

= Tawny nurse shark =

The tawny nurse shark (*Nebrius ferrugineus*) is a species of carpet shark in the family *Ginglymostomatidae* , and the only extant member of the genus *Nebrius* . It is found widely along coastlines in the Indo @-@ Pacific , preferring reefs , sandy flats , and seagrass beds from very shallow water to a depth of 70 m (230 ft) . With a cylindrical body and a broad , flattened head , the tawny nurse shark is quite similar in appearance to the nurse shark (*Ginglymostoma cirratum*) of the Atlantic and East Pacific , from which it can be distinguished by its pointed @-@ tipped dorsal fins and narrow , sickle @-@ shaped pectoral fins . The maximum recorded length of the tawny nurse shark is 3 @. @ 2 m (10 ft) .

Nocturnal in habits , the tawny nurse shark tends to spend the day resting in piles of two dozen or more individuals inside caves or under ledges . At night , it is an active @-@ swimming predator that uses a powerful suction force to extract prey from inside holes and crevices . The diet of this species consists mainly of octopus , though they also take other invertebrates , small bony fishes , and rarely sea snakes . It is aplacental viviparous , meaning the embryos hatch from egg capsules inside the mother . It is the only carpet shark in which the embryos are oophagous , feeding on eggs produced by the mother while inside the uterus . The litter size may be as small as one or two , based on the large size of near @-@ term embryos .

Compared to the nurse shark , the tawny nurse shark has a more placid disposition and will often allow divers to touch and play with it . However , it should be accorded respect due to its powerful jaws and sharp teeth . This species is caught by commercial fisheries across most of its range for meat , fins , liver oil , leather , and fishmeal . It is also esteemed as a game fish off Queensland , Australia , and is known for its habit of spitting water in the faces of its captors . The International Union for Conservation of Nature (IUCN) has assessed the tawny nurse shark as Vulnerable , with subpopulations in several areas already diminished or extirpated .

= = Taxonomy and phylogeny = =

The tawny nurse shark was first described by French naturalist René @-@ Primevère Lesson as *Scyllium ferrugineum* , based on a 1 @. @ 4 m (4 ft 7 in) long specimen from New Guinea . His short account was published in 1831 in *Voyage au tour du monde , sur la corvette La Coquille* . A more detailed description , along with an illustration , was published by German naturalist Eduard Rüppell in 1837 as *Nebrius concolor* , based on a specimen from the Red Sea . Both names were retained , often in separate genera (*Ginglymostoma* and *Nebrius* respectively) , until they were synonymized by Leonard Compagno in 1984 . Compagno recognized that the tooth shape differences used to separate these species were the result of differences in age , with *N. concolor* representing younger individuals .

The genus name *Nebrius* is derived from the Greek word *nebris* or *nebridos* , meaning the skin of a fawn . The specific epithet *ferrugineus* is Latin for " rust @-@ colored " . Other common names for this species include giant sleepy shark , Madame X (a name coined by the shark fisherman Norman Caldwell in the 1930s for the then @-@ unidentified Australian specimens) , nurse shark , rusty catshark , rusty shark , sleepy shark , spitting shark , and tawny shark . Based on morphological similarities , *Nebrius* is believed to be the sister genus of *Ginglymostoma* , with both being placed in a clade that also contains the short @-@ tail nurse shark (*Pseudoginglymostoma brevicaudatum*) , the whale shark (*Rhincodon typus*) , and the zebra shark (*Stegostoma fasciatum*) .

= = Distribution and habitat = =

The tawny nurse shark is widely distributed in the Indo @-@ Pacific region . In the Indian Ocean , it is found from KwaZulu @-@ Natal , South Africa northward to the Red Sea , Persian Gulf and India , including Madagascar , Mauritius , the Chagos Archipelago , the Seychelles , and the Maldives . In the western Pacific , it occurs from southern Japan and the coast of China to the Philippines , Southeast Asia , and Indonesia , to as far south as the northern coast of Australia . In the central

Pacific , it has been reported from off New Caledonia , Samoa , Palau , the Marshall Islands , and Tahiti . Fossil teeth belonging to this species have been found in the Pirabas Formation of northern Brazil , dating back to the Lower Miocene (23 ? 16 Ma) . The presence of these fossils indicates that the range of the tawny nurse shark once extended to the tropical Atlantic Ocean , prior to the formation of the Isthmus of Panama .

