speared fish headfirst into a hole or crevice, and attempt to grab it. If they fail to immediately capture it they may rest with their bodies half out of the hole the prey is in, but sooner or later one will grab the prey. The shark then thrashes until it extracts or dismembers its victim. It feeds primarily on bony fishes, including eels (a moray was found in one), squirrelfishes, snappers, damselfishes, parrotfishes, surgeonfishes, triggerfishes, and goatfishes and octopi, but also spiny lobsters and crabs. One whitetip reef shark was found in the stomach of a giant grouper, and it is likely that other, larger carcharhinid sharks prey on it.

The whitetip reef shark often does not react to swimmers or divers unless approached, in which case it flees or keeps a distance between itself and the people involved. When spearfishing, other fish-collecting activity or deliberate baiting to lure sharks for photography is done by divers near the bottom where this shark occurs, it is readily attracted and seeks out potential food sources. Although whitetips may approach divers very closely under such conditions, they are rarely aggressive, and divers have been able to feed them by hand. On rare occasions, whitetips have bitten divers, but apparently in self-defence when molested, and especially when excited during spearfishing bouts. For example, Randall (1977) was attacked by one that he had speared and pursued. Other divers have had to repeatedly fend off excited and apparently attacking whitetips while contesting speared fishes, with them. One spearfishing diver was bitten in the leg by a whitetip that had come up behind him, but was not greatly injured. Its small size, small teeth, and generally placid and unaggresive behaviour makes it far less dangerous than many other carcharhinids, but even this shark can be stimulated into attacking, like a domestic cat or dog. Randall (1977) regards the possibility of ciguatera poisoning from eating the meat of the whitetip as more of a danger than attack by it, although areas where whitetips are toxic are few and sporadic.

Size : Maximum said to be about 213 cm but adults are very rare over 160 cm; males maturing at about 104 to 105 cm and reaching 168 cm, females maturing at 105 to 109+ cm and reaching at least 158 cm; size at birth about 52 to 60 cm.

Interest to Fisheries : Details of fisheries involving this species are sketchy. It is apparently fished off Pakistan, India, Sri Lanka and Madagascar, and probably elsewhere where it occurs. It is fished with floating and fixed bottom gillnets and longlines, and its meat and liver utilized fresh for human consumption.

Literature : Beebe & Tee-Van (1941); Fowler (1941); Wheeler (1960); Fourmanoir (1961); Gohar & Mazhar (1964); Bass, D'Aubrey & Kistnasamy (1975b); Taniuchi (1975); Randall (1977); Johnson (1978); Compagno (1979).

Remarks: Randall (1977) presented a comprehensive. survey of the life-history of this species, with a detailed review of its distribution.

The characters said by Whitley (1939) to separate his T. apicalis from the wide-ranging T. obesus apparently do not hold (Taniuchi, 1975; Bass, D'Aubrey & Kistnasamy, 1975b; Randall, 1977; Compagno, 1979), nor do eastern Pacific representatives of the species differ significantly from Indo-West Pacific sharks (Compagno, 1979).

9.8 FAMILY SPHYRNIDAE Gill, 1872

SPHYRN

Family Sphyrnidae Gill, 1872, Smithsonian Misc.Coll., (247):24.

Synonymy : Subfamily Zyganinae Swainson, 1838 (Family Squalidae); Family Zygaenidae Owen, 1846; Family Cestraciontoidae Gill, 1862 (not Subfamily Cestraciontini Bonaparte, 1838 equals Family Heterodontidae Gray, 1851).

FAO Names: En - Bonnethead sharks, Hammerhead sharks, Scoophead sharks; Fr - Requins marteau; Sp - Cornudas.

Field Marks : The hammer or mallet-shaped lateral expansions of the heads of these sharks are unique.

Diagnostic Features : Head with laterally expanded blades, shaped like a double-bitted axe or mallet in profile; eyes circular or nearly so; nictitating eyelids internal; spiracles absent; anterior nasal flaps short and triangular, not barbel-like; internarial width usually about 7 to 14 times the nostril width (but only 1.1 to 1.3 times it in Eusphyra, which has tremendously expanded nostrils); labial furrows vestigial or absent; teeth small to moderately large, more or less bladelike, with acute and narrow to moderately broad cusps, no lateral cusplets, and with basal ledges and grooves strong to absent; teeth weakly differentiated in upper and lower jaws; tooth rows 24 to 37/25 to 37. Precaudal pits present. First dorsal fin moderate-sized to very large but not keel-like, much shorter than caudal fin; first dorsal base ahead of pelvic bases, varying from equidistant between pectoral and pelvic bases to closer to pectoral bases; midpoint of first dorsal base always in front of pelvic origins; second dorsal fin much smaller than first; pectoral fins with radials extending into distal web of fins. Ventral caudal lobe strong, undulations or ripples present in dorsal caudal margin. Neurocranium without primary supraorbital

crests, but with tips of preorbital and postorbital processes fused to form unique secondary supraorbital crests; vertebral centra with strong, wedge-shaped intermedial calcifications. Valvular intestine with a scroll valve. Colour light grey or brownish above, white below, no colour pattern. Development viviparous.

