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Trade in and Conservation of two Shark Species, Porbeagle (*Lamna nasus*) and Spiny Dogfish (*Squalus acanthias*)

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PREFACE

Many shark species are already threatened by overexploitation through fisheries and international trade. This development raised concern with conservation organizations as well as fisheries organizations, both on national and international level.

FAO has developed an International Plan of Action for the Conservation and Management of Sharks and has recommended that shark fishing states conduct stock assessments and develop similar action plans on national level. CITES is discussing shark conservation and unsustainable trade in sharks, their parts and derivatives and has already listed shark species on its appendices and is considering further listing proposals.

CITES is playing an essential role for the protection of species of wild fauna and flora against over-exploitation through international trade and the German Federal Agency for Nature Conservation fully supports the sustainable use of wild animal and plant species under this convention. As German federal institution we have a special responsibility for the conservation of our own fauna including native shark species. Therefore, supported by TRAFFIC Europe, we compiled information on the conservation status of and international trade in porbeagle and spiny dogfish, species native to our waters and threatened by fisheries and international trade. These data are presented now in the hope that everybody interested in sharks will be able to use it to promote shark conservation and to restrict shark fisheries and international trade in sharks, their derivatives and products to a sustainable level.

Professor Dr. Hartmut Vogtmann
President of the Federal Agency for Nature Conservation

I. INTRODUCTION

Already in 1994 at CoP 9 Parties to CITES recognized that ongoing significant unsustainable use of sharks and their products posed a severe threat to the conservation of many shark species. Since then issues of trade in sharks have been discussed under CITES, various respective resolutions and decisions have been adopted and the Animals Committee has established a specific Shark Working Group to deal with shark issues.

Sharks are particularly vulnerable to overexploitation owing to their late maturity, longevity and low fecundity. Unregulated and unreported trade is contributing to unsustainable fishing for a number of shark species. In 1999 FAO prepared an International Plan of Action on the Conservation and Managements of Sharks (IPOA Sharks). Those members, involved in direct or indirect fisheries of sharks, were encouraged to develop and adopt similar plans on national basis (NPOA-Sharks). However, until today insufficient progress has been made in achieving shark management through the implementation of IPOA-Sharks except in states where comprehensive shark assessment reports and NPOA-Sharks have been developed. Unsustainable fisheries of sharks and trade in sharks and their products are still continuing.

CITES activities cannot substitute the implementation of IPOA- and NPOA-Sharks, however, listing of shark species under CITES can assist and promote this process by the neccessity of non-detriment findings for international trade, regulation and proper monitoring of trade.

Resolution Conf. 12.6 recommends that Parties continue to identify endangered shark species that require consideration for inclusion in the Appendices, if their management and conservation status does not improve. In the light of this recommendation the German Scientific Authority to CITES has started in 2003 to compile information on the conservation status and trade of two shark species native to Germany and known to be threatened already at least on national level. The results showed that both species qualify for CITES listing and proposal were written to put the species on Appendix II. However, as the poposals did not find the political approval of the qualified majority of the 25 EC member states they were not submitted to the CITES secretariat.

As the data collected on the species' conservation status and trade in these sharks and their products may be used as a valuable information source for ongoing activities in shark conservation worldwide we have decided to publish them as a special volume of the "BfN-Skripten" of the German Federal Agency for Nature Conservation.

II. EXECUTIVE SUMMARY

a) Both shark species occur in temperate waters of the northern and southern hemisphere. Whereas the spiny dogfish (*Squalus acanthias*) is found in waters of the continental shelf the porbeagle (*Lamna nasus*) also occurs offshore down to depths of 200 m, sometimes even deeper. Spiny dogfish and porbeagle belong to those shark species more vulnerable to over-exploitation by fisheries because of their late maturity, longevity, low reproductive capacity, and a very low intrinsic rate of population increase (5-7 % per annum in *Lamna nasus* and 2-7 % in *Squalus acanthias*). The spiny dogfish has a very long generation time (25-40 years). Its aggregating habit makes it as well vulnerable to fisheries. Most stocks are highly migratory.

b) Meat of *Lamna nasus* as well as *Squalus acanthias* is highly valued, particularly in the European Union (EU). The large fins of the porbeagle as well as the small ones

of the spiny dogfish are valuable as well. *Lamna nasus* is taken in target fisheries and is a retained and utilised economically-important component of multispecies fisheries. Its Meat and fins enter international trade, but are generally not recorded at species level. Other products (liver oil, cartilage, jaws, teeth and skin) are less fully utilised.
European market demand for *Squalus acanthias* is driving fisheries that preferentially target aggregations of mature (usually pregnant) females. As for the porbeagle other products (liver oil, cartilage, skin) of the spiny dogfish are less fully utilised.
A highly efficient DNA test is available to identify parts and derivatives of porbeagle, a similar test for the spiny dogfish will soon be available.

c) The two North Atlantic target fisheries of *Lamna nasus* are well documented; both have been unsustainable and have depleted stocks to a low population size. As a result of these stock depletions, reported landings have dropped from thousands of tonnes to a few hundreds in less than 50 years (1950s to late 1990s) (HEESSEN 2003). The Northwest Atlantic Canadian Department of Fisheries stock assessment documents a decline to about 11% of baseline caused by fisheries overexploitation, although sustainable management introduced in 2002 should enable recovery. There is no stock assessment for the more heavily fished Northeast Atlantic population, which is likely to have experienced a much more serious decline. No information is available for southern hemisphere or high seas stocks, which are a high value catch component in longline fisheries, particularly for tuna and swordfish.

Some target *Squalus acanthias* fisheries have been documented for over 100 years. Fisheries stock assessments report a decline in total biomass of 95% from baseline in the Northeast Atlantic and a decline in biomass of mature females of 75% in just 10 years in the Northwest Atlantic. Declining catch per unit effort (CPUE) data from other regions indicate that similar levels of decline have likely been experienced there. Elsewhere, increased fishing effort during a period of rising international market demand infers that other stocks are under similar pressure. International trade demand for spiny dogfish meat has caused the serial depletion of global stocks of spiny dogfish. Thus, European market demand caused the depletion of the Northeast Atlantic stock, followed by the depletion of the Northwest Atlantic stock. This pattern continues; fishing pressure is now focusing on largely unmanaged southern hemisphere stocks, with landings exported to Europe.

d) Sustainable management based on stock assessment and scientific advice has been in place for *Lamna nasus* in the Canadian EEZ since 2002. Quotas in European Community waters apply only to non-EU fleets (i.e. of the Faeroe Islands and Norway). They greatly exceed total landings by these states and have no sustainable management role. There is no management in the southern hemisphere, although New Zealand plans to introduce quota management in October 2004. Regional Fishery Organisations (RFOs) (CCAMLR and ICCAT) are not managing high seas fisheries for *Lamna nasus*.

Management for *Squalus acanthias* is in place in only a few regions and in only a limited part of the range of highly migratory stocks. In the majority of cases, current management is obviously inadequate to reverse current declining trends and to ensure future sustainable fisheries. No RFO is managing fisheries for this species.

e) An assessment of compliance with the CITES Listing Criteria shows that both species qualify for listing on Appendix II of the convention. The North Atlantic stocks of *Lamna nasus* and the *Squalus acanthias* stocks of the Northern Hemisphere and South America meet criteria Bi) and Bii) of Annex 2a of Res. Conf. 9.24 (rev.). Both North American stocks of the porbeagle have experienced significant population declines, ongoing in one stock. Despite the lack of trade data for *Lamna nasus*, it is clear that all of the fins and some of the meat of this species enter international trade. Significant and ongoing population declines are reported for the Northern Hemisphere and South American stocks of the spiny dogfish as well. A large proportion of *Squalus acanthias* products of current fisheries in the North and Southwest Atlantic enters international trade.

Despite a lack of information on the status of the Southern Ocean population of *Lamna nasus*, it is caught by fisheries and its meat and fins enter international trade. Serious depletion of the North Atlantic stocks of *Squalus acanthias* has not only led to increased fishing pressure on the South American stocks, but - most recently - also to Indo-Pacific stocks. All these latter stocks, from the Southern Ocean for *Lamna nasus* and from the Indo-Pacific for *Squalus acanthias*, qualify as well for a listing on Appendix II under criterion B of Annex 2b) of Res. Conf. 9.24 (rev.) ("*species which must be subject to regulation in order that trade in specimens of certain species included in Appendix II in accordance with Article II, paragraph 2(a), may be brought under effective control*").

f) Both shark species meet the guidelines suggested by FAO for the listing of commercially exploited aquatic species. It falls into FAO's lowest productivity category of the most vulnerable species; those with an intrinsic rate of population increase of <0.14 and a generation time of >10 years (FAO 2001). Some documented stock declines of *Lamna nasus* have clearly exceeded the qualifying level of 20% or less of historic baseline, or are declining so rapidly as to qualify for Appendix I listing under the FAO guidelines.The same is true for the North Atlantic stocks of *Squalus acanthias* which have also clearly exceeded the qualifying level of 20% or less of historic baseline.

g) The 2003 IUCN Red List assessment for both shark species is Near Threatened. The North Atlantic and Mediterranean stocks of *Lamna nasus* are more seriously threatened. The North Atlantic stocks of *Squalus acanthias* are assessed as Vulnerable and Endangered based on past fisheries records, stock assessments, and continued unsustainable exploitation. Assessments for other regional stocks of both species are underway as well as a review of their global status.

h) A number of initiatives and actions are proposed to improve the conservation status of the porbeagle and the spiny dogfish. These activities should be taken under the umbrella of CITES, FAO and EU jurisdiction. The three most important recommendations are as follows:

CITES Parties should be encouraged to develop Appendix II listing proposals - not only for the two species mentioned above - and submit them for consideration at forthcoming meetings of the conferences of the parties. CITES-listings would help ensure that international trade is not detrimental to the survival of the species, and thereby effectively assist with the regulation and monitoring of the exploitation of threatened species as well as actively contribute to the implementation of the United Nations Food Agriculture Organisation (FAO) International Plan of Action (IPOA) for the Conservation and Management of Sharks.

Shark fishing states that have not yet conducted shark stock assessments and developed National Plans of Action for the Conservation and Management of Shark stocks (NPOA Sharks) under the umbrella of FAO's International Plan (IPOA Sharks) should be encouraged to undertake this action.

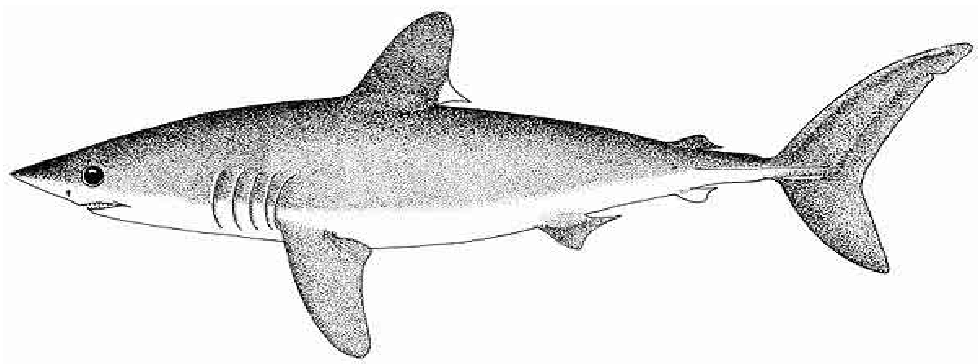
The European Community should urgently develop an EU Action Plan for the Conservation and Management of Sharks. Such a plan should be drafted by the EU Commission for discussion by the Council of Ministers and the European Parliament early next year in order for the respective Councils to have decided upon first actions by the end of 2005.

III. PORBEAGLE - *Lamna nasus* (BONATERRE, 1788)

1. Biological parameters

Porbeagle sharks are warm-blooded. They grow and mature faster than many cold-blooded sharks, but are still, however, relatively slow growing and late maturing, long-lived and bear only small numbers of young. This results in a low intrinsic rate of population increase (5-7% per annum in an unfished population (DFO 2001)) and vulnerability to over-exploitation, made worse by a tendency for fisheries to capture large immature specimens long before they reach maturity. Unmanaged and poorly managed fisheries for this species have been unsustainable.

Life history characteristics vary between stocks. Females mature at an age of 13 years and length of 217-259cm in the Northwest Atlantic, and at 185-202cm in the southern hemisphere. They produce litters of 1-5 pups (usually four), 65-80cm long after an 8-9 month pregnancy. They may breed every year. Males mature at 8 years old and a smaller size. Porbeagle sharks reach a maximum length of 365cm, weight of 230kg, and age of 26-45 years (CAMPANA *et al*. 2002 a, b, NATANSON *et al*. 2002, JENSEN *et al*. 2002, COMPAGNO 2001, FISCHER 1987, DFO 2001).



350cm

Figure 1. Porbeagle *Lamna nasus* (*Source*: FAO Species Identification Sheet, 2003)

1.1 Distribution

The porbeagle shark is an active, warm-blooded epipelagic species inhabiting boreal and temperate waters, sea temperature 1-18°C. It has been recorded in the States listed in Table 2a and its distribution ranges from close inshore (especially in summer) to far offshore, where it is often associated with submerged banks and reefs. These sharks occur from near the surface to depths of 200m. They have occasionally been caught at depths of 350-700m (CAMPANA and JOYCE 2004, COMPAGNO 2001). They occur singly, in shoals, and in feeding aggregations (Compagno 2001). The population segregates (at least in some regions) by age, reproductive stage and sex.

