Before the Secretary of Commerce

Petition to List Northwest Atlantic Porbeagle Sharks (*Lamna nasus*) as an Endangered Species

Photo source: Discovery Channel

January 21, 2010

Executive Summary

This is a petition to list the Northwest Atlantic population of *Lamna nasus*, commonly known as the porbeagle shark, as an endangered species throughout all or a significant portion of its range pursuant to the federal Endangered Species Act (ESA).

Porbeagles are a long-lived, slow maturing fish. Females take 13 years to reach sexual maturity and can live up to 45 years. Females spawn every one to two years, giving live birth to an average litter of four pups. They are particularly vulnerable to overexploitation due to their late onset of sexual maturity and low lifetime fecundity.

Porbeagle populations in the Northwest Atlantic have suffered two major declines. The first began in the 1960s with the onset of large-scale commercial fisheries targeting them. The population collapsed within six years and after a decade of low catches and modest recovery collapsed again in the 1990s, when fishing effort again increased. Porbeagles have suffered a loss of up to 90% of their virgin biomass. Mature females may still be declining and current fisheries catches are skewed to juveniles aged three years or less.

Given the species' limited ability to recover in a reasonable time frame, it is doubtful that current fishing effort is sufficiently low to allow for recovery. At present, there is no clear evidence that the decline in porbeagle abundance has ceased and experts have opined that uncertainties in the modeling of population trajectories indicate that it has not.

International bodies have expressed grave concern for the Northwest Atlantic population of porbeagles. The International Union for Conservation of Nature (IUCN) lists them as "endangered." In 2004, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, a scientific body) recommended that Canada list them as "endangered" under the Canadian Species at Risk Act (SARA) (defining an "endangered" species as "a wildlife species that is facing imminent extirpation or extinction"). *See* Species at Risk Act, R.S.C., ch. 29 Canada's decision not to list them under SARA was based almost entirely on economic impacts that would result from the listing. The COSEWIC report stated:

> This wide-ranging oceanic shark is the only representative of its genus in the North Atlantic. The abundance has declined greatly since Canada entered the fishery in the 1990s after an earlier collapse and partial recovery. Fishery quotas have been greatly reduced, and the fishery has been closed in some areas where mature sharks occur. The landings now are comprised mostly of juveniles. Its life history characteristics, including late maturity and low fecundity, render this species particularly vulnerable to overexploitation.

Porbeagles are also proposed for addition to Appendix II under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a listing supported by the United Nations Food and Agriculture Organization. The National Marine Fisheries Service (NMFS) proposed to prohibit landings of porbeagles as recently as 2007, but declined to do so in the wake of objections by fisheries and regional fishery managers.

A 2009 International Council for Exploration of the Sea and the International Commission for the Conservation of Atlantic Tunas (ICES/ICCAT) workshop found that various models lead to population trajectories for porbeagles that include a possible decline since 2001. Mature female spawners in the population may still be declining and the current commercial catch of porbeagles is dominated by those at age 3, which is a decade younger than their sexual maturity. Under-reporting of catches by high seas fleets may be significant and, according to Canadian scientists, may undermine Canada's management regime and push porbeagles closer to a crash. There are no mandates regulating the amount of catch of porbeagles on the high seas.

Marine species suffering similar rates of decline due to overexploitation (e.g., humpback whales and Steller sea lions) were listed as endangered by the NMFS under the ESA. The NMFS should designate porbeagle sharks as endangered under the ESA.

Notice of Petition

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PETITIONER:

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The Petitioner The Humane Society of the United States ("The HSUS" or "Petitioner") hereby formally petitions the Secretary of the United States Department of Commerce ("Secretary"), pursuant to 16 U.S.C. § 1533(b)(3), 5 U.S.C. § 553(e) and 50 C.F.R. § 424.14(a), to list porbeagle sharks (*Lamna nasus*) as an endangered species under the Endangered Species Act, 16 U.S.C. §§ 1531, *et seq*.

I. Petitioner

The HSUS is a national, non-profit environmental organization with more than 12 million members and constituents nationwide, including more than 1.5 million members and activists in the Atlantic coastal states from Maine through New York, within the common range of porbeagle sharks. In these Atlantic coastal states, The HSUS works actively to improve the management of marine and estuarine resources. The HSUS's members regularly visit coastal areas and otherwise enjoy the ocean and its inhabitants. Our members enjoy seeing animals alive in the wild, are distressed when they view dead sharks, which they believe have been unnecessarily killed in recreation and are concerned about the decline in shark numbers and their risk of extinction. The HSUS can be contacted in Washington, DC at 2100 L St. NW, Washington, DC 20037, phone number (202) 452-1100.

II. Specific Requested Actions

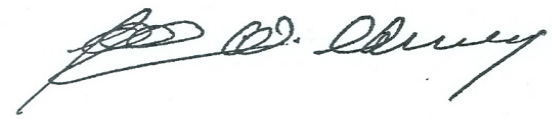
Petitioner requests that the Secretary, through the National Marine Fisheries Service (NMFS), list the porbeagle shark (*Lamna nasus*) as an endangered species in the Northwest Atlantic and thereby prohibit the take, including fishing, of porbeagle sharks.

III. The NMFS Must Issue an Initial Finding that the Petitioned Action May Be Warranted within 90 Days

Upon receipt of this petition, the ESA requires NMFS to initiate a specific response process. First, within 90 days, the NMFS must "make a finding as to whether the petition presents substantial scientific or commercial information indicating that the petition action may be warranted." 16 U.S.C. § 1533(b)(3)(A). Petitioners need not demonstrate that the proposed revision action is warranted, rather, Petitioners must only present information demonstrating that such action may be warranted. *Id.* Within 12 months of receiving this petition, NMFS is required to determine how it will proceed with the requested listing, moving forward with a proposed rule if it determines such action is warranted. *Id.* § 1533(b)(3)(B). A decision to list must be based on "best scientific and commercial data available." *Id.* § 1533(b)(1)(A).

While The Petitioner believes that the best available science demonstrates that listing porbeagle sharks as endangered *is* in fact warranted, there can be no reasonable dispute that the available information indicates that listing the species as endangered or threatened *may* be warranted, including because the IUCN has declared them to be endangered and a scientific body in Canada has recommended endangered status for this population as well.

Accordingly, the NMFS must promptly make a positive initial finding on the petition and commence a status review, as required by 16 U.S.C. § 1533(b)(3)(A).



Date: This 21st day of January 2010.

John W. Grandy, Ph. D.

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I. Introduction

Since 1961, porbeagle sharks (*Lamna nasus*) in the Northwest Atlantic have suffered disastrous declines in their population as a result of commercial fisheries. In 2006, the NMFS listed the species as a "species of concern," largely as a result of a loss of up to 90% of the virgin population in just the past 50 years (NMFS 2006); 71 Fed. Reg. 61,022 (Oct. 17, 2006).[1]

Further, in 2006 the International Union for Conservation of Nature (IUCN) listed the Northwest Atlantic population of porbeagles as "endangered" with the justification that porbeagles in the Northwest Atlantic have been "seriously overexploited." This overexploitation has resulted in a population decline of between 11% and 17% of virgin biomass within a three generation period for this species and in the number of female spawners being estimated at only 10% of the virgin abundance (IUCN 2006).

In 2004, the Committee on the Status Endangered Wildlife in Canada (COSEWIC) conducted a scientific review of the status of porbeagles (COSEWIC 2004), and concluded that the species was endangered and should be so listed under Canada's Species at Risk Act (SARA). Canada did not follow this scientific advice, and instead issued a reduced quota.

Although management measures have been taken by both the United States and Canada in an attempt to reduce fishery-related mortality, it is not clear that declines have been reversed and there is some evidence that they may be continuing, particularly in light of under-reporting of actual mortality.

II. Species Account

A. Biology and Status

1. Physical Description

Porbeagles are a shark in the family *Lamnidae*, also known as mackerel sharks. Both their dorsal and lateral surfaces are dark bluish to gray in color, though the ventral surface of their head and abdomen are white in the northern hemisphere. They have a heavy spindle-shaped body with a moderately long conical snout. Their gill slits are visibly large. Among their distinguishing features, the caudal peduncle is strongly keeled, with short secondary keels on the caudal base, with a crescent-shaped caudal fin. The tip of their first dorsal fin is free of white coloration (FMNH, undated).

Porbeagles are distinguished from white sharks by spike-like smooth-edged teeth and by the position of their second dorsal fin, which is directly over the anal fin. The presence of tooth cusplets and secondary caudal fin distinguish them from shortfin mako sharks. That being said, recreational fishermen often refer to them as "fakos" because of their general resemblance to mako sharks and have difficulty as well distinguishing them from great white sharks. (New

[1] A Species of Concern is a species for which NMFS "has some concerns regarding status and threats but . . . insufficient information is available to indicate a need to list the species under the ESA." 69 Fed. Reg. 19,975 (Apr. 15, 2004).

England Sharks, Undated a; BigFish Bait, Undated; Coastsider Undated). They reach a maximum size of 11.6 feet (365 cm) total length, with some variability in estimates for size at reproductive maturity (FMNH, undated). They share the ability to thermo-regulate with other members of the mackerel shark family, maintaining a body temperature 12-18º above ambient water temperature.

2. Historic Range, Present Range and Stock Structure

Porbeagles are wide-ranging in both coastal and pelagic waters throughout temperate and cold-temperate waters worldwide and are most common on continental shelves in the North Atlantic, in the southern Atlantic, southern Indian Ocean, southern Pacific and Antarctic Ocean (IUCN 2006).