Habitat, Distribution and Biology : The hammerheads are a small but common family of wide-ranging warm-temperate and tropical sharks found in continental and insular waters on or adjacent to their shelves but with none being truely oceanic. Depths range from the surface, surfline and intertidal region down to at least 275 m depth. Hammerheads are very active swimmers, ranging from the surface to the bottom, and occur in all warm seas. Several species occur in schools, sometimes with hundreds of individuals. Some of the larger species seem to find fish baits on longlines quicker than other sharks, and expire more swiftly than most other species after being caught. The unique flattened and laterally expanded prebranchial head of hammerheads has been interpreted by some shark biologists and functional morphologists as a bowplane primarily serving to increase manouvering capabilities in these sharks, but sensory physiologists and shark behaviourists are more impressed by the increased sensory capacity afforded by their expanded heads, like the sensor plate of a metal detector. The more wide-spaced eyes may enhance binocular vision anteriorly, the expanded nasal capsules allow larger nasal organs and perhaps a more acute and more directional olfactory sense, and the increased head area allows more extensive lateral line canals and Ampullae of Lorenzini and possibly more capable pressure and electromagnetic senses. In the genus Sphyrna the sequentially increased lateral expansion of the head among species may indicate enhanced manouverability as well as sensory enhancement in the more broad-headed species; however, head expansion is carried beyond what seems optimal for increasing manouverability in the bizarre winghead shark (Eusphyra blochii) but certainly may indicate amore capable sensorium in this shark. Hammerheads are versatile feeders that take a wide variety of bony fishes, elasmobranchs, cephalopods, crustaceans, and other prey; some habitually feed on other elasmobranchs, and one species (S. tiburo) has enlarged, almost Heterodontus-like posterior teeth as an adaptation to crushing invertebrate prey. Some of the larger species have been involved in attacks on people, but recent studies on a few species of these sharks show that they are not particularly aggressive in unbaited situations.

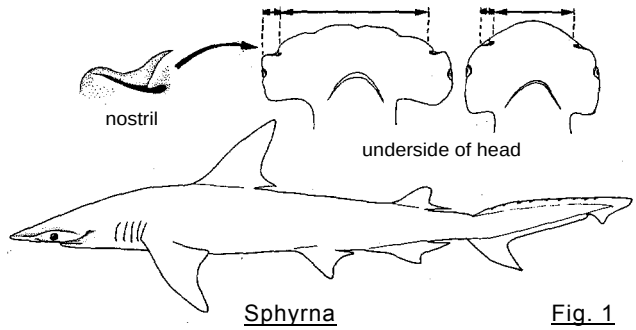
Interest to Fisheries : The larger species of Sphyrna are important elements of tropical inshore and offshore fisheries. The small species of Sphyrna and the small Eusphyra blochii figure in local fisheries where they occur.

Remarks : The present classification of the family follows Gilbert (1967,1967a) and Compagno (1979).

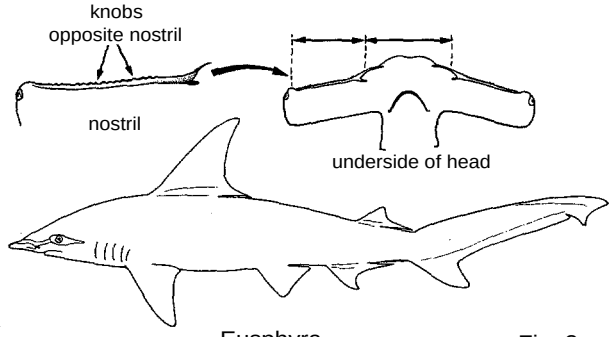
Key to Genera :

1a. Lateral blades of head anteroposteriorly broad, not winglike. Nostrils short, their widths 7 to 14 times in internarial width and less than half of mouth width. No knobs along anterior margin of head (Fig. 1) ..... **Sphyrna**

1b. Lateral blades of head very narrow and winglike. Nostrils greatly enlarged, their widths 0.8 to 0.9 times in the internarial width and nearly twice the mouth width. Knobs present along anterior margin of head, opposite nostrils (Fig. 2) ..... **Eusphyra**



Sphyrna Fig. 1



Eusphyra Fig. 2

Eusphyra Gill, 1862

SPHYRN Eusp

Genus: Eusphyra Gill, 1862, Ann.Lyceum Nat.Hist.N.Y., 7(32):403, 412.

Type Species : "Eusphyra blochii Gill, 1862", by original designation, = "z. nob. Blochii" Cuvier, 1817 and Zygaena blochii Valenciennes, 1822.

Synonymy : None.

Diagnostic Features: Head wing- or arrow-shaped in dorsoventral view and very broad, width across head about 40 to 50% of total length; lateral blades of head very narrow and winglike; nostrils greatly enlarged, their widths 0.8 to 0.9 times in internarial width and nearly twice mouth width; bumps present along anterior margin of head opposite nostrils. Upper precaudal pit longitudinal and not crescentic.

Remarks : For the taxonomic history of this genus, and the rationalle for recognizing it, see Compagno (1979). Bigelow & Schroeder (1948) revived this genus, but it has met with mixed acceptance. Bigelow & Schroeder noted that it differed from Sphyrna by having its nostrils closer to the midline of the snout than the eyes rather than vice-versa, while Fraser-Brunner (1950) and Gilbert (1967, 1967a) distinguished it (as a subgenus) by the presence of "outer narial grooves" extending laterally nearly to the eyes. Compagno (1979) found that these grooves are not simple, dermal depressions like the prenarial grooves but are enormous lateral extensions of the nostrils.

