

= Porbeagle =

The porbeagle ( *Lamna nasus* ) is a species of mackerel shark in the family Lamnidae , distributed widely in the cold and temperate marine waters of the North Atlantic and Southern Hemisphere . In the North Pacific , its ecological equivalent is the closely related salmon shark ( *L. ditropis* ) . The porbeagle typically reaches 2 @. @ 5 m ( 8 @. @ 2 ft ) in length and a weight of 135 kg ( 298 lb ) ; North Atlantic sharks grow larger than Southern Hemisphere sharks and differ in coloration and aspects of life history . Gray above and white below , the porbeagle has a very stout midsection that tapers towards the long , pointed snout and the narrow base of the tail . It has large pectoral and first dorsal fins , tiny pelvic , second dorsal , and anal fins , and a crescent @-@ shaped caudal fin . The most distinctive features of this species are its three @-@ cusped teeth , the white blotch at the aft base of its first dorsal fin , and the two pairs of lateral keels on its tail .

The porbeagle is an opportunistic hunter that preys mainly on bony fishes and cephalopods throughout the water column , including the bottom . Most commonly found over food @-@ rich banks on the outer continental shelf , it makes occasional forays both close to shore and into the open ocean to a depth of 1 @, @ 360 m ( 4 @, @ 460 ft ) . It also conducts long @-@ distance seasonal migrations , generally shifting between shallower and deeper water . The porbeagle is fast and highly active , with physiological adaptations that enable it to maintain a higher body temperature than the surrounding water . It can be solitary or gregarious , and has been known to perform seemingly playful behavior . This shark is aplacental viviparous with oophagy , developing embryos being retained within the mother 's uterus and subsisting on non @-@ viable eggs . Females typically bear four pups every year .

Only a few shark attacks of uncertain provenance have been attributed to the porbeagle . It is well regarded as a game fish by recreational anglers . The meat and fins of the porbeagle are highly valued , which has led to a long history of intense human exploitation . However , this species cannot sustain heavy fishing pressure due to its low reproductive capacity . Direct commercial fishing for the porbeagle , principally by Norwegian longliners , led to stock collapses in the eastern North Atlantic in the 1950s , and the western North Atlantic in the 1960s . The porbeagle continues to be caught throughout its range , both intentionally and as bycatch , with varying degrees of monitoring and management . The International Union for Conservation of Nature ( IUCN ) has assessed the porbeagle as Vulnerable worldwide , and as either Endangered or Critically Endangered in different parts of its northern range .

= = Taxonomy = =

The etymology of the word " porbeagle " is obscure . A common suggestion is that it combines " porpoise " and " beagle " , referencing this shark 's shape and tenacious hunting habits . Another is that it is derived from the Cornish porth , meaning " harbor " , and bugel , meaning " shepherd " . The Oxford English Dictionary states that the word was either borrowed from Cornish or formed from a Cornish first element with the English " beagle " ; however , none of the proposed Cornish root words is fully satisfactory . The Dictionary also notes that there is no evidence for a connection to the French porc , meaning " swine " , or to porpoise , as has been proposed . Other common names for the porbeagle include Atlantic mackerel shark , Beaumaris shark , bottle @-@ nosed shark , and blue dog .

The first scientific description of the porbeagle was authored by French naturalist Pierre Joseph Bonnaterre in the 1788 Tableau encyclopédique et methodique des trois règnes de la nature , and based on an earlier 1769 account by Welsh naturalist Thomas Pennant . Bonnaterre named the shark *Squalus nasus* , the specific epithet *nasus* being Latin for " nose " . In 1816 , French naturalist Georges Cuvier placed the porbeagle into its own subgenus , *Lamna* , which later authors elevated to the rank of full genus .

= = Phylogeny and evolution = =

Several phylogenetic studies , based on morphological characters and mitochondrial DNA sequences , have established the sister species relationship between the porbeagle and the salmon shark ( *L. ditropis* ) , which occurs in place of it in the North Pacific . The genus *Lamna* evolved 65 ? 45 Ma . When its two extant species diverged from each other is uncertain , though the precipitating event was likely the formation of the ice cap over the Arctic Ocean , which would have isolated sharks in the North Pacific from those in the North Atlantic .