In the Northwest Atlantic, porbeagles are found off the coast of Greenland, Canada, and the United States, including Maine, Massachusetts, and Rhode Island. They are found more rarely off New York and New Jersey, and they have been sighted as far south as South Carolina and Bermuda (COSEWIC 2004). In the Northeast Atlantic, they are found from Iceland through the Norwegian Sea, to the Barents Sea around Scandinavia. They are also found in Russian waters and along the European coast to the Straits of Gibraltar and south to the Azores.

There is no evidence of mixing of these Northwest and Northeast Atlantic stocks (COSEWIC 2004). Both historic and recent tagging studies have shown almost no trans-Atlantic movements, implying that the two North Atlantic populations are distinct (ICES/ICCAT 2009). There is no evidence of genetic exchange between the North Atlantic and southern hemisphere populations (Stevens et al. 2006). The International Council for Exploration of the Sea and the International Commission for the Conservation of Atlantic Tunas (ICES/ICCAT) workshop concluded that there is a single stock of porbeagle in the Northwest Atlantic north of 35º north and west of 42º west. A working group of ICES/ICCAT considered that, for purposes of fisheries catch, the Northeast and Northwest Atlantic stocks can be separated at 40º west longitude (ICES/ICCAT 2009).

Studies in the Northwest Atlantic show that 90% of tagged sharks moved less than 500 nautical miles from their original tagging location (ICES/ICCAT 2009). While they are more common on continental shelves to depths of 200m, they have been caught at depths of 350-700 m (CITES 2007).

There is evidence that porbeagles in the Northwest Atlantic migrate annually along the coast between the Gulf of Maine and Newfoundland (Campana and Joyce 2004). The Canadian Department of Fisheries and Oceans (DFO) concludes that mature porbeagles are rarely seen in the winter and spring, showing sex-specific and seasonal migration of mature sharks toward mating grounds off southern Newfoundland in the spring. An additional area, believed to be a mating ground, was discovered in 2008 on George's Bank (Canadian Press 2008). The birthing grounds for the porbeagle shark in the Northwest Atlantic remain unknown (CITES 2007).

There is little historical information available on changes in geographic range of this species over time. However, an analysis done for Canadian DFO concluded that, for porbeagles in the

Northwest Atlantic, there does not appear to have been any change in area of occupancy or degree of fragmentation since 1961 when commercial fishing effort increased dramatically (Campana et al. 2003). Further, evidence from tagging studies indicates that introduction of individuals from other areas would not re-establish the porbeagle shark population in the Northwest Atlantic (SARA registry).

3. Life History, Longevity and Growth

Porbeagle sharks reach sexual maturity at a late age and have low fecundity. Their life span is between 25 and 46 years (Gibson and Campana 2005). They give live birth to a litter of approximately four young (range two to six) who are born after a gestation of approximately eight to nine months (Gibson and Campana 2005). At birth the pups are 65-80 cm in length.

Males and females grow at similar rates until males reach sexual maturity at age 8 (fork length of 162-185 cm), after which their rate of growth declines (Gibson and Campana 2005, Campana et al. 2003). Similarly, female growth rate declines after they reach sexual maturity at approximately 13 years and 210-230 cm fork length (Campana et al. 2003).

4. Habitat

Porbeagle sharks inhabit cool and temperate waters with temperatures between 2-18º C, with a preference in the Northwest Atlantic for temperatures between 5-10º C (Campana and Joyce 2004). Although they are most common from near surface to 200m depth along continental shelves, catches have been reported at depths ranging from 350-700m (COSEWIC 2004). In the summer they are often found inshore, but may range well offshore in association with submerged banks and reefs (COSEWIC 2004). Although the pupping grounds are not known for the Northwest Atlantic population, there is a presumed mating ground off southern Newfoundland and the entrance to the Gulf of St. Lawrence (Campana and Joyce 2004, CITES 2007). Ongoing tagging studies with pop-up tags may reveal spring pupping areas.

5. Prey

Porbeagles are an apex predator with few natural predators. They feed on fish, squid and some small sharks but do not prey on marine mammals (CITES 2009).

Porbeagle sharks are opportunistic predators, and feed in colder waters, primarily on midwater fish in the spring and groundfish in shallower waters in the fall (Campana and Joyce 2004). There may be an evolutionary advantage to feeding in colder waters where there is less competition for prey resources among predators that are less capable of thermoregulation (Campana and Joyce 2004). Indeed the fishery catch rate for porbeagles was highest at intermediate sea surface temperatures of 5-13º C and lower at higher temperatures (Campana and Joyce 2004).

Joyce et al. (2002) found that, for the first half of the year, the diet of porbeagles consists largely of pelagic fish, including mackerel, herring, longnose lancet fish and squid. In the fall, cod, flounder, lumpfish and other groundfish comprise their diet when porbeagles tend to be in shallower waters. Less common prey include wolfish, spiny dogfish, sandlance, redfish, small crabs and other miscellaneous shellfish and gastropods (Joyce et al. 2002). As with other ocean

dwellers, porbeagles have been known to ingest anthropogenic detritus and debris floating in the water (Joyce et al. 2002).

Porbeagles may be found feeding alone or in aggregations (COSEWIC 2004). Diet does not vary significantly between sexes; however, there are variations between juveniles, subadults and adults, and across seasons. As their size increases and they are able to capture larger prey, porbeagles become more pisciverous, capturing large teleosts and smaller elasmobranches (Joyce et al. 2002). Adults consume more groundfish and fewer cephalopods than juveniles and subadults (Joyce et al. 2002). As they move from deep to shallow water, their diet may shift such that juveniles and subadults on the Scotian Shelf in the spring are favoring pelagic fish and cephalopods while the adults are eating groundfish, pelagic fish and cephalopods (Joyce et al. 2002). In the fall, consumption of pelagic fish was noticeably reduced, with groundfish increasing in the diet of each size class (Joyce et al 2002).

In the Northwest Atlantic, there is speculation that prey abundance may be a modifier of distribution of porbeagles, particularly since they tend to be found near fronts or on productive continental shelves, where prey can be more concentrated or abundant (Campana and Joyce 2004).

DFO considers the abundance of the Northwest Atlantic population too low for the species to play a crucial role in ecosystem function or regulation (Campana and Joyce 2004). However, Stevens et al. (2000) speculate that apex predators may have such an important role that their removal can have a disproportionate and even counter-intuitive impact on trophic relationships, including causing declines in some prey species.

6. Recruitment and Natural Mortality

Porbeagles are thought to have low natural mortality. An intrinsic rate of population increase of 5-7% has been hypothesized (CITES 2007). They are a slow growing and late maturing species, which is long lived and has limited reproductive potential (CITES 2007). When generation time is defined as the average age of females in an unfished population, the porbeagle's generation time is around 18 years, but uncertainty over life history results in estimates that range between 20 and 50 years (CITES 2007).

Sampling of porbeagles from commercial fishing vessels indicates that 50% of male porbeagles are sexually mature at approximately eight years of age at a fork length of 174 cm, while females do not reach sexual maturity until approximately age 13 at 217 cm fork length (Jensen et al. 2002). Study authors found that a fall mating period from September through November resulted in litters containing an average of 4 pups born in April-June, with a high likelihood of a one-year reproductive cycle and a gestation of eight to nine months (Jensen et al. 2002).

Young sharks are independent from birth and have a high survival rate (SARA registry). The first year is one of relatively rapid growth, followed by slowing growth and late maturation (SARA registry). Other than humans, the species has no known predators (ibid). In the absence of exploitation, life expectancy is believed to be between 25 and 46 years (SARA registry).

7. Population Status and Trends

By any measure, porbeagles are a stock at risk. The analysis done pursuant to Canada's SARA detailed the decline and rise and then further decline of porbeagles in conjunction with exploitation (SARA registry). A rapid drop in numbers followed an increase in fishing that began in 1961. The drop was followed by a slight rebound in the 1980s and a drop to a record low in 2001. The record low represented a loss of biomass of approximately 90% over a period of 40 years (SARA registry). The number of spawning females at the time of the analysis was estimated at 6075, representing one tenth of the initial abundance (Campana et al. 2003).

Another indication of overfishing is the reduction in size of porbeagles observed captured in the mating grounds off Newfoundland and the Gulf of St. Lawrence. Length of captured individuals dropped from more than 200 cm in 1961 to 140 cm in 2000, which is well below the size at sexual maturity and indicates a low proportion of mature individuals in the population (COSEWIC 2004). The analysis found that prior to 1991, porbeagles aged 10-15 years were the most abundant group found off southern Newfoundland, but in recent years the most abundant age group was animals aged 3 years or less.

The IUCN lists porbeagles in the Northwest Atlantic as "endangered" and "declining" (Stevens et al. 2006). The NMFS has declared that the Northwest Atlantic population has declined by about 90% since 1961 when commercial exploitation began in earnest. In 2006, the NMFS listed porbeagles as a "species of concern" (NMFS undated); 71 Fed. Reg. 61,022 (Oct. 17, 2006). Studies based on tag recaptures and age and sex-structured population models suggest that recent biomass is 10-20% of that present in the virgin population (Campana et al. 2008).

In 2007, a proposal was filed by Germany to list porbeagles under Appendix II of CITES. The report accompanying the proposal estimated numbers of mature females at 12-15% of virgin levels and found that, despite what Canadian DFO believes to be a relatively stable population since 2002, there is a continued slight decline in mature females in the Northwest Atlantic (CITES 2007). As is the case for many overexploited populations, large mature females are not well represented and in the current population, they have declined to 10% of the virgin population of three generations earlier (Campana et al. 2001, Campana et al. 2003).

Recent stock assessments have estimated the total population size for the Northwest Atlantic at 188,000-191,000 sharks (CITES 2007). In 2009, ICCAT/ICES estimated a range of 11,000 to 14,000 mature female spawners, or 12-16% of the 1961 level (ICCAT/ICES 2009). However, just five years prior to this, the COSEWIC evaluation concluded that there were only approximately 6,075 female spawners in the Northwest Atlantic (COSEWIC 2004). The following summarizes population and catch trend data (COSEWIC 2004).