Eusphyra blochii (Cuvier, 1817)

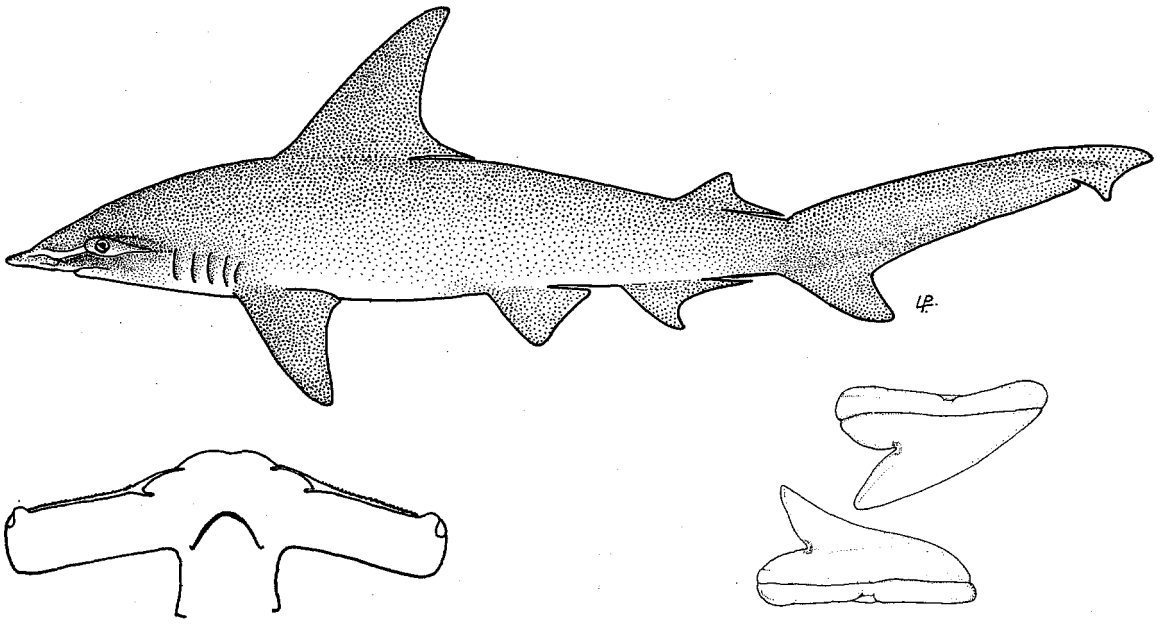
SPHYRN Eusp 1

Zygaena nob. Blochii Cuvier, 1817, Reg.Anim., 2:127, ftn. 3, also as Zygaena Blochii Valenciennes, 1822, Mem.Mus.Hist.Nat.Paris, 9:227, pl. 1, fig. 2. Based on the Squalus zygaena (not Linnaeus, 1758) of Bloch (1785, Naturg.ausl.Fische, 1, pi. 117). Holotype: None? Fowler (1941) thought the type locality to be India.

Synonymy : Zygaena latycephala van Hasselt, 1823; Zygaena laticeps Cantor, 1837.

Other Scientific Names Recently in Use : Sphyrna blochii (Cuvier, 1817).

FAO Names: En - Winghead shark; Fr - Requin-marteau planeur; Sp - Cornuda planeadora.



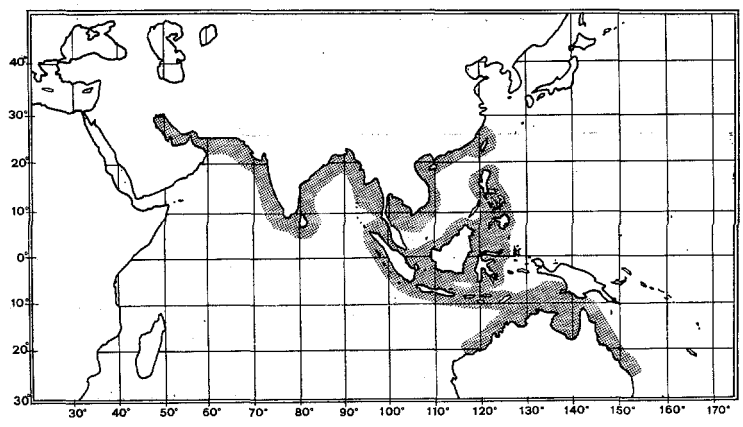
underside of head

Upper and lower tooth

Field Marks : An unmistakable shark, with its immense, broad, wing-shaped head, nearly or quite half the shark's length.

Diagnostic Features: See genus.

Geographical Distribution : Indo-West Pacific: The "Gulf" between the Arabian Peninsula and Iran to Pakistan, India, Sri Lanka, Bangladesh, Burma, Malaysia, Thailand, Viet Nam, China, Taiwan Island, The Philippines, Indonesia, Australia (Queensland and Northern Territory).



Habitat and Biology : A rather small tropical shark of remarkable appearance, found in shallow water on the continental and insular shelves.

Viviparous, with a yolk-sac placenta; number of young 6 to 11 (most commonly 6). In Bombay waters, birth takes place just before the monsoon season, in April and May, mating apparently takes place during the monsoon, June through August, and females with small embryos appear in September and October; this suggests a gestation period of about 8 months, but this needs to be confirmed. Pregnant females are said to fight each other.

The diet of this small shark is not reported, but it probably consists of small fishes, cephalopods and crustaceans. An apparently harmless shark, not known to attack people.

The function of the vast lateral blades of the head of this shark are uncertain; they seem excessively hypertrophied for manouvering organs or bowplanes, but perhaps more important is their role in increasing the volume and surface area of some of the sense organs of the head, particularly the lateral line canals, Ampullae of Lorenzini, and olfactory organs, as well as providing an increased stereoscopic visual effect.

Size : Maximum possibly not exceeding 152 cm, males immature at 79 cm and adult at 132 cm, presumably maturing at a metre or less; pregnant females are 104 to 144 cm; size at birth 32 to 45 cm.

Interest to Fisheries : A common fisheries species in India, Pakistan, Malaysia and Thailand, and probably elsewhere in its range. It is caught with floating gillnets, probably fixed bottom gillnets, stake nets, seines, with floating and bottom longlines, and probably on hook-and-line. Its meat is utilized fresh for human consumption; livers yield a high-potency vitamin oil; and offal is probably processed into fishmeal.