The species occurs in:
Northwest Atlantic: Greenland, Canada, United States, and Bermuda;
Northeast Atlantic: Iceland and western Barents Sea to Baltic, North and Mediterranean Seas, including Russia, Norway, Sweden, Denmark, Germany, Holland, United Kingdom, Ireland, France, Portugal, Spain, and Gibraltar; entire Mediterranean coast (not Black Sea); Morocco, Madeira, and Azores;
Southern Atlantic: southern Brazil and Uruguay to southern Argentina; Namibia and South Africa;
Indo-West Pacific: South-central Indian Ocean from South Africa east to between Prince Edward and Crozet Islands, between Kerguelen and St. Paul Islands, and southern Australia, New Zealand. Sub Antarctic waters off South Georgia, Marion, Prince and Kerguelen Islands; and
Eastern South Pacific: southern Chile to Cape Horn (COMPAGNO 2001).

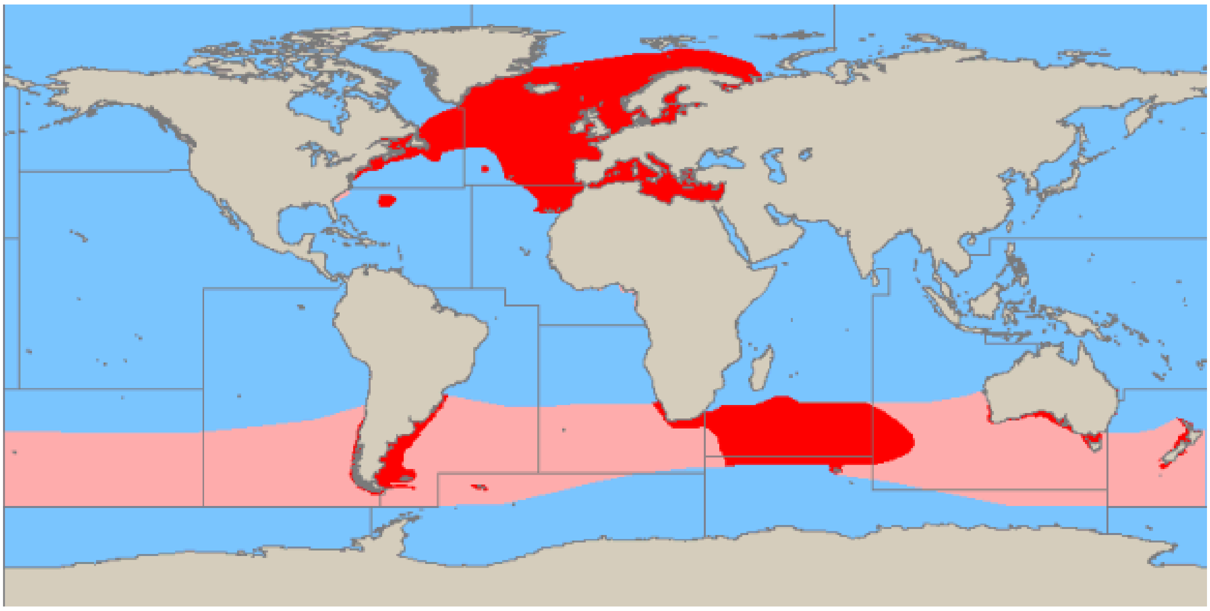


Figure 2. Distribution of porbeagle (Red/Dark: certain, Pink/Light: uncertain)
(*Source*: FAO Species Identification Sheet 2003)

There is apparently no (or extremely limited) genetic exchange between the northwest and northeast Atlantic populations. The stock structure of the southern hemisphere population(s) is unknown.

1.2 Habitat availability

Critical habitats for this species and threats to these habitats are unknown. High levels of heavy metals (particularly mercury) in such habitats would be of concern because of their bioaccumulation and bio-magnification in top oceanic predators, but their impacts on population fitness is unknown. Potential effects of climatic changes on world ocean temperatures and related biomass production could impact porbeagle food sources.

1.3 Population status

Global: The porbeagle shark has a relatively low reproductive potential, with an intrinsic annual rate of population increase of 5-7% because of its slow growth, late maturity and small litter size (see above). The 2000 IUCN Red List assessed the porbeagle shark as 'Near Threatened' globally, with North Atlantic stocks more seriously threatened following population depletion caused by unsustainable fishing pressure. This assessment is currently under review.

Southern hemisphere: Longline swordfish and tuna fleets in the southern hemisphere are presumed to take a significant bycatch, but no data or stock assessments are available.

Northwest Atlantic: A detailed stock assessment is available for porbeagle within the Canadian 200-nautical mile Exclusive Economic Zone (EEZ). According to the Canadian Department of Fisheries and Oceans (DFO 2001), the biomass in 2000 was depleted to 11-17% of virgin levels in 1961 (before fishing began), despite the introduction of a Total Allowable Catch (TAC) in 1995. (The annual TAC was cut significantly in 2002 in order to reduce catches to sustainable levels and enable stock rebuilding.)

Northeast Atlantic: No stock assessment is available, but because this population was depleted well before that in the Northwest Atlantic and has not benefited from restrictions on catch or effort or technical fisheries management measures, it is presumed more seriously depleted than that in Canadian waters. This population was assessed as Vulnerable in the 2000 IUCN Red List of Threatened Species (STEVENS 2000), but this assessment is under review and likely to be upgraded to a more severe assessment of risk.

Mediterranean: Porbeagle shark is extremely rare (Anon 2003b).

Some range States have included the species in their Red List, including Germany and Sweden where porbeagle is listed as vulnerable (VU) (BINOT *et al*. 1998, E. MEHNERT, Swedish Board of Agriculture, *in litt*. to the German Ministry of Environment (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, BMU), 23 September 2003). The UK identified porbeagle as a species of conservation concern in its response to the Convention on Biological Diversity in 1995.

1.4 Population trends

The declining population trends during the past fifty years in the North Atlantic (see above) , which is the major reported source of world catches, is reflected in declining catches for this highly valuable species during a period of rising fishing effort and market demand, and improved fisheries technology (see below).

Porbeagle landings from the Southern Hemisphere are only reported to FAO by New Zealand in the Pacific southwest (21t in 1997) and are minor in comparison with those in the North Atlantic (Figure 6), although actual catches must be much higher than this. The only trend data identified for southern stocks are records of declining captures of porbeagle by the Uruguayan pelagic tuna longline fleet during 1981–1998 (DOMINGO undated). During the 1980s, only the two most valuable shark species were retained for their meat: porbeagle and mako *Isurus oxyrinchus*, representing about 10% of the total catch. By 1991, the abundance of these two species had fallen considerably but shark fin prices were rising and blue sharks *Prionace glauca* and eight other species of large sharks were also retained (Figure 10). The status of the population on the Argentinean continental shelf is yet to be assessed (VICTORIA LICHTSTEIN, CITES authority of Argentina, *in litt*., 27 October 2003).

Northeast Atlantic

Porbeagle has been fished in this region by many European countries, principally Denmark, France, Norway and Spain (Figure 8). The Northeast Atlantic fishery began when Norway started targeting porbeagle in the 1930s using longlines. Norwegian landings first reached a peak of 3884t in 1933. About 6000t were taken by the Norwegian fleet in 1947, when the fishery reopened after the Second World War, followed by a progressive drop in landings to between 1200-1900t from 1953–1960. The collapse of this fishery led to the redirection of fishing effort by Norwegian and Danish longline shark fishing vessels into the Northwest Atlantic. Norwegian landings from the Northeast Atlantic subsequently decreased to only 10–40t/year in the late 1980s/early 1990s, while average Danish landings fell from over 1500t in the early 1950s to less than 100t throughout the 1990s (DFO 2001, GAULD 1989, Figure 8).

French and Spanish longliners have operated directed fisheries for porbeagle since the 1970s. Reported landings from the main French fishing grounds in the Celtic Sea and Bay of Biscay decreased from over 1092t in 1979 to 3-400t in the late 1990s. Spanish vessels appear to have taken porbeagle opportunistically both in the early and late 1970s and since 1998. Landings off Spain tend to be greater during the spring and autumn, with a drop in the summer (MEJUTO 1985, LALLEMAND-LEMOINE 1991). It is unclear, however, whether the very variable early landings data from the Spanish fleet (from nil to nearly 4000 t/year, Figure 8) represents huge variations in catches, possibly the result of 'boom and bust' fisheries removing different segments of the stock, or differences in catch reporting. BONFIL (1994) estimated that 50t of porbeagle were taken as a supplementary catch in the Spanish longline swordfish fishery in the Mediterranean and Atlantic during 1989. The long line fishery in the Bay of Biscay (ICES Area VIII, Figure 3), directed at the more abundant blue shark, also landed about 30t of mainly porbeagle and some shortfin mako (*Isurus oxyrinchus*) during 1998 - 2000. ICES data (HEESSEN 2003) indicate that annual landings from Area IXa into mainland Portugal peaked at almost 3000t in 1987-88 and have since declined (these records do not appear in the FAO statistics (Figure 8)).

Reported landings from the historically most important fisheries, around the UK and in the North Sea and adjacent inshore waters have decreased to very low levels during the past 30-40 years, while catches from the offshore ICES sub-regions west of Portugal, west of the Bay of Biscay and around the Azores have increased since 1989 (Figure 9). This is attributed to a decline in heavily fished and depleted inshore populations and redirection of effort to previously lightly exploited offshore stocks.

Northwest Atlantic

Porbeagle fishing in the Northwest Atlantic started in 1961, when the fleet of Norwegian shark longliners began operating off the coast of New England and Newfoundland after the Northeast Atlantic stocks had been depleted (Figure 7). Catches increased rapidly from about 1,900t in 1961 to more than 9,000t in 1964 (Figure 6). By 1965 many of the vessels had switched to other species or moved to other grounds because of the population decline (DFO 2001). The fishery collapsed after only six years, landing less than 1,000t in 1970, and took 25 years for only very limited recovery to take place (Figure 5a). Smaller landings were also reported by Faeroese fishing vessels from around the same time and throughout the 1970s and 1980s (Figure 6). Norwegian and Faroese fleets have been excluded from Canadian waters since the establishment of Canada's EEZ in 1995. Canadian and US authorities reported all landings after 1995.

Three Canadian vessels entered the targeted Northwest Atlantic fishery in 1994. Catches of 1,000–2,000 t/year throughout much of the 1990s reduced population levels to a new low in under ten years: the average size of sharks and catch rates were the smallest on record in 1999 and 2000 (Figures 5a to d). By 2000, catch rates of mature sharks were reduced to 10% of the 1992 peak, and immature catch rates to 30% of 1991 peak. The biomass in 2000 was estimated as 11–17% of virgin biomass and fully recruited F estimated as 0.26 (DFO

2001). The 2001 stock assessment by the Canadian Department of Fisheries states: 'An annual catch of 200-250t would correspond to fishing at about MSY and would allow population growth.' Following this advice, the quota was reduced to 250 tonnes for the period 2002-2007 to allow population growth and recovery.

1.5 Geographic trends

No information is available on any changes in the geographic range of porbeagle, but this species now appears to be scarce, if not absent, in areas where it was formerly commonly reported (e.g. in the Western Mediterranean, ALEN SOLDO *in litt*. 2003).

1.6 Role of species in its ecosystem

This shark feeds mainly on small to moderate-sized pelagic schooling fishes, including mackerel, pilchards and herring, also on demersal fishes including gadoids and other sharks, for instance spiny dogfish (COMPAGNO 2001). In the Northwest Atlantic, pelagic fish and squid are the main diet in deep water, and pelagic and demersal fish are important in their diet in shallow water (JOYCE *et al*. 2002). As with many other large shark species, the porbeagle is an apex predator, occupying a position near the top of the marine food web (it does not feed on marine mammals). STEVENS *et al*. (2000) warn that the removal of populations of top marine predators may have a disproportionate and counter-intuitive impact on trophic interactions and fish population dynamics, including by causing decreases in some of their prey species. Aside from humans, there is little known about predators of porbeagle sharks, but orcas and white sharks might take this species (COMPAGNO 2001).

1.7 Threats

1.7.1 Directed fisheries

As described above, intensive directed fishing for the valuable meat of porbeagle sharks has been the major threat to populations during the twentieth century. This species is also a valued target game fish species for recreational fishing in Ireland and UK. The recreational fishery in Canada and the US is very small (FAO 2003, DFO 2001).

1.7.2 Incidental fisheries

Porbeagles are a valuable secondary target of many fisheries, particularly longline fisheries, also gill nets, driftnets, pelagic and bottom trawls, and handlines. Examples include the demersal longlines for Patagonian toothfish (*Dissostichus eleginoides*) in the southern Indian Ocean and by the Argentinean fleet (VICTORIA LICHTSTEIN, CITES Management Authority of Argentina, *in litt*. to TRAFFIC Europe, 27 October 2003), and longline swordfish and tuna fisheries in international waters off the coasts of Argentina and Uruguay (DOMINGO undated). Despite the large amount of fishing activity that will result in porbeagle captures in the Southern Hemisphere, New Zealand is the only country that reports landings to FAO, indicating that the southern catch is largely unreported.

The high value of porbeagle shark meat means that it is not appropriate to describe these exploited incidental captures as 'bycatch'. The exception is in those high seas tuna and billfish fisheries where vessels holding space is too limited to enable even valuable shark carcasses to be retained; in these cases the fins alone may be retained (e.g. the Japanese longline fishery for southern bluefin tuna off Tasmania and New Zealand, the pelagic fishing fleets of other countries in the southern Indian Ocean and probably elsewhere in the Southern Hemisphere (COMPAGNO 2001).