Year	Location	Data Used	Trend	Data Source
1964–1970	Northwest Atlantic	Norwegian landings	~90% decline in catch	Landings data
1961–2000	Northwest Atlantic	Stock assessment	83–89% decline from virgin biomass	DFO 2001a
1961–1966	Northwest Atlantic	Stock assessment	>50% decline in abundance	DFO 2005a
1961–2004	Northwest Atlantic	Stock assessment	85–88% decline in mature females	DFO 2005a

Stock assessments document a correlation between steep declines in landings and catch per unit effort (CPUE) and a decline in biomass (COSEWIC 2004).

The analysis by COSEWIC recommended that porbeagles be listed as endangered under the Canadian SARA (COSEWIC 2004). The report summarized the rationale behind the recommendation as follows:

> This wide-ranging oceanic shark is the only representative of its genus in the North Atlantic. The abundance has declined greatly since Canada entered the fishery in the 1990s after an earlier collapse and partial recovery. Fishery quotas have been greatly reduced, and the fishery has been closed in some areas where mature sharks occur. The landings now are comprised mostly of juveniles. Its life history characteristics, including late maturity and low fecundity, render this species particularly vulnerable to overexploitation (COSEWIC 2004).

A 2009 ICES/ICCAT workshop concluded that varying models differ in presumed productivity of porbeagles (ICES/ICCAT 2009). The workshop concluded that total population size is 22-27% of its size in 1961, which is 95-103% of its size in 2001 (i.e. as of the ICES/ICCAT workshop, either below or above the 2001 abundance). Mature females were believed to be 83-103% of the 2001 value (COSEWIC 2005). Thus the population and number of spawners may have increased slightly, remained stable, or even further declined.

Projections by Canada of recent increases in porbeagle abundance should be taken with caution, given the limited productivity and the statement in the ICES/ICCAT report that, although models differed in projected recovery time, "under the low productivity model, recovery to [maximum sustainable yield] was predicted to take over 100 years at exploitation rates of 4% of vulnerable biomass" (ICES/ICCAT 2009). A 4% exploitation rate at this low population level may still be overly risk prone, and assessments of mortality are likely underestimates due to unreported catch and bycatch.

It is worth noting that the analysis done by COSEWIC cautioned that statements by DFO that the decline had ceased and is reversible were premature and stated that "in fact, the biomass trajectory from the age- and sex-structured model shows no indication that the decline in porbeagle abundance has ceased. At this point, it is also uncertain if the declines are reversible. Recent research has clearly demonstrated that reductions in fishery mortality, while necessary, are not always sufficient for population recovery" (COSEWIC 2004).

B. Distinct Population Segment

1. ESA Definition of "Distinct Population Segment"

The Northwest Atlantic Population of Porbeagle Shark is a Distinct Population. The ESA grants NMFS authority to list any "species" as endangered, and species is defined to include "any distinct population segment of any species," or "DPS." 16 U.S.C. §§ 1533; 1532(16). Pursuant to the Fish and Wildlife Service and NMFS's Joint Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act, NMFS must consider (1) the "[d]iscreteness of the population segment in relation to the remainder of the species to which

it belongs;" (2) "[t]he significance of the population segment to the species to which it belongs;" and (3) "[t]he population segment's conservation status in relation to the [ESA's] standard's for listing." 61 Fed. Reg. 4722, 4725 (Feb. 7, 1996).

"Discreteness" of a population segment is based on whether "it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation." *Id.* Courts have interpreted "markedly" to mean "appreciably" separate from other populations. *Nat'l Ass'n of Home Builders v. Norton,* 340 F.3d 835, 851 (9th Cir. 2003).

To determine a population segment's "significance," NMFS must consider the population's "biological and ecological significance" to the taxon to which it belongs, including (1) "[p]ersistence of the [DPS] in an ecological setting unusual or unique for the taxon;" (2) "[e]vidence that loss of the [DPS] would result in a significant gap in the range of a taxon;" (3) "[e]vidence that the [DPS] represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range," *or* (4) "[e]vidence that the [DPS] differs markedly from other populations of the species in its genetic characteristics." 61 Fed. Reg. at 4725.The significance factors are "nonexclusive" -- if any one factor is satisfied, a discrete population is considered significant. *See Maine v. Norton*, 257 F. Supp. 2d 357, 388 (D. Me. 2003). If a population segment is discrete and significant, then it is a DPS and may be evaluated for endangered and threatened status.

2. The Northwest Atlantic Population of Porbeagle Sharks is a Distinct Population Segment

There is little question the Northwest Atlantic population of porbeagle shark is a distinct population segment under the ESA. The Northwest Atlantic porbeagle population is "distinct" because it is "markedly separated from other populations" due to "physical [and] behavioral factors," as evidenced by "genetic . . . discontinuity." 61 Fed. Reg. at 4725. Further, the Northwest Atlantic porbeagle population is "significant" because "loss of the [DPS] would result in a significant gap in the range of a taxon," including the entire Northwest Atlantic Ocean. *Id.*

Specifically, the IUCN evaluated several populations of porbeagle sharks in the Atlantic and found two "separate distinct populations" in the North Atlantic: the Northeast Atlantic and the Northwest Atlantic (Stevens et al. 2006). Their analysis concluded that there was "apparently little exchange between adjacent populations" (Stevens et al. 2006). Tagging studies recorded only one trans-Atlantic movement, implying that the two north Atlantic populations are essentially distinct (ibid). There is no evidence of genetic exchange between the North Atlantic and southern hemisphere populations, which are separated by warm equatorial waters (Stevens et al. 2006). Analysis undertaken by COSEWIC also concluded that tagging studies from the North Atlantic provide strong evidence that there are "distinct porbeagle populations in the Northeast and Northwest Atlantic," with no mixing found to occur between the two populations (COSEWIC 2004).

Further, studies in the Northwest Atlantic indicate there is a single porbeagle population that undertakes extensive annual migrations between southern Newfoundland and the Gulf of St. Lawrence to at least Massachusetts (DFO 1999). The Northwest Atlantic population straddles the Canadian and American 200 mile Exclusive Economic Zones (EEZ), though most of the area of occupancy falls in Canadian waters (COSEWIC 2004).

Between January and February, porbeagles are caught in the Gulf of Maine, Georges Bank and the Scotian Shelf (COSEWIC 2004). Through the spring they are on the edge of the Scotian Shelf and then move northeastward. During the summer and fall, they are found off the coast of southern Newfoundland and in the Gulf of St. Lawrence (COSEWIC 2004). From late September through December, gravid females have been found on the Scotian Shelf and Grand Banks, but females are seldom seen from January through June in Canadian fisheries (COSEWIC 2004). During the winter they have been caught off the continental shelf in deep water basins (COSEWIC 2004).

Tagging studies indicate that the Northwest Atlantic porbeagle population could not be enhanced by porbeagles originating in other areas (COSEWIC 2004). Accordingly, scientific evidence is clear that the Northwest Atlantic population of porbeagle sharks is a discrete and significant population, and thus constitutes a DPS of the species pursuant to the ESA. 16 U.S.C. § 1532(16); 61 Fed. Reg. at 4725.

III. The Porbeagle Shark Satisfies the Statutory Criteria for Listing as an Endangered and/or Threatened Species

A species is endangered if it "is in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. § 1532(6). A species is threatened if it "is likely to become an endangered species within the foreseeable future" *Id.* § 1532(20). In determining whether or not a species is endangered or threatened, the NMFS must base its decision on five factors prescribed by statute. 16 U.S.C. § 1533(1)(a)(A)-(E). These factors are:

> (A) the present or threatened destruction, modification, or curtailment of [the species'] habitat or range;
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
> (C) disease or predation;
> (D) the inadequacy of existing regulatory mechanisms; or
> (E) other natural or manmade factors affecting [the species'] continued existence.

The presence of "any one or a combination" of the listing factors requires listing. 50 C.F.R. § 424.11(c); *Carlton v. Babbitt*, 900 F. Supp. 526, 530 (D.D.C. 1995); *see Nat'l Wildlife Fed. v. Norton*, 386 F. Supp. 2d. 553, 558 (D. Vt. 2005) ("Each factor is equally important and a finding by the Secretary that a species is negatively affected by just one of the factors warrants a non-discretionary listing as either endangered or threatened."). Further, the listing decision must be made "solely on the basis of the best scientific and commercial data available." 16 U.S.C. § 1533(b)(1)(A); *Northern Spotted Owl v. Hodel*, 716 F. Supp. 479, 480 (W.D. Wash. 1988) (explaining that the ESA "was amended in 1982 to ensure that the decision whether to list a

species . . . was based solely on an evaluation of the biological risks faced by the species, to the exclusion of all other factors").
Applying the listing factors and on the basis of the best scientific information available, porbeagle sharks are clearly endangered under the ESA. 16 U.S.C. § 1533(a)(1)(A)-(E). The biology of Northwest Atlantic porbeagle sharks makes them particularly vulnerable to overexploitation and places them at high risk of extinction. In concluding that porbeagle sharks should be designated as endangered under Canada's SARA, the COSEWIC report found:

> This wide-ranging oceanic shark is the only representative of its genus in the North Atlantic. The abundance has declined greatly since Canada entered the fishery in the 1990s after an earlier collapse and partial recovery. Fishery quotas have been greatly reduced, and the fishery has been closed in some areas where mature sharks occur. The landings now are comprised mostly of juveniles. Its life history characteristics, including late maturity and low fecundity, render this species particularly vulnerable to overexploitation.