Fossilized porbeagle remains are known from Late Miocene epoch ( c . 7 @. @ 2 Ma ) deposits in Belgium and the Netherlands , Pliocene epoch ( 5 @. @ 3 ? 2 @. @ 6 Ma ) deposits in Belgium , Spain , and Chile , and Pleistocene epoch ( 2 @. @ 6 Ma to 12 @, @ 000 BP ) deposits in the Netherlands . However , *Lamna* teeth that closely resemble those of the porbeagle have been found in the La Meseta Formation on Seymour Island off the Antarctic Peninsula , which date to the middle to late Eocene epoch ( 50 ? 34 Ma ) . There is much taxonomic confusion regarding *Lamna* in the fossil record due to the high degree of variability in adult tooth morphology within species .

= = Distribution and habitat = =

The porbeagle has an almost global amphitemperate distribution , i.e. it is absent from the tropics ; in the North Pacific , its niche is assumed by the salmon shark . It is found mostly within 30 ? 70 ° N and 30 ? 50 ° S latitudes . In the North Atlantic , the northern limit of its range extends from the Newfoundland Grand Banks off Canada , through southern Greenland , to Scandinavia and Russia ; the southern limit of its range extends from New Jersey and Bermuda , through the Azores and Madeira , to Morocco . It is found in the Mediterranean Sea , but not the Black Sea . Normally , North Atlantic sharks only stray as far south as South Carolina and the Gulf of Guinea , but pregnant females from the western North Atlantic population are known to range into the Sargasso Sea , almost as far as Hispaniola , to give birth . In the Southern Hemisphere , the porbeagle apparently occupies a continuous band bound in the south by the Antarctic Convergence , and extending as far north as Chile and Brazil , the Western Cape province of South Africa , Australia to southern Western Australia and southern Queensland , and New Zealand . It is speculated that the porbeagle colonized the Southern Hemisphere during the Quaternary glaciation ( beginning c . 2 @. @ 6 Ma ) , when the tropical climate zone was much narrower than it is today .

Offshore fishing banks are the favored habitat of the porbeagle , though it can be found anywhere from a depth of 1 @, @ 360 m ( 4 @, @ 460 ft ) in oceanic basins to littoral ( close to shore ) waters less than 1 m ( 3 @. @ 3 ft ) deep , over the entire water column . There is a single , anomalous record from brackish water , of a juvenile in Mar Chiquita in Argentina . A tracking study off the British Isles has found substantial variation in the short @-@ term movements of this species , both between and within individuals . Vertical movements tended to increase with water depth and corresponding temperature stratification : in shallow , unstratified waters , sharks either showed no pattern in changing depth or made reverse diel movements , spending the day in shallow water and descending at night . In deeper , stratified waters , the sharks performed a regular diel migration , spending the day below the thermocline and rising towards the surface at night . The porbeagle favors water temperatures of 5 to 10 ° C ( 41 to 50 ° F ) , though it has been reported across a temperature range of 1 to 23 ° C ( 34 to 73 ° F ) .

Porbeagle populations in the Northern and Southern Hemispheres appear to be completely separate . There are two stocks in the North Atlantic , east and west , that seldom mix ; only one individual is known to have crossed the Atlantic , covering 4 @, @ 260 km ( 2 @, @ 650 mi ) from Ireland to Canada . Several discrete stocks are likely present in the Southern Hemisphere as well . This species segregates by size and sex in the North Atlantic , and at least by size in the South Pacific . For example , males outnumber females 2 : 1 off Spain , females are 30 % more numerous than males off Scotland , and immature males are predominant in the Bristol Channel . Older , larger sharks may frequent higher latitudes than younger individuals .

