glaucostegus typus* (Bennett, 1830) (Giant guitarfish)
- *Glaucostegus granulatus* Cuvier, 1829 (Sharpnose guitarfish)

***Glaucostegus granulatus* Cuvier, 1829 (Sharpnose guitarfish)**

Large sized guitarfish with flattened, narrow, wedge shaped disc with a strongly depressed trunk, snout elongate, narrowly triangular and bluntly pointed tip, rough skin, denticles enlarged on back and top of head and mostly joined along their entire length in midline, spiracular folds short and widely separated, dorsal fins closely located, interspace 1.3-1.6 times first dorsal fin base, tail 1- 1.4 times disc length, dorsal uniformly yellow or brown in colour, fin margins pale, snout translucent except rostral cartilage; white ventrally, Maximum size: 230 cm TL.



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*Glaucostegus granulatus*



*Glaucostegus obtusus*

***Glaucostegus obtusus* (Müller & Henle, 1841) (Widenose guitarfish)**

Small sized guitarfish with a flattened, broad shovel-shaped disc strongly depressed trunk, snout short and broadly triangular, denticles enlarged on back and thorns on snout tip and around orbit, One small spiracular fold, nasal flaps barely penetrating into interdorsal space, dorsal fins short, closely located, dorsal uniformly grey or grey brown, white ventrally, fin margins pale, snout translucent, Maximum size: 93 cm TL.

***Glaucostegus thouin* (Anonymous, 1798) (Clubnose guitarfish)**

Large sized guitarfish with a flattened, large wedge-shaped disc; strongly depressed trunk, snout elongated with a bulbous tip, projecting well forward, denticles on back along their entire length, spiracular folds short and widely separated, dorsal fins closely located, interspace 2-2.5 times first dorsal fin base length, dorsal uniformly yellow or brown without blotches or spots, fin margins pale, snout margins translucent; snout tip greyish, disc white ventrally, Maximum size: 300 cm TL.



*Glaucostegus thouin*

(Source: Kizhakudan et al., 2018)

**Banjo rays (Family Trygonorrhinidae)**

Banjo rays are small to large guitarfishes with a broad, flattened sub-oval to wedge-shaped disc, and a rather narrow, depressed trunk. The snout varies from very long and pointed to rather short and broadly rounded. Eyes and spiracles are small to medium-sized, and the spiracle has either 1 well-developed fold or none. Nostrils short and almost horizontal. Anterior nasal flaps are very broad, extending over entire length of nostril, with a long median lobe. A broad nasal curtain is present in one genus (*Trygonorrhina*). Mouth profile is weakly convex to strongly arched. The skin is covered with fine to very coarse denticles, with small to very large thorns in row along mid-line of body, and usually small patches near eyes and on shoulders. Short- to long-based pelvic fins are positioned laterally behind disc. Two tilted dorsal fins are well separated with the first well to slightly behind tips of the pelvic fins. Caudal fin small and lacks a prominent ventral lobe. All species have strong colour patterns consisting of lines, bars, spots and blotches on the dorsal surface, but the cranium and rostral cartilage are not usually sharply demarcated at their edges with the snout. The undersurface is mainly white but black blotches are sometimes present on the snout and posterior disc. Until recently, banjo rays were included in the guitarfishes (*Rhinobatidae*), but molecular research has shown that members of these groups are distinct from each other. Banjo rays are represented by 3 genera (*Aptychotrema*, *Trygonorrhina* and *Zapteryx*) and 8 valid species. They occur in temperate and tropical seas, primarily inshore on continental shelves but also to ~220 m depth. None of the species occurs

in freshwater. Bottom-dwellers, they rest on soft and hard substrates, including seagrasses. Viviparous (aplacental) producing large litters of up to 18 pups. Diet consists primarily of small benthic invertebrates and fishes. They grow up to 1.5 m TL (Last et al., 2016).

- ***Aptychotrema* Norman, 1926**
  - *Aptychotrema rostrata* Shaw, 1794 (Eastern shovelnose ray)
  - *Aptychotrema timorensis* Last, 2004 (Spotted shovelnose ray)
  - *Aptychotrema vincentiana* Haacke, 1885 (Western shovelnose ray)
- ***Trygonorrhina* J. P. Müller & Henle, 1838**
  - *Trygonorrhina dumerilii* (Castelnau, 1873) (Southern fiddler ray)
  - *Trygonorrhina fasciata* J. P. Müller & Henle, 1841 (Eastern fiddler ray)
- ***Zapteryx* D. S. Jordan & C. H. Gilbert, 1880**
  - *Zapteryx brevirostris* J. P. Müller & Henle, 1841 (Shortnose guitarfish)
  - *Zapteryx exasperata* D. S. Jordan & C. H. Gilbert, 1880 (Banded guitarfish)
  - *Zapteryx xyster* D. S. Jordan & Evermann, 1896 (Southern banded guitarfish)