Porbeagles are negatively affected by a number of factors in the ESA listing criteria. 16 U.S.C. § 1533(a)(1)(A)-(E).

A. Present or Threatened Destruction, Modification or Curtailment of Habitat or Range

"[P]resent or threatened destruction, modification, or curtailment" of porbeagle habitat is negatively affecting the species. 16 U.S.C. § 1533(a)(1)(A). Critical habitats and concrete information on these habitats are unknown (CITES 2007). Nonetheless heavy metals, including mercury, bioaccumulate and may affect fitness. Further, on-going increases in ocean temperature and pH and related biomass production could have a potentially adverse effect on this species.

1. Coastal Pollution

A portion of the range for this species intersects heavily settled coastal areas, where runoff of heavy metals (particularly mercury) can bioaccumulate and may be biomagnified in apex predators such as porbeagles. A report as part of the proposal to CITES to add porbeagles to Appendix II expressed concern over high levels of ecosystem contaminants (PCBs, organo-chlorines and heavy metals) that bioaccumulate and are biomagnified at high trophic levels (CITES 2010). The report cites work by Stevens et al. (2005), finding that these contaminants are associated with infertility in sharks.

Fish length is positively correlated with mercury levels, including for sharks, though it is not uniformly correlated in various species (Evers et al. 2008). A study in New Zealand found a strong linear relationship between total mercury and methyl mercury concentrations in porbeagles (Vleig et al. 1993). There are no well-described effect levels for mercury in sharks. A study in Florida found notable mercury levels in sharks, with two species having mercury levels in their muscle above an effect level shown to impact growth and reproduction in walleye (op cit.). The impacts of mercury or other bioaccumulated contaminants on the fitness of porbeagles are unknown.

2. Global Climate Change And Ocean Temperatures

Global climate change is occurring and is likely to continue, posing a long-term threat to porbeagle sharks and their recovery from severe depletion. The Report of the Intergovernmental Panel on Climate Change (IPCC 2001), released in 2007, states atmospheric concentration of carbon dioxide has increased by 36% since 1750, the highest level for the past 650,000 years and perhaps higher than any level in the past 20 million years (K. Denman et al. 2007). As of March 2006, the atmospheric carbon dioxide concentration was 381 ppm and rising at over 2 ppm per year (Shukman, 2006). Over the past 100 years, the global temperature average has risen by approximately 0.74° C ± 0.18° C (Trenbeth et al. 2007). Global warming is likely to accelerate as greenhouse gas emissions continue and increase. The IPCC report projected an increase of between 1.1 and 6.4° C (2-11.5° F) by the end of this century (Solomon, et al. 2007). The higher the level of greenhouse gas emissions, the more the world will warm and the more ocean temperature will increase, with consequent adverse impacts on marine life, including porbeagle sharks.

The warming of ocean waters has already resulted in measurable effects on the marine ecosystem. Temperature is an important factor influencing the range of most marine species and it affects their physiology as well. Even minor changes can be seriously disruptive. Porbeagle sharks range only in cool and temperate waters with temperatures between 2-18º C and, in the North Atlantic, with a preference for temperatures between 5-10º C (Campana and Joyce 2004). They are most commonly found from near surface to 200 m depths along continental shelves (Campana and Joyce 2004). While there is little research to date indicating any significant change in distribution of porbeagles, in the period 1948-1998, global ocean temperatures increased by 0.31° C on average in the upper 300 m (Levitus et al. 2000). Locally, some ocean regions are experiencing even greater warming (Bindoff et al. 2007). Global ocean temperatures have increased by 0.10º C in the upper 700 m (ibid) and porbeagles have been caught as deep as 700 m (Campana and Joyce 2004). Notably, the largest increases in global ocean temperature have occurred in the upper ocean where primary production is concentrated and warming appears to be affecting global ocean productivity (Beherenfeld et al. 2006). Significant declines in net primary production globally between 1997 and 2005 were attributed to reduced nutrient enhancement due to ocean surface warming (Beherenfeld et al. 2006).

This may result in significant future effects on both the distribution of the prey resources favored by porbeagles, the distribution of potential competitors for prey resources, and on the porbeagle's thermoregulatory system. Any of these adverse impacts can severely limit the potential for recovery.

3. Ocean Acidification

Because of its potential effect on zooplankton and the marine food web, ocean acidification poses a risk to porbeagles and their recovery. Just in the past few decades, up to 30% of the carbon dioxide released by human activities has been absorbed by the world's oceans (Feely et al. 2004). Most of the carbon dioxide released into the atmosphere from anthropogenic activities will be absorbed by the oceans (Caldiera and Wickett 2003). As carbon dioxide is absorbed by

the oceans, it changes the chemistry of sea water, lowering the pH and resulting in ocean acidification (WBGU 2006).

Surface ocean pH has already dropped by approximately 0.1 units on the pH scale from 1750 to 1992, which is equivalent to a 30% increase in acidity (Orr et al. 2005). There are projections that, by the end of the 21st century, the pH may drop by another 0.3-0.4 units, which is equivalent to a 100-150% increase in acidity (Orr et al. 2005, Meehl et al. 2007).

Increasing ocean acidification affects the marine ecosystem as it affects the physiology of numerous marine organisms, with ripple effects through the food chain (Fabry et al. 2008). These changes include impacts to photosynthesis of phytoplankton, changes in metabolic rates of zooplankton and fish, nitrification by microorganisms and increasing uptake of metals (WBGU 2006). With increases in the ocean's carbon dioxide levels, fish and other marine species may experience an accumulation of carbon dioxide in their tissues, called hypercapnia, leading to increases in internal acidity (Fabry et al. 2008). This condition affects acid-base regulation, metabolic activity, respiration, and ion exchange, which in turn can lead to impaired growth and higher natural mortality (Fabry et al. 2008).

The ongoing increase in ocean acidification poses an additional threat to the health of the populations of a number of marine species, porbeagle sharks among them.

B. Overutilization for Commercial, Recreational, Scientific or Educational Purposes

Porbeagle sharks are suffering from severe "overutilization for commercial [and] recreational purposes," requiring that the species be listed. 16 U.S.C. § 1533(a)(1)(A). Porbeagle populations have crashed precipitously. The analysis done for COSEWIC cited concerns that, for virtually all sharks, low productivity results in little resilience to fishing pressure (COSEWIC 2004). The analysis documents increasing catches followed by rapid stock decline and collapse, requiring decades to recovery, if recovery occurs at all (COSEWIC 2004). The population has crashed twice in the Northwest Atlantic over the 43-year history of intensified commercial fishing (Campana et al. 2008). It first collapsed in 1967 after annual catches of over 9,000 metric tons (mt). After partial recovery during the succeeding 25 years, annual catches throughout the 1990s of 1,000-2000 mt once again drove the population to record-low numbers. Since that time, both the size and age composition of the shark catch have markedly declined, with an age- and sex-structured model indicating a biomass of only 10-20% of that in the virgin population (Campana et al. 2008). The Campana et al. authors conclude that, in light of slow pup production and the very low numbers of mature females now in the population, "it is unlikely that even the strict quota management that has been implemented will allow the population to rebuild quickly" (Campana et al. 2008).

In fact the COSEWIC analysis (2004) cited work by Holden that questions whether it is possible for sharks to be sustainably exploited; however harvest and bycatch continue. Both commercial and recreational fisheries land porbeagle sharks. Additional mortality is suffered when sharks are released alive or as dead discards. Each of these impacts is discussed below, both for domestic fisheries and for international fisheries that take porbeagles from the North Atlantic stock.

1. Impacts of Commercial Fisheries

a. Historic fishing for porbeagles

Between the world wars, Norwegian and Danish fishermen caught porbeagles to the point of scarcity in their nearby waters, leading them to explore other waters (NMFS 2008(a)). Around 1960, they began to fish in the Newfoundland Bank and the waters east of New York. In the early 1960s, there was a small fishery for porbeagles by Norwegian fishermen off the U.S. Atlantic coast. Between 1961 and 1964, their catch increased from 1,800 to 9,300 mt, and later declined to 200 mt (COSEWIC 2004).

An ICCAT meeting of September 2001 reviewed available statistics for Atlantic and Mediterranean pelagic sharks (COSEWIC 2004). Landings estimates for porbeagles peaked in 1997, with an estimated total of 1,450 mt, and have slowly declined each year since that time period (1998-2000). This was reiterated by the NMFS in its Environmental Impact Statement (EIS) for Amendment 2 to the Highly Migratory Species Fishery Management Plan (HMS FMP) (NMFS 2008a).

b. U.S. commercial fisheries

In the U.S., porbeagle sharks are caught primarily in pelagic longline fisheries. The NMFS describes the fishery as primarily targeting swordfish, yellowfin tuna, and bigeye tuna in various areas and seasons (NMFS 2008a). Secondary target species include dolphin fish, albacore tuna, pelagic sharks (including mako, thresher, and porbeagle sharks), as well as several species of large coastal sharks (ibid). Although this gear can be modified (e.g., depth of set, hook type) to target swordfish, tunas, or sharks, it is generally a multi-species fishery. Vessel operators are opportunistic, switching gear style and making subtle changes to target the best available economic opportunity of each individual trip. Pelagic longline gear sometimes attracts and hooks non-target finfish with little or no commercial value (NMFS 2008a).