2. Utilisation and trade

Porbeagle shark products include fresh, frozen and dried-salted meat for human consumption, oil and fishmeal for fertilizer, and fins for shark-fin soup (COMPAGNO 2001). The commercial value of the species has been documented through present and past market surveys (FLEMING AND PAPAGEORGIOU 1997, ROSE 1996, and TRAFFIC Europe 2003 market surveys). Findings indicate that the demand for fresh, frozen or processed meat, as well as fins and other products of porbeagle is sufficiently high to justify the existence of an international market, in addition to national utilisation. Despite the high value of its meat, and unlike other high-priced fish such as swordfish, bluefin tuna and spiny dogfish, trade in porbeagle is not documented at species level. This makes it difficult to assess the importance and scale of its utilisation worldwide. The species is also utilised for sports fishing in Ireland, USA and UK (FAO 2003), with catches either retained for meat and/or trophies, or tagged and released (DFO 2001).

2.1 National utilisation

Meat
According to GAULD (1989), porbeagle was one of the most valuable (by weight) marine species landed in Scotland in the 1980s. In 1997 and 1998 porbeagle meat was auctioned at EUR 5-7/kg, about four times the wholesale price of blue shark (EUR 1.5/kg) (VAS and THORPE 1998). In Newlyn fishing harbour (South England), the retail price for fresh porbeagle shark loin is about EUR 25/kg (TRAFFIC Europe market survey, November 2003). In Germany it is offered as meat of "Kalbsfisch" or "See-Stör".

Other products
Porbeagles may be utilised nationally in some range states for their liver oil, cartilage and skin (VANNUCCINI 1999). Low-value parts of the carcass may be processed into fishmeal. There is limited utilisation of jaws and teeth as marine curios. No significant national use of porbeagle parts and derivatives has been reported, partly perhaps because records at species level are not readily available, and partly because landings are now so small, particularly in comparison with other species.

2.2 Legal international trade

Meat
A great deal of trade occurs between European Union (EU) Member States, such as UK exporting to France and Spain and Italy importing from France. Canada exports porbeagle meat to Italy (S. CAMPANA *in litt*.). The EU is reported to export porbeagle to the USA, where it is consumed in restaurants (VANNUCCINI 1999). However, these commercial transactions could not be quantified nor their economic value estimated. The lack of available trade data is due to the absence of code for Porbeagle products in the customs Harmonised System as well as in the Combined Nomenclature of the EU. In the EU, codes such as 0302 65 90 – Fresh or chilled shark (excl. dogfish of the species '*Squalus acanthias*' and '*Scyliorhinus* spp.), 0303 75 90 –Frozen sharks (excl. dogfish) and 0304 20 69 –Frozen fillets of sharks (excl. dogfish), cannot be used to estimate trade in Porbeagle because they mix products of a variety of shark species and would therefore lead to incorrect conclusions. In Australia, data on exports of Porbeagle to the US are grouped with mako sharks (IAN CRESSWELL,

CITES Management Authority of Australia, *in litt*. to BMU, February 2004). Porbeagle is imported by Japan (SONU 1998). Until targeted customs control and monitoring systems, or compulsory reporting mechanisms to FAO are established, data on international trade in porbeagle products will not be available. Currently, the scale and value of global consumption of the species cannot be assessed.

Fins

Among the ten nations recorded by FAO as trading in porbeagle products, only Argentina and Norway are reported to export fins of this species (VANNUCCINI 1999), but this is only because these products are not usually declared at species level, not because trade does not occur. The species does not appear on the list of preferred species for its fins (VANNUCCINI 1999) and was reported to be relatively low value by MCCOY and ISHIHARA (1999), quoting FONG and ANDERSON (1998). The large size of porbeagle fins nonetheless means that these are a relatively high value product. They have been identified in the fin trade in Hong Kong (SHIVJI *et al*. 2002). New Zealand is currently attempting to establish the size of former catches by establishing a conversion factor to scale up reported landings of porbeagle fins to whole weight (MALCOLM FRANCIS, NIWA, New Zealand, in litt. April 2004). The appropriate weight ratio from the Canadian fishery is 1.8–2.8% (STEVE CAMPANA, DFO Canada, April 2004).

Others

Porbeagle is included in the list of shark species whose hides are processed into leather and livers are extracted for oil (VANNUCCINI 1999, FISCHER 1987), but trade records are not kept. Cartilage is probably also processed and traded. Other shark parts are used in the production of fishmeal, which is probably not a significant product from porbeagle fisheries because of the high value of the species' meat (VANNUCCINI 1999).

2.3 Illegal trade

Because no national legislation has been adopted by range States or trading nations to regulate trade in *Lamna nasus*, there is no evidence for illegal trade taking place. Where strict fishery management controls are in place for porbeagle (i.e. in Canadian waters), the infringement of these controls could lead to illegal trade. No evidence for such trade has been identified.

2.4 Actual or potential impact of trade

The unsustainable porbeagle fisheries described above have been driven by the high value of the meat in national and international markets. Trade has therefore been the driving force behind depletion of populations in the North Atlantic and may potentially threaten southern hemisphere populations.

2.5 Captive breeding for commercial purposes

Porbeagle sharks have never been maintained in captivity and are probably unsuitable candidates for aquaria. Their life history constraints also preclude captive breeding for commercial purposes.

3. Conservation and management

3.1 Legal status

3.1.1 National

Porbeagle sharks are not known to have been awarded any legal status in any range state (their management status is described below).

3.1.2 International

The porbeagle shark is included on Table 1a (Highly Migratory Species) of the UN Convention on the Law of the Sea (UNCLOS), which lists 'Family Isurida' (an old name for Family Lamnidae) among other oceanic sharks. The UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks establishes rules and conservation measures for high seas fisheries resources has been in force since 2001. It directs States to pursue co-operation in relation to listed species through appropriate sub-regional fisheries management organisations or arrangements. No progress with implementation of shark fisheries management appears to have been achieved.

The species is listed on Annex III, 'Species whose exploitation is regulated' of the Barcelona Convention Protocol concerning specially protected areas and biological diversity in the Mediterranean, signed in 1995 but not yet ratified. The Mediterranean population of this species was also added in 1997 to Appendix III of the Bern Convention (the Convention on the Conservation of European Wildlife and Natural Habitats) as a species whose exploitation must be regulated in order to keep its population out of danger. No management action has yet followed these listings.

Annex V of the Convention on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area [also called OSPAR (Oslo-Paris) Convention] requires OSPAR to develop a list of threatened and/or declining species and habitats in need of protection or conservation in the OSPAR maritime area (Northeast Atlantic). OSPAR member states were invited in 2001 to submit proposals for inclusion on this list. In response, Portugal – on behalf of the Azores, proposed to list porbeagle *Lamna nasus* in the wider Atlantic because of its biological sensitivity, keystone importance and the severe decline in its population. This proposal has not yet been adopted.

3.2 Species management

3.2.1 Population monitoring

Large numbers of porbeagle sharks are taken as a utilized bycatch in high seas fisheries targeting tuna and billfish. Some RFOs may, under their terms of reference, monitor if not manage these bycatch shark fisheries. The remit of the International Commission for the Conservation of Atlantic Tunas (ICCAT), for example, covers other species of fishes exploited in tuna fisheries. ICCAT has adopted specific resolutions, including *Resolution 95-2 –Cooperation with FAO to study status of stocks & shark by-catches*, to support improved management of shark stocks, including studies on shark by-catch. It has recommended that the Commission Contracting Parties (CPC) develop and conduct observer programs to collect accurate data on shark catches and discards by species, particularly blue (*Prionace glauca*), porbeagle (*Lamna nasus*), and shortfin mako sharks (*Isurus oxyrinchus*), but Members are not complying with its guidance and the value of these data is limited (ANON. 2003b). Porbeagle was later excluded from the above list of three species for particular attention (ICCAT Resolution 01-11 –*Atlantic sharks*). Data on porbeagle mortality and discards are recorded in the Atlantic shark catch statistics (last updated by ICCAT on 25 June 2001), but these data are outdated and seem largely incomplete, likely underestimating the impact of by-catch on the species (Excel file at http://www.iccat.es).

Although catches are reported to ICES, there is no monitoring of porbeagle populations in the Northeast Atlantic. In the Northwest Atlantic, monitoring of porbeagle catches is undertaken by Canadian and US scientific observer programs, which trigger management decisions when the quota is reached (CAMPANA *et al*. 2003). The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) does not monitor porbeagle catches in the southern ocean.

3.2.2 Habitat conservation

None.

3.2.3 Management measures

The International Plan of Action (IPOA) for the Conservation and Management of Sharks, adopted by the FAO at the 23rd Session of the Conference on Fisheries (COFI) in February 1999, urges states with active shark fisheries to implement conservation and management plans. However, this initiative is voluntary and, although 116 countries reported shark landings for 2001 to FAO, members of FAO reported to the 25th session of COFI in February 2003 that only six countries had developed a National Plan of Action (NPOA) while a further 11 have partially developed a NPOA for sharks.

At the 12th meeting of the Conference of the Parties of CITES, it was reported (Doc. 41.1 *Conservation and management of sharks*) that, despite significant landings of sharks and their products, progress on the implementation of the IPOA was negligible and that the NPOA-Sharks are not developing rapidly enough. The AC agreed at its 19th meeting (August 2003) to create an inter-sessional working group in order to better implement CITES Resolution Conf. 12.6 and associated Decisions, including a critical appraisal of progress with implementation of the FAO IPOA. A report on progress will be submitted to the 20th meeting of the Animals Committee.

<u>Northeast Atlantic</u>
Since 1982, a resource allocation agreement between the European Community (EC), Norway and the Faeroe Islands has provided the fishing fleets of the latter two states with a Total Allowable Catch (TAC – annual catch quota) for porbeagle in EC waters. Despite reductions over the years, the combined value of these quotas has still been higher than total landings from the Northeast Atlantic since 2000 (Norway currently receives a quota of 200t and the Faeroe Islands 125t) and there is no TAC for EU fishing fleets catching porbeagle in EC waters. The European Commission's draft NPOA (2001) acknowledges that the management of elasmobranchs goes well beyond the EC Common Fisheries Policy (CFP) and should be related to other environmental legislation; this is a matter that needs to be addressed by the EU for this and other vulnerable species.

<u>Northwest Atlantic</u>
A Canadian management plan that limits the number of licenses, types of gear, fishing areas and seasons, prohibits finning, and restricts recreational fishing to catch-and-release only, has been in force since 1995. Fisheries management plans for pelagic sharks in Atlantic Canada established non-restrictive catch guidelines of 1500t for porbeagle prior to 1997 (DFO 2001). Due to the limited scientific information available at the time, abundance,

mortality and yield calculations could not be made. A provisional TAC of 1000t was therefore set in place for the period 1997-1999, based largely on historic reported landings and the observation that recent catch rates had decreased. In 1998, the Canadian government initiated a research program, which included all aspects of porbeagle biology and population dynamics. This, combined with industry support and US collaboration through the National Marine Fisheries Service (NFMS), increased the understanding of porbeagle biology and population dynamics (DFO 2001) and led to two consecutive analytical stock assessments (CAMPANA *et al.* 2001 & 1999). Based on these assessments, the Shark Management Plan for 2002-2006 reduced the TAC to 250t. This value is calculated to be close to MSY and should allow stock recovery (CAMPANA *et al*. 2003). There is an annual quota in US waters under the Highly Migratory Species Fisheries Management Plan.

Australasia

In 1991, Australia brought in legislation that prevented Japanese longliners fishing in the EEZ from landing shark fins unless they were accompanied by the carcass. Since 1996, these vessels have not fished in the Australian EEZ. Finning is currently prohibited on domestic Australian tuna longliners. A small regulated fishery is permitted by New Zealand (COMPAGNO 2001), which will be quota management for porbeagle shark in October 2004. Currently there are no other management measures applicable to the Antarctic and Southern Ocean, since CCAMLR appears not to be monitoring or managing this species.

3.3 Control measures

3.3.1 International trade

Other than the usual sanitary regulations related to seafood products, there are no control measures or monitoring systems to assess the nature, level and characteristics of international trade in porbeagle.

3.3.2 Domestic measures

None, except for the usual sanitary regulations.

4. Information on similar species

Lamna nasus is one of five species in the family Lamnidae, or mackerel sharks, which also includes the white shark *Carcharodon carcharias* and two species of mako, genus *Isurus*. The other member of its genus is the salmon shark *Lamna ditropis*, which most resembles the porbeagle shark but is restricted to the North Pacific where porbeagle does not occur. The mako shark *Isurus oxyrinchus* may be misidentified as porbeagle in Mediterranean fisheries although the two are quite distinct (http://www.zoo.co.uk).

With regard to meat, the product most commonly traded for this species in Europe, porbeagle is one of the highest priced shark meat in trade and usually, therefore, identified by name. SHIVJI *et al*. (2002) have developed a species-specific primer and highly efficient multiplex PCR (Polymerase Chain Reaction) screening assay for several lamnid sharks, including porbeagle, shortfin mako and longfin mako sharks (also silky, blue, sandbar and dusky sharks).

5. Assessment of porbeagle with regard to CITES listing

5.1 Assessment under CITES criteria

This proposal for the listing of porbeagle shark on Appendix II of CITES is based on the following assessment of the species biological status, using CITES Appendix II criterion B (i) and (ii) (Ref. AC19 Doc. 9: "*B. It is known, or can be inferred or projected, that harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by either i) exceeding, over an extended period, the level that can be continued in perpetuity; or ii) reducing it to a population level at which its survival would be threatened by other influences*.").

Due to its low reproduction rate and late age of maturity, porbeagle is especially vulnerable to over-exploitation by unregulated fisheries driven by global market demand.
The species has been subjected to unsustainable fisheries in the North Atlantic, where reported landings dropped 90% from thousands of tonnes to a few hundreds in less than 50 years (1950s to late 1990s) (HEESSEN 2003). The Northwest Atlantic population was virtually fished out in about five years and the Canadian Department of Fisheries' stock assessment identified a population decline of 83–89% between 1961 and 2000. Most populations are unmanaged.
The high market value of porbeagle meat makes it a competitive commodity for international trade, particularly to the EU. All or most fins landed will have entered international trade.