Literature : Fowler (1941); Setna & Sarangdhar (1949,1949b); Stead (1963); Gilbert (1967); Appukuttan (1978); Compagno (1979).

Remarks : Cuvier (1817), in a footnote to his account of Squalus zygaena Linnaeus, 1758 (placed in the new subgenus Zygaena Cuvier, 1817, but listed as S. zygaena), described this species as follows: "(3) Ajoutez l'espéce représentée par B1.117, reconnaissable a ses narines placées bien plus pr&s du milieu (z. nob. Blochii). Sa deuxiéme dorsale est aussi bien plus près de la caudale" (ftn 3, p. 127). Cuvier's citation of this species may not be a properly formed Linnaean binomial, but apparently he intended to show that the Squalus zygaena Bloch, 1785 was not conspecific with S. zygaena Linnaeus, 1758. "z. nob. Blochii" can be interpreted as Zygaena Blochii nobis (that is of Cuvier, 1817), as was done by Valenciennes (1822'), who had an alcohol-preserved specimen of the species and described and illustrated it in detail.

Sphyrna Rafinesque, 1810

SPHYRN Sphyrn

Genus : Sphyrna Rafinesque, 1810, Indic.Ittiolog.Siciliana, Messina, 46, 60.

Type Species : Squalus zygaena Linnaeus, 1758, by subsequent designation of Jordan & Gilbert (1883:26).

Synonymy : Genus Sphyrnias Rafinesque, 1815; Subgenus Cestrorhinus Blainville, 1816 (Genus Squalus Linnaeus, 1758); Subgenus Zygaena Cuvier, 1817 (Genus Squalus Linnaeus, 1758); Genus Zygoena Risso, 1826; Genus Sphyrichthys Thienemann, 1828; Genus Platysqualus Swainson, 1839; Genus Zygaena Swainson, 1839; Genus Sphyra van der Hoeven, 1855; Genus Cestracion Gill, 1862 (junior homonym of Cestracion Oken, 1817); Genus Reniceps Gill, 1862.

Diagnostic Features: Head variably spade, mallet or axe-shaped in dorsoventral view and moderately broad, width across head about 17 to 33% of total length; lateral blades of head broad, not winglike; nostrils short, their widths 7 to 14 in internarial width and less than half mouth width; no bumps along anterior margin of head. Upper precaudal pit transverse and crescentic.

Remarks : Arrangement of the species follows Gilbert (1967, 1967a) and Compagno (1979), who recognize two subgenera: Platysqualus, for S. corona, S. media, S. tiburo, and S. tudes and Sphyrna, for S. couardi, S. lewini, S. mokarran, and S. zygaena. Gilbert 1967, 1967a) included Eusphyra as a subgenus of Sphyrna but Compagno (1979) ranked it as a genus.

According to Johnson (1978), there may be another species of large (to at least 3 m) hammerhead in French Polynesian waters, presumably belonging to the genus Sphyrna, subgenus Sphyrna, but which has a fairly narrow, relatively long mallet-shaped head rather like S. media. This has been seen several times by divers but specimens have not been collected yet.

Key to Species:

1a. Head shovel-shaped and narrow, its width 21% of total length or less (usually less). Anterior margin of head not notched. Posterior teeth expanded as broad, molariform crushers ..... **S. tiburo**

1b. Head broader and more hammer- or axe-shaped, its width over 22% of total length. Anterior margin of head more or less notched, just medial to nostrils. Posterior teeth not expanded as molariform crushers.

2a. Posterior margins of lateral blades of head usually more or less transverse. Free rear tip of first dorsal over or behind pelvic origins. Posterior margin of anal fin straight or concave, not deeply notched. Size smaller, adults less than 2 m

3a. Prenarial grooves present on anterior edge of head medial to nostrils. Head with a well-defined medial indentation and paired lateral indentations on its anterior edge. First dorsal fin more erect ..... **S. tudes**

3b. Prenarial grooves hardly developed on anterior edge of head. Head with poorly defined medial and lateral indentations. First dorsal fin more falcate

4a. Snout longer, preoral length usually over 2/5 of head width. Mouth narrowly arched. Anal fin shallowly concave ..... **S. corona**

4b. Snout shorter, preoral length usually less than 2/5 of head width. Mouth broadly arched. Anal fin more deeply concave..... **S. media**

2b. Posterior margins. of lateral blades of head usually arching posterolaterally (except in adults of S. mokarran). Free rear tip of first dorsal well in front of pelvic origins. Posterior margin of anal fin usually deeply notched. Size larger, adults at least 3 m

5a. Anterior margin of head nearly straight in adults. Prenarial grooves absent or hardly developed. Teeth strongly serrated at all sizes. Pelvic fins high and falcate. First dorsal markedly falcate. Second dorsal fin high, with a short inner margin and deeply concave posterior margin ..... **S. mokarran**

5b. Anterior margin of head moderately convex in adults, strongly so in young. Prenarial grooves well-developed. Teeth smooth-edged in young, weakly serrate in adults. Pelvic fins low and not falcate, with nearly straight posterior edges. First dorsal usually semifalcate. Second dorsal fin low, with a long inner margin and nearly straight posterior margin

6a. No median indentation on anterior margin of head. Free rear tip of second dorsal well ahead of upper caudal origin. Anal base about as large as second dorsal base ..... **S. zygaena**

6b. A prominent median indentation on anterior margin of head. Free rear tip of second dorsal nearly reaching upper caudal origin. Anal base noticeably larger than that of second dorsal

7a. Lateral lobes of head narrower transversely and longer from front to back in adults. First dorsal origin over pectoral midbases. Pectoral fins plain, not dark-tipped ..... **S. couardi**