Sharks, including porbeagle sharks, are regulated under the NMFS's Highly Migratory Species Fishery Management Plan (HMS FMP), issued pursuant to the Magnuson-Stevens Fishery Conservation and Management Act. *See* 50 C.F.R. Part 635. According to the Final EIS for Amendment 2 to the HMS FMP (Final EIS), the U.S. has minimal landings of porbeagles. Based on HMS Logbook data from 2003 to 2005, 1,685 porbeagle sharks were reported discarded alive, 484 were reported as discarded dead, and 31 were reported as being kept over those three years (NMFS 2008a). On average, 1.7 mt dwt (3,867 lbs dw) of porbeagle sharks were commercially landed between 2003 and 2006. Based on 2006 ex-vessel prices, the NMFS believes this is equivalent to $7,378 total fishery-wide (assuming 5% of the landings are fins and 95 percent of the landings are carcass weight) (NMFS 2008a). The low number of porbeagle landings is likely indicative of the species' decreasing abundance.

Although the NMFS's draft preferred alternative in the EIS would have prohibited landings of porbeagles (NMFS 2007), in its final rule for Amendment 2 to the HMS Fishery Management Plan, the NMFS set a total allowable catch (TAC) of 11.3 mt dw, with a commercial quota of 1.7 mt dw (NMFS 2008a). The TAC is intended "to account for landings that *occur illegally*, [and] dead discards and/or landings outside of NMFS jurisdiction" (NMFS 2007, emphasis added).

According to the NMFS, after adjustments for overharvest in the prior year, the 2009 quota for porbeagle sharks is 1.4 mt (3,147 lbs dw) (NMFS 2009). As of the end of the third quarter of this past year (October 31, 2009), an estimated 0.8 mt (1,733 lbs dressed weight) had been caught by commercial fisheries. This represents 55.1% of the quota (NMFS 2008a). The commercial quota for porbeagles is 1.5 mt dw for 2010 (NMFS 2009b). Even with a reduced quota, fisheries are not catching porbeagles to the extent permitted under the quota, which is an indication of a reduced biomass.

The NMFS has not conducted stock assessments on porbeagle sharks and, as such, it relies on Canadian data when determining the impact of fisheries on porbeagles. The 2008 Final EIS on Amendment 2 to the HMS Fishery Management Plan largely relied on Canadian stock assessments of porbeagle sharks from 1999 through 2005 (NMFS 2008a). The Final EIS cited the 2005 recovery assessment report conducted by Canada, which found that porbeagles are overfished, but that overfishing was not occurring. Based on that Canadian finding, the NMFS declared that porbeagles are overfished but not subject to overfishing. 71 Fed. Reg. 65,086, 65,087 (Nov. 7, 2006). The Canadian assessment concluded that the North Atlantic porbeagle stock has a 70% probability of recovery in approximately 100 years if fishery effort is less than or equal to 0.04 of the population (NMFS 2008a). The NMFS adopted the Canadian DFO conclusion that reduced quotas in Canada had resulted in exploitation levels being brought to sustainable levels (NMFS 2008a). Information that we provide below, also from a Canadian scientific assessment, calls that conclusion into question, as it may not represent the best available scientific information.

The impact of U.S. commercial fisheries relative to the total 11.3 mt TAC was not available.

c. Canadian commercial fisheries

According to a 2010 report to CITES, three offshore and several inshore Canadian vessels entered the targeted Northwest Atlantic fishery in the 1990s (CITES 2010). Catches of 1,000–2,000 mt/year reduced population levels to a new low in less than 10 years. The average size of sharks and catch rates were the smallest on record in 1999 and 2000 (CITES 2010). Catch rates of mature sharks in 2000 were 10% of those in 1992, and biomass was estimated at 11-17% of virgin biomass (CITES 2010). The annual Canadian catch quota was reduced for the years 2002-2007 to allow population growth and reduced again in 2006. Landings have since ranged from 139 t to 229 t (CITES 2010). The 2010 report to CITES states that, according to the FAO Fishstat report of 2009, Canadian fisheries landed 94 t of porbeagles in 2007. According to press reports, the porbeagle fishery is worth an estimated $2 million annually on the East Coast of Canada, with 90% of the catch going to markets in the U.S., in Boston (Canadian Press, 2008).

d. International commercial fisheries

According to a summary report presented to CITES, international fisheries pose a threat to porbeagles. Although the CITES report does not specify which particular porbeagle population in the North Atlantic (i.e., Northeast or Northwest) is landed in international fisheries, if any significant portion involve catch of porbeagles from the Northwest Atlantic population, the population will further decline. The majority of catches of porbeagles in the Northwest Atlantic

come from the Canadian fleet, although fishing by Spanish, Icelandic and Japanese vessels also occurs both within and outside of the Canadian EEZ (ICES/ICCAT 2009).

Taiwanese, Korean and Japanese tuna longliners are reported to take a largely unknown bycatch of porbeagles on the high seas in the North Atlantic (CITES 2010). Most of the catch is reportedly discarded or landed at ports near the fishing grounds (CITES 2010). Stocks and catches are reported to be "under investigation" by the Fishery Agency of Japan (ibid). The report cites work by Campana and Gibson in 2008 that concluded that the unreported porbeagle bycatch observed on Japanese vessels could have amounted to ~200 t in 2000 and 2001. Spanish catches were also considered unreported (CITES 2010). The report concludes that *these levels of combined Northwest Atlantic landings will prevent stock recovery* (CITES 2010).

Campana and Gibson have noted that in 2005 and 2006, the Spanish catch of porbeagles exceeded that of Canada (Campana and Gibson 2008). They stated that if catches are substantial (>100t), the total porbeagle catch, including the Canadian catch, would result in exploitation greater than MSY and at unsustainable levels leading to additional population crash (Campana and Gibson 2008).

In 2007, the highest porbeagle catches in either targeted or bycatch fisheries were 356 t by France, 228 t by Spain, and 94 t by Canada, though the particular porbeagle population in the North Atlantic (i.e., Northeast or Northwest) was not specified (CITES 2010). But the CITES report quotes ICES/ICCAT (2009) as noting that reported landings "grossly underestimate actual landings" (CITES 2010). If any significant portion of these landings by countries other than Canada involve catch of porbeagles from the Northwest Atlantic stock (and at least some unaccounted portion likely does), this could greatly undermine efforts to recover the stock.

e. Reviews of evidence of over-exploitation of porbeagles internationally and domestically by commercial fisheries

Several recent reports have concluded that over-exploitation of the Northwest Atlantic population of porbeagles by fisheries is occurring.

ICES/ICCAT: The 2009 workshop report of the International Council for Exploration of the Sea and the International Commission for the Conservation of Atlantic Tunas (ICES/ICCAT) concluded that catch data for the Northwest Atlantic is relatively complete, though it is only estimated for some pelagic fleets (ICES/ICCAT 2009). The workshop did note, however that studies of data from the U.N. Fish and Agriculture Organization (FAO) and regional fisheries management organizations (RMFOs) were not always consistent.

Data presented to the ICES/ICCAT workshop from the U.S. pelagic longline logbook program between 1992 and 2008 showed an initial decrease in catch from 1992-2001, followed by a sharp increase until 2003 and a subsequent decrease until 2008 (ICES/ICCAT 2009). The majority of catches of porbeagles in the Northwest Atlantic come from the Canadian fleet, although fishing by Spanish, Icelandic and Japanese vessels also occurs both within and outside of the Canadian EEZ (ICES/ICCAT 2009).

The ICCAT workshop employed a variety of models to estimate status and project population trends for the Northwest Atlantic porbeagle population (ICES/ICCAT 2009), including a Bayesian Surplus Production (BSP) model that had been used in previous ICCAT assessments for other species, a catch-weighted model and an age-structure model. The results obtained varied: a catch-weighted model resulted in a finding that the population was at 66% of the 1961 biomass, and an age-structured model showed the current population between 10 to 24% of the 1961 biomass. The BSP model resulted in findings more similar to this latter model, though its results were quite sensitive to how the input catch per unit effort (CPUE) series was calculated and weighted.

The BSP model used in the ICES/ICCAT workshop resulted in a finding that the population could recover to its most productive level (Bmsy) in about 20 years if there was no fishing. Use of an age- and sex-structured life history model indicated that porbeagles could recover if fishing mortality was below 4% of the vulnerable biomass. It was speculated that recovery could take anywhere from decades to 100 years depending on the productivity that was assumed for the species (ICES/ICCAT 2009).

Varying models differed in presumed productivity of porbeagles (ICES/ICCAT 2009). This is reflected in the projections of current population trajectory. The workshop concluded that total population size is 22-27% of its size in 1961, which is 95-103% of its size in 2001. Mature females were believed to be 83-103% of the 2001 value. Thus, in the 8 years examined, the population and the number of spawners may have increased slightly, remained stable, or even further declined.

The workshop concluded that, for porbeagles in the Northwest Atlantic, biomass is well below Bmsy, though fishery mortality was also believed below maximum sustainable yield (F_{MSY}). The workshop stated that the Total Allowable Catch (TAC) of 185 t relative to the MSY catch of 250 t and closure of the mating grounds in Canada to targeted fisheries were deemed "conservative" (ICES/ICCAT 2009) although at the same time, models included the possibility that declines are continuing.

Contrary to the finding that Canadian management assumptions were likely correct, the ICES/ICCAT report emphasized that "[t]he success of the Canadian recovery program is contingent on proper accounting of all catches, including high-seas fleets. Catches within the Canadian EEZ appear to be well accounted for. However, the quantities of porbeagles taken in high-seas longline fleets are unclear, as there is widespread non-reporting and generic reporting of sharks" (ICES/ICCAT 2009, p. 14). The ICES/ICCAT workshop further recommended that high-seas fleets should not target porbeagles and should report all bycatch. The report also recommended that areas known to have high abundance of important life history states (e.g., mating, pupping and nursery grounds) should also be subject to fishing restrictions, noting "such grounds are not exclusively in the Canadian EEZ" (ICES/ICCAT, p.14). There is no means of enforcing this recommendation.

