= Kitefin shark =

The kitefin shark or seal shark (Dalatias licha) is a species of dogfish shark in the family Dalatiidae , and the only species in its genus . It is found sporadically around the world , usually close to the sea floor at depths of 200 ? 600 m (660 ? 1 @,@ 970 ft) . With a sizable oil @-@ filled liver to maintain neutral buoyancy , this shark is able to cruise slowly through the water while expending little energy . The kitefin shark has a slender body with a very short , blunt snout , large eyes , and thick lips . Its teeth are highly differentiated between the upper and lower jaws , with the upper teeth small and narrow and the lower teeth large , triangular , and serrated . Its typical length is 1 @.@ 0 ? 1 @.@ 4 m (3 @.@ 3 ? 4 @.@ 6 ft) .

Armed with large teeth and a strong bite , the kitefin shark is a powerful , solitary predator that takes many different types of prey , ranging from bony fishes , sharks and rays , to cephalopods , crustaceans , polychaete worms , siphonophores , and possibly carrion . It also takes bites out of animals larger than itself , similar to its smaller relative , the cookiecutter shark (Isistius brasiliensis) . This shark is aplacental viviparous and gives birth to 10 ? 14 young . The kitefin shark is fished commercially for its meat , skin , and liver oil , primarily by Portugal and Japan . A fishery targeting this species existed off the Azores from the 1970s to the 1990s , but collapsed due to overfishing and falling liver oil prices ; the rapid depletion of the Azores stock is often cited as an example of the susceptibility of deep @-@ sea sharks to human exploitation . The low reproductive rate of this species renders it susceptible to overfishing and , coupled with known population declines , has led it to be assessed as Near Threatened by the International Union for Conservation of Nature (IUCN) .

= = Taxonomy = =

The kitefin shark was originally described as Squalus licha by French naturalist Pierre Joseph Bonnaterre , in his 1788 Tableau encyclopédique et méthodique des trois regnes de la nature ; the type specimen from " Le cap Breton " has since been lost . This species was later placed in its own genus , Dalatias , which came from the synonymy of Constantine Rafinesque 's 1810 Dalatias sparophagus with S. licha . However , some authorities dispute this on the grounds that D. sparophagus is a nomen dubium , and prefer to use the next available genus name Scymnorhinus . The genus name Dalatias is derived from the Greek dalos or dalou , meaning " torch " . The specific epithet licha comes from la liche , the French name for this shark . Additional common names used for the kitefin shark include black shark and darkie Charlie .

= = Phylogeny and evolution = =

Cladistic studies have consistently found that the closest relatives of the kitefin shark are the cookiecutter sharks (Isistius) , with which they share several dentitional , skeletal , and muscular similarities . Dalatias and Isistius are believed to have evolutionarily diverged shortly after the transition between the Cretaceous and Tertiary periods (65 @.@ 5 Ma) , as part of a larger adaptive radiation of dogfish sharks from the deep sea into relatively shallower habitats .

The oldest fossil teeth that definitively belong to the kitefin shark date to the Middle Eocene epoch , such as those recovered from Bortonian @-@ stage deposits (43 @.@ 0 ? 37 @.@ 0 Ma) in New Zealand . Dalatias fossil teeth dating to various ages have also been discovered in Europe , the former USSR , Japan , and western India . The fossil material now recognized as belonging to this species were historically described under a multitude of different names .

= = Description = =

The kitefin shark has a moderately elongated body with a very short , rounded snout . The eyes and spiracles are large . The lips are thick with pleats or fringes , though are not modified to be suctorial . There are 16 ? 21 tooth rows in the upper jaw and 17 ? 20 tooth rows in the lower jaw . The upper

teeth are small and spike @-@ shaped , curving slightly towards the corners of the mouth . The lower teeth are very large , knife @-@ shaped , and serrated , with their bases interlocking to form a continuous cutting surface .