7b. Lateral lobes of head broader transversely and shorter from front to back in adults. First dorsal origin slightly behind pectoral insertions. Pectoral fins dark-tipped ..... **S. lewini**

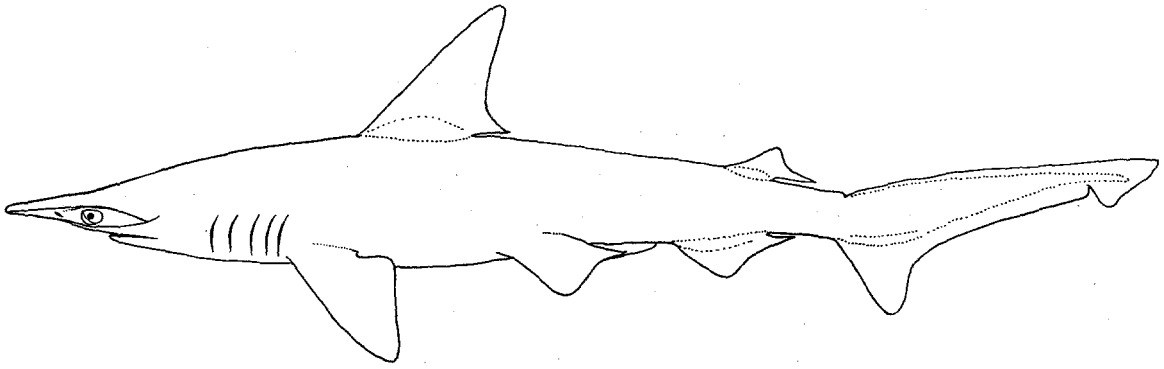
Sphyrna corona Springer,1940

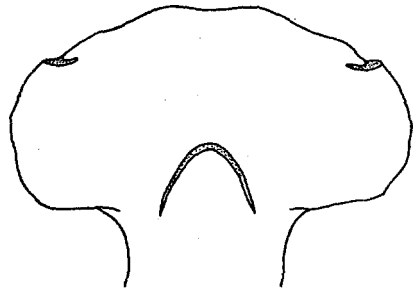
SPHYRN Sphyrn 5

Sphyrna corona Springer, 1940, Stanford Ichthyol.Bull., 1(5):163, fig. 4. Holotype: SU-11882, 663 mm adult male. Type Locality: Panama, eastern Pacific.

Synonymy : None.

FAO Names : En - Scalloped bonnethead; Fr - Requin-marteau cornu; Sp - Cornuda coronada.



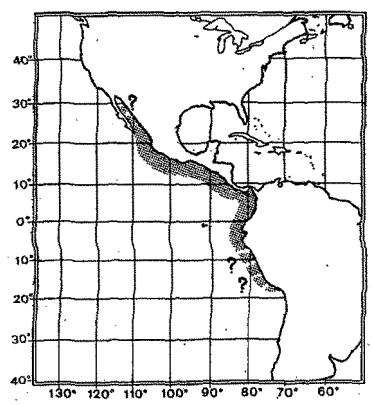


underside of head

Field Marks: A small hammerhead with a moderately broad, anteriorly arched, mallet-shaped head with medial and lateral indentations on its anterior edge and transverse posterior margins, no prenarial grooves, snout rather long and about 2/5 of head width, small, strongly arched mouth, free rear tip of first dorsal fin over pelvic insertions, posterior margin of anal fin nearly straight.

Diagnostic Features: Expanded prebranchial head mallet-shaped and moderately wide but longitudinally elongated, its width 24 to 29% of total length (mostly above 25%); distance from tip of snout to rear insertions of posterior margins of expanded blades over half of head width; anterior margin of head broadly arched with shallow lateral and medial indentations; posterior margins of head moderately wide, transverse, and broader than mouth width; prenarial grooves hardly developed anteromedial to nostrils; preoral snout about 2/5 of head width; rear ends of eyes well anterior to upper symphysis of mouth; mouth rather narrowly arched; anterior teeth with long slender cusps, not serrated, posterior teeth mostly cuspidate and not molariform. First dorsal moderately falcate, its origin just behind pectoral insertions, its free rear tip about opposite or behind pelvic origins; second dorsal fin moderately high, slightly lower than anal, with a weakly concave posterior margin; its inner margin moderately long, less than twice fin height, and ending well ahead of upper caudal origin; pelvic fins not falcate, with straight or slightly concave posterior margins; anal fin larger than second dorsal fin and rather long, base 8.2 to 9.2% of total length; its origin in front of second dorsal origin, its posterior margin shallowly concave to nearly straight. Total vertebral centra 135 to 140. A small hammerhead, maximum size less than 1 m. Colour grey above, white below, no prominent fin markings.

Geographical Distribution : Eastern Pacific: ? Gulf of California, and southern Mexico to Peru.



Habitat and Biology : Almost nothing is known of the biology of this small uncommon tropical hammerhead, which lives on the continental shelf, presumably inshore. Viviparous, with a yolk-sac placenta; number of young per litter 2 ?

Size: Maximum about 92 cm; adolescent male 51 cm, adult male, 67 cm; size at birth at or above 23 cm. Probably the smallest species of hammerhead.

Interest to Fisheries : Probably taken in local inshore fisheries where it occurs, but details are lacking.

Literature : Springer (1940); Beebe & Tee-Van (1941); Kato, Springer & Wagner (1967); Gilbert (1967); Chirichigno (1980).