This body concluded that dramatic declines have occurred and, depending on variables fed into the models used, spawning females may even have continued to decline. Recovery from

dramatic population declines could take decades and as much as 100 years and the workshop found that, though the TAC is 65 mt less than MSY, there is undocumented fishing occurring and areas important to key life stages remain unprotected (ICES/ICCAT 2009). Because of this it is reasonable to presume that the MSY may be exceeded.

CITES: There have been several proposals submitted to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to add porbeagle sharks to Appendix II. Listing on Appendix II would require permitting prior to export. These proposals to add porbeagles to Appendix II review the species' status relative to fishing effort. Most recently, a petition was submitted in 2007 and another has been drafted by Sweden for the 2010 meeting (CITES 2010).

The current CITES petition was written in 2009 and emphasizes the importance of considering the number of mature females in a population when defining effective population size. In this case, female spawners in the Northwest Atlantic were stated to be 12-16% of their original abundance and 83-103% of abundance in 2001 (CITES 2010). As noted above, this means that they may be increasing slightly, remaining stable in numbers or even continuing to decline (CITES 2010).

The report comments on the fact that landings in the North Atlantic have exhibited marked declining trends over the past 60 years during a period of rising fishing effort, improved fisheries technology and market demand for this species (CITES 2010). The report notes a finding by ICES/ICCAT that declines in catch per unit effort (CPUE) are correlated to declining biomass.

COSEWIC: In 2004 the COSEWIC issued a report on the status of porbeagles, particularly with regard to fisheries exploitation in Canada. International bodies and U.S. managers have cited the Canadian plan to keep fishery-related mortality to 4% of the population as a means of assuring sustainability. A Fishery Maximum Sustainable Yield (F_{MSY}) of 200-250 t was estimated from a life table analysis as 0.04 under the assumption of logistic growth (COSEWIC 2004). The COSEWIC analysis concluded that "when population abundance is as low as the current porbeagle population, even small absolute catches can correspond to high exploitation rates" (COSEWIC 2004, p. 29). This concern is magnified given the low number of mature porbeagles in the population. The analysis concluded that, as a result, a quota that equated to 4% of the population in the mid-1990s (~200 t) would be greater in actual amount than a quota of 4% on the current smaller population. There is great uncertainty in estimating F_{MSY}, which underlies all assumptions of sustainable exploitation levels and recovery.

The COSEWIC analysis also expressed concern that the life table analysis does not take into consideration stochastic factors that can impact the persistence of small populations. COSEWIC concludes that, although harvesting at F_{MSY} should generally lead to the population moving to its most productive level (B_{MSY}), this may result in a level of harvest too high for porbeagles. This is partially due to the fact that estimates of MSY and F_{MSY} for most fish populations are insufficiently accurate to be used in management and porbeagles do not appear to be an exception to this. Further, the COSEWIC analysis cites work by Quinn and Deriso (1999) that suggests that, for populations below a certain threshold (often recommended at 20% of original

abundance, which is a higher threshold than current porbeagle abundance estimates), fishing mortality should be reduced or curtailed. Another reason for precaution beyond the current quotas was that at their currently low level of abundance, porbeagles may experience depensation (i.e., a decrease in mature individuals leading to reduced survival and production). The authors of the COSEWIC report also cite work by Punt (2000) that demonstrated that in shark populations where depensation occurs, the F_{crash} (i.e., the fishing level at which the population is rendered extinct) moves closer to F_{MSY}.

The COSEWIC report concludes that DFO's comments that the decline has ceased and is reversible are premature and tenuous and that the current reductions in fishery mortality may not be sustainable, nor the declines reversible (COSEWIC 2004). The authors state that research indicates that reductions in fishing mortality, while necessary, are not always sufficient for population recovery (COSEWIC2004).

2. Impacts of Recreational Fisheries

Porbeagle sharks may be caught by individual recreational fishermen aboard chartered vessels or in tournament fishing. As of 2002, anglers are required to possess an angling permit to fish recreationally for any HMS managed species. 50 C.F.R. § 635.4(c)(1); 67 Fed. Reg. 77,434, 77, 435 (Dec. 18, 2002).

Tournaments taking place in federal waters register with the NMFS HMS division (NMFS 2008). In its 2008 Final EIS for the HMS FMP, the NMFS states that this registration and reporting (which is done if a tournament is selected for reporting) allows collection of information used to assess the stock and estimate annual catch (NMFS 2008a). However, as we explain below, either reporting by tournaments is lacking or the NMFS does not appear to have used these data in the analyses leading to the decision-making, as the data appear incomplete or lacking.

The NMFS reports "that approximately 300-400 HMS fishing tournaments occur annually along the U.S. Atlantic coast including the Gulf of Mexico and Caribbean" (NMFS 2008a). The NMFS reports that in 2007, there were 59 tournaments with prize categories for pelagic sharks, and the majority of shark tournaments occur in the North Atlantic region, specifically Rhode Island, New York, and Massachusetts. (NMFS 2008a, table 3.38). Many of these tournaments award prizes for pelagic sharks, and some specifically offer prizes for the largest porbeagle sharks caught. In fact the first place tournament winner in 2009 in the Martha's Vineyard Monster Shark Tournament was for a 361 lb porbeagle shark. In 2008 the largest porbeagle caught in this tournament was 332 lbs (Offshore reports undated) and the tournament has had a special porbeagle prize category in prior years (BBGFC 2009, New England Shark, undated). The Downeast Maine Shark Tournament offers prizes for the largest porbeagle shark caught (Downeast 2009). A record-sized porbeagle (455 lbs) was caught in Maine in 2007 (On the Water, undated). Tournaments encourage targeting porbeagle sharks.

There is a conflict between information on recreational take of porbeagles in the NMFS Final EIS for the HMS FMP (NMFS 2008a). Table 3-24 in the Final EIS reports "Recreational Harvest of Atlantic Pelagic Sharks by Species in number of fish: 1999-2006" and reports no porbeagles

taken recreationally between those years based on reporting by Cortés and Neer (2005) and Cortés (pers. comm.). Because the NMFS does not report landings in tournaments elsewhere in the Final EIS, one presumes that this table was intended to summarize all recreational landings by individuals fishing either ad hoc or participating in tournaments. In contradiction to this, Table 3.26 (NMFS 2008a) reports that between 1998 and 2005, four porbeagle sharks were kept (one each year in 1998, 2002, 2004 and 2005) and an additional 25 were caught and released alive. It is not clear how the numbers in these two tables of recreationally caught porbeagles relate to each other or why they appear to conflict.

Even the higher numbers provided in Table 3-26 do not properly represent landings. Other sources clearly indicate additional landings in those years. For example, in 2005, when the NMFS's Final EIS indicates a single landing of a porbeagle was reported, the first place winner in the Oak Bluffs Monster Shark Tournament won with two porbeagles weighing 378 lbs each (New England Sharks, undated). This does not appear to be accounted for in the NMFS records.

News reports often yield information on porbeagle sharks being caught. For example, in July 2009, a 170 lb porbeagle was caught off Montauk the week of July 7, 2009, and two porbeagles (and possibly a third) were caught off Montauk a week later (Montauk report 2009). A 414 lb porbeagle (a Massachusetts state record at that time) was caught in 2004, and then in September 2009, this Massachusetts record was broken with the catch of a 482 lb porbeagle off Nantucket (New England Sharks/porbeagle).

Further, statements from recreational fishing guides also indicate that porbeagles are caught more often than the NMFS's accounting reflects. Fishing guides state that porbeagles are most often caught in August and September in Maine and from October through December in Massachusetts when "you can fish for them within a few miles from shore" (New England Sharks/porbeagle). We believe that the NMFS underestimates the number of porbeagles caught (or caught and discarded) as a result of recreational fishing.

The number of tournaments targeting HMS species in the U.S. continues to increase. In table 3-36, the total number of tournaments is at an all-time high for the period from 2001 to 2007 (NMFS 2008a). With the exception of Connecticut, states from Maine through New York that are well within the range of Northwest Atlantic porbeagles, all reflected either status quo or an increase in the number of HMS tournaments during that time period, with Massachusetts showing the greatest increase (NMFS 2008a). Though the NMFS asserts that the number of tournaments targeting pelagic sharks declined from 2006-2007 (from 67 to 59), it is notable that table 3-38 shows that three of the top six states in which tournaments awarded prizes for pelagic sharks in 2007 were Massachusetts, Maine and New York, where porbeagles are routinely caught by anglers (NMFS 2008a).

3. Release-Related and Discard Mortality

There is conflicting information on the degree to which porbeagles are captured incidentally in other fisheries and the extent to which they are discarded rather than landed. Given the acknowledged under-reporting of actual landings, as has been documented in CITES reports and

summarized above, the addition of discarded sharks complicates our understanding of the true level of mortality to which porbeagles are subject.

The ICES/ICCAT workshop concluded that "insufficient data were available" to estimate discards, although they state that "as porbeagle is a high-value species, it is unlikely that large numbers are discarded. Discard survival is not known for either longline-caught porbeagles (which could be high) or for porbeagles caught in other fisheries on the continental shelf" (ICES/ICCAT 2009).

The NMFS states that bycatch in the recreational rod and reel fishery is difficult to quantify because many fishermen "may not be targeting a particular pelagic species" and thus may consider any fish they catch a target rather than bycatch. Table 3-26 summarizes sharks kept and released by the rod and reel fishery from Maine through Virginia in the period 1997-2005, some portion of which may be considered to have subsequently died. While we believe it to be an underestimate, 25 porbeagles are reported to have been released alive during that time period, with an additional four reported to have been kept (NMFS 2008a).