The first dorsal fin is slightly smaller and shorter @-@ based than the second , and neither has spines . The first dorsal fin originates behind the free rear tip of the pectoral fins , while the second originates above the middle of the pelvic fin bases . The pectoral fins are short and rounded . The caudal fin has a prominent upper lobe with a well @-@ developed notch near the tip , and a barely present lower lobe . The form and arrangement of the fins is similar to the Portuguese dogfish (Centroscymnus coelolepis) , from which this species can be distinguished by the lack of fin spines . The dermal denticles are small and flat , with a single horizontal ridge ending in a point .

The coloration is a uniform dark brown or gray , sometimes with faint black spots on the back . The fins have white or translucent trailing edges , and the tip of the caudal fin is black . An 90 cm (3 @.@ 0 ft) long kitefin shark with partial albinism , lacking pigment on 59 % of its body , was caught in the Gulf of Genoa in 2003 . Unlike in a previous case of an albino Portuguese dogfish , the abnormal coloration of this individual had not diminished its ability to capture prey . Most kitefin sharks are 1 @.@ 0 ? 1 @.@ 4 m (3 @.@ 3 ? 4 @.@ 6 ft) long and weigh 8 kg (18 lb) ; the maximum reported length is 1 @.@ 6 m (5 @.@ 2 ft) , possibly 1 @.@ 8 m (5 @.@ 9 ft) .

= = Distribution and habitat = =

The kitefin shark has an almost circumglobal range in tropical and warm @-@ temperature waters , consisting of a number of widely separated populations with likely little interchange between them . This shark has not been reported from the eastern Pacific and northern Indian Oceans . In the northern Atlantic , it occurs in the Georges Bank and the northern Gulf of Mexico , and from the North Sea to Cameroon , including around the British Isles , in the western and central Mediterranean Sea , and off Madeira and the Azores . In the Indian Ocean , it is found off South Africa and Mozambique . In the Pacific , it occurs off Japan , Java , Australia and New Zealand , and the Hawaiian Islands . There is a single record of this species in the southern Atlantic , from off southern Brazil .

An offshore , deepwater species , the kitefin shark is most common at a depth of 200 ? 600 m (660 ? 1 @,@ 970 ft) , but has been captured from the surface to as deep as 1 @,@ 800 m (5 @,@ 900 ft) . Off the Azores this shark segregates by sex , with females most common around a depth of 230 m (750 ft) and males most common around 412 ? 448 m (1 @,@ 352 ? 1 @,@ 470 ft) . The kitefin shark inhabits the outer continental shelves and upper continental slopes , and is also found around oceanic islands and seamounts . It is the only member of its family that tends to be found close to the sea floor as opposed to in the middle of the water column , though on occasion it has been captured well above the bottom .

= = Biology and ecology = =

Relatively common where it occurs , kitefin sharks are usually solitary in nature but may form small groups . It is a slow swimmer with a large liver filled with squalene , a lipid less dense than water , allowing it to maintain neutral buoyancy and hover above the bottom with little effort . Studies off the coast of North Africa and in the Gulf of Genoa have found males outnumbering females by 2 : 1 and 5 : 1 respectively ; this imbalanced sex ratio has not been observed off South Africa and may reflect sampling bias . The kitefin shark is preyed upon by larger fishes and sharks , as well as by sperm whales (Physeter macrocephalus) . Parasite data on this species is limited ; an examination of two sharks caught off Ireland found three nematodes in the stomach lumen . One could be identified as Anisakis simplex L3 , while another may have been a larval Raphidascaris .