Seasonal migrations have been observed in porbeagles from both hemispheres . In the western North Atlantic , much of the population spends the spring in the deep waters of the Nova Scotia continental shelf , and migrates north a distance of 500 ? 1 @, @ 000 km ( 310 ? 620 mi ) to spend

late summer and fall in the shallow waters of the Newfoundland Grand Banks and the Gulf of St. Lawrence . In December , large mature females migrate south over 2 @, @ 000 km ( 1 @, @ 200 mi ) into the Sargasso Sea for pupping , keeping deeper than 600 m ( 2 @, @ 000 ft ) during the day and 200 m ( 660 ft ) at night so as to stay in the cooler waters beneath the Gulf Stream . In the eastern North Atlantic , porbeagles are believed to spend spring and summer in shallow continental shelf waters , and disperse northwards to overwinter in deeper waters offshore . Migrating sharks may travel upwards of 2 @, @ 300 km ( 1 @, @ 400 mi ) , though once they reach their destination they tend to remain within a relatively localized area . In the South Pacific , the population shifts north past 30 ° S latitude into subtropical waters in winter and spring , and retreats south past 35 ° S latitude in summer , when sharks are frequently sighted off subantarctic islands .

#### = = Description = =

The porbeagle is a very stout @-@ bodied shark with a fusiform ( spindle @-@ like ) shape . The long , conical snout tapers to a sharp point , and is supported by enlarged , highly calcified rostral cartilages . The eyes are large and black , without nictitating membranes ( protective third eyelids ) . The small , S @-@ shaped nostrils are positioned in front of and below the level of the eyes . The mouth is large and strongly curved , with moderately protrusible jaws . North Atlantic sharks have 28 ? 29 upper tooth rows and 26 ? 27 lower tooth rows , while Southern Hemisphere sharks have 30 ? 31 upper tooth rows and 27 ? 29 lower tooth rows . Each tooth has a strongly arched base and a nearly straight , awl @-@ like central cusp , which is flanked by a pair of smaller cusplets in all but the smallest individuals . The five pairs of gill slits are long and precede the pectoral fin bases .

The pectoral fins are long and narrow . The first dorsal fin is large and high , with a rounded apex , and originating just behind the pectoral fin bases . The pelvic fins are much smaller than the first dorsal fin . The second dorsal and anal fins are smaller still , and placed about even with each other on narrow bases that allow pivoting from side to side . The sides of the caudal peduncle are expanded into prominent lateral keels . A second , shorter pair of keels are present below the main keels . The caudal fin is large and crescent @-@ shaped , with the lower lobe almost as long as the upper ; there are both dorsal and ventral depressions ( precaudal pits ) at the caudal fin base , and a deep ventral notch near the tip of the upper caudal fin lobe . The skin is soft and covered by tiny , flattened dermal denticles ( scales ) , lending a velvety texture . Each denticle has three horizontal ridges that lead to teeth on the posterior margin .

The dorsal coloration is a medium to dark gray or slate , extending to the bases of the pectoral fins . The underside is white ; adults in the Southern Hemisphere often have dark coloring under the head and dusky blotches scattered over the belly . The free rear tip of the first dorsal fin is abruptly light gray or white , a feature unique to this species . The porbeagle may attain a length of 3 @. @ 7 m ( 12 ft ) , though this is uncertain and may have resulted from confusion with other mackerel shark species . A more typical length is 2 @. @ 5 m ( 8 @. @ 2 ft ) . Female sharks grow larger than males in the North Atlantic , with maximum confirmed fork lengths ( snout tip to caudal fin fork ) of 2 @. @ 5 m ( 8 @. @ 2 ft ) for males and 3 @. @ 0 m ( 9 @. @ 8 ft ) for females . Southern Hemisphere sharks are smaller and the two sexes are similar in size , with males and females attaining fork lengths of 2 @. @ 0 m ( 6 @. @ 6 ft ) and 2 @. @ 1 m ( 6 @. @ 9 ft ) respectively . Most porbeagles weigh no more than 135 kg ( 298 lb ) , with the record being a 230 kg ( 510 lb ) individual caught off Caithness , Scotland in 1993 .

