= Bigeye thresher =

The bigeye thresher (Alopias superciliosus) is a species of thresher shark , family Alopiidae , found in temperate and tropical oceans worldwide . Like other thresher sharks , nearly half its total length consists of the elongated upper lobe of the tail fin . Its common name comes from its enormous eyes , which are placed in keyhole @-@ shaped sockets that allow them to be rotated upward . This species can also be distinguished by a pair of deep grooves on the top of its head , from which its scientific name is derived .

The large eyes of the bigeye thresher are adapted for hunting in low light conditions . It is one of the few sharks that conduct a diel vertical migration , staying in deep water during the day and moving into surface waters at night to feed . To protect its sensitive brain and eyes from the temperature changes accompanying these movements , the bigeye thresher has a vascular exchange system called the rete mirabile around those organs . This species feeds mainly on fish and squid , which are stunned via whip @-@ like strikes of the long tail . Bigeye threshers are ovoviviparous , usually bearing litters of two pups . The embryos are oophagous and feed on ova produced by the mother while inside the uterus . This shark is caught by commercial fisheries across its range ; the meat is not highly regarded but the skin , fins , and liver oil are valued . It has been assessed as Vulnerable by the International Union for Conservation of Nature (IUCN) .

= = Taxonomy and phylogeny = =

British biologist Richard Thomas Lowe was the first to scientifically describe the bigeye thresher , in papers published in Proceedings of the Royal Society of London (1840) and Transactions of the Zoological Society of London (1849 , sometimes given as 1839) . He based his description on a specimen caught off Madeira in the eastern Atlantic Ocean . However , Lowe 's description was subsequently overlooked by researchers and this species was known by different names until the 1940s , when new specimens from Cuba and Florida prompted its original scientific name to be resurrected . The specific epithet superciliosus is from the Latin super meaning " above " , and ciliosus meaning " eyebrow " , referring to the distinct lateral grooves above the eyes .

An allozyme analysis conducted by Blaise Eitner in 1995 showed that the closest relative of the bigeye thresher is the pelagic thresher (A. pelagicus) , with which it forms a clade . Fossil remains of the bigeye thresher dating to the Middle Miocene (16 @.@ 0 ? 11 @.@ 6 Ma) have been found in the Hokuriku region of Japan .

= = Distribution and habitat = =

The bigeye thresher has a virtually circumtropical distribution . In the western Atlantic Ocean , it has been reported from New York to Florida , the Bahamas , Cuba , Venezuela , Tobago and southern Brazil . In the eastern Atlantic , it is known from Portugal , Madeira , Senegal , Guinea to Sierra Leone , Angola , and the Mediterranean Sea . In the western Indian Ocean , it occurs off South Africa , Madagascar , and the Arabian Sea . In the Pacific Ocean , it is known from southern Japan , Taiwan , New Caledonia , northwestern Australia , and New Zealand , and eastward to Hawaii , southern California , the Gulf of California , and west of the Galapagos Islands . Analysis of mitochondrial DNA has shown that Atlantic and Indo @-@ Pacific populations are somewhat genetically divergent from each other .

Bigeye threshers are usually found over the continental shelf and in the open sea , though they are occasionally encountered in shallow coastal waters . They occur in surface temperatures of 16 ? 25 ° C (61 ? 77 ° F) , but have been tracked as far down as 723 m (2 @,@ 372 ft) , where the temperature is only 5 ° C (41 ° F) . Little is known of their geographical movements ; one individual has been documented moving from New York to the Gulf of Mexico , a straight @-@ line distance of 2 @,@ 767 km (1 @,@ 719 mi) .

= = Description = =

The eyes of the bigeye thresher can measure up to 10 cm (3 @.@ 9 in) across in adults . Each eye is taller than wide , with a bulbous upper portion . The orbits extend onto the dorsal surface of the head , allowing the eyes to orient upwards . There are also a pair of distinctive lateral grooves that extend from above the eyes to over the gill slits , giving it a " helmet " -like appearance . The snout is moderately long and bulbous , and there are no labial furrows at the corners of the mouth . The teeth are moderately large with a single , narrow cusp . There are 19 ? 24 teeth in the upper jaw and 20 ? 24 teeth in the lower jaw ; their shapes are similar in both jaws . There are large and small dermal denticles , with the smaller ones more numerous and interspersed amongst the larger ones . The smaller denticles taper to a point .

Up to half the body length is taken up by the long upper lobe of the caudal fin , which is broader than in other threshers . The large pectoral fins have a curved anterior margin and broad tips . The first dorsal fin is placed further back than in the other thresher sharks , with the free rear tip located above or just before the pelvic fins . Its coloration is a deep , metallic violet to purplish brown above and creamy white below . This color rapidly fades to a dull gray after death . Most bigeye threshers are 3 @.@ 3 ? 4 @.@ 0 m (10 @.@ 8 ? 13 @.@ 1 ft) long and weigh 160 kg (350 lb) . The largest known bigeye thresher measured 4 @.@ 9 m (16 ft) long and weighed 364 kg (802 lb) , and was caught near Tutukaka , New Zealand , in February 1981 .