A powerful and versatile deepwater predator , the short , robust jaws of the kitefin shark give it an enormously strong bite . It feeds mainly on bony fishes (including deepwater smelts , viperfishes , scaly dragonfishes , barracudinas , greeneyes , lanternfishes , bristlemouths , cod and other gadids , grenadiers , deepwater scorpionfishes , bonito , snake mackerels , deepwater cardinalfishes , and

sea toads) , but also takes a wide variety of other animals , including skates , smaller sharks (Galeus , Squalus , Etmopterus and Centrophorus) , squid and octopus , crustaceans (amphipods , isopods , shrimp and lobsters) , polychaete worms , and siphonophores . Like the related cookiecutter shark , the kitefin shark is also capable of excising chunks of flesh from animals larger than itself , including other sharks and whales . The presence of fast @-@ swimming fishes in its diet suggests the kitefin shark may scavenge , or have some other means of capturing faster prey . In the Mediterranean , bony fishes are the most important food year @-@ round , with the second @-@ most important prey being sharks in the winter and spring , crustaceans in the summer , and cephalopods in the fall . Captured males are more likely to have full stomachs than females for unknown reasons .

Reproduction in the kitefin shark is aplacental viviparous , with the embryos hatching inside the uterus and being sustained to term by yolk . Adult females have two functional ovaries and two functional uteruses ; the uterus is not divided into compartments . In the Mediterranean , breeding occurs throughout the year with peaks in spring and fall ; females may have a year of rest in between pregnancies . The litter size is 10 ? 16 , increasing with female size . The young are born at a length of 30 ? 45 cm (12 ? 18 in) , varying by geographic location , after a possible gestation period of two years . The males mature sexually at a length of 77 ? 121 cm (2 @.@ 53 ? 3 @.@ 97 ft) , and the females at a length of 117 ? 159 cm (3 @.@ 84 ? 5 @.@ 22 ft) . There is no relationship between an individual 's size at birth , size at maturity , and maximum size .

= = Human interactions = =

The kitefin shark inhabits depths too great for it to be a danger to humans . Its upper teeth have been found lodged in underwater fiberoptic cables . This species has a long history of human exploitation : the meat is consumed in the eastern Atlantic and Japan , and the offal processed into fishmeal . The liver oil is utilized in Portugal , Japan , and South Africa . The skin is made into a type of shagreen useful in the making of furniture and jewelry , and is also favored for the manufacture of " boroso " , a Spanish polished leather . This shark has no commercial value in the western Atlantic .

The continuing expansion of commercial fisheries into the deep sea has raised concerns about the vulnerability of this and other deepwater shark species to overfishing , as these sharks have slow growth and reproductive rates . This is exemplified by the rapid stock depletion and collapse of the Azores kitefin shark fishery . This targeted fishery began in the early 1970s for the production of liver oil . In the early 1980s , the fishing fleet was enlarged with the addition of industrial vessels equipped with demersal gillnets , resulting in a fishery peak in 1984 of 937 tons landed . After 1991 , kitefin shark catches declined precipitously to under 15 tons annually which , along with a drop in the global price of liver oil , led to the fishery becoming unprofitable by the end of the decade . A population assessment has suggested that the northeastern Atlantic stock had fallen to 50 % of the pre @-@ exploitation biomass .

Fisheries operating off Portugal and Japan are responsible for most commercial landings of the kitefin shark , generally as bycatch in bottom trawls and on hook @-@ and @-@ line . Portugal reported a kitefin shark bycatch of 282 tons in 2000 and 119 tons in 2003 . In other areas of the northeastern Atlantic this shark is rare and reported catches are likely confounded by misidentifications of other species ; some are caught by mixed @-@ species gillnet fisheries operating in deep water west of the British Isles , where surveys suggest that kitefin shark numbers may have declined by 94 % since the 1970s . In the Mediterranean , this shark is caught incidentally by bottom trawl and gillnet fisheries . Although it is generally discarded alive , many are unable to return to deep water and do not survive . In the Southern Hemisphere , catches by the Australian South East Trawl Fishery are increasing following the relaxation of regulations regarding seafood mercury content ; this species is not included under Australian fishery quotas . New Zealand kitefin shark catches peaked from 1986 to 1997 . The International Union for Conservation of Nature (IUCN) has assessed the kitefin shark as Near Threatened worldwide , and as Vulnerable in the northeastern Atlantic in light of documented population declines .