#### = = Biology and ecology = =

Fast and energetic , the porbeagle can be found singly or in groups . Its fusiform body , narrow caudal peduncle with lateral keels , and crescent @-@ shaped tail are adaptations for efficiently sustaining speed , which have also been independently evolved by tunas , billfishes , and several other groups of active fishes . It and the salmon shark are the thickest @-@ bodied members of their family ( length @-@ depth ratio approaching 4 @. @ 5 ) , and consequently have the stiffest swimming style : they oscillate their tails while holding their bodies mostly rigid , which confers

propulsive power with high energy efficiency , but at the cost of maneuverability . The large gill surface area of the porbeagle allows more oxygen to be delivered to its tissues . It also has a short band of aerobic " red muscle " along each side , which can contract independently of the regular " white muscle " at a lower energy cost , enhancing the shark 's stamina .

Porbeagles are among the few fishes that exhibit apparent play behavior . There are reports , principally off the Cornish coast , of this species rolling and repeatedly wrapping itself in long kelp fronds near the surface ; this activity may have an exploratory or self @-@ stimulatory purpose , though alternately the shark may be attempting to feed on small kelp organisms or scrape off parasites . In addition , porbeagles within a group have been seen chasing each other , and they will reportedly " play with anything floating on the water " : individuals have been observed prodding , tossing , or biting natural and artificial objects , including pieces of driftwood and balloon floats used by anglers .

Great white sharks ( *Carcharodon carcharias* ) and killer whales ( *Orcinus orca* ) are plausible , albeit undocumented , predators of the porbeagle . There is a record of a small individual caught off Argentina that bore bite marks from a copper shark ( *Carcharhinus brachyurus* ) or similar species , but it is uncertain whether the porbeagle was the target of attempted predation or if the two were simply involved in interspecific aggression . Known parasites of this species include the tapeworms *Dinobothrium septaria* and *Hepatoxylon trichiuri* , and the copepods *Dinemoura producta* , *Laminifera doello @-@ juradoi* , and *Pandarus floridanus* . Natural annual mortality is low , estimated to be 10 % for juveniles , 15 % for adult males , and 20 % for adult females in the western North Atlantic .

#### == = Feeding == =

The porbeagle is an active predator that predominantly ingests small to medium @-@ sized bony fishes . It chases down pelagic fishes such as lancet fish , mackerel , pilchards , herring , and sauries , and forages near the bottom for groundfishes such as cod , hake , icefish , dories , sand lances , lumpsuckers , and flatfish . Cephalopods , particularly squid , also form an important component of its diet , while smaller sharks such as spiny dogfish ( *Squalus acanthias* ) and tope sharks ( *Galeorhinus galeus* ) are rarely taken . Examinations of porbeagle stomach contents have also found small shelled molluscs , crustaceans , echinoderms , and other invertebrates , which were likely ingested incidentally , as well as inedible debris such as small stones , feathers , and garbage fragments .

In the western North Atlantic , porbeagles feed mainly on pelagic fishes and squid in spring , and on groundfishes in the fall ; this pattern corresponds to the spring @-@ fall migration of these sharks from deeper to shallower waters , and the most available prey types in those respective habitats . Therefore , the porbeagle seems to be an opportunistic predator without strong diet specificity . During spring and summer in the Celtic Sea and on the outer Nova Scotian Shelf , porbeagles congregate at tidally induced thermal fronts to feed on fish that have been drawn by high concentrations of zooplankton . Hunting porbeagles regularly dive from the surface all the way to the bottom , cycling back every few hours ; this vertical movement may aid in the detection of olfactory cues . There is a report of a one @-@ year @-@ old porbeagle 1 m ( 3 @. 3 ft ) long , which had fed on krill and polychaete worms .

#### == = Life history == =

The timing of the porbeagle 's reproductive cycle is unusual in that it is largely similar in both hemispheres , rather than being offset by six months . This suggests that its reproduction is not significantly affected by temperature or day length , perhaps owing to its endothermic physiology . Mating takes place mainly between September and November , though females with fresh mating scars have been reported as late as January off the Shetland Islands . The male bites at the female 's pectoral fins , gill region , and flanks while courting and to hold on for copulation . Two mating grounds are known for western North Atlantic porbeagles , one off Newfoundland and the other on

Georges Bank in the Gulf of Maine . Adult females have a single functional ovary , on the right , and two functional uteruses . They probably reproduce every year . The litter size is typically four , with two embryos oriented in opposing directions sharing each uterus ; on rare occasions a litter may contain as few as one or as many as five pups . The gestation period is 8 ? 9 months .