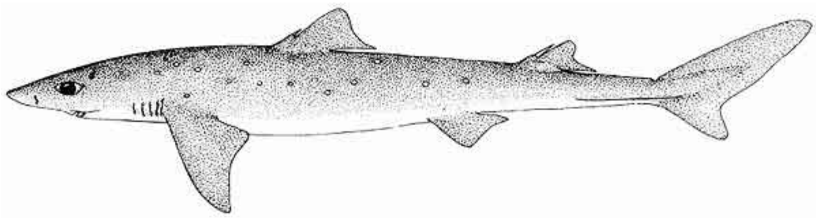
5.2 Assessment under FAO criteria

The UN Food and Agriculture Organization (FAO), has carefully considered the application of the CITES listing criteria to commercially exploited aquatic species through a series of technical consultations. FAO (2000) notes that large, long-lived, late-maturing species, with both high and low fecundity, but more so the latter, are at a relatively high risk of extinction from exploitation. Productivity, as a surrogate for resilience to exploitation, was considered to be the single most important consideration when assessing population status and vulnerability to fisheries. The most vulnerable species are those with an intrinsic rate of population increase of <0.14 and a generation time of >10 years (FAO 2001). Life history data presented in section 2.4 indicate that the porbeagle shark falls into FAO's lowest productivity category and, as such, could qualify for consideration for Appendix I listing if their population declined to 20% or less of the historic baseline (FAO, 2001). The stock assessment for the Northwest Atlantic clearly demonstrates that this stock has exceeded this level of depletion. Although there is no stock assessment for the northeast Atlantic, this stock is considered highly likely to be depleted even further, because of its longer history of exploitation and the absence of management.

IV. SPINY DOGFISH - *Squalus acanthias* LINNAEUS, 1758

1. Biological parameters

The spiny dogfish is very long-lived, slow-growing and late maturing, with a very slow metabolic rate, limited reproductive capacity and one of the lowest population growth rates calculated for any shark species: 2.3% annual rate of population increase from maximum sustainable yield (MSY) in the Northeast Pacific (SMITH *et al*. 1998), 4-7% in the Northeast Atlantic (HEESSEN 2003) and annual mortality averaging 0.092 in the Northwest Atlantic (US National Marine Fisheries Service). Age at maturity varies considerably between stocks, ranging from 12-23 years for females and 6-14 years for males (COMPAGNO 1984). Maximum age is at least 34-40 years (FORDHAM in press), with some estimates approaching or surpassing 100 years (it is not possible accurately to age large animals) (COMPAGNO 1984). Two tagged male spiny dogfish recaptured in the Northeast Atlantic in 1999 after 35-37 years at liberty had grown an average of only 3.3mm and 2.7mm per year, to 78 and 90cm long respectively (growth rates slow markedly after maturity is reached) (ANON 2002). The reproduction cycle of spiny dogfish makes it particularly vulnerable to over-fishing. Generally, they have a pregnancy of 18-24 months with females giving birth once every two years. They produce small litters of 2-11 pups (larger older females have larger litters), at a sex ratio of 1:1. Pups are 18-33cm long at birth; females mature at 75-94cm (depending upon stock). The maximum observed sizes of spiny dogfish (males and females respectively) were 100 and 125cm in the Northwest Pacific, 107 and 130cm in the Northeast Pacific, 86 and 108cm in the Northwest Atlantic, and 83 and 120cm in the Northeast Atlantic (larger in the Black Sea) (KETCHEN 1972, HEESSEN 2003).



Usually less than 150cm long

Figure 11. Spiny dogfish *Squalus acanthias*
(*Source*: FAO Species Identification Sheet, 2003)

1.1 Distribution

Spiny dogfish *Squalus acanthias* occurs world-wide on the continental shelf, from the intertidal to the shelf slope, in temperate and boreal waters, within water temperatures of 7-8°C to 12-15°C. The species is most common in coastal waters and therefore caught in fisheries operating inside the 200-nautical mile Exclusive Economic Zones (EEZ) of States. The principal populations are found in the Northwest and Northeast Atlantic (including Mediterranean and Black Seas), Northeast and Northwest Pacific (including the Sea of Japan), the South Atlantic and Southeast Pacific off South America and New Zealand, with smaller populations off South Africa and southern Australia (see Table 2b). Some populations are largely sedentary, others migrate long distances, but mixing between populations is limited.

Spiny dogfish are usually found swimming just above the seabed, but also move throughout the water column on the continental shelf. They have been recorded to depths of 900m (COMPAGNO 1984) but are most common from 10-200m (MCEACHRAN and BRANSTETTER 1989). Spiny dogfish are usually found in large schools, segregated by size and sex with, for example, large pregnant females schooling together (COMPAGNO 1984), exposing them to fisheries that target these individuals (ref. 2.3).

TEMPLEMAN (1944) suggested that mature females were present off Newfoundland (Northwest Atlantic) from January through May, and their pups in inshore areas during the same season, while CASTRO (1983) reported that, in the North Atlantic, spiny dogfish pups are found offshore in deepwater wintering grounds. Primarily epibenthic, they are not known to associate with any particular habitat (MCMILLAN and MORSE 1999). They are thought to mate in winter (CASTRO 1983, COMPAGNO 1984). In Australia, breeding occurs in large bays and estuaries (LAST and STEVENS 1994). North Atlantic mating grounds are unknown.

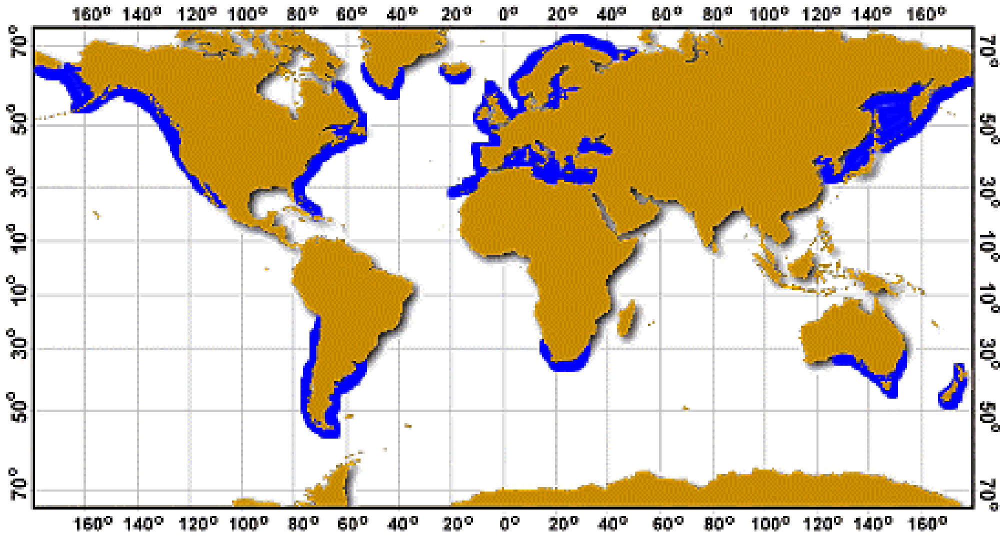


Figure 12. Global Spiny Dogfish distribution (*Source*: FAO 2003)

1.2 Habitat availability

Coastal development, pollution, dredging and bottom trawling affect coastal or benthic habitats on which spiny dogfish and their preys are dependent (ASMFC 2002). Such environmental threats may have potential impacts on spiny dogfish stocks associated with areas of habitat degradation and loss.

1.3 Population status

Fisheries stock assessments demonstrate that the two main North Atlantic stocks of spiny dogfish are significantly depleted (HEESSEN 2003, SARC 2003). Catch per unit effort data (CPUE, a good indicator of population trend) indicate that some North Pacific stocks are also depleted.

The Northeast Atlantic stock assessment (HEESSEN 2003) used a Bayesian assessment approach based on a Schaefer stock production model, and incorporating other relevant data to set 'prior' distributions for key parameters. The base case assessment estimated that the Northeast Atlantic stock in 2001 was depleted to below 5% of its initial 'carrying capacity' biomass at the start of the catch data series in 1906. Other model scenarios testing alternative plausible values of parameter inputs all estimated that the stock had declined to between 2 and 9% of its initial biomass (Figures 13 and 14).

In the IUCN Red List, the Northeast Atlantic subpopulation of spiny dogfish is currently categorised as 'Endangered' (EN) (FORDHAM 2003a). The red list classification criteria (A2bd+3bd+4bd) confirm that this designation was made on the basis of past, ongoing and estimated future reductions in population size of at least 50%, as indicated by both abundance indices and catches. This assessment will be reviewed by the IUCN Shark Specialist Group – the Red List Authority for chondrichthyan fishes, in 2004 in the light of the DELASS assessment (Sarah FOWLER personal communication).

Annex V of the OSPAR Convention on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area requires OSPAR to develop a list of threatened and declining species and habitats in need of protection or conservation in the OSPAR maritime area (the Northeast Atlantic). OSPAR member states were invited in 2001 to submit proposals for inclusion on this list. In response, Belgium proposed listing spiny dogfish *Squalus acanthias* in the North Sea on the basis that it is a sensitive species and had declined significantly in their national waters. This species has not yet been added to the OSPAR list of threatened and/or declining species and habitats

The Northwest Atlantic population of spiny dogfish is over-fished. According to recent stock assessments (SARC 2003), reproductive biomass peaked in 1989 during recovery from overfishing by European fleets prior to the establishment of the USA and Canadian EEZs. Average weight of landed females halved from 4kg in 1987 to 2kg in 2000. The 2001 pup estimate was the lowest in the 33-year time series for the fifth consecutive year. Overall, mature female biomass has been reduced 75% in the past ten years (Figures 15, 16 and 17). The 2003 stock assessment review panel (SARC 2003) found that the overall biomass of spiny dogfish had decreased by over one-third since the early 1990s, and that mature females accounted for only 15% of the stock. In addition to the alarming decline in number of females, trends in smaller litters of smaller pups with very low survival rates have persisted since the mid 1990s (Figure 18).

The IUCN Red List categorises Northwest Atlantic spiny dogfish as 'Vulnerable' (VU), using the same red list criteria as for the Northeast Atlantic; this designation was made on the basis of estimated reductions in population size of at least 30% (FORDHAM 2003b) and will also be reviewed in 2004. Regional Red List assessments are currently underway for other populations of spiny dogfish. Fisheries and population trend data indicate that populations in the North Pacific (except off Alaska, BOLDT *et al*. 2003) and along the southern South American coast may, in particular, also be depleted and qualify for inclusion in the IUCN Red List of Threatened Species. At global level, spiny dogfish is categorised in the IUCN Red List as Near Threatened (NT). The IUCN Shark Specialist Group consultation on draft red list assessments for additional regional populations may lead to a 2004 review of the global assessment. Some range States have included the species in their Red List, such as Germany where spiny dogfish is listed as vulnerable (VU) (BINOT *et al*. 1998).

This important and wide-ranging commercial species is particularly vulnerable to overfishing because of its late maturity, low reproductive capacity, linked to its long gestation time, between 18 to 22 months (FAO 2003), and longevity. These biological parameters are aggravated by the fact that fishers preferentially target the largest mature (often pregnant) females, whose aggregating habit and predictable migration patterns make it relatively easy for fishers to continue to obtain good catches even when the whole stock is seriously depleted. Spiny dogfish are also caught as small as 50cm (around 4-5 years old) and are fully recruited in the fishery at lengths of approximately 70-80cm, at ages above around 8 years old (HEESSEN 2003). Female spiny dogfish in the North Atlantic are, therefore, being exploited before they reach maturity at 74–94cm.

1.4 Population trends

Detailed fishery stock assessments describing population trends are available only for the stocks in the Northwest Atlantic (SARC 2003) and the Northeast Atlantic (HEESSEN 2003), as presented above. Less detailed information on population trends is available from data on catch per unit effort (a good indicator of population trend) for some North Pacific stocks. Where such data are not available, population trends are inferred using landings data reported by national fisheries agencies to FAO or ICES (the International Council for the

Exploration of the Seas), viewed against a general global trend of increasing fishing effort and rising market demand.

On a global scale, based on 20th century reported landings, the most important spiny dogfish commercial stocks are (or were historically) in the shelf seas of the Northeast Atlantic; these are now also the most depleted. According to FAO, 89% of the world spiny dogfish landings reported between 1950 and 2001 (excluding miscellaneous sharks, etc) were taken in this region (Figure 19, Table 3). Over this period, landings were sustained at levels of 30-50,000 tonnes (1 tonne (t) = 1000kg) per year for most of the 1960s, 70s and 80s. Since the mid 1980s, spiny dogfish reported landings in the Northeast Atlantic have decreased particularly steeply (Figure 19 and 21; Tables 4 & 6) while those elsewhere have mostly increased (Figure 20, Table 3). By 2001, Northeast Atlantic reported landings had dropped to 27% of their historical FAO-reported peak of nearly 50,000 t[1], taken in 1972 (Table 3); they fell again in 2002 (Figure 19), to ~11% of their historical ICES-recorded peak as stock biomass also continued to decline.

Other stocks yielding significant landings are in the Northeast Pacific (off western North America), the Southwest Pacific (mainly New Zealand) and Northwest Pacific, where the high landings reported in Japanese documents (e.g. TANIUCHI 1990) are apparently not included in FAO statistics. Landings reported to FAO[1] from these parts of the world often appear to show some 'boom and bust' cycles, followed, more recently, by an overall increase up to 2000, and a slight drop in 2001 (Figure 20, Table 3). Landings reported to FAO in 2001 in the Northwest Atlantic, as well as the Northeast and Southwest Pacific were 56%, 80% and 58% respectively of their historical peak landings from 1950 to 2001 (Table 3). Much of the following descriptions of regional trends are from the review by FORDHAM (in press).