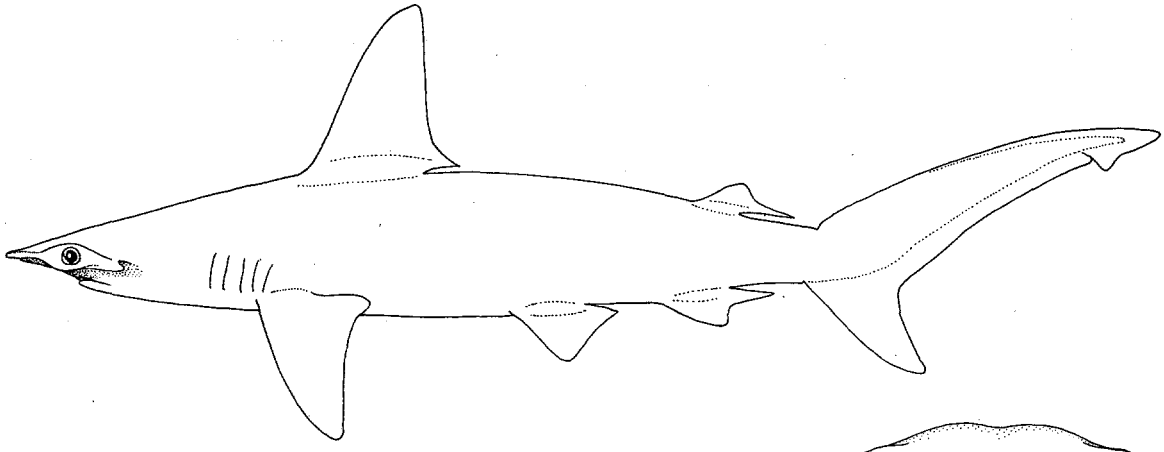
Sphyrna couardi Cadenat, 1950

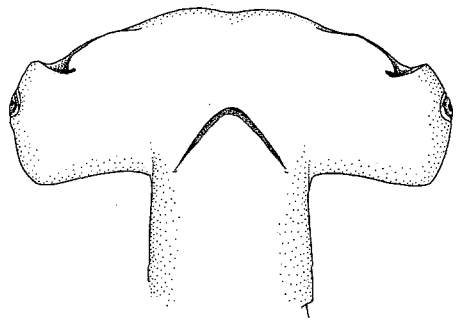
SPHYRN Sphyrn 6

Sphyrna couardi Cadenat, 1950, Bull.Inst.Fr.Afr.Noire, (3):99. Holotype: In Museum National d'Histoire Naturelle, Paris? Type Locality: Senegal.

Synonymy : None.

FAO Names : En - Whitefin hammerhead; Fr - Requin-marteau aile blanche; Sp - Cornuda aliblanca.





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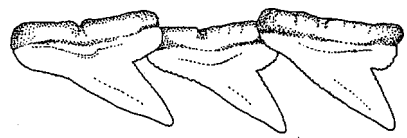
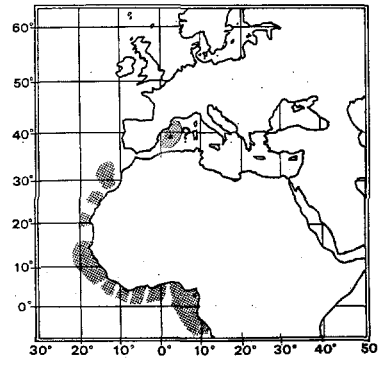


upper teeth

Field Marks: A large hammerhead with a moderately broad, fairly narrow-bladed head, anterior margin of head very broadly arched in adults and with a prominent median indentation, teeth with moderately broad cusps and smooth edges, moderately falcate first dorsal fin with origin over pectoral midbases and free rear tip in front of pelvic origins, low second dorsal fin with weakly concave posterior margin, long posterior margin about twice fin height, and free rear tip nearly or quite reaching upper caudal origin, non-falcate pelvic fins, a deeply notched posterior anal margin, and plain pectoral fins.

Diagnostic Features: Expanded prebranchial head hammer- or axe-shaped and moderately wide but longitudinally moderately short, its width 21 to 25% of total length; distance from tip of snout to rear insertions of posterior margins of expanded blades half to slightly less than half of head width; anterior margin of head broadly arched with prominent medial and lateral indentations; posterior margins of head of moderate width, angled posterolaterally, and about equal or less than mouth width; well-developed prenarial grooves present anteromedial to nostrils; preoral snout between 1/5 to 1/3 of head width; rear ends of eyes about opposite to upper symphysis of mouth; mouth rather broadly arched; anterior teeth with moderately long stout cusps and smooth edges, posterior teeth mostly cuspidate and not keeled and molariform. First dorsal somewhat falcate, its origin over rear ends of pectoral bases ahead of their insertions, its free rear tip well anterior to pelvic origins; second dorsal fin low, somewhat less than anal height, with a slightly concave posterior margin; its inner margin long, about twice the fin height, and ending almost opposite upper caudal origin; pelvic fins not falcate, with straight or slightly concave posterior margins; anal fin larger than second dorsal fin and rather long, base 4.5 to 5.6% of total length, its origin well ahead of second dorsal origin, its posterior margin deeply notched. Vertebral counts unknown. A large hammerhead, to 3 m. Colour blue-grey or grey-brown above, white below, fins unmarked.

Geographical Distribution : Eastern North Atlantic: Senegal, Ivory Coast, Guinea, Gabon, and Congo; possibly Mediterranean Sea.



Habitat and Biology : A little-known and uncommon coastal-pelagic shark of tropical West Africa. Viviparous, with a yolk-sac placenta; number of young 24 to 28. Mainly eats fishes, especially benthic bony fishes such as eels and flatfish, also benthic and epibenthic cephalopods. Not known to attack people.