Like other members of its family , the porbeagle is aplacental viviparous with oophagy , i.e. the main source of embryonic nutrition are unfertilized eggs . During the first half of pregnancy , the mother ovulates enormous numbers of tiny ova , packed into capsules up to 7 @. @ 5 cm ( 3 @. @ 0 in ) long , into her uteruses . A newly conceived embryo is sustained by a yolk sac and emerges from its egg capsule at 3 @. @ 2 ? 4 @. @ 2 cm ( 1 @. @ 3 ? 1 @. @ 7 in ) long . At this time , the embryo has well @-@ developed external gills and a spiral valve intestine . When the embryo is 4 @. @ 2 ? 9 @. @ 2 cm ( 1 @. @ 7 ? 3 @. @ 6 in ) long , it has resorbed its external gills and most of its yolk sac , but cannot yet feed as it lacks the means to open egg capsules . At a length of 10 ? 12 cm ( 3 @. @ 9 ? 4 @. @ 7 in ) , the embryo grows two massive , recurved " fangs " in the lower jaw for tearing open capsules , as well as two much smaller teeth in the upper jaw . It begins to feed voraciously on yolk , acquiring an enormously distended stomach ; to accommodate this , the muscles on the belly split down the middle and the skin on the abdomen stretches greatly .

At 20 ? 21 cm ( 7 @. @ 9 ? 8 @. @ 3 in ) long , the embryo appears pink because it lacks pigment except in its eyes , and its head and gill region are laterally enlarged and gelatinous . The yolk stomach can comprise up to 81 % of the embryo 's total weight when it is 30 ? 42 cm ( 12 ? 17 in ) long . The embryo gains pigment and sheds its fangs at a length of 34 ? 38 cm ( 13 ? 15 in ) . Around this time , the mother stops producing ova . From then on , the embryo relies mainly on the yolk stored in its stomach , though it may continue to feed on remaining eggs by squishing the capsules between its jaws or swallowing them whole . It begins to transfer its energy stores from its stomach to its liver , causing the former to shrink and the latter to grow exponentially . The embryo is essentially fully pigmented by a length of 40 cm ( 16 in ) , and has assumed its newborn appearance by a length of 58 cm ( 23 in ) . By then , its stomach has shrunk enough for the abdominal muscles to close , leaving what has been termed an " umbilical scar " or " yolk sac scar " ( neither is accurate ) . Several series of single @-@ cusped teeth grow in both jaws , though they lie flat and remain non @-@ functional until birth .

Newborn porbeagles measure 58 ? 67 cm ( 23 ? 26 in ) long and do not exceed 5 kg ( 11 lb ) . Up to a tenth of the weight is made up of the liver , though some yolk also remains in its stomach and continues to sustain the pup until it learns to feed . The overall embryonic growth rate is 7 ? 8 cm ( 2 @. @ 8 ? 3 @. @ 1 in ) per month . Sometimes one pup in a uterus is much smaller than the other , but otherwise normal . These " runts " may result from a dominant , forward @-@ facing embryo eating most of the eggs as they arrive , and / or the mother being unable to provide an adequate egg supply for all her offspring . Birthing occurs from April to September , peaking in April and May ( spring @-@ summer ) for North Atlantic sharks and June and July ( winter ) for Southern Hemisphere sharks . In the western North Atlantic , birth occurs well offshore in the Sargasso Sea at depths of around 500 m ( 1 @, @ 600 ft ) .