Northeast Atlantic

The spiny dogfish fishery is by far the most important of the directed fisheries for elasmobranchs in the Northeast Atlantic. Available studies indicate that there is a single Northeast Atlantic unit stock (HEESSEN 2003). Catches are taken from north of the Bay of Biscay to the coast of Norway, including the North Sea and around the west of Ireland and Scotland. France, Ireland, Norway and United Kingdom all take spiny dogfish in directed fisheries and as an important utilised by-catch in trawl fisheries. Other European countries make smaller landings (see Table 4). Early landings rose to over 20,000t, dropped to 7-8000t in the early 1940s, due to a cessation of fishing during World War II, rose rapidly in the 1950s to a peak of over 58,000t in 1963 (ICES data) then entered a downward trend after the early 1960s. Catches fluctuated between 30,000 and 60,000t in the 1970s and '80s and have fallen steeply since 1987 (Figure 19 and 21). According to ICES landings statistics (which include some early records excluded by FAO as 'unidentified' sharks), landings in 2002 were about 11% of the peak catches taken in 1963 (Figure 19). The DELASS stock assessment (HEESSEN 2003) indicates a stock biomass decline to 5% of baseline (greater than the decline in landings). Substantial declines in national landings reported to FAO include Norwegian landings that in 2001 were only 4% of their historic maximum in 1961, and French landings that had fallen to just 9% of their peak in the early 2000s (Table 4).

Northwest Atlantic

Data from both US commercial landings and research vessel survey catches indicate a pronounced and consistent decrease in average length of females in 2001-2003 compared

[1] There are considerable discrepancies between FAO data and data available from states or regional fisheries organisations. FAO data are usually lower, presumably due to under-reporting by states. Thus, FAO reports a peak catch of just under 50,000t in the Northeast Atlantic, whereas data from the International Council for the Exploration of the Sea (ICES) give a peak of over 58,000t. Even larger discrepancies are evident when comparing FAO data with those from the National Oceanographic and Atmospheric Administration (NOAA) in the USA, particularly in recent years (Figure 19). National data are more accurate, but can be harder to obtain.

to 1985-1988 and a 75% reduction in abundance of the mature females preferentially targeted by this fishery. Low pup abundance has continued for seven consecutive years. The long term projection, incorporating apparent lower survival of pups from smaller females and lower spawning potential, leads to stock collapse under current fishing mortality in the region (SARC 2003). Off the eastern US, landings increased from 500t in the early 1960s to 9689t in 1966 and peaked in 1974 at 25,620t. Foreign fleets (from the former Soviet Union, former East German Republic, Poland, Japan and Canada) accounted for virtually all the reported catch from 1966 to 1977 (NOAA 1995). Annual US commercial spiny dogfish landings from the Atlantic increased from only a few hundred tonnes in the late 1970s to around 4500t during 1979-1989. Increasing European demand led to a sevenfold increase in landings, to a peak of 27,200t in 1996. Discards are poorly monitored but thought to be significant, exceeding landings in some years (NOAA 1998). Landings fell to 14,906t in 1999, prior to the introduction of management (RAGO and SOSEBEE 2002), but federal quotas have continually been exceeded as a result of continued high levels of fishing activity in state waters. US recreational catches increased from about 350t annually in 1979-1980 to 1700t in 1989, averaged 1300t from 1990-1994, then decreased in 1996 to 386t (NOAA 1998).

In the Canadian Atlantic, spiny dogfish are targeted in the Bay of Fundy, Scotian Shelf and Gulf of St. Lawrence. Foreign landings on the Scotian Shelf peaked at 24,000t in 1972-1975, but were then replaced by national fisheries (ICES 1997). Atlantic Canadian landings prior to 1979 were insignificant (OWC 1996). A directed fishery has since developed off the Maritimes Region, trans-boundary to Canada and US Atlantic coastal waters. Landings increased from an average of 500t from 1979-1988 to 1800t in 1994. After a subsequent decrease to roughly 400t in 1996 and 1997, spiny dogfish landings (primarily from Nova Scotia) more than doubled in 1998 and 1999, reaching a peak in 2000 of 2660t (in excess of the US quota) (RAGO and SOSEBEE 2002). FAO data for spiny dogfish landings in USA and Canadian waters are significantly lower than actual landings recorded in fisheries department statistics.

Northeast Pacific

Spiny dogfish have been fished in British Columbia (Canada) for over 4000 years (BONFIL 1999). More intense exploitation (for liver oil and meat) began in the late 1800s (KETCHEN 1986) and evolved into the region’s most important shark fishery. By 1870, spiny dogfish were surpassing whales in economic importance, producing 190,000 litres of oil, mostly for export to Great Britain. In 1876, oil exports constituted at least 24% of the total value of all fish. Production peaked in 1883 at more than one million litres, equivalent to 9000-14,000t of round weight exports (BONFIL 1999). KETCHEN (1986) speculates that a combination of factors (including the advent of petroleum lubricants, lighting fuels and electric lamps) led to fishery collapse around 1910. From 1917 to 1939, spiny dogfish was used for fishmeal and meat exported to the US. Increased value of liver oil resulted in an expansion of the fishery and by 1944, spiny dogfish supported the most valuable Canadian west coast fishery (KETCHEN 1986). Landings reached 31,000t then fell to <3000t in 1949. Fishable biomass had been reduced by 75% in 1950 (ANDERSON 1990), when the synthetic production of vitamin A led to the collapse of the oil market.

Washington is the only US Pacific state with a directed spiny dogfish fishery, mostly in Puget Sound where, in 1995, the spiny dogfish population was considered to be nearly “fully utilized” (PALSSON *et al*. 1997). By the late 1990s, landings had decreased by more than 85% (CAMHI 1999, Boldt *et al*. 2003). US scientists believe that the sub-stock has been overfished in Puget Sound and some indicators support this, with catches at historic lows. Other sub-stocks appear to be relatively healthy (SUSAN SMITH, US NMFS, in litt. March 2004).

Spiny dogfish are the predominant shark species taken off Alaska, which banned directed shark fishing in 1998, but where spiny dogfish bycatch (90% discarded) comprises the bulk of shark landings (CAMHI 1999). In 1997, over 1000t of total shark catches were reported from the region's groundfish fisheries. Catch rates have increased 20-fold in the Gulf of Alaska in the late 1990s and five-fold in Prince William Sound in recent years (NMFS 2000).

Mediterranean and Black Seas

A stock assessment (Virtual Population Analysis) indicates that the exploited stock increased until 1981, when it reached 226,700t, then decreased 60% to about 90,000t in 1992 (PRODANOV *et al*. 1997). Although there are only limited data on landings from the Mediterranean, some catch reduction has been observed (ALDEBERT 1997). Overall, the stock may be less seriously depleted than in the Atlantic. Turkey and the former USSR target spiny dogfish in the Black Sea, with minor landings by Bulgaria and Romania. Fishing intensity and landings increased significantly from 1979 as prices rose, mainly targeting fish aged 8–19 years. Landings data are incomplete in the last few years of the time series presented in this analysis. The fishery continues.

Northwest Pacific

Japanese coastal and offshore fisheries (longline, trawl & gillnet) have historically taken large amounts of spiny dogfish off the Northeast coast and in the Sea of Japan. TANIUCHI (1990) reported that catches dropped by 80% from more than 50,000t in 1952 to only 10,000t in 1965. The following trends are reported by the GOVERNMENT OF JAPAN FISHERIES AGENCY (2003). Offshore trawl catches of spiny dogfish were over 700t in 1974-1979. Since then, catches have decreased to 1-200t in the late 1990s and up to 2001. Catch rates for Danish seines and bull trawls fell from 100-200kg per haul in the mid 1970s to 10-20kg per haul in the late 1990s. This 90% reduction in CPUE (catch per unit effort) may indicate that stocks have declined to a similar extent during this period. In the Sea of Japan, spiny dogfish have been fully exploited with longlines and trawl-nets since before 1897. Harvests in this region from 1927 to 1929 were 7500 to 11,250t, accounting for 17-25% of Japan's overall catch. Available statistics since 1970 show a decrease in CPUE from 8-28 units in the 1970s, to only 1-5 between 1995 and 2001, an overall decrease of around 80-90%.

Australasia

Considered coarse, spiny dogfish meat is low value in Australia (LAST and STEVENS 1994). Tasmanian recreational gillnet fisheries take substantial amounts (SIMPFENDORFER, pers. comm. in FORDHAM in press). FAO data for 1977-1989 show a significant increase in landings in New Zealand. From 1989-1992, spiny dogfish made up 33% of the shark catch (BONFIL 1994), with 2831t to 5607t landed annually (STEVENS 1993). Recent anecdotal reports indicate increased demand for spiny dogfish off New Zealand, with industry publications encouraging fishermen to land rather than discard the species. New Zealand trawl surveys indicate increasing spiny dogfish biomass between the mid 1990s and 2002 (FRANCIS, pers. comm. in FORDHAM in press) and reported landings increased from 3273t in 1991-1992 to 13,076t in 2001-2002 (ANON. 2003a), possibly driven by growing exports to the EU (Figure 22, Table 7). New Zealand also experiences high levels of unreported discards of this species. Recognising this cumulative pressure from targeted fishery as well as discarded by-catch and the high vulnerability of the species to over-fishing, the government of New Zealand included spiny dogfish in its Quota Management System (QMS) and is currently developing proposals to limit its fishery to prevent overexploitation (ANON. 2003a).

South America

Squalus acanthias is one of the most important coastal commercial species along the southeastern coast of South America (Uruguay and Argentina), where landings of the genus have decreased considerably. It is also taken as bycatch in mixed demersal fisheries and the target fishery for *Lophius gastrophysus*. Patagonian trawlers fishing for hake and shrimp take a bycatch of spiny dogfish. Rising effort in these fisheries and a lack of bycatch control is considered to be a threat to spiny dogfish and other elasmobranch populations in the region (VAN DER MOLEN *et al*. 1998). As in many other regions, large pregnant females are commonly targeted. The impact of rising fishing efforts, targeting in particular whitemouth croaker *Micropogonias furnieri*, from 1994 to 1999 in Argentina and Uruguay coastal areas was analysed based on biomass indices of chondrichthyan species. Spiny dogfish was listed as one of the species that suffered a more than 50% drop in their abundance in along the north coast of Argentina and south URUGUAY (MASSA *et al*. 2002). It is not possible to assess any more accurately the status of the population of this species in Argentinean waters (VICTORIA LICHTSTEIN, CITES Management Authority of Argentina, *in litt*. to TRAFFIC Europe, 27 October 2003). The volume of spiny dogfish landings by the Argentinean fishing fleet is also unknown because its records are kept at the genus level only. Based on the growing demand for cartilaginous fish in Argentina, the development of a commercial exploitation of this species may be expected in the future (VICTORIA LICHTSTEIN *op cit*.). Discrepancies between South American exports of spiny dogfish (Figure 22; Table 7) and landings reported to FAO (Figure 20) by the same countries, suggest a lack of accurate reporting to FAO by some Members.

<u>South Africa</u>
Spiny dogfish are considered a nuisance by South African fishermen and not targeted commercially. The demersal trawl catch for the South Coast was recently estimated at 4.7t, 99% discarded. Off the West coast, an estimated 3.4t is taken annually (100% discarded) (SMALE pers. comm., in FORDHAM in press).

1.5 Geographic trends

No changes have been reported in the geographic distribution of this species.

1.6 Role of species in its ecosystem

Spiny dogfish feed mainly on a variety of bony fishes, such as herring, haddock and even cod (ASMFC 2003), and some invertebrates (COMPAGNO 1984). They are preyed upon by some larger sharks, and marine mammals (COMPAGNO 1984). Their abundance does not appear to affect the recruitment of groundfish (LINK *et al*. 2002 in ASMFC 2003, BUNDY 2003).

1.7 Threats

The principal threat to this species worldwide is over-exploitation, whether by fisheries that target spiny dogfish, or by fishing gear that catches the species incidentally as a by-catch. Survival rates are good when bycatch is returned alive to the sea in good condition, but it is often retained and utilised.

1.7.1 Directed fisheries

This is a valuable commercial species in many parts of the world, caught in bottom trawls, gillnets, line gear, and by rod and reel. Widely utilized for its flesh, particularly valued for human consumption in Europe, its liver oil and fins are also consumed. Some former fisheries were driven mainly by the demand for oil, until synthetic vitamin A became available and this market collapsed. Despite low quality, spiny dogfish fins have been routinely traded to East Asia (for shark fin soup) for at least the two last decades of the 20th century (ROSE 1996). Cartilage and hides are also utilised, and landings used to produce fishmeal and fertiliser if markets for human consumption are not available (COMPAGNO 1984). They have also been utilized as scientific specimens for teaching purposes.

1.7.2 Incidental fisheries

Because it occurs in many areas where gill nets, longlines and trawls are used, these gears catch spiny dogfish. Those with small mesh size may kill young individuals, which may not reach the retail market if discarded (ASMFC 2003, ANON. 2003a, BUNDY 2003). In EU waters, for instance, the deepwater bottom trawl fishery for *Nephrops* and shrimps along the south coast of Portugal has been identified as most involved in spiny dogfish discards (European Parliament 1999). The US Northeast Regional Stock Assessment Review Committee (SARC) assessed the relative importance of spiny dogfish by-catch for the period 1968-2002, and estimated that the mean of discards (16,700t) was more than double the mean of US reported landings (7200t) from the region (SARC 2003), part of the Northwest Atlantic (Figure 4). In the Southwest Atlantic, a study undertaken in Argentina and Uruguay estimated that spiny dogfish abundance dropped by 50% in just four years following the intensification of fishing activities, particularly the coastal whitemouth croaker *Micropogonias furnieri* fishery (MASSA *et al*. 2003). Although bycatch also impacts spiny dogfish stocks, it is generally unreported and not included in national fisheries statistics on utilised landings.