= = Biology and ecology = =

The size and upward orientation of the bigeye thresher 's eyes are adapted to search for the silhouettes of prey in dim light . This species is one of a handful of shark species that conducts a diel vertical migration , spending daytime in deeper water between 300 ? 500 m (980 ? 1 @,@ 640 ft) , beneath the thermocline where the temperature ranges from 6 to 12 ° C (43 to 54 ° F) , and ascending above it to water less than 100 m (330 ft) deep during nighttime . This migration likely relates to finding prey at night and avoiding predators during the day . The sharks ' daytime swimming patterns are usually steady , while at night they have a pattern of slow ascents and rapid descents .

Bigeye threshers are likely preyed upon by larger sharks and marine mammals . Known parasites of the bigeye thresher include the copepod Pagina tunica , and the tapeworm Litobothrium janovyi . Sea lampreys (Petromyzon marinus) have been seen attached near the cloaca of this shark . The bigeye thresher appears to be an ecological competitor of the blue shark (Prionace glauca) , and the numbers of the two species are negatively correlated such as that only one of two occurs in any given location .

= = = Feeding = = =

The bigeye thresher has larger teeth than other threshers and feeds on a wider variety of prey . Known food items include schooling forage fish such as mackerel and herring , benthic fishes such as hake and whiting , larger pelagic fishes such as lancetfish and small billfish , squid such as lycoteuthids and ommastrephids , and possibly crab megalopae . They likely use their long tails to stun their prey prior to capture , as they are often found hooked by their tails on longlines and with the bait fish in their stomachs . The shape of their eye sockets give them binocular vision in an upward direction to better aim their strikes . In the Mediterranean , they are strongly associated with schools of frigate mackerel (Auxis rochei) , suggesting that these sharks follow concentrations of their prey from place to place . It is said that the bigeye thresher uses its long tail to smack down birds .

= = = Life history = = =

Like other mackerel sharks , bigeye threshers are ovoviviparous and bear litters of two pups , one in each uterus . Very rarely , the litter size may be one , three , or four . There is no defined breeding

season and most adult females are pregnant throughout the year without any apparent lag time between pregnancies . The gestation period is unknown . The developing fetuses are initially nourished by a yolk sac , and later on exhibit oophagy , in which they consume infertile eggs produced by their mother (and possibly also uterine fluid) . There is no evidence of sibling cannibalism as in the sand tiger shark (Carcharias taurus) . Unborn embryos are similar in appearance to adults , with proportionally larger heads and eyes . They are covered with a thin layer of epithelium that prevents the uterine wall from being abraded by the embryo 's sharp dermal denticles ; this has not been observed in the young of other thresher sharks . The young measure 1 @.@ 35 ? 1 @.@ 4 m (4 @.@ 4 ? 4 @.@ 6 ft) long at birth . Males mature at a length around 2 @.@ 7 ? 2 @.@ 9 m (8 @.@ 9 ? 9 @.@ 5 ft) and at an age of 9 ? 10 years , while females mature at a length around 3 @.@ 3 ? 3 @.@ 6 m (11 ? 12 ft) and at an age of 12 ? 14 years . The maximum lifespan of this species is believed to be 19 years for a male and 20 years for a female . A female bigeye thresher is estimated to produce only 20 young over her entire life .

= = = Thermoregulation = = =

There is conflicting evidence on whether the bigeye thresher is warm @-@ bodied like the common thresher (A. vulpinus) . In a 1971 study , Carey et al. probed the swimming muscles of two bigeye threshers with a thermistor needle and reported finding a temperature elevation of 1 @.@ 8 and 4 @.@ 3 ° C (3 @.@ 8 and 9 @.@ 1 ° F) compared to the ambient environment . However , an anatomical examination conducted by Sepulveda et al. in 2005 found that though the bigeye thresher possesses the aerobic red muscles responsible for generating heat in the common thresher , these muscles are arranged in two strips along the flanks just beneath the skin , as opposed to near the core of the body . There is also no blood vessel countercurrent exchange system (the rete mirabile) in the trunk to limit the loss of metabolic heat to the water . Based on these differences , the authors questioned earlier measurements and concluded it was unlikely that the bigeye thresher maintains an elevated body temperature . The bigeye thresher does possess a highly developed rete system around its brain and eyes . This is thought to function in buffering those sensitive organs against temperature changes during the shark 's daily migrations up and down the water column , which can be as much as 15 ? 16 ° C (27 ? 29 ° F) .

= = Human interactions = =

The bigeye thresher shark is rarely encountered by divers underwater and poses no danger . This species is or was taken by longline fisheries operated by many countries , including the United States , Japan , Spain , Brazil , Uruguay , and Mexico , and constitutes about 10 % of the pelagic shark catch . The bigeye thresher comprises 20 % of the longline catch off Cuba , where it is attracted at night using cyalume sticks (chemical lights) . It is also significant to Taiwanese fisheries , which land about 220 metric tons annually . The meat is marketed fresh , smoked , or dried and salted , though it is not highly regarded due to its mushy texture . The skin is used to make leather products , the liver oil for vitamins , and the fins for shark fin soup .

In the waters of the United States , this species is considered a nuisance bycatch of longlines , gillnets , and trawls . It is also occasionally caught in shark nets around beaches in South Africa . Along with the other thresher species , the bigeye thresher is listed as a game fish by the International Game Fish Association (IGFA) , and is pursued by recreational anglers off the United States , South Africa , and New Zealand . The bigeye thresher is highly susceptible to over @-@ exploitation due to its low lifetime fecundity . All three thesher shark species were assessed as Vulnerable by the International Union for Conservation of Nature (IUCN) in 2007 .