

## = Crocodile shark =

The crocodile shark ( *Pseudocarcharias kamoharui* ) is a species of mackerel shark and the only extant member of the family Pseudocarchariidae . A specialized inhabitant of the mesopelagic zone , the crocodile shark can be found worldwide in tropical waters from the surface to a depth of 590 m ( 1 @, @ 940 ft ) . It performs a diel vertical migration , staying below a depth of 200 m ( 660 ft ) during the day and ascending into shallower water at night to feed . Typically measuring only 1 m ( 3 @. @ 3 ft ) in length , the crocodile shark is the smallest living mackerel shark . It can be distinguished by its elongated cigar @-@ shaped body , extremely large eyes , and relatively small fins .

An active @-@ swimming predator of pelagic bony fishes , squid and shrimp , the crocodile shark has a sizable oily liver that allows it to maintain its position in the water column with minimal effort . The size and structure of its eyes suggests that it is adapted for hunting at night . The crocodile shark is aplacental viviparous , with females typically giving birth to litters of four . The fetuses are oophagous , meaning that they feed on undeveloped eggs ovulated for this purpose by their mother . Due to its small size , the crocodile shark poses little danger to humans and is of little commercial importance . However , substantial numbers are caught as bycatch , leading it to be assessed as Near Threatened by the International Union for Conservation of Nature ( IUCN ) . This species was responsible for damaging deep sea fiberoptic cables when the technology was first deployed in 1985 .

## = Taxonomy and phylogeny =

The English common name " crocodile shark " is derived from its Japanese name mizuwani ( ?? , literally " water crocodile " ) , which refers to its sharp teeth and habit of snapping vigorously when taken out of the water . Other common names for this species include Japanese ragged @-@ tooth shark , Kamohara 's sand @-@ shark , and water crocodile . The crocodile shark was first described as *Carcharias kamoharui* in a 1936 issue of Zoological Magazine ( Tokyo ) by ichthyologist Kiyomatsu Matsubara , based on a 73 @. @ 5 cm ( 28 @. @ 9 in ) long specimen found at the Koti Fish Market in Japan . The type specimen is a 1 m ( 3 @. @ 3 ft ) long adult male found at a fish market in Su @-@ ao , Taiwan .

After being shuffled between the genera *Carcharias* and *Odontaspis* in the family Odontaspidae by various authors , in 1973 Leonard Compagno resurrected Jean Cadenat 's 1963 subgenus *Pseudocarcharias* from synonymy for this species and placed it within its own family . The morphology of the crocodile shark suggests affinity with the megamouth shark ( *Megachasma* ) , basking shark ( *Cetorhinus* ) , thresher sharks ( *Alopiidae* ) , and mackerel sharks ( *Lamnidae* ) . More recent phylogenetic analyses , based on mitochondrial DNA , have suggested that the crocodile shark is closely related to either the megamouth shark or the sand sharks ( *Odontaspidae* ) . Alternately , analysis based on dentition suggests that the closest relatives of the crocodile shark are the thresher sharks , followed by the mackerel sharks . Fossil *Pseudocarcharias* teeth dating to the Serravallian age ( 13 @. @ 6 ? 11 @. @ 6 Ma ) of the Miocene epoch have been found in Italy , and are identical to those of the modern @-@ day crocodile shark .

## = Description =

The crocodile shark has a spindle @-@ shaped body with a short head and a bulbous , pointed snout . The eyes are very large and lack nictating membranes ( protective third eyelids ) . The five pairs of gill slits are long , extending onto the dorsal surface . The sizable , arched jaws can be protruded almost to the tip of the snout and contain large teeth , shaped like spikes in the front and knives on the sides . There are fewer than 30 tooth rows in either jaw ; in the upper jaw , the first two large teeth are separated from the lateral teeth by a row of small intermediate teeth .

The pectoral fins are small , broad , and rounded . The pelvic fins are nearly as large as the pectorals . The first dorsal fin is small , low and angular ; the second dorsal fin is smaller than the

first but larger than the anal fin . The caudal fin is asymmetrical with a moderately long upper lobe . The caudal peduncle is slightly compressed with weak lateral keels . The dermal denticles are small , with a flattened crown bearing small ridges and backward @-@ pointing cusps It is dark brown above and paler below , sometimes with a few dark blotches on the sides and belly and / or a white blotch between the corner of the mouth and the first gill slit . The fins have thin translucent to white margins . The crocodile shark grows to a maximum length of 1 @.@ 1 m ( 3 @.@ 6 ft ) . Most individuals are 1 m ( 3 ft ) long and weigh 4 ? 6 kg ( 9 ? 13 lbs ) .