Size : Maximum said to be about 300 cm; adult males 141 to 184 cm; adult (gravid) females from 230 to 235 cm; size at birth about or above 30 to 32 cm (full-term fetuses).

Interest to Fisheries : Taken in West African shark fisheries, but details are lacking.

Literature : Cadenat (1950); Gilbert (1967); Compagno (1979, 1981); Cadenat & Blache (1981).

Remarks : According to Cadenat & Blache (1981), one of the syntypes of S. tudes Valenciennes, 1822, MNHN 1049 from Nice, France (Mediterranean Sea), and the lectotype of that species as designated by Gilbert (1967), is actually based on a fetus of the present species (see remarks under S. tudes), which, apart from causing further nomenclatorial confusion, would also extend the range of this species into the Mediterranean.

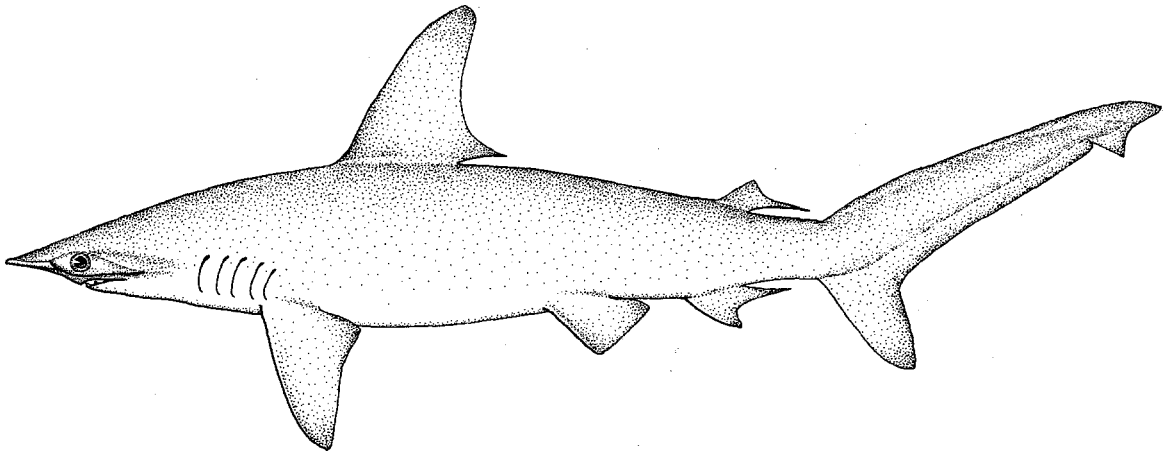
Sphyrna lewini (Griffith & Smith, 1834)

SPHYRN Sphyrn 1

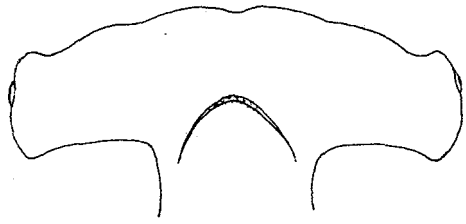
Zygaena lewini Griffith & Smith, in Cuvier, Griffith & Smith, 1834, Anim.Kingd., 10:640, pl. 50. Holotype: Unknown. Type Locality: South coast of New Holland (Australia).

Synonymy : Zygaena malleus Valenciennes, 1822 (in part); ? Zygaena indica van Hasselt, 1823; Cestracion leeuwenii Day, 1865; Zygaena erythraea Hemprich & Ehrenberg, 1899; Cestracion oceanica Garman, 1913; Sphyrna diplana Springer, 1941.

FAO Names: En - Scalloped hammerhead; Fr - Requin-marteau halicorne; Sp - Cornuda común.

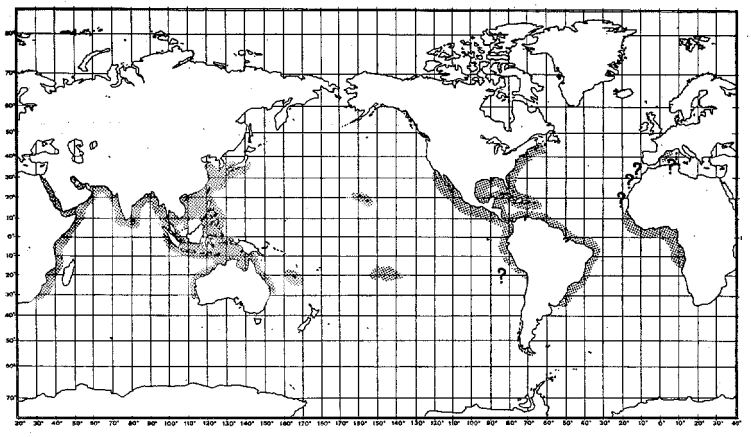


Field Marks: A large hammerhead with a broad, narrow-bladed head, anterior margin of head very broadly arched in adults and with a prominent median indentation, teeth with moderately broad cusps and smooth to weakly serrated edges, moderately falcate first dorsal fin with origin over or behind pectoral insertions and free rear tip in front of pelvic origins, low second dorsal fin with weakly concave posterior margin, long posterior margin about twice fin height, and free rear tip nearly or quite reaching upper caudal origin, non-falcate pelvic fins, a deeply notched posterior anal margin, and dusky or black-tipped pectoral fins.