An inshore species , the tawny nurse shark inhabits continental and insular shelves over sandy flats or beds of seagrass , as well as along the outer edges of coral or rocky reefs . This shark may be found from the surf zone , often in water barely deep enough to cover its body , to a maximum depth of 70 m (230 ft) on coral reefs ; it is most common at a depth of 5 ? 30 m (16 ? 98 ft) . Young sharks are generally found in the shallow areas of lagoons , while adults may be encountered across a variety of habitats .

= = Description = =

The tawny nurse shark grows to a maximum length of 3 @.@ 2 m (10 ft) . It has a robust , cylindrical body with a broadly rounded and flattened head . The eyes are small and face laterally , with prominent ridges over them and smaller spiracles behind . There are a pair of long , slender barbels in front of the nostrils . The mouth is small , with the lower lip divided into three lobes . There are 29 ? 33 tooth rows in the upper jaw and 26 ? 28 tooth rows in the lower jaw , arranged in an imbricate (overlapping) pattern with the outermost 2 ? 4 functional rows separated from the rest by a narrow space . Each tooth resembles a fan , with a broad base rising to a small , sharp central point flanked by 3 or more smaller cusps on both sides . As the shark ages , the teeth become relatively taller and thicker . The fourth and fifth pairs of gill slits are placed much closer together than the others .

The dorsal and pelvic fins are angular , with the first dorsal fin larger than the second . The pectoral fins are narrow , pointed , and falcate (sickle @-@ shaped) ; their shape separates this species from the similar @-@ looking nurse shark . The origin of the first dorsal fin is about even with the origin of the pelvic fins , while the origin of the anal fin is even with or somewhat behind the origin of the second dorsal fin . The caudal fin has a shallow upper lobe and barely present lower lobe , comprising about a quarter of the total length in adults . The dermal denticles are diamond @-@ shaped , bearing 4 ? 5 faint ridges radiating from a blunt point . Tawny nurse sharks are yellowish , reddish , or grayish brown above and off @-@ white below , and are capable of slowly changing their color to better blend with the environment . Young sharks have starkly white lower eyelids .

Many tawny nurse sharks found off the coasts of Japan , Taiwan , and the Ryukyu Islands lack a second dorsal fin . This physical abnormality has been speculated to result from pregnant females being exposed to water of unusually high salinity and / or temperature , possibly from human activity . In 1986 , a 2 @.@ 9 m (9 ft 6 in) long adult male with both a missing dorsal fin and partial albinism (in the form of white body color with gray @-@ brown eyes) was captured off Wakayama Prefecture , Japan . This anomalous individual is the largest albino shark known to date , having survived for a long time in the wild despite its lack of camouflage .

= = Biology and ecology = =

With a more streamlined form than other nurse sharks , the tawny nurse shark is believed to be a less benthic , more active swimmer . The characteristics of its body , head , fins , and teeth are comparable to other active reef sharks sharing its range , such as the sicklefin lemon shark (Negaprion acutidens) . Tawny nurse sharks are primarily nocturnal , though they are said to be active at all hours off Madagascar , and in captivity they will become diurnally active if presented with food . During the day , groups of two dozen or more sharks can be found resting inside caves and under ledges , often stacked atop one another . Individual sharks have small home ranges that they consistently return to each day .

The tawny nurse shark has few natural predators ; attacks on this species have been reported from bull sharks (Carcharhinus leucas) and great hammerheads (Sphyrna mokarran) , while the related

nurse shark has been known to fall prey to tiger sharks (*Galeocerdo cuvier*) and lemon sharks (*Negaprion brevirostris*) . Known parasites of this species include five species of tapeworms in the genus *Pedibothrium* , which infest the shark 's spiral intestine .