2. Utilisation and trade

Compared to most other shark species, catch and trade in spiny dogfish are well documented. This is due to its long history of domestic and international utilization. This is by far the most important shark species landed commercially in the Northeast Atlantic, where it has been of considerable importance to fisheries for 70 years (Figure 21). Formerly also important for liver oil, it is now targeted for its meat.

2.1 National utilisation

Meat

Spiny dogfish meat is eaten in Europe, Australia, New Zealand, South America and Japan. It is consumed fresh, frozen or smoked. Markets favour mature females due to their larger size. In the UK, spiny dogfish is known as “rock salmon,” or “huss”. In Germany, meat is sold as “See-Aal” (sea eel) and belly flaps are smoked to make *Schillerlocken* (ROSE 1996). The latter is a delicacy worth about EUR 48/kg in German supermarkets (HOMES, V., *in litt*. to TRAFFIC Europe, 28 November 2003) compared to EUR 15/kg for *rock salmon* in the UK (internet, November 2003). In France, fresh meat is sold as *aiguillat commun* or *saumonette d’aiguillat* at about EUR 10/kg in French retail outlets in 1994 (FLEMING and PAPAGEORGIOU 1997), which remained stable until 2003 (RINGUET, S. pers. comm. to TRAFFIC Europe, November 2003). In the 1990s, Northeast US industry groups campaigned to create domestic demand for spiny dogfish under the more palatable name "cape shark" (FORDHAM in press).

Others

While spiny dogfish no longer retain their historical importance as a source of valuable liver oil for lighting and vitamin A, the oil is still utilised to some extent, likely mixed with that of other shark species. Spiny dogfish oil was used in the former Soviet Union (FISCHER *et al*. 1987). Fins may be utilised nationally in Japan but are of relatively low value because of their small size. The possible use of other parts and derivatives of spiny dogfish, such as cartilage, leather or curios (teeth or jaws) is not well documented or officially recorded and, if it occurs, it is of negligible importance compared with the utilisation of meat. A US assessment of the importance of recreational fishing for spiny dogfish concluded that this is not significant compared with commercial fishing (SARC 2003). Although more common in the past, Spanish fishermen still use sharkskin to polish and sand their boats (ROSE 1996).

Spiny dogfish heads are used as bait for other fisheries, in Morocco for instance (FISCHER *et al*. 1987).

2.2 Legal international trade

Meat

Special codes are used by customs services of the main importing countries to record international trade in meat of *Squalus acanthias* at species level. These codes are part of the customs Harmonised System, called Combined Nomenclature in the European Union (EU). The two specific codes are, 03026520 for 'Fresh or chilled dogfish of the species *Squalus acanthias*' and 03037520 for 'Frozen dogfish of the species *Squalus acanthias*'. Based on FAO and customs data (Eurostat import data and US customs export data), in 2001 the EU represented the world largest market for spiny dogfish meat, consuming at least 65% of the world reported landings (Tables 3 and 7). Import prices for frozen spiny dogfish dropped by more than 50% from EUR 17/kg in 1995 to EUR 6/kg in 2002, while volumes rose from 450t to 1500t. France has been historically the largest consumer of spiny dogfish meat, importing an annual average of 5000t (98% spiny) from 1990-1994, with the UK as its top European supplier. At that time (1988-1994), Norway was the largest of nine non-EU suppliers of fresh or chilled spiny dogfish to the EU, followed by the US. In 2001, in addition to their 11,700t reported landings (wet weight), EU Member States imported 7100t spiny dogfish. From the total (18,800t), less than 1% was exported or re-exported. The largest proportion of 'fresh or chilled' and 'frozen' spiny dogfish imported into the EU in 2001 was destined to France (1500t), Germany (1400t), Denmark (1300t), the UK (1000t) and Italy (700t). USA (2700t – representing 92% of US reported landings), Canada (1950t –23% of Canada's reported landings) and Norway (1400t –98% of reported landings) supplied 75% of EU imports in 2001 (Figure 22). As European spiny dogfish stocks decline, demand is being met by imports from 25 countries, including emerging South American, African and Pacific suppliers (Table 7) such as Argentina, Mauritania and New Zealand, which exported to the EU only 5% of its 2001 reported landings (4200t). Discrepancies appeared between Argentina's landings reported to FAO (Table 3) and EU imports recorded in Eurostat (Table 7) for 2001 (ref. 2.4).

Japanese imports of fresh spiny dogfish rose from 23t in 1986, to 60t in 1997, when the wholesale price was EUR 7.4/kg, or 3 times the value of any other fresh shark (SONU 1998).

Fins

Among the 20 nations recorded by FAO as trading in spiny dogfish products, only Japan, New Zealand, South Africa and the United Kingdom reported exports of fins of this species. Also, Malaysia and Singapore did not include *Squalus acanthias* among shark species used for fins (VANNUCCINI, 1999). Because, however, volumes of shark fins in international trade are generally lumped under a unique custom codes that does not allow to record the product at species level, data on global imports of spiny dogfish fins are not readily available.

Others

While fresh or frozen meat remains the most important commercial commodity, tails and fins are exported as well, e.g. from USA to China, Taiwan and Canada, cartilage and livers are exported from USA to France, Italy, Switzerland and Taiwan where they are used for medicinal purposes (ASMFC 2003). The species is also included in the list of sharks whose hides are processed into leather and from where livers are extracted (VANNUCCINI 1999). However, no reliable trade data are available, and according to past studies and surveys these products do not constitute the main markets for spiny dogfish parts and derivatives (FLEMING and PAPAGEORGIOU 1997, VANNUCCINI 1999), which suggest that their use plays a less relevant role in spiny dogfish catch.

2.3 Illegal trade

In the absence of legally binding regulatory measures concerning catch or trade of spiny dogfish at national or international level, as is the case for the large majority of countries involved in shark catch and by-catch, no fishery activity or trade transaction is illegal, including transhipment of spiny dogfish. Even in areas where directed shark fishing has been prohibited, such as in Alaska, related trade measures have not been adopted to restrict trade in products of shark by-catch, which therefore remains legal and unlimited and is composed in large proportions of spiny dogfish products.

2.4 Actual or potential impact of the trade

Since foreign markets are in most cases the driving economic force behind spiny dogfish fisheries around the world (see IV.2.2, Figure 22; Table 7), unregulated international trade is the main threat to the species. The lack of adequate management of spiny dogfish stocks in the majority of range states, coupled with the long established market demand for its products, has led to a direct impact on the species populations. Fisheries that formerly caught the spiny dogfish as by-catch and largely discarded it, are now moving towards landing and exporting its valuable products.

2.5 Captive breeding for commercial purposes

Not economic viable, due to the slow reproductive and growth rates of this species.

3. Conservation and management

3.1 Legal status

3.1.1 National

None. Some countries, for instance Sweden (E. MEHNERT, Swedish Board of Agriculture, *in litt*. to BMU, 23 September 2003), are assessing the need to adopt special conservation measures for shark species such as spiny dogfish.

3.1.2 International

There are no international mechanisms in place for the conservation of spiny dogfish. The species is not listed on any international wildlife or fisheries agreement and has no international legal status.

3.2 Species management

3.2.1 Population monitoring

Population monitoring depends on routine monitoring of catches, collection of reliable data on the indicators of stock biomass and good knowledge of biology and ecology. In the case of spiny dogfish, relatively good landings data are available for some major fisheries, particularly in the Northeast Atlantic (HEESSEN 2003) and the Northwest Atlantic (ASMFC

2003, SARC 2003, NMFS 2003), also in the Black Sea (PRODANOV *et al*. 1997). Comprehensive commercial landings and research survey data have confirmed that stocks are, as described above, seriously depleted in European waters. In the Northwest Atlantic, dogfish abundance remains at relatively high levels, but the abundance of mature females is extremely low. In most parts of the world, however, not only is there a lack of reporting on discards of spiny dogfish by-catch, for instance by bottom trawlers, but catch data for spiny dogfish, other sharks and rays are not recorded at species level. Scientists participating in the EU-funded DELASS project recommended that a higher priority must be given to the establishment of market sampling programs and observer programs, even in the Northeast Atlantic. The information from these programs will help to determine species compositions of elasmobranchs in catch and landing quantities, particularly where important data for stock assessments and population evaluation are missing (HEESSEN 2003).

3.2.2 Habitat conservation

No efforts have been made to identify and protect critical spiny dogfish habitat, although some is protected from damage by bottom trawling inside marine protected areas or static gear reserves.

3.2.3 Management measures

Although several range States (China, Greenland and Cyprus, *in litt.* to the German Ministry of Environment (BMU), October and November 2003) recognise the occurrence of spiny dogfish in their fisheries by-catch, none have engaged in adopting the necessary national measures to limit or regulate this mortality and possible trade in its products.

The International Plan of Action (IPOA) for the Conservation and Management of Sharks adopted by the FAO at the 23rd Session of the Conference on Fisheries (COFI) in February 1999 urges states with active shark fisheries to implement conservation and management plans. However, this initiative is voluntary and, although 116 countries reported shark landings for 2001 to FAO, members of FAO reported to the 25th session of COFI in February 2003 that only six countries had developed a National Plan of Action (NPOA) while a further 11 have partially developed a NPOA for sharks.

At the 12th meeting of the Conference of the Parties of CITES, it was reported (ref. Doc. 41.1 *Conservation and management of sharks*) that, despite significant landings of sharks and their products, progress on the implementation of the IPOA was negligible and that the NPOA-Sharks are not developing rapidly enough. The AC agreed at its 19th meeting (August 2003) to create an inter-sessional working group in order to better implement CITES Resolution Conf. 12.6 and associated Decisions, including a critical appraisal of progress with implementation of the FAO IPOA. A report on progress will be submitted to the 20th meeting of the Animals Committee.

Some RFOs may potentially monitor or manage pelagic shark fisheries. Of these, the International Commission for the Conservation of Atlantic Tunas (ICCAT) has adopted specific resolutions to support improved management of shark stocks, including studies on shark by-catch, with an initial focus on shortfin mako and blue sharks (ICCAT Resolution 01-11 –*Atlantic sharks*). Spiny dogfish is not a pelagic shark and not recorded in ICCAT's Atlantic shark catch statistics (last update June 2001 http://www.iccat.es). If recorded at all, it is probably included within the category "Coastal sharks nei".

Northeast Atlantic

Sharks are fish species whose conservation falls within the domain of the European Common Fishery Policy (CFP) that is supposed to establish '…in the light of available scientific opinion, conservation measures necessary to ensure rational and responsible exploitation, on a sustainable basis, of living marine resources, taking account of, *inter alia*, the impact of fishing activities on the marine ecosystem'. HOLDEN (1968) first warned that part of the Northeast Atlantic stock was over-exploited, but it was not until 1988, that the first TAC was established for this species in the North Sea, a small part of European waters, based on historic landings, not on scientific advice. Total Allowable Catch (TAC – or annual catch quota) have consistently and massively exceeded recent North Sea landings. The European Commission's STECF (Scientific, Technical and Economic Committee for Fisheries) has since 1999 recommended a TAC for spiny dogfish fisheries in the European Community (EC) North Sea waters. In 1999, the TAC was set at 8870t (Table 5), paradoxically more than twice the total reported landings for the ICES North Sea area the year before, 3288t in 1998. In 2002, the TAC for EC waters was reduced by 36%, set at 7100t, with 81% of it (5745t) allocated to the UK. The basis for these catch quotas is unclear, since both were much higher than the total North Sea (ICES areas IIIa, IV and Via and b – Figure 3) and UK reported landings for the previous year, 5700t and 1006t for 2001 respectively (Table 5). For 2003, the proposed TAC for EC North Sea waters was set at 5840t, a 18% reduction compared to 2002, with 76% (4413t) allocated to the UK. This is inconsistent with both the total North Sea (1416t) and the UK (1013t) total reported landings in 2002. The UK had landed only 24% of its 2003 quota by early December 2003 (Table 5).

Spiny dogfish has been included in a species list annexed to an agreement recently signed between the European Community, represented by the Commission, and the International Council for the Exploration of the Sea (ICES), with the objective of overcoming the lack of assessment of sharks (EUROPEAN COMMUNITY 2001). In the European Commission's preliminary draft NPOA (2001), governments acknowledged that the management of elasmobranchs goes well beyond the European Community (EC) Common Fisheries Policy (CFP) and should be related to other environmental legislation and that this is a matter that needs to be addressed by the EU.

Norway manages its spiny dogfish fishery with a minimum landing size intended to protect mature females. This is of limited value for a migratory stock that is unmanaged elsewhere in its range.

Northwest Atlantic management

In the Northwest Atlantic, spiny dogfish fisheries are managed by the Canadian and American government agencies. In Eastern Canada, the first quota and management measures for spiny dogfish were put in place in 2002. The first US management plan specifically for spiny dogfish was developed in the late 1990s by the Mid-Atlantic and New England Fishery Management Councils, and took effect in 2000, in response to a decade of intense unregulated fishing (BONFIL 1999). The National Marine Fisheries Service (NMFS) has imposed low, science-based trip limits and quotas ever since, but federal management measures are not compulsory in state waters and directed fishing is continuing at unsustainable levels nearshore, particularly in Massachusetts. The Atlantic States Marine Fisheries Commission (ASMFC), whose spiny dogfish plan mirrors that in federal waters on paper, this year ignored the scientific advice and adopted state spiny dogfish trip limits in excess of the limits suggested by the NMFS. In response NMFS shut down spiny dogfish fishing in federal waters in early 2003 (The Ocean Conservancy, August 2003).