Both sexes grow at similar rates until the onset of maturation , with females maturing later and at a larger size than males . In the first four years of life , the annual growth rate is 16 ? 20 cm ( 6 @. @ 3 ? 7 @. @ 9 in ) and similar in both hemispheres ; thereafter , sharks from the western South Pacific begin to grow slower than those from the North Atlantic . In the North Atlantic , males mature at a fork length of 1 @. @ 6 ? 1 @. @ 8 m ( 5 @. @ 2 ? 5 @. @ 9 ft ) and an age of 6 ? 11 years , and females at a fork length of 2 @. @ 0 ? 2 @. @ 2 m ( 6 @. @ 6 ? 7 @. @ 2 ft ) and an age of 12 ? 18 years . In the Southwest Pacific , males mature at a fork length of 1 @. @ 4 ? 1 @. @ 5 m ( 4 @. @ 6 ? 4 @. @ 9 ft ) and an age of 8 ? 11 years , and females at a fork length of 1 @. @ 7 ? 1 @. @ 8 m ( 5 @. @ 6 ? 5 @. @ 9 ft ) and an age of 15 ? 18 years . The oldest porbeagle on record was 26 years of age and measured 2 @. @ 5 m ( 8 @. @ 2 ft ) long . The maximum lifespan of this species appears to be 30 ? 40 years in the Atlantic , but could be as much as 65 years in the South Pacific .

== Thermoregulation ==

Like other members of its family , the porbeagle is endothermic : metabolic heat generated by its red muscles is conserved within the body by specialized systems of blood vessels called retia mirabilia ( Latin for " wonderful nets " ; singular rete mirabile ) , that act as highly efficient countercurrent heat exchangers . The porbeagle has several rete mirabile systems : the orbital retia accessing its brain and eyes , the lateral cutaneous retia accessing its swimming muscles , the suprahepatic rete accessing its viscera , and the kidney rete .

Among sharks , the porbeagle 's capacity for elevating body temperature is second only to the salmon shark 's . Its red muscles are located deep within the body , adjacent to the spine , and its lateral rete is composed of over 4 @, @ 000 small arteries arranged in bands . It has one of the highest core temperatures within its family , 8 ? 10 ° C ( 14 ? 18 ° F ) warmer than that of the surrounding water . Being warm @-@ bodied may allow this shark to maintain higher cruising speeds , hunt in deep water for extended periods of time , and / or enter higher latitudes during winter to exploit food resources not available to other sharks . The orbital retia of the porbeagle can raise the temperature of its brain and eyes by 3 ? 6 ° C ( 5 ? 11 ° F ) , and likely serve to buffer those sensitive organs against the large temperature shifts that accompany changes in depth ; potential benefits of this include increased visual acuity and reduced response times .

= = Human interactions = =

The porbeagle has very rarely , if ever , bitten swimmers or boats . As of 2009 , the International Shark Attack File attributes three bites to this species , one provoked and none fatal , and two on boats . One older anecdote tells of a fisherman who provoked a porbeagle into leaping from the water and tearing his clothes . In another account of a swimmer bitten by a " mackerel shark " , the species responsible could easily have been a misidentified shortfin mako or great white shark . Recently in the North Sea , adult porbeagles have been filmed charging at divers working on oil platforms , sometimes even brushing lightly against them without doing harm . These rushes do not appear to have predatory intent and may instead be motivated by curiosity or defense .

At one time , porbeagles were regarded as nuisances by some commercial fishers because they damaged lighter fishing gear intended for smaller species and stole hooked fish from lines . This shark is highly valued as a game fish by sport fishers in Ireland , the United Kingdom , and the United States . It fights strongly on hook @-@ and @-@ line , but does not usually jump into the air like the related shortfin mako . Novice anglers often mistake this shark for the mako , which has earned it the affectionate moniker " fako " in New England . The International Game Fish Association keeps records on the porbeagle .

= = Commercial fishing = =

Prized for its meat and fins , the porbeagle has long been under heavy fishing pressure . The meat is sold fresh , frozen , or dried and salted , and ranks among the most valuable of any shark : in 1997 and 1998 it had a wholesale price of EUR 5 ? 7 / kg , four times that of the blue shark ( *Prionace glauca* ) . Most of the demand comes from Europe , though the United States and Japan also import this species . The fins are shipped to East Asia for use in shark fin soup . The remainder of the shark may also be utilized , for production of leather , liver oil , and fishmeal . International trade in the porbeagle appears to be significant , but remains unquantified as shark products tend not to be reported to the species level , and many consist of a mix of various species . This shark is caught most readily on longlines , but is also susceptible to gillnets , driftnets , trawls , and handlines . It is valuable enough to be generally retained when caught as bycatch ; if storage space cannot be spared it may be finned and the carcass discarded .