=== Feeding ===

The tawny nurse shark may be one of the few fishes specializing in preying on octopus . Other known food items include corals , sea urchins , crustaceans (e.g. crabs and lobsters) , squid , small fishes (e.g. surgeonfish , queenfish , and rabbitfish) , and the occasional sea snake . Hunting tawny nurse sharks swim slowly just above the sea floor , poking their heads into depressions and holes . When a prey item is found , the shark forcefully expands its large , muscular pharynx , creating a powerful negative pressure that sucks the prey into its mouth .

=== Life history ===

Mating in the tawny nurse shark is known to occur from July to August off Madagascar . Adult females have one functional ovary and two functional uteruses . The mode of reproduction is aplacental viviparity , meaning that the embryos hatch inside the uterus ; females in captivity have been documented depositing up to 52 non @-@ viable egg capsules , which has led to erroneous reports of this shark being oviparous . The egg capsules of this species are onion @-@ shaped , with thin , brown , translucent shells . The tawny nurse shark is the only carpet shark in which there is oophagy : once the developing embryos exhaust their supply of yolk , they gorge on eggs produced by the mother and acquire the distended abdomen characteristic of such oophagous embryos . Unlike in mackerel sharks , the eggs consumed by the embryos are large and shelled rather than small and undeveloped . There is no evidence of sibling cannibalism as in the sand tiger shark (*Carcharias taurus*) .

Various authors have reported the length at birth anywhere from 40 to 80 cm (16 to 31 in) , with the discrepancy possibly reflecting geographic variation . Although females release up to four fertilized eggs into each uterus , the very large size of the newborns suggest that the litter size may be as few as one or two . In one examined female that had two embryos sharing a single uterus , one embryo was much smaller and thinner than the other , implying that competition may eliminate the additional siblings . Males attain sexual maturity at a length of 2 @.@ 5 m (8 ft 2 in) , and females at a length of 2 @.@ 3 ? 2 @.@ 9 m (7 ft 7 in ? 9 ft 6 in) .

=== Human interactions ===

Encounters with tawny nurse sharks underwater indicate a more docile demeanor than the similar nurse shark ; usually divers are able to approach the sharks closely and even touch and play with them without incident . However , this species has been infrequently provoked into biting , and merits respect due to its strength , small but sharp teeth , and extremely powerful jaws . Tawny nurse sharks are favored attractions for ecotourist divers off Thailand , the Solomon Islands , and elsewhere . This species also adapts well to captivity and is displayed in public aquaria in Europe , the United States , Okinawa , and Singapore , where they may become tame enough to be hand @-@ fed .

The tawny nurse shark is taken by commercial fisheries operating throughout its range , including off Pakistan , India , Thailand , and the Philippines ; an exception is in Australian waters , where it is only taken in small numbers as bycatch . This shark is caught using demersal trawls , floating and fixed bottom gill nets , and on hook @-@ and @-@ line . The meat is sold fresh or dried and salted , the fins are used for shark fin soup , and the offal processed into fishmeal . In addition , the liver is a source of oil and vitamins , and the thick , tough skin is made into leather products . Off Queensland , Australia , the tawny nurse shark is valued by big @-@ game anglers . When hooked , large individuals are tenacious opponents and are difficult to subdue due to their habit of spinning . They are also capable of spitting a powerful jet of water into the faces of their captors , making grunting

noises in between jets (making the tawny shark one of the few species of sharks to produce a noise) ; whether this is a deliberate defensive behavior is uncertain .

The International Union for Conservation of Nature (IUCN) has assessed the tawny nurse shark as Vulnerable worldwide , as it faces heavy fishing pressure and its low reproductive and dispersal rates limit the ability of over 80% exploited populations to recover . Furthermore , this shark 's inshore habitat renders it susceptible to habitat degradation , destructive fishing practices (e.g. poisons and explosives , especially prevalent off Indonesia and the Philippines) , and human harassment . Localized declines or extirpations of the tawny nurse shark have been documented off India and Thailand . Off Australia , this species has been assessed as of Least Concern , as there it is not targeted by fisheries .