The first quota set in the Canadian Maritimes Region (Eastern Canada, Northwest Atlantic), was a cap of 2500t in 2001. That limit was exceeded by 1000t. In 2002, the Department of Fisheries and Oceans (DFO) Canada set a cap again at 2500t, but this was enforced. Allocations to fishing communities/stakeholders were based on their prior catches. The quota was allocated to the fixed gear fleet of vessels less than 45 feet, with all other fleets limited to a bycatch of spiny dogfish consistent with historic landings. In recognition of conservation concerns for dogfish, a 5-year scientific research and monitoring programme was initiated in 2002 to develop a comprehensive stock assessment for the population.

Northeast Pacific
British Columbia spiny dogfish have been broadly managed through groundfish regulations since 1978. Spiny dogfish are subject to TACs that have not yet been reached. Discards are difficult to estimate due to misreporting and lack of observers (BONFIL 1999).

Spiny dogfish fisheries in the US North Pacific receive minimal management. Off Alaska, they are the predominant shark taken and are regulated under an “other species” TAC (Alaska NMFS report 2000, GAICHAS *et. al*. 1999, GAICHAS 2000). Washington includes spiny dogfish in bottomfish management plans, but there are few species-specific measures. The directed fishery is subject to mesh restrictions but not quotas. Although the USA and Canada conduct cooperative surveys for Northeast Pacific spiny dogfish, there is no coordinated, international management for the stock (CAMHI 1999).

Northwest Pacific
Currently no catch control for management of sharks is being enforced by Regional Fisheries Management Organisations, which focus on tuna. Depending on the results of stock assessment, however, there is a possibility that catch control will be introduced for conservation and management of sharks in the future. Further, in response to FAO's call for development of national plans of action for conservation and management of shark stocks, Japan has developed its national plan of action with framework to monitor the state of sharks in Japan, and will recommend, when necessary, to introduce measures for conservation and management of the shark resources (CITES AC19 Doc. 18.3).

Southern hemisphere
New Zealand is the only country where management is being introduced to limit catches to current sustainable levels. This anticipates the expansion of the spiny dogfish fishery to meet European demand for the meat (FORDHAM in press).

3.3 Control measures

3.3.1 International trade

At present the international trade regulations concerning trade controls of spiny dogfish are almost non-existent and are limited to the usual sanitary measures for fishery products and/or to import duties (tariffs) that are, for instance, 6% in the EU. The latter explains why the only tool available to monitor exports and imports of spiny dogfish products was set up, namely the specific customs codes for frozen and fresh or chilled spiny dogfish (see IV.2.2). However, these codes are used by customs services on a voluntary basis. While in the EU, spiny dogfish codes are used for economical reasons; in Japan for instance import of frozen spiny dogfish is lumped with other shark products under a less specific code, No. 0303 7500, which does not allow estimation of trade at species level.

3.3.2 Domestic measures

None. Even where spiny dogfish catch quotas have been established, such as in some countries of the North Atlantic, no particular legal trade measures have been adopted to prevent the sale or export of spiny dogfish landings in excess to the quota.

4. Information on similar species

The genus *Squalus*, characterised by the absence of an anal fin and the presence of two dorsal fins, each preceded by a sharp spine, is currently under review (COMPAGNO in preparation). The spiny dogfish *Squalus acanthias* is one of the only members of this genus that poses no taxonomic problems, being identified by the location of the first dorsal fin behind or sometimes over the pectoral fin free rear tips and the spine origin well behind the pectoral free rear tips, usually with white spots on the side of the body (COMPAGNO 1984). The former suggestion of the existence of two sub-species is not longer accepted due to the considerable overlap between morphometric ratios and vertebral counts (AL-BADRI & LAWSON 1985). In contrast, it is uncertain how many species occur within the other two main species groups of *Squalus* (COMPAGNO in preparation), some of which have an overlapping distribution with *S. acanthias*.

With regard to meat, the product most commonly traded for this species, in Europe spiny dogfish is found in the same processing and retail markets as catsharks *Scyliorhinus* spp. and smooth-hounds *Mustelus* spp., although the former is marketed in the north and the latter in the south of Europe.

Several recent studies on shark DNA show promising perspectives for elasmobranch species identification (PANK *et al*. 2001, SHIVIJI *et al*. 2002, CHAPMAN *et al*. 2003) as well as for the rapid assessment of intra-specific variation, such as sub-species or population differentiation and structure (KEENEY and HEIST 2003, STONER *et al*. 2002). Highly efficient DNA tests already exist for 29 shark species (M. SHIVJI pers. comm.). There is high potential for the application of these techniques to other species, such as spiny dogfish, for which samples have already been collected from Northeast and Northwest Atlantic specimens (HEESSEN 2003). DNA testing for the identification of spiny dogfish meat, as well as other products less relevant to international trade, could soon be developed (Dr Arne Ludwig, Institute for Zoo and Wildlife Research, Department of Evolutionary Genetics (Berlin), pers comm. to TRAFFIC Europe, November 2003). A research proposal to sequence the genome of spiny dogfish *Squalus acanthias* is being jointly developed by Mound Desert Island Biological Laboratory (MDIBL) and the Washington University Genome Sequencing Centre (*in litt*., 7 December 2003).

5. Assessment of spiny dogfish with regard to CITES listing

5.1 Assessment under CITES criteria

This proposal for the listing of spiny dogfish on Appendix II of CITES is based on the following assessment of the species biological status, using CITES Appendix II criterion B (i) and (ii) (Ref. AC19 Doc. 9: "*B. It is known, or can be inferred or projected, that harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by either i) exceeding, over an extended period, the level that can be continued in perpetuity; or ii) reducing it to a population level at which its survival would be threatened by other influences*.").

a. The species has been subjected to unsustainable fisheries in several parts of its range.

b. A large proportion of the products of these fisheries was destined for and has entered international trade.

c. In recent years, the Northeast and Northwest Atlantic spiny dogfish fisheries have largely been supported by the high demand for spiny dogfish in Europe. The depletion of these two stocks and the existing constant demand have, since the late 1980s, caused increasing fishing pressure on South Atlantic and Pacific stocks (Figures 20 and 21).

5.2 Assessment under FAO criteria

The United Nations Food and Agriculture Organisation (FAO) has carefully considered the application of the CITES listing criteria to commercially exploited aquatic species through a series of technical consultations. FAO (2000) notes that large, long-lived, late-maturing species, with both high and low fecundity, but more so the latter, are at a relatively high risk of extinction from exploitation. Productivity, as a surrogate for resilience to exploitation, was considered to be the single most important consideration when assessing population status and vulnerability to fisheries. The most vulnerable species are those with an intrinsic rate of population increase of <0.14 and a generation time of >10 years (FAO 2001). Life history data presented in section 2.4 indicate that the spiny dogfish falls into FAO's lowest productivity category and, as such, could qualify for consideration for Appendix I listing if their population declined to 20% or less of the historic baseline (FAO, 2001). FAO (2001) further recommend that even if a species is no longer declining, if populations have been reduced to near the extent-of-decline-guidelines (defined as from 5-10% above the Appendix I extent of decline), they could be considered for Appendix II listing. The declines described for several spiny dogfish fisheries are taken as an indicator of declining population size to 5-10% of historic baseline.

5.3 CITES Provisions under Article IV, paragraphs 6 and 7: *Introduction from the sea*

This provision does not apply to spiny dogfish catch, which occurs within countries EEZ and will therefore not involve introduction of specimens from offshore fishing grounds.

V. PERSPECTIVES

Porbeagle and Spiny Dogfish are only one example of shark species overexploited by fisheries. Several initiatives and actions should be started or continued in order to improve the conservation status of sharks in general, specifically for porbeagle and spiny dogfish, and to limit shark fisheries and international trade in sharks, their derivatives and products to a sustainable level (see also CITES Res.Conf. 12.6).

Under CITES

CITES Parties should be encouraged to develop Appendix II listing proposals - not only for the two species mentioned above - and submit them for consideration at forthcoming meetings of the conferences of the parties. CITES-listings would help ensure that international trade is not detrimental to the survival of the species, and thereby effectively assist with the regulation and monitoring of the exploitation of threatened species as well as actively contribute to the implementation of the United Nations Food Agriculture Organisation (FAO) International Plan of Action (IPOA) for the Conservation and Management of Sharks.

The Shark Working Group of the Animals Committee should continue its work, especially by reviewing the progress achieved under IPOA Sharks, identifying key species and examine them for consideration and possible listing under CITES, and make species-specific recommendations to improve the conservation status of sharks and the regulation of international trade in these species.

The Standing Committee should establish a working group to deal with the legal and technical issues related to the term "Introduction from the sea" and develop a scheme under which CITES import, export and re-export permits can be issued.

Management Authorities of the CITES Parties should collaborate with their national customs authorities to expand their current classification system to allow for the collection of detailed data on shark species trade including, where possible, separate categories for processed and unprocessed products (for meat, cartilage, skin and fins), and to distinguish imports, exports and re-exports. Wherever possible, these data should be species-specific.

Under FAO

Shark fishing states that have not yet conducted shark stock assessments and developed National Plans of Action for the Conservation and Management of Shark stocks (NPOA Sharks) under the umbrella of FAO's International Plan (IPOA Sharks) should be encouraged to undertake this action.

FAO COFI and Regional Fisheries Management Organizations should take steps to undertake research, training, data collection, data analysis and shark management development outlined by FAO as necessary to implement IPOA Sharks.

FAO and ICES (International Council for the Exploitation of the Seas) should support the adoption of CITES listing proposals - especially in cases when the listing criteria as suggested by FAO are met - as these listings are a contribution to the IPOA Sharks.

Under EU jurisdiction

The European Community should urgently develop an EU Action Plan for the Conservation and Management of Sharks. Such a plan should be drafted by the EU Commission for discussion by the Council of Ministers and the European Parliament early next year in order for the respective Councils to have decided upon first actions by the end of 2005.

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The draft information for porbeagle and spiny dogfish had been distributed to all known or suspected range states of the two species in the end of 2003 and quite a number of responses providing helpful comments and additional data were received. Therefore we would like to express our gratitude especially to the CITES Management Authorities of Argentina, Australia, Brazil, Canada, China, Cyprus, Estonia, Faroer Islands, Greece, Greenland, Japan, Macedonia, Mexico, Slovenia, Spain, Sweden, and USA.

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VIII. ANNEX: FIGURES

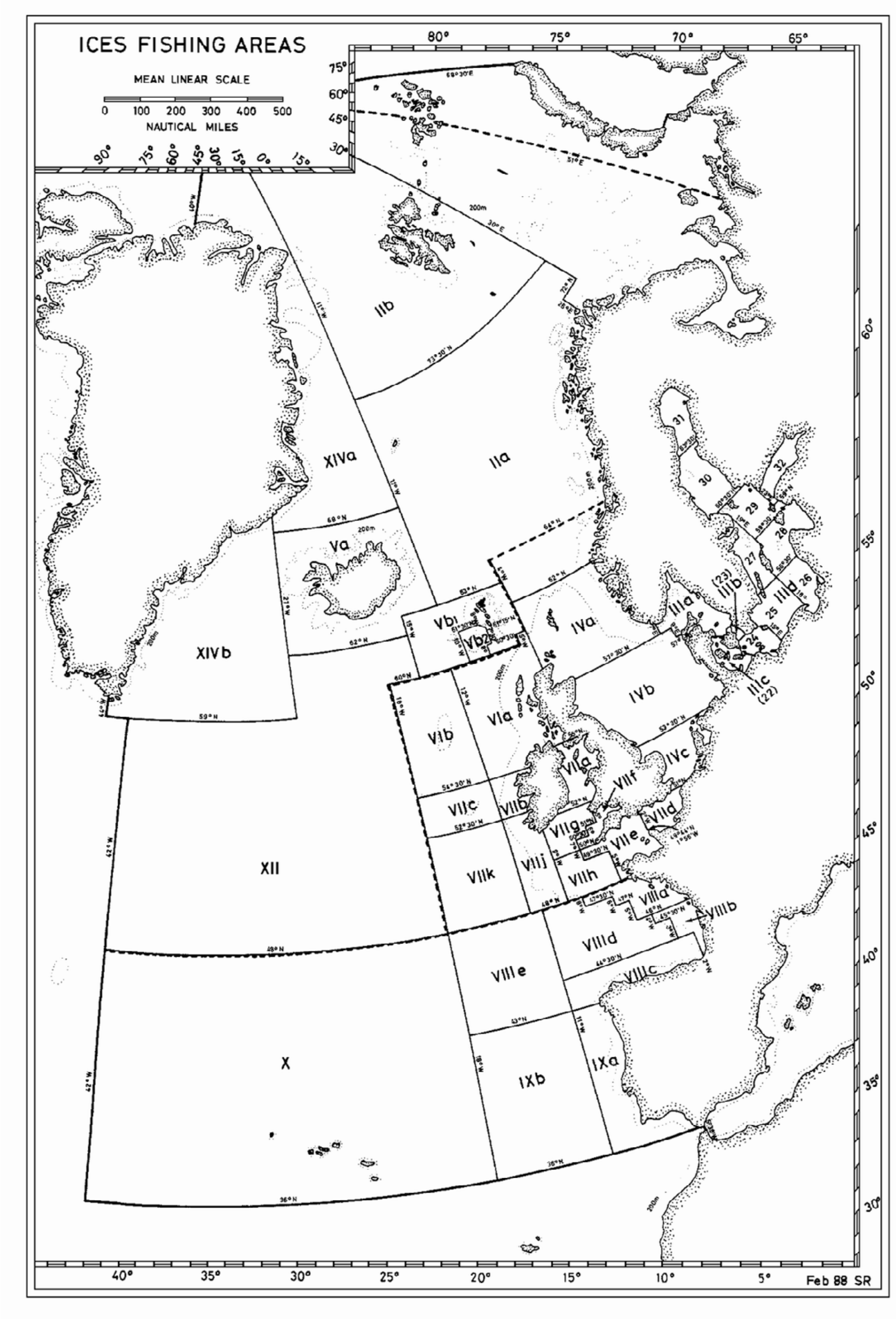


Figure 3. ICES fishing areas in the Northeast Atlantic.