Intensive fishing for the porbeagle dates back the 1930s , when Norway and to a lesser extent Denmark began operating longline vessels in the western North Atlantic . The Norwegian annual catch rose from 279 tons in 1926 to 3 @, @ 884 tons in 1933 , and peaked at around 6 @, @ 000 tons in 1947 , with the resumption of fishing after World War II . Soon after the stock collapsed : Norwegian annual catches declined steadily to 1 @, @ 200 ? 1 @, @ 900 tons from 1953 to 1960 ,

160 ? 300 tons in the early 1970s , and 10 ? 40 tons in the late 1980s to early 1990s . Similarly , Danish annual catches fell from 1 @, @ 500 tons in the early 1950s to under 100 tons in the 1990s . Presently , many European countries continue to catch porbeagles in the eastern North Atlantic , with Norway , Denmark , France , and Spain foremost among them . France and Spain began to target porbeagles in the eastern North Atlantic in the 1970s . French fishers operate mainly in the Celtic Sea and the Bay of Biscay , and saw a decline from an annual catch of over 1 @, @ 000 tons in 1979 to 300 ? 400 tons in the late 1990s . Catches by Spanish fishers have been highly variable , ranging from negligible to over 4 @, @ 000 tons per year , which may reflect shifts of fishing effort into historically less @-@ exploited waters .

As porbeagles had become scarce in the eastern North Atlantic , in the 1960s the Norwegian fishing fleet moved west to the waters off New England and Newfoundland . A few years later , they were joined by longline vessels from the Faroe Islands . Norwegian annual catches rose from 1 @, @ 900 tons in 1961 to over 9 @, @ 000 tons in 1965 ; the catch was largely exported to Italy , where porbeagle ( smeriglio ) is an extremely popular food fish . Again , the stock collapsed , this time in only six years : by 1970 Norwegian catches had fallen to under 1 @, @ 000 tons per year , and Faroese catches observed a similar trend . With the population decimated , most fishers moved on or switched to other species . Porbeagle numbers gradually recovered in the ensuing 25 years , to about 30 % of pre @-@ exploitation levels . In 1995 , Canada established an Exclusive Economic Zone ( EEZ ) and became the primary fisher of porbeagles in the region . Between 1994 and 1998 , Canadian fishing vessels landed 1 @, @ 000 ? 2 @, @ 000 tons per year , which depleted the population to 11 ? 17 % of pre @-@ exploitation levels by 2000 . Strict regulations and greatly reduced fishing quotas introduced in 2000 have since begun to reverse the stock decline , though recovery of the stock is projected to take decades due to the low productivity of the species . There is evidence that incidental artificial selection caused by heavy fishing has led to a compensatory growth response , i.e. faster growth and earlier maturation .

In the Southern Hemisphere , commercial fishing for the porbeagle is mostly undocumented . Substantial numbers are caught incidentally by pelagic longline fisheries targeting more valuable species such as southern bluefin tuna ( *Thunnus maccoyii* ) , swordfish ( *Xiphus gladius* ) , and Patagonian toothfish ( *Dissostichus eleginoides* ) , including vessels operated by Japan , Uruguay , Argentina , South Africa , and New Zealand . Porbeagle catches by the Uruguayan tuna pelagic longline fishery peaked in 1984 with 150 tons landed . Records of catch per unit effort ( CPUE ) for this fishery have shown a 90 % decline in porbeagle landings from 1988 to 1998 , though it is uncertain whether this reflects a real population decline or changing fishing habits . New Zealand has reported annual catches of 150 ? 300 tons , mostly of immature individuals , from 1998 to 2003 .

### == = Conservation == =

The rapid collapse of porbeagle stocks on both sides of the North Atlantic is often cited as archetypal of the " boom and bust " pattern of most shark fisheries . Factors including a small litter size , long maturation time , and the capture of multiple age classes all contribute to this shark 's susceptibility to overfishing . The International Union for Conservation of Nature has assessed the porbeagle globally as Vulnerable , Endangered in the western North Atlantic ( including the Baltic ) , and Critically Endangered in the eastern North Atlantic and Mediterranean Sea .