underside of head

Diagnostic Features : Expanded prebranchial head hammer- or axe-shaped and very wide but longitudinally short, its width 24 to 30% of total length (mostly above 26%); distance from tip of snout to rear insertions of posterior margins of expanded blades less than half of head width; anterior margin of head very broadly arched, with prominent medial and lateral indentations; posterior margins of head wide, angled posterolaterally and generally broader than mouth width; well-developed prenarial grooves present anteromedial to nostrils; preoral snout about 1/5 to 1/3 of head width; rear ends of eyes slightly anterior to upper symphysis of mouth; mouth rather broadly arched; anterior teeth with moderately long, stout to slender cusps, smooth or weakly serrated, posterior teeth mostly cuspidate and not keeled and molariform. First dorsal moderately falcate, its origin above or slightly behind pectoral insertions, its free rear tip well anterior to pelvic origins; second dorsal fin low, less than anal height, with a shallow concave posterior margin; its inner margin long, about twice the fin height, and ending almost opposite upper caudal origin; pelvic fins not falcate, with straight or slightly concave posterior margins; anal fin larger than second dorsal fin and rather long, base 4.3 to 6.4% of total length; its origin well ahead of second dorsal origin, its posterior margin shallowly concave to nearly straight. Total vertebral centra 174 to 209. A large hammerhead, to over 3 m. Colour grey-brown above, white below, with dusky to black pectoral fin tips.



Geographical Distribution: Essentially circumglobal in coastal warm temperate and tropical seas. Western Atlantic: New Jersey to Brazil, including Gulf of Mexico and Caribbean. Eastern Atlantic from ? Mediterranean and Senegal to Zaire. Indo-West Pacific: South Africa and Red Sea to Pakistan, India, Burma, Thailand, Indonesia, China (including Taiwan Island), Japan, The Philippines, Australia (Queensland, Western Australia), New Caledonia. Central Pacific: Hawaii and Tahiti. Eastern Pacific: Southern California and Gulf of California to Panama, Ecuador and ? northern Peru.

Habitat and Biology : Probably the most abundant hammerhead, a coastal-pelagic, semioceanic warm-temperate and tropical species occurring over continental and insular shelves and in deep water adjacent to them, often approaching close inshore and entering enclosed bays and estuaries. Ranges from the intertidal and surface down to at least 275 m depth. Young sharks primarily occur close inshore. Forms large true schools at different stages of its life-history, though solitary individuals of both young and adults also occur.

This species is apparently highly mobile and in part migratory, and forms huge schools of small migrating individuals that move poleward in the summer in certain areas such as off Natal, South Africa. Elsewhere, as in the East China Sea, it may not migrate and is thought to form large resident populations. Adults males and females may segregate during certain phases of their life-cycle. Off southern Baja California, in the Gulf of California, polarized schools of scalloped hammerheads of mixed sexes with females predominating and sizes from immatures of slightly less than a metre to adults over 3 m have been intensely observed underwater by A. Peter Klimley and Donald R. Nelson. These congregate offshore over seamounts and near islands, and show a considerable range of behaviours including lateral tilting of the body (possibly to enhance the shark's view of divers when approached from above and behind them); accelerated swimming variants with headshaking, thrusting the midsection while swimming rightside up or upside down, and corkscrew swimming with rotation around their longitudinal axes; hitting other hammerheads with their snouts; jaw opening; and clasper flexion. Some of these displays may involve aggression or courtship. Many females bear apparent courtship scars, but a smaller proportion of males have them too. The function of these schools is uncertain: reproduction is thought unlikely because of the presence of juveniles in the schools; defence unlikely because of the absence of possible predators on the hammerheads; and grouping for attaining a swimming advantage in the strong currents that are common in these places is also unlikely because the sharks school when currents are absent. Feeding advantages may occur for the sharks to cluster near food resources or even for social feeding, but so far this is hypothetical because the sharks have never been seen to feed in the daytime when observations can be made, though they may do so at night. Sharks have been tracked and may wander off from the schooling area.

Viviparous, with a yolk-sac placenta; number of young in a litter 15 to 31. Off Hawaii, adults move inshore in Kaneohe Bay, Oahu to drop young and mate. The smallest young are found close inshore in the bay but these move into deeper water as they grow, to eventually depart for open water.

The scalloped hammerhead takes a wide variety of fish prey, but also invertebrates (especially cephalopods). Food items include sardines and herring, anchovies, ten-pounders (Elopidae), conger eels, milkfish, sea catfish, silversides, halfbeaks, mullet, lizardfish, barracuda, bluefish, spanish mackeral, jacks, porgies, mojarras, cardinal fishes, goatfish, grunts, damselfishes, parrotfishes, wrasses, butterfly fishes, surgeonfish, gobies, flatfish, sharpnose sharks (Rhizoprionodon), blacktip reef sharks, angelsharks, stingrays, squid, octopi, cuttlefishes, sea snails, shrimp, mantis shrimp, crabs, lobsters and isopods.

The scalloped hammerhead is probably dangerous to people but this is uncertain because until recently large hammerheads, particularly this species and S. zygaena, have been regularly confused with one another, and so several unprovoked and provoked attacks on swimmers and divers as well as a few boat attacks can only be attributed to 'hammerheads'. Under baited conditions these hammerheads have made close approaches to divers but quickly lost interest and departed when they apparently determined that the divers were not the source of the food odour. In ongoing studies on the social behaviour of these sharks off seamounts in the Gulf of California A. Peter Klimley and Donald R. Nelson (pers. comm.) have found large schools of adult scalloped hammerheads to be rather timid and very difficult to approach when they used SCUBA, so that much of their work must be done by free-diving on the sharks to measure, sex, tag, track with sonic tags, photographs, and record their activities. These sharks are probably less dangerous than the smaller but more aggressive grey reef shark (Carcharhinus amblyrhynchos), and much less than the bull, tiger and great white sharks.

Size : Maximum about 370 to 420 cm, males maturing at 140 to 165 cm and reching at least 295 cm, females maturing at about 212 cm and reaching at least 309 cm; size at birth 42 to 55 cm.