#### = = Distribution and habitat = =

The crocodile shark is almost circumtropical in distribution . In the Atlantic Ocean , it is known from off Brazil , Cape Verde , Guinea @-@ Bissau , Guinea , Angola , South Africa , and Saint Helena Island , though it has not yet been reported from the northwestern Atlantic . In the Indian Ocean , it occurs in the Mozambique Channel and possibly the Agulhas Current and the Bay of Bengal . In the Pacific , it occurs from Japan , Taiwan , and the Korean Peninsula in the northwest , southward to Indonesia , Australia , and New Zealand , and eastward to the western coast of the Americas from Baja California to Chile , including the Marshall , Phoenix , Palmyra , Johnston , Marquesas , Line , and Hawaiian Islands in between .

From distribution records , the crocodile shark 's range seems to be bound by the latitudes 37 ° N and 44 ° S , where the average sea surface temperature is 20 ° C ( 68 ° F ) . This species is not evenly distributed but is rather locally abundant in certain areas , suggesting that it is not strongly migratory . The crocodile shark is usually found in the pelagic zone from the surface to a depth of 590 m ( 1 @.@ 940 ft ) . It is occasionally encountered inshore near the bottom and has been known to strand on the beaches of South Africa , possibly after being stunned by upwellings of cold water .

#### = = Biology and ecology = =

With a long body , small fins , and large liver rich in squalene and other low @-@ density lipids , the crocodile shark is convergently similar to mesopelagic dogfish sharks such as the cookiecutter shark ( *Isistius brasiliensis* ) . The liver may comprise a fifth of the shark 's weight , and acts as an incompressible float that allows it to maintain neutral buoyancy in the water column with little effort . Like many other inhabitants of the mesopelagic zone , the crocodile shark apparently migrates closer to the surface at night to feed and descends into deeper water during the day , being rarely found above a depth of 200 m ( 660 ft ) during daytime .

The large eyes of the crocodile shark , equipped with a reflective green or yellow retina and lacking an expanded iris , suggest that it is a nocturnal hunter that relies on sight to pick out the silhouettes or bioluminescence of its prey . Little is known of the crocodile shark 's feeding habits ; it is thought to be an active , fast @-@ swimming predator based on its strong musculature , large tail , and behavior when captured . On one occasion , a crocodile shark off Cape Point , South Africa , jumped out of the water in pursuit of bait . Its diet consists of small to medium @-@ sized bony fishes ( including bristlemouths and lanternfishes ) , squid ( including onychoteuthids , mastigoteuthids , pholidoteuthids , and cranchiids ) and shrimp . Crocodile sharks are not known to be preyed upon by any other species .

The crocodile shark is aplacental viviparous and typically gives birth to litters of four , two pups to each uterus . The gestation period is unknown but believed to be long . The embryos have yolk sacs at 3 ? 4 cm ( 1 @.@ 2 ? 1 @.@ 6 in ) long ; once the yolk sac is fully absorbed they become oophagous : the mother produces large numbers of thin @-@ walled egg capsules that contain 2 ? 9 eggs each , which are then consumed by the unborn embryos . The abdomens of the embryos become characteristically distended with ingested yolk material , which can make up a quarter of the embryo 's total weight . It is unclear how two crocodile shark fetuses manage to share a single uterus , when in some other oophagous mackerel sharks such as the sand tiger shark ( *Carcharias taurus* ) , only one fetus survives in each uterus . The pups are born at approximately 40 cm ( 16 in )

long ; males attain maturity at 74 ? 110 cm ( 29 ? 43 in ) and females at 89 ? 102 cm ( 35 ? 40 in ) . There is no defined reproductive season .

= = Human interactions = =

With its small size , non @-@ cutting teeth , and oceanic habitat , the crocodile shark is not considered dangerous to humans . However , it has a powerful bite that invites caution . This species is a common bycatch of various pelagic longline fisheries meant for tuna and swordfish . The largest numbers are caught by the Japanese yellowfin tuna fishery and the Australian swordfish fishery , both operating in the Indian Ocean . This species is also sometimes caught on squid jigs and in tuna gillnets . It is usually discarded due to its small size and low @-@ quality meat . However , its oily liver is potentially valuable . No data is available on the population status of the crocodile shark , though it is probably declining from bycatch mortality . Coupled with its low reproductive rate , this has led the International Union for Conservation of Nature ( IUCN ) to assessed it as Near Threatened .

After AT & T installed the first deep sea fiberoptic cable between Gran Canaria and Tenerife in the Canary Islands in September 1985 , the system suffered a series of shorts that necessitated costly repairs . It was discovered that attacks from the crocodile shark were responsible for most of the failures , possibly because they were attracted to the electric field around the cables . Since crocodile sharks are not benthic in nature , they were presumably biting the cables as they were being deployed . The problem was solved by protecting the cables with a layer of steel tape beneath a dense polyethylene coating .