The porbeagle is listed on Annex 1 ( Highly Migratory Species ) of the UN Convention on the Law of the Sea ( UNCLOS ) and on Annex 1 of the Conservation of Migratory Species ( CMS ; also known as the Bonn Convention ) Migratory Shark Memorandum of Understanding . This species benefits from bans on shark finning instituted by several nations and supranational entities , including Canada , the United States , Brazil , Australia , the European Union , and the International Commission for the Conservation of Atlantic Tunas ( ICCAT ) . Although the Animals Committee of the UN Convention on International Trade in Endangered Species of Wild Fauna and Flora ( CITES ) recommended additional conservation actions for the porbeagle , CITES rejected proposals to list the species in 2008 and again in 2010 . In March 2013 , the porbeagle was listed on Appendix II of

CITES , allowing for increased regulation in the international trade of this species .

In March 2015 , The National Marine Fisheries Service responded to a court order to compile information as to whether the shark will be listed as threatened or endangered under The Endangered Species Act .

===== Southern Hemisphere =====

The only regulation of porbeagle catches in the Southern Hemisphere is New Zealand 's total allowable catch ( TAC ) of 249 tons per year , instituted in 2004 .

===== Eastern North Atlantic and Mediterranean Sea =====

In the eastern North Atlantic , porbeagle fisheries have never been restricted despite well documented historical declines . Since 1985 , Norway and the Faroe Islands are allowed annual quotas of 200 tons and 125 tons respectively from European Community waters . Although these quotas are lower than the originals set in 1982 ( 500 tons for Norway and 300 tons for the Faroe Islands ) , they are still consistently higher than the yearly total porbeagle catch in the region and thus have no practical effect .

In the Mediterranean Sea , the porbeagle is on the verge of extinction , with a population decline of over 99 % since the mid 20th century . Its range has contracted to the waters around the Italian Peninsula , where there may be a nursery area . Only a few dozen specimens have been recorded in the past few decades , from scientific surveys , swordfish fishery bycatch , and sport fishers . In 1995 , it was included in Annex III ( " species whose exploitation is regulated " ) of the Barcelona Convention Protocol on protected areas and biodiversity in the Mediterranean , which has not been ratified . In 1997 , it was listed on Appendix III of the Bern Convention ( the Convention on the Conservation of European Wildlife and Natural Habitats ) . However , these listings have yet to result in the implementation of new management plans , despite the recognized need for urgent action .

The European Union prohibits EU vessels from fishing for , retaining , boarding , transhipping or landing porbeagle sharks in all waters since January 2012 . It is subject to a zero total allowable catch in EU waters by any vessel .

===== Western North Atlantic =====

The western North Atlantic porbeagle population has a more positive prospect than in the eastern North Atlantic . Fishing in Canadian waters was originally regulated by the 1995 Fisheries Management Plan for pelagic sharks in Atlantic Canada , which established an annual quota of 1 500 tons , restricted the time , place , and gear types allowed for commercial fishing , and set limits for bycatch and recreational fishing . In 2000 ? 2001 , Fisheries and Oceans Canada ( DFO ) prepared a detailed population model and concluded that a quota of 200 ? 250 tons would allow for population growth , resulting in a quota of 250 tons being adopted for the period of 2002 ? 2007 . The mating ground off of Newfoundland was also closed to shark fishing . In 2004 , the Committee on the Status of Endangered Wildlife in Canada ( COSEWIC ) listed the porbeagle as Endangered , largely on the basis of the low population abundance ( < 25 % of original numbers ) . Canada decided not to list the species under its Species At Risk Act , but further reduced the total fishing quota to 185 tons . In US waters , the 1993 Fishery Management Plan for Sharks of the Atlantic Ocean sets an annual quota of 92 tons ( post processing ) for the porbeagle . In 2006 , this species was listed as a Species of Concern by the National Marine Fisheries Service ( NMFS ) , meaning that it merits conservation concern but there is insufficient data for inclusion on the US Endangered Species Act .