#### **Additional families**

Two additional families are associated with the order but their phylogenetic relationships have not been fully resolved:

- Family Platyrrhinidae (fanrays)
- Family Zanobatidae (panrays)

#### **Platyrrhinidae**

The Platyrrhinidae are a family of rays, commonly known as thornbacks due to their dorsal rows of large thorns. They resemble guitarfishes in shape. Though traditionally classified with stingrays, molecular evidence suggests they are more closely related to electric rays in the order Torpediniformes.

- **Genus *Platyrrhina* J. P. Müller & Henle, 1838**
  - *Platyrrhina hyugaensis* Iwatsuki, Miyamoto & Nakaya, 2011 (Hyuga fanray)
  - *Platyrrhina sinensis* Bloch & J. G. Schneider, 1801 (fanray)
  - *Platyrrhina tangi* Iwatsuki, J. Zhang & Nakaya, 2011 (yellow-spotted fanray)
- **Genus *Platyrrhinoidis* Garman 1881**
  - *Platyrrhinoidis triseriata* D. S. Jordan & Gilbert, 1880 (thornback guitarfish)

#### **Zanobatidae**

The panrays are a genus, *Zanobatus*, of rays found in coastal parts of the warm East Atlantic Ocean, ranging from Morocco to Angola. It is the only genus in the family Zanobatidae, which

traditionally has been included in the Myliobatiformes order, but based on genetic evidence it is now in Rhinopristiformes or a sister taxon to Rhinopristiformes.

The two species of panrays are generally poorly known and one of the species was only scientifically described in 2016. They are up to about 60 cm (2 ft) long, and brownish above with a heavily mottled, blotched or barred dark pattern. They are ovoviviparous and feed on benthic invertebrates.

There are two recognized species in the genus:

- *Zanobatus maculatus* Séret, 2016 (Maculate panray)
- *Zanobatus schoenleinii* (J. P. Müller & Henle, 1841) (Striped panray)

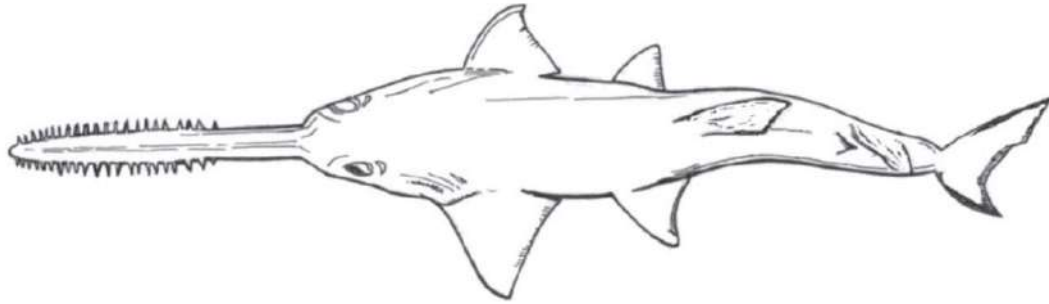
### **Sawfishes (Family Pristidae)**

Sawfishes are amongst the largest of all rays. Their snout is greatly extended to form a hard, flattened blade armed along each edge with a row of sharp, tooth-like denticles – hence the common name ‘sawfishes’. The shape of the rostrum and the number, size and position of these rostral teeth differ between species. A shark group, the sawsharks (Pristiophoridae), resemble sawfishes in having a highly modified blade-like snout edged with rostral teeth, but have barbels on the snout and their gills located on the side of the head rather than its undersurface. Unlike other ray groups, the pectoral fins of sawfishes are not fused to the body to form an obvious disc. A sawfish’s body is strong, elongate and more or less sub-cylindrical with a slightly flattened head projecting well forward of the pectoral fins. Eyes are positioned near the sides of the head. Nostrils lie posterior to the toothed part of the rostrum and the mouth is broad and transverse. The two dorsal fins are similar in shape and rather tall, with the first dorsal fin located fully or partly above the pelvic fins. Caudal fin is well developed and its ventral lobe is variably extended depending on the species. All species are plain coloured varying from yellowish, brownish, greyish or greenish above. The family includes 2 genera and 5 valid species. Sawfishes once occurred worldwide in warm temperate to tropical rivers and inshore continental waters, but their abundance and distribution globally has declined dramatically over the last century. Some species are now regionally extinct and all are considered endangered. Sawfishes are largely benthic, resting on or feeding near the bottom. Their highly modified rostrum is used to stun prey such as invertebrates and small fishes. All species are viviparous (aplacental). Most species are large, reaching up to 7 m TL.