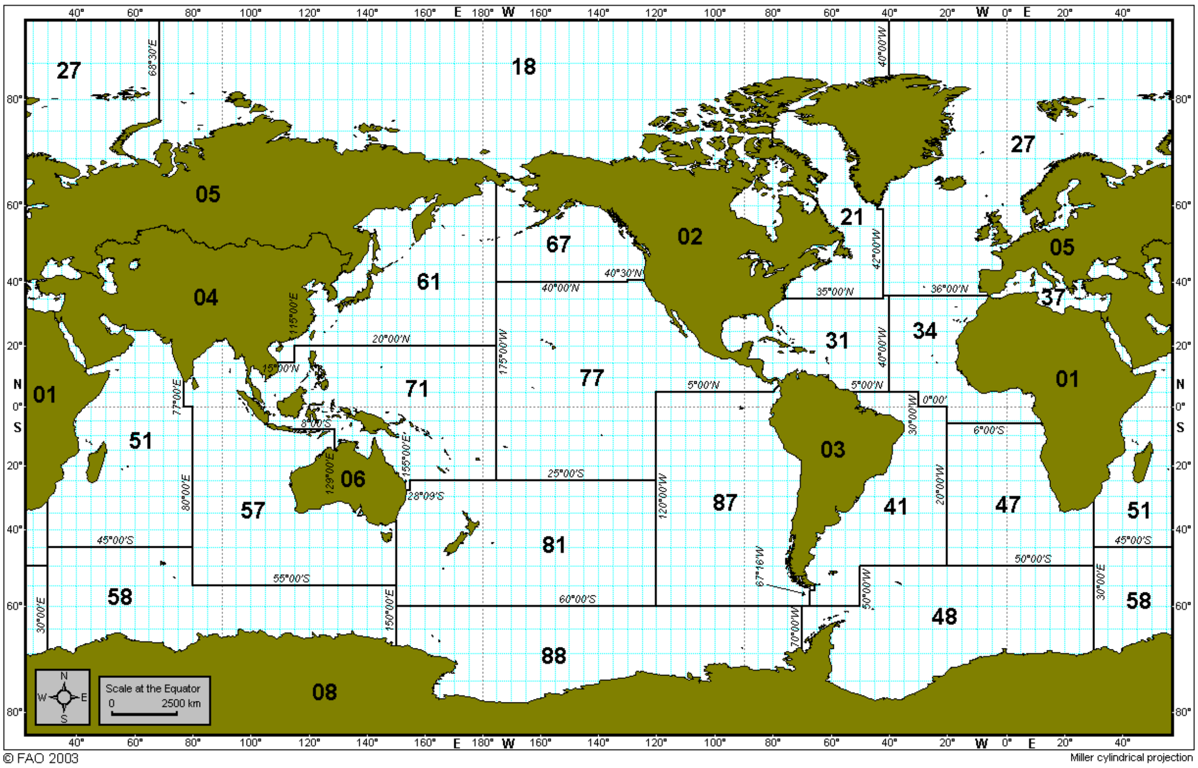


Figure 4. Map of FAO Fishing Areas.

Porbeagle reported landings are mostly taken in the north Atlantic regions 27 and 27.

01 - Africa-Inland Water
02 - America-Inland Water
03 - America South - Inland Water
04 - Asia-Inland Water
05 - Europe-Inland Water
06 - Oceania-Inland Water
21 - Atlantic, Northwest
27 - Atlantic, Northeast
31 - Atlantic, Western Central
34 - Atlantic, Eastern Central
37 - Mediterranean and Black Seas
41 - Atlantic, Southwest
47 - Atlantic, Southeast
48 - Atlantic, Antarctic
51 - Indian Ocean, Western
57 - Indian Ocean, Eastern
58 - Indian Ocean, Antarctic
61 - Pacific, Northwest
67 - Pacific, Northeast
71 - Pacific, Western Central
77 - Pacific, Eastern Central
81 - Pacific, Southwest
87 - Pacific, Southeast
88 - Pacific, Antarctic

Figure 5a. Biomass (t) of the Canadian porbeagle stock, 1961-2000.
(Source: Population model in DFO 2001)

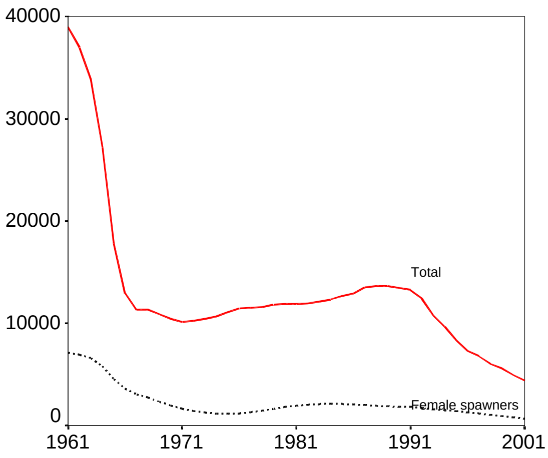


Figure 5b. Fishing mortality on Canadian porbeagle stock, 1961-2000.
(Source: Population model in DFO 2001)

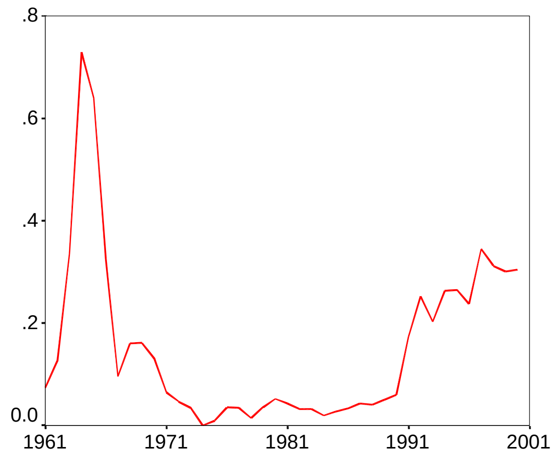


Figure 5c. Median fork lengths (cm) numbers of porbeagles in the Canadian porbeagle fishery, 1961-2000.
(Source: DFO 2001)

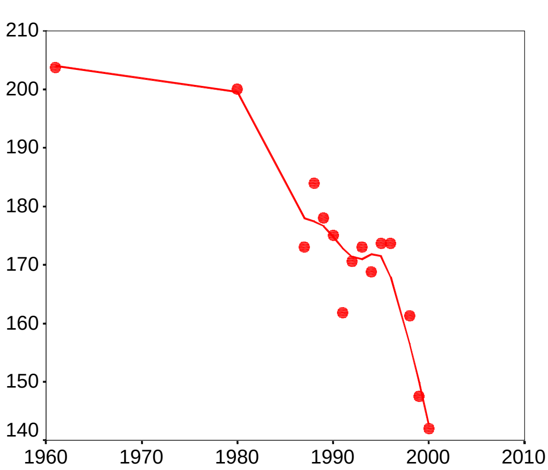
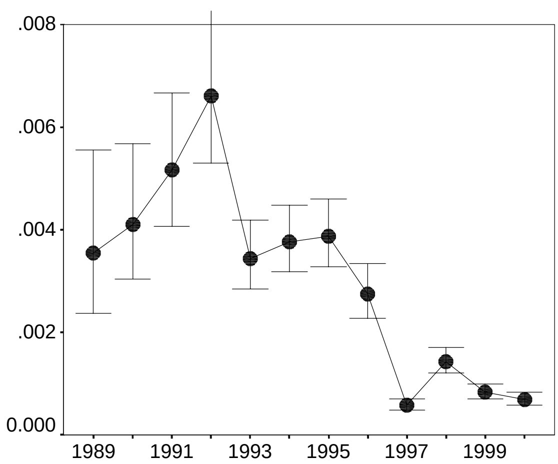


Figure 5d. Catch rates (standardised of mature sharks per hook) in the Canadian porbeagle fishery, 1989-2000.
(Source: Population model in DFO 2001)



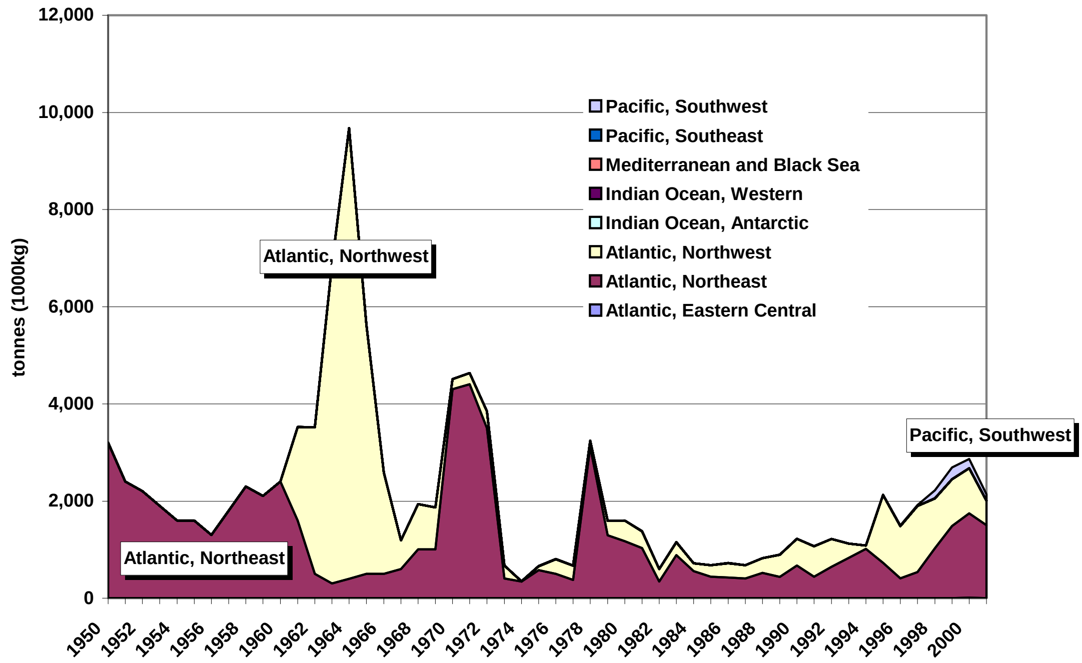


Figure 6. Total world reported landings of porbeagle shark (*Lamna nasus*) (t) by FAO fishing area from 1950 to 2001. See Figure 4 for map of FAO fishing areas.
(Source: FAO via Fishbase)
NB: This graph excludes pre-1950s landings reported from the Northeast Atlantic. These peaked at 3884t in 1933 and again at about 6000t in 1947, before falling rapidly.

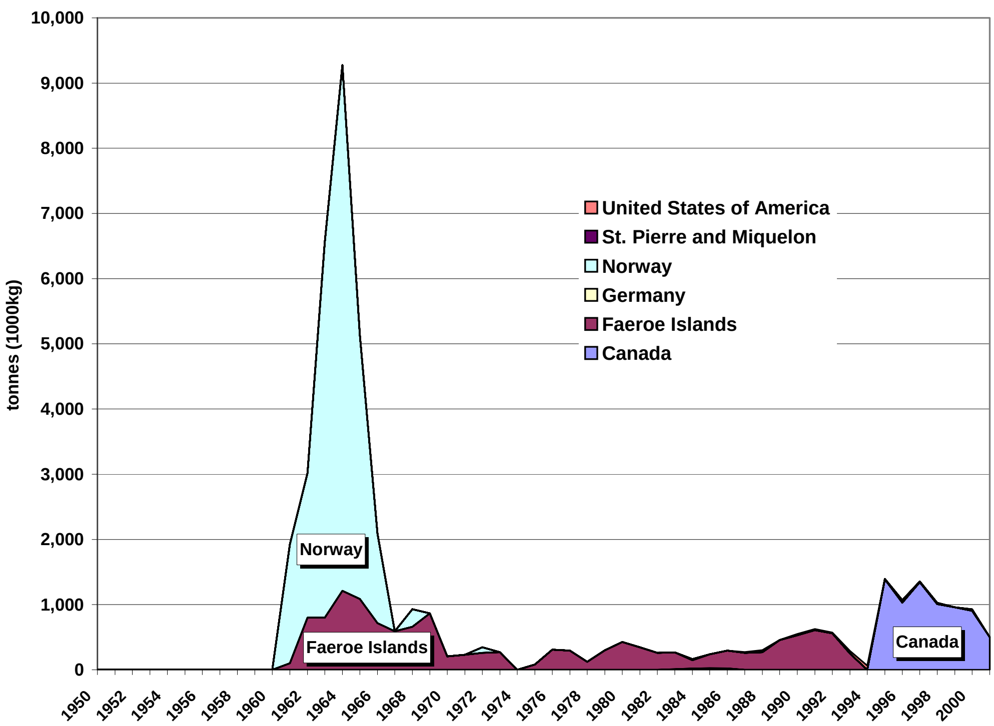


Figure 7. Total reported landings of porbeagle shark (*Lamna nasus*) (in tonnes or 1000kg) by country, in the Northwest Atlantic region, from 1950 to 2001.
(*Source*: FAO via FishBase)

