

= Grey reef shark =

The grey reef shark (*Carcharhinus amblyrhynchos* , sometimes misspelled *amblyrhynchus* or *amblyrhinchos*) is a species of requiem shark , in the family Carcharhinidae . One of the most common reef sharks in the Indo -@-@ Pacific , it is found as far east as Easter Island and as far west as South Africa . This species is most often seen in shallow water near the drop @-@ offs of coral reefs . The grey reef shark has the typical " reef shark " shape , with a broad , round snout and large eyes . This species can be distinguished from similar species by the plain or white @-@ tipped first dorsal fin , the dark tips on the other fins , the broad , black rear margin on the tail fin , and the lack of a ridge between the dorsal fins . Most individuals are less than 1 @.@ 9 m (6 @.@ 2 ft) long .

Grey reef sharks are fast @-@ swimming , agile predators that feed primarily on free @-@ swimming bony fishes and cephalopods . Their aggressive demeanor enables them to dominate many other shark species on the reef , despite their moderate size . Many grey reef sharks have a home range on a specific area of the reef , to which they continually return . However , they are social rather than territorial . During the day , these sharks often form groups of five to 20 individuals near coral reef drop @-@ offs , splitting up in the evening as the sharks begin to hunt . Adult females also form groups in very shallow water , where the higher water temperature may accelerate their growth or that of their unborn young . Like other members of its family , the grey reef shark is viviparous , meaning the mother nourishes her embryos through a placental connection . Litters of one to six pups are born every other year .

Grey reef sharks were the first shark species known to perform a threat display , a stereotypical behavior warning that it is prepared to attack . The display involves a " hunched " posture with characteristically dropped pectoral fins , and an exaggerated , side @-@ to @-@ side swimming motion . Grey reef sharks often do so if they are followed or cornered by divers to indicate they perceive a threat . This species has been responsible for a number of attacks on humans , so should be treated with caution , especially if they begin to display . They are caught in many fisheries and are susceptible to local population depletion due to their low reproduction rate and limited dispersal . As a result , the International Union for Conservation of Nature has assessed this species as Near Threatened .

= = Taxonomy and phylogeny = =

Dutch ichthyologist Pieter Bleeker first described the grey reef shark in 1856 as *Carcharias* (*Prionodon*) *amblyrhynchos* , in the scientific journal *Natuurkundig Tijdschrift voor Nederlandsch @-@ Indië* . Later authors moved this species to the genus *Carcharhinus* . The type specimen was a 1 @.@ 5 metres (4 @.@ 9 ft) -long female from the Java Sea . Other common names used for this shark around the world include black @-@ vee whaler , bronze whaler , Fowler 's whaler shark , graceful shark , graceful whaler shark , grey shark , grey whaler shark , longnose blacktail shark , school shark , and shortnose blacktail shark . Some of these names are also applied to other species .

In older literature , the scientific name of this species was often given as *C. menisorrh* . The blacktail reef shark (*C. wheeleri*) , native to the western Indian Ocean , is now regarded as the same species as the grey reef shark by most authors . It was originally distinguished from the grey reef shark by a white tip on the first dorsal fin , a shorter snout , and one fewer upper tooth row on each side . Based on morphological characters , vertebral counts , and tooth shapes , Garrick (1982) concluded the grey reef shark is most closely related to the silvertip shark (*C. albimarginatus*) . This interpretation was supported by a 1992 allozyme phylogenetic analysis by Lavery .

= = Description = =

The grey reef shark has a streamlined , moderately stout body with a long , blunt snout and large , round eyes . The upper and lower jaws each have 13 or 14 teeth (usually 14 in the upper and 13 in

the lower) . The upper teeth are triangular with slanted cusps , while the bottom teeth have narrower , erect cusps . The tooth serrations are larger in the upper jaw than in the lower . The first dorsal fin is medium @-@ sized , and there is no ridge running between it and the second dorsal fin . The pectoral fins are narrow and falcate (sickle @-@ shaped) .