In Amendment 2 to the HMS FMP (2008), the NMFS stated that, based on HMS Logbook data from 2003 to 2005, 1,685 porbeagle sharks were reported discarded alive, 484 were reported as discarded dead and 31 were reported as being kept over those three years. In considering the impact of prohibiting landings (which the NMFS initially proposed but did not select as a final management tool), the NMFS calculated that based on the number of porbeagle sharks kept from 2003 to 2005, U.S. fishermen have not been targeting porbeagle sharks. The NMFS calculated that, since only 7% of the porbeagle sharks that were initially caught were discarded dead annually (1,685 discarded alive + 484 discarded dead + 31 kept = 2,200 total porbeagle sharks caught; 484 discarded dead /2200 total catch = 22%; 22% /3=7% discarded dead per year), prohibiting the retention of porbeagle sharks would not be expected to result in large numbers of dead discards. In fact, if landings were prohibited, dead discards of porbeagle sharks might only increase by 0.7 porbeagle sharks per year (7% x 31 porbeagle sharks =2 porbeagle sharks discarded dead under alternative 2; 2 porbeagle sharks/3 years =0.7 porbeagle/year) (NMFS 2008a). Given that this stock is overfished, the NMFS stated that "prohibiting the retention of this species would eliminate any future fishery from developing while not increasing dead discards. This may result in slightly positive ecological impacts for this stock" (NMFS 2008a, p. 4-25).

Despite the positive benefit of prohibiting landings, and the likelihood that it would both discourage future fisheries and not substantially increase discards, the NMFS did not choose this alternative. 73 Fed. Reg. 40,658, 40665 (July 15, 2008).

C. Predation and Disease

The ESA requires NMFS to consider predation and disease as one of the listing factors. 16 U.S.C. § 1533(1)(C). As noted earlier, other than humans, the species has no known predators (CITES 2007). Sharks host a number of parasites. There is some anecdotal evidence that sharks have a low incidence of disease, especially cancer, yet the true incidence of disease in sharks is

difficult to ascertain (National Geographic 2003). It is unlikely that either disease or predators are playing a significant role in the recent population trajectories of sharks.

D. Insufficiency of Existing Regulatory Mechanisms

In addition, the insufficiency of existing regulatory measures to protect the Northwest Atlantic population of porbeagles from decline triggers ESA listing. 16 U.S.C. § 1533(a)(1)(D). A number of governmental bodies regulate shark fishing. Additionally, there are a number of international agreements that pertain to shark management and affect Northwest Atlantic porbeagles. These will first be summarized, then will be followed by discussion of their inadequacy as a means of preventing further declines in porbeagles, which have already suffered a loss of up to 90% of their original population.

1. Federal Management

Congress enacted the Magnuson-Stevens Fishery Conservation and Management Act (MSA) in 1976 to govern marine fisheries management. Generally, the MSA regulates fishing in federal waters, and each state has jurisdiction over fisheries within three miles of its shoreline. *See* 16 U.S.C. §§ 1801; 1856(a)(1).

The Act creates eight regional fishery management councils that must prepare FisheryManagement Plans (FMP) for each fishery under the council's authority. 16 U.S.C. § 1852(h). The plans must generally prevent overfishing while providing for optimal yield. *Id.* § 1851(a)(1). The FMPs are in turn codified and implemented by NMFS. However, because sharks are highly migratory, the NMFS prepares and then codifies a Highly Migratory Species (HMS) FMP that governs shark fishing in federal waters.

The current HMS FMP requires federal permits and sets retention limits for vessels participating in either commercial or recreational shark fishing. *See* 50 C.F.R. Part 635. Under the current FMP regulations, commercial fisheries may take an annual quota of 1.7 mt of porbeagles, *id.* § 635.27(b)(1)(vi), and recreational vessels may retain one porbeagle per trip, *id.* § 635.22(c)(1). The FMP specifically prohibits the retention of any "prohibited species" by either commercial or recreational fisheries in federal waters. *Id.* §§ 635.27(b)(1); 635.22(c)(3). In addition, the MSA regulations require that any federally-permitted vessel always comply with all federal MSA regulations, even when operating in state waters. *Id.* § 635.4(a)(10).

Porbeagle sharks have continued to decline, despite NMFS management. Indeed, the NMFS has taken contradictory stances with regard to its management. In 2007, the NMFS proposed prohibiting the landing of porbeagles (NMFS 2007); 72 Fed. Reg. 41,392 (July 27, 2007). The NMFS argued that:

> the continued harvest of porbeagle sharks could lead to negative ecological impacts for this species. The 2005 Canadian stock assessment determined that porbeagle sharks are overfished, with a 70 percent probability of recovery in approximately 100 years.…If landings were to increase in the future, this could lead to overfishing and further depletion of porbeagle shark stocks (DEIS, p. 4-3).

The NMFS further stated that "If no new closures are put into place for sandbar, porbeagle and dusky sharks, these species may not recover in the recommended rebuilding timeframe and result in longer term negative economic impacts" (DEIS, p. 4-13). At the same time that the NMFS was proposing to prohibit domestic landings, it proposed a prohibition on retention of porbeagles in the Northwest Atlantic Fisheries Organization (NAFO), which was withdrawn due to lack of support (Shark Alliance 2007).

Despite this support for prohibiting landings of porbeagles, in 2008 the final Amendment 2 to the HMS FMP provided a TAC and quota for both commercial and recreational landings of porbeagles. In its rationale for this change, the NMFS explained that "rebuilding times based on zero fishing mortality were not chosen for sandbar and porbeagle sharks because of the need to consider economic impacts" and what the NMFS considered the "impracticality" of the measure based on public comment (NMFS 2008b). Instead NMFS sought merely to "cap U.S. fishing mortality at the current level." 73 Fed. Reg. 35,778, 35,785 (June 24, 2008). It did so with the assumption that Canada will continue to take action and that "other countries that have a directed fishery for porbeagles have reduced their porbeagle quotas" (NMFS 2008b). The NMFS made this assumption despite international bodies that have repeatedly documented that catch and bycatch of porbeagles by nations other than Canada and the U.S. are largely under-reported if they are reported at all (ICES/ICCAT 2009, COSEWIC 2010). Even prior to these assessments, in the 2004 report, COSEWIC stated that there were no mandated management measures in international waters, catches in international waters were poorly accounted for and "total porbeagle catches cannot be estimated without knowing total fishing effort" (COSEWIC 2004, p. 27)

The U.S. should adopt the most risk adverse approach to recovering a species that is so overfished that it has lost 90% of its original population, and economic considerations alone should not affect that goal. This is particularly true in light of findings discussed elsewhere in this petition that unreported landings are likely to undermine the Canadian regime on which the U.S. has relied, that landings are largely juvenile porbeagles who are a decade younger than sexual maturity, and that uncertainties in models used by ICES/ICCAT may be resulting in an ongoing decline in mature females.

2. State Management

In addition to the MSA and its Regional Fishery Councils regulating federal waters, the Atlantic States Marine Fisheries Commission ("Commission") coordinates fisheries in state waters. Since 1942, the Commission has chartered as a federal compact, which coordinates with the various states to develop interstate Fishery Management Plans (IFMPs) for species that migrate between the states' coastal waters. *Medeiros v. Vincent*, 431 F.3d 25, 27 (1st Cir. 2005).

In 1993, Congress made the Commission's IFMPs federally enforceable. The Atlantic Coast Fisheries Cooperative Management Act ("ACFCMA") allows the Commission to identify measures contained in the IFMP with which all states must comply. 16 U.S.C. § 5104(a)(1). If a member state fails to comply with one of the measures, the NMFS may then determine whether the IFMP measure is "necessary for the conservation of the fishery in question." *Id.* § 5106(a)(2). The NMFS may then impose a moratorium on fishing in the state's waters. *Id.* § 1506(c).

The Commission comprises all states from Florida to Maine. In August 2008, the ASMFC issued an Interstate Fishery Management Plan for Atlantic Coastal Sharks (Coastal Shark IFMP).[2] The Coastal Shark IFMP contains numerous measures that the Commission has deemed necessary for states to comply with, thus making the prohibitions federally enforceable. These include recreational prohibitions on number of sharks taken, prohibition on recreational take of federally-designated prohibited species, and required closure of commercial fisheries in state waters when the NMFS closes a federal fishery. *Id.*

3. International Management

In Canada, porbeagle shark management falls under the Department of Fisheries and Oceans (DFO) (COSEWIC 2004). Canada has instituted management of porbeagles, with an established TAC of 185 t (60 t bycatch, 125 t directed fishery) as of 2006 (CITES 2010). Canada's management regime is predicated on the assumption that current removals will result in a 70% probability of recovery within 100 years; that is, with the issuance of the TAC, there is still an almost 1 in 3 chance that porbeagles will not have recovered in 100 years' time. The issuance of this TAC followed a 2004 recommendation by scientists that porbeagles be listed as "endangered" under the Canadian SARA (COSEWIC 2004). In spite of the scientific recommendation by COSEWIC to list porbeagles as endangered, "in 2006 the Canadian government decided not to list the porbeagle shark under SARA due to the economic impact of a listing, both on the commercial fishing industry and on the government…" (NMFS 2008a).

Family *Lamnidae,* including porbeagles, is listed in Annex 1 (Highly Migratory Species) of the U.N. Convention on the Law of the Sea, which directs States to pursue cooperation in regional or sub-regional fishery management organizations. According to the report to CITES (2010), "there has not yet been any progress with implementation of oceanic shark fisheries management. *Lamna nasus* is included in Appendix II of the Convention on the Conservation of Migratory Species (CMS), which is developing an instrument for the conservation of migratory sharks, which may stimulate conservation action, but only at some point in the future" (CITES 2010).

The species is also listed in other conventions that do not directly pertain to the Northwest Atlantic, including the Barcelona Convention Protocol and the OSPAR Convention for the Protection of the Marine Environment of the Northeast Atlantic.