- *Anoxypristis cuspidata* (Latham, 1794) (Knifetooth sawfish)
- *Pristis clavata* Garman, 1906 (Dwarf sawfish)
- *Pristis pectinata* Latham, 1794 (Smalltooth sawfish)
- *Pristis zijsron* Bleeker, 1851 (Green sawfish)
- *Pristis pristis* (Linnaeus, 1758) (Largetooth sawfish)

***Anoxypristis cuspidata* (Latham, 1794) (Knifetooth sawfish)**

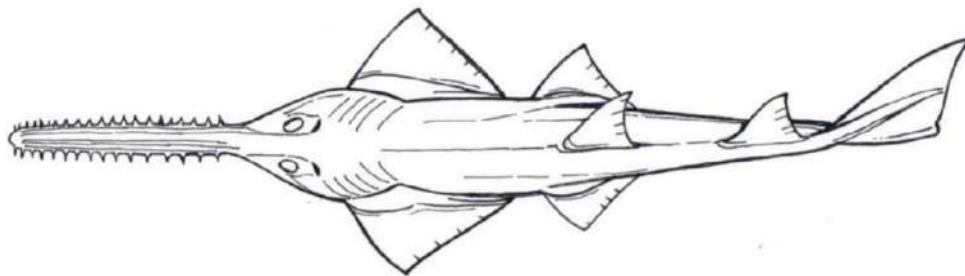
Medium sized sawfish with smooth skin, rostral saw very long and narrow, nearly 31% TL, rostral teeth absent on saw base, teeth slightly close together near tip than at middle of saw, first dorsal-fin origin posterior to pelvic-fin origin, caudal fin lunate, ventral lobe of caudal fin well developed, size >1/2 of upper. Small fleshy lobe in the outer margin of upper lobe, two lateral keels on caudal fin base, dorsal colour grey/yellowish brown with a bluish tinge, white ventrally, fins pale, Maximum size: 470 cm TL.



*Anoxypristis cuspidata* (Source: Kizhakudan et al., 2018)

***Pristis zijsron* Bleeker, 1851 (Green sawfish)**

Very large and heavy sized sawfish with rough denticles on body, rostrum narrow and slender, nearly 23-33% TL, 23–37 pairs of rostral teeth (other Indian sawfishes 14-26), rostral teeth close together at tip of rostrum than base, first dorsal fin origin slightly posterior to pelvic fin origin, nearly half way across the base of pelvic, posterior margin of caudal fin straight in adult and convex in young, no fleshy lobe on the outer margin of upper lobe, no ventral lobe, single large median keel on caudal fin base, no short keel below this, dorsal colour uniformly olive to greenish brown, white ventrally, Maximum size: 730 cm TL.



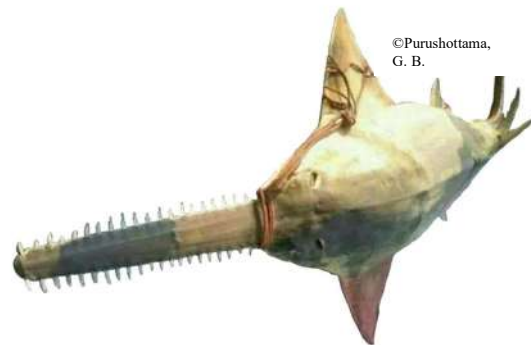
*Pristis zijsron* (Source: Kizhakudan et al., 2018)

***Pristis pristis* (Linnaeus, 1758) (Largetooth sawfish)**

Very large and heavy sized sawfish with rough denticles on body, rostrum narrow and slender, nearly 23-33% TL, 23–37 pairs of rostral teeth (other Indian sawfishes 14-26), rostral teeth close together at tip of rostrum than base, first dorsal fin origin slightly posterior to pelvic fin origin, nearly half way across the base of pelvic, posterior margin of caudal fin straight in adult and convex in young, no fleshy lobe on the outer margin of upper lobe, no ventral lobe, single large median keel on caudal fin base, no short keel below this, dorsal colour uniformly olive to greenish brown, white ventrally, Maximum size: 730 cm TL



*Pristis pristis*



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