The coloration is grey above , sometimes with a bronze sheen , and white below . The entire rear margin of the caudal fin has a distinctive , broad , black band . There are dusky to black tips on the pectoral , pelvic , second dorsal , and anal fins . Individuals from the western Indian Ocean have a narrow , white margin at the tip of the first dorsal fin ; this trait is usually absent from Pacific populations . Grey reef sharks that spend time in shallow water eventually darken in color , due to tanning . Most grey reef sharks are less than 1 @.@ 9 m (6 @.@ 2 ft) long . The maximum reported length is 2 @.@ 6 m (8 @.@ 5 ft) and the maximum reported weight is 33 @.@ 7 kg (74 lb) .

= = Distribution and habitat = =

The grey reef shark is native to the Indian and Pacific Oceans . In the Indian Ocean , it occurs from South Africa to India , including Madagascar and nearby islands , the Red Sea , and the Maldives . In the Pacific Ocean , it is found from southern China to northern Australia and New Zealand , including the Gulf of Thailand , the Philippines , and Indonesia . This species has also been reported from numerous Pacific islands , including American Samoa , the Chagos Archipelago , Easter Island , Christmas Island , the Cook Islands , the Marquesas Islands , the Tuamotu Archipelago , Guam , Kiribati , the Marshall Islands , Micronesia , Nauru , New Caledonia , the Marianas Islands , Palau , the Pitcairn Islands , Samoa , the Solomon Islands , Tuvalu , the Hawaiian Islands , and Vanuatu .

Generally a coastal , shallow @-@ water species , grey reef sharks are mostly found in depths of less than 60 m (200 ft) . However , they have been known to dive to 1 @,@ 000 m (3 @,@ 300 ft) . They are found over continental and insular shelves , preferring the leeward (away from the direction of the current) sides of coral reefs with clear water and rugged topography . They are frequently found near the drop @-@ offs at the outer edges of the reef , particularly near reef channels with strong currents , and less commonly within lagoons . On occasion , this shark may venture several kilometers out into the open ocean .

usually near dropoffs , outer slopes and reef channels with strong currents near the outer edges of reefs .

= = Biology and ecology = =

Along with the blacktip reef shark (*C. melanopterus*) and the whitetip reef shark (*Triaenodon obesus*) , the grey reef shark is one of the three most common sharks inhabiting Indo @-@ Pacific reefs . They actively expel most other shark species from favored habitats , even species larger in size . In areas where this species co @-@ exists with the blacktip reef shark , the latter species occupies the shallow flats , while the former stays in deeper water . Areas with a high abundance of grey reef sharks tend to contain few sandbar sharks (*C. plumbeus*) , and vice versa ; this may be due to their similar diets causing competitive exclusion .

On the infrequent occasions when they swim in oceanic waters , grey reef sharks often associate with marine mammals or large pelagic fishes , such as sailfish (*Istiophorus platypterus*) . There is an account of around 25 grey reef sharks following a large pod of bottlenose dolphins (*Tursiops* sp .) , along with 25 silky sharks (*C. falciformis*) and a single silvertip shark . Rainbow runners (*Elagatis bipinnulata*) have been observed rubbing against grey reef sharks , using the sharks ' rough skin to scrape off parasites .

Grey reef sharks are prey for larger sharks , such as the silvertip shark . At Rangiroa Atoll in French Polynesia , great hammerheads (*Sphyrna mokarran*) feed opportunistically on grey reef sharks that are exhausted from pursuing mates . Known parasites of this species include the nematode *Huffmanella lata* and several copepod species that attach to the sharks ' skin , and juvenile stages of the isopods *Gnathia trimaculata* and *G. grandilaris* that attach to the gill filaments and septa (the

dividers between each gill) .

== Feeding ==

Grey reef sharks feed mainly on bony fishes , with cephalopods such as squid and octopus being the second @-@ most important food group , and crustaceans such as crabs and lobsters making up the remainder . The larger sharks take a greater proportion of cephalopods . These sharks hunt individually or in groups , and have been known to pin schools of fish against the outer walls of coral reefs for feeding . They excel at capturing fish swimming in the open , and they complement hunting whitetip reef sharks , which are more adept at capturing fish inside caves and crevices . Their sense of smell is extremely acute , being capable of detecting one part tuna extract in 10 billion parts of sea water . In the presence of a large quantity of food , grey reef sharks may be roused into a feeding frenzy ; in one documented frenzy caused by an underwater explosion that killed several snappers , one of the sharks involved was attacked and consumed by the others .

== Life history ==

During mating , the male grey reef shark will bite at the female 's body or fins to hold onto her for copulation . Like other requiem sharks , it is viviparous : once the developing embryos exhaust their supply of yolk , the yolk sac develops into a placental connection that sustains them to term . Each female has a single functional ovary (on the right side) and two functional uteruses . One to four pups (six in Hawaii) are born every other year ; the number of young increases with female size . Estimates of the gestation period range from 9 to 14 months . Parturition is thought to take place from July to August in the Southern Hemisphere and from March to July in the Northern Hemisphere . However , females with " full @-@ term embryos " have also been reported in the fall off Enewetak . The newborns measure 45 ? 60 cm (18 ? 24 in) long . Sexual maturation occurs at around seven years of age , when the males are 1 @.@ 3 ? 1 @.@ 5 m (4 @.@ 3 ? 4 @.@ 9 ft) long and females are 1 @.@ 2 ? 1 @.@ 4 m (3 @.@ 9 ? 4 @.@ 6 ft) long . Females on the Great Barrier Reef mature at 11 years of age , later than at other locations , and at a slightly larger size . The lifespan is at least 25 years .

== Behavior ==

Grey reef sharks are active at all times of the day , with activity levels peaking at night . At Rangiroa , groups of around 30 sharks spend the day together in a small part of their collective home range , dispersing at night into shallower water to forage for food . Their home range is about 0 @.@ 8 km² (0 @.@ 31 sq mi) . At Enewetak in the Marshall Islands , grey reef sharks from different parts of the reef exhibit different social and ranging behaviors . Sharks on the outer ocean reefs tend to be nomadic , swimming long distances along the reef , while those around lagoon reefs and underwater pinnacles stay within defined daytime and night @-@ time home ranges . Where there are strong tidal currents , grey reef sharks move against the water : towards the shore with the ebbing tide and back out to sea with the rising tide . This may allow them to better detect the scent of their prey , or afford them the cover of turbid water in which to hunt .

There is little evidence of territoriality in the grey reef shark ; individuals will tolerate others of their species entering and feeding within their home ranges . Off Hawaii , individuals may stay around the same part of the reef for up to three years , while at Rangiroa , they regularly shift their locations by up to 15 km (9 @.@ 3 mi) . Individual grey reef sharks at Enewetak become highly aggressive at specific locations , suggesting they may exhibit dominant behavior over other sharks in their home areas .

== Sociality ==

Social aggregation is well documented in grey reef sharks . In the northwestern Hawaiian Islands ,

large numbers of pregnant adult females have been observed slowly swimming in circles in shallow water , occasionally exposing their dorsal fins or backs . These groups last from 11 : 00 to 15 : 00 , corresponding to peak daylight hours . Similarly , at Sand Island off Johnston Atoll , females form aggregations in shallow water from March to June . The number of sharks per group differs from year to year . Each day , the sharks begin arriving at the aggregation area at 09 : 00 , reaching a peak in numbers during the hottest part of the day in the afternoon , and dispersing by 19 : 00 . Individual sharks return to the aggregation site every one to six days . These female sharks are speculated to be taking advantage of the warmer water to speed their growth or that of their embryos . The shallow waters may also enable them to avoid unwanted attention by males .

Off Enewetak , grey reef sharks exhibit different social behaviors on different parts of the reef . Sharks tend to be solitary on shallower reefs and pinnacles . Near reef drop offs , loose aggregations of five to 20 sharks form in the morning and grow in number throughout the day before dispersing at night . In level areas , sharks form polarized schools (all swimming in the same direction) of around 30 individuals near the sea bottom , arranging themselves parallel to each other or slowly swimming in circles . Most individuals within polarized schools are females , and the formation of these schools has been theorized to relate to mating or pupping .

= = = Threat display = = =

The " hunch " threat display of the grey reef shark is the most pronounced and well known agonistic display (a display directed towards competitors or threats) of any shark . Investigations of this behavior have been focused on the reaction of sharks to approaching divers , some of which have culminated in attacks . The display consists of the shark raising its snout , dropping its pectoral fins , arching its back , and curving its body laterally . While holding this posture , the shark swims with a stiff , exaggerated side to side motion , sometimes combined with rolls or figure 8 loops . The intensity of the display increases if the shark is more closely approached or if obstacles are blocking its escape routes , such as landmarks or other sharks . If the diver persists , the shark will either retreat or launch a rapid open mouthed attack , slashing with its upper teeth .

Most observed displays by grey reef sharks have been in response to a diver (or submersible) approaching and following it from a few meters behind and above . They also perform the display towards moray eels , and in one instance towards a much larger great hammerhead (which subsequently withdrew) . However , they have never been seen performing threat displays towards each other . This suggests the display is primarily a response to potential threats (i.e. predators) rather than competitors . As grey reef sharks are not territorial , they are speculated to be defending a critical volume of " personal space " around themselves . Compared to sharks from French Polynesia or Micronesia , grey reef sharks from the Indian Ocean and western Pacific are not as aggressive and less given to displaying .

= = Human interactions = =

Grey reef sharks are often curious about divers when they first enter the water and may approach quite closely , though they lose interest on repeat dives . They can become dangerous in the presence of food , and tend to be more aggressive if encountered in open water rather than on the reef . There have been several known attacks on spearfishers , possibly by mistake , when the shark struck at the speared fish close to the diver . This species will also attack if pursued or cornered , and divers should immediately retreat (slowly and always facing the shark) if it begins to perform a threat display . Photographing the display should not be attempted , as the flash from a camera is known to have incited at least one attack . Although of modest size , they are capable of inflicting significant damage : during one study of the threat display , a grey reef shark attacked the researchers ' submersible multiple times , leaving tooth marks in the plastic windows and biting off one of the propellers . The shark consistently launched its attacks from a distance of 6 m (20 ft) , which it was able to cover in a third of a second . As of 2008 , the International Shark Attack File

listed seven unprovoked and six provoked attacks (none of them fatal) attributable to this species .

Although still abundant at Cocos Island and other relatively pristine sites , grey reef sharks are susceptible to localized depletion due to their slow reproductive rate , specific habitat requirements , and tendency to stay within a certain area . The IUCN has assessed the grey reef shark as Near Threatened ; this shark is taken by multispecies fisheries in many parts of its range and used for various products such as shark fin soup and fishmeal . Another threat is the continuing degradation of coral reefs from human development . There is evidence of substantial declines in some populations . Anderson et al .. (1998) reported , in the Chagos Archipelago , grey reef shark numbers in 1996 had fallen to 14 % of 1970s levels . Robbins et al .. (2006) found grey reef shark populations in Great Barrier Reef fishing zones had declined by 97 % compared to no @-@ entry zones (boats are not allowed) . In addition , no @-@ take zones (boats are allowed but fishing is prohibited) had the same levels of depletion as fishing zones , illustrating the severe effect of poaching . Projections suggested the shark population would fall to 0 @.@ 1 % of pre @-@ exploitation levels within 20 years without additional conservation measures . One possible avenue for conservation is ecotourism , as grey reef sharks are suitable for shark @-@ watching ventures , and profitable diving sites now enjoy protection in many countries , such as the Maldives .