The International Plan of Action for the Conservation and Management of Sharks urges all States with shark fisheries to implement conservation and management plans, but it is voluntary. ICCAT is responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and adjacent seas but the only pelagic sharks considered "tuna-like" are Atlantic blue sharks and shortfin mako (NMFS 2008a). ICCAT requires the contracting parties since 2007 to take measures to reduce mortality of porbeagle sharks in directed Atlantic fisheries, where a peer reviewed stock assessment is not available (NMFS 2008a).

In 2007, the U.S. proposed a prohibition on retention of porbeagles in the Northwest Atlantic Fisheries Organization (NAFO), which was withdrawn due to lack of support. In 2008, the

[2] Fishery Management Report No. 46, August 2008, available at http://www.asmfc.org/speciesDocuments/coastalSharks/fmps/interstateFMPforAtlanticCoastalSharks.pdf

NAFO Scientific Council was warned that overfishing in the high seas NAFO Regulatory Area was undermining Canada's management for porbeagles and would lead to a population crash (Campana and Gibson 2008). The NAFO Parties decided that ICCAT should take further action for porbeagles. Though ICCAT did not take action at its 2008 meeting, as noted below, a 2009 ICCAT workshop report on porbeagles recommended that porbeagles in the Northwest Atlantic not be targeted and that key spawning, nursery and pupping areas be protected (ICES/ICCAT 2009).

The CITES report concluded that "[o]ther than sanitary regulations related to seafood products and measures that facilitate the collection of import duties, there are no controls or monitoring systems to regulate or assess the nature, level and characteristics of trade in *L. nasus*" (CITES 2010). It further noted that domestic fisheries management measures adopted by a few countries cannot deliver sustainable harvest of porbeagles when stocks are exploited by several fleets (CITES 2010).

4. Summary of Failure of Existing Mechanisms

The situation in which porbeagles find themselves is an illustration of the well-known tragedy of the commons, whereby multiple parties, acting independently in support of their self-interest, deplete a shared limited resource even when it is clear that it is not in anyone's long-term interest for this to happen. Indeed, despite the dramatic depletion of porbeagles, there is insufficient collaborative effort to assure that they are not continuing to be depleted.

The U.S. does not track all mortality in relation to the TAC. Landings are reported by commercial fisheries, but discards are largely derived from self-reporting by fishermen and are likely to be underestimates. The accounting of recreational fishing-related mortality and discard is sorely lacking. As such the NMFS is not adequately documenting mortality in relation to sustainability in the catches of porbeagles. It cannot assure that U.S. mortality, in combination with other mortality in this same stock in the Northwest Atlantic, is sufficient to assure that porbeagles do not suffer declines even deeper than the 90% decline they have already sustained. The NMFS deems the current Canadian management regime the best available information on which to base domestic management, yet there is every indication that this regime will not be able to prevent further declines.

In 2008, Campana and Gibson warned that Canada's management regime (on which other management regimes are predicated, including that of the U.S.) would likely be undermined as a result of unaccounted fishing occurring in the high seas. As a result, they warned this undocumented fishing would likely lead to a population crash.

Much of the world, including the U.S. has relied on Canadian estimates of MSY and porbeagle population trajectories, and the Canadian assurance that their management regime is conservative. This reliance on the Canadian management regime ignores evidence that indicates that MSY may be overestimated and that undocumented fishing may exceed even these optimistic MSY calculations. In addition, population modeling done by ICES/ICCAT in 2009 shows ranges of population trajectory since 2001 that include the possibility that mature females in the population are still declining. Further, as the value of sharks continues to increase

globally, there may be additional pressure to target them. There are little if any means of enforcing limits on catches of porbeagles in international waters.

E. Other Natural or Man-Made Factors

Finally, the ESA requires NMFS to consider "other natural or manmade factors affecting [the species'] continued existence" as one of the listing factors. 16 U.S.C. § 1533(a)(1)(E).

Of considerable concern is the unique and troubling risk at which small populations find themselves. Using IUCN categories, Purvis et al. (2000) stated that factors such as high trophic level, low population density, slow life history and, in particular, small geographical range are all significantly and independently associated with high risk of extinction for populations that are declining. Where there is variability among species' extinction risk, much of the variation can be accounted for by external anthropogenic factors that affect species. In this case, porbeagles, struggling to recover from a reduction of 90% of the virgin population, are placed at greater risk by continued fishing pressure that is compounded by their life history and lowered density.

In its report, the COSEWIC cited Punt (2000) in warning that for sharks with very low productivity like the porbeagle shark, the biomass and fisheries mortality rate at which recruitment failure occurs may be quite close to the rates where population depensation and ultimate extirpation occur (COSEWIC 2004).

As a result of their drastically reduced population, porbeagles are additionally placed at risk of adverse effects resulting from natural stochastic events.

IV. Requested Listing

Petitioner HSUS requests that the Northwest Atlantic Population of Porbeagle Sharks be listed as an endangered species under the ESA. As described above, the Northwest Atlantic porbeagle shark population has declined precipitous over the past 50 years -- the population has lost 90% of its numbers since 1961 when commercial exploitation began in earnest. Continued "overutilization" of porbeagles by commercial and recreational fisheries both domestically and abroad will exacerbate this decline. 16 U.S.C. § 1533(a)(1)(B). The decline may be magnified by "disease" and "threatened destruction, modification, or curtailment" of the porbeagle's habitat due to water pollution, changing ocean temperatures, and ocean acidification. *Id.* § 1533(a)(1)(A), (C). Due to the "inadequacy of existing regulatory mechanisms" on both the domestic and international levels, the Northwest Atlantic population of porbeagles will not recover from its currently decimated status without protection pursuant to the ESA. 16 U.S.C. § 1533(a)(1)(D); 50 C.F.R. § 424.11(c)(4). There is no question the Northwest Atlantic population of porbeagle sharks constitutes a "Distinct Population Segment" that "is in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. §§ 1532(16); 1532(6).

The NMFS itself has already acknowledged that the Canadian COSEWIC assessment from 2005 represents the "best available science" on porbeagle status. The NMFS specifically stated the Canadian assessment "was reviewed by NMFS scientists who determined it used appropriate methodologies and, because it used all available fishery and biological data including U.S.

landings and research, constituted the best available science. These NMFS scientists also determined that because the stock assessed is a unit stock that extends into U.S. waters, the assessment and its recommendations were appropriate for use in U.S. domestic management" (NMFS 2008b).

As the NMFS is aware, the COSEWIC analysis specifically recommended that the Northwest Atlantic stock of porbeagle sharks be listed as "endangered" pursuant to the Canadian Species at Risk Act (SARA). *See* Species at Risk Act, R.S.C., ch. 29 (Can.) (defining an "endangered" species as "a wildlife species that is facing imminent extirpation or extinction"). The Canadian government declined to take the science-based recommendation of COSEWIC based almost entirely on the grounds that the listing would have adverse economic consequences.

However, the ESA does not permit NMFS to consider economic factors in making a listing determination. Instead, NMFS must make a listing determination "*solely* on the basis of the best scientific and commercial data available." 16 U.S.C. § 1533(b)(1)(A); 50 C.F.R. § 424.11(b); *see also* H. REP. NO. 97-835, 97th Congress, Second Session 20 (1982) ("economic considerations have no relevance to determinations regarding the status of species"); *New Mexico Cattle Growers Ass'n v. U.S. Fish and Wildlife Serv.*, 248 F.3d 1277, 1282 ("[E]conomic analysis is not a factor in the listing determination.") (10th Cir. 2001); H.R. REP. NO. 97-835(1982) ("economic considerations have no relevance to determinations regarding the status of species").

V. Conclusion

In its analysis of the status of porbeagles, COSEWIC concluded that:

> [T]he porbeagle population is threatened by its limited capacity for recovery and by exploitation. The life history characteristics of the porbeagle shark, late maturity and low fecundity, render this species highly vulnerable to overexploitation, as is evidenced by the history of its fisheries. Fishing pressure collapsed the population within six years in the 1960s, and after decades of low catches and modest recovery, when fishing increased in the 1990s the population collapsed again, to an overall low. Given the low productivity of this species, it would take at a minimum several decades to recover from its current low abundance level. It is uncertain; however, if the current quota, which is estimated to be at approximately FMSY and is directed primarily on immature porbeagle, is sufficiently low enough to allow for recovery. At present, there is no evidence to indicate that the decline in porbeagle abundance has ceased (COSEWIC 2004).

This pessimistic assessment is compounded by the fact that unaccounted high seas fishing may, in fact, be exceeding the MSY for porbeagles. Indeed, after noting that Canadian catch quotas are 185 t and the MSY is stipulated at 250 t, Campana and Gibson warned NAFO in 2008 that "[t]he accuracy of the 2005 and 2006 NAFO statistics for porbeagle has been questioned, but in general, they probably under-report actual porbeagle catches… If [NAFO Regulated Area] catches (either reported or unreported) are substantial (>100t), then total porbeagle catches

(including the Canadian catch) would put the porbeagle exploitation rate at unsustainable levels" (Campana and Gibson 2008).

The 2009 ICES/ICCAT workshop employed models that indicated that, depending on variables put into the models; female spawners range from 83% to 103% of their 2001 numbers, and thus may still be declining (ICES/ICCAT 2009).

Although the U.S. catches of porbeagles are minor in comparison to those of Canada, the U.S. is a major market. Further, to encourage other countries to limit their take (as the U.S. tried to do with NAFO in 2007), the U.S. needs to lead by example. This species is in dire need of immediate conservation action.

For all of the reasons discussed in this petition, the NMFS must list the porbeagle shark in the Northwest Atlantic as an endangered species under the Endangered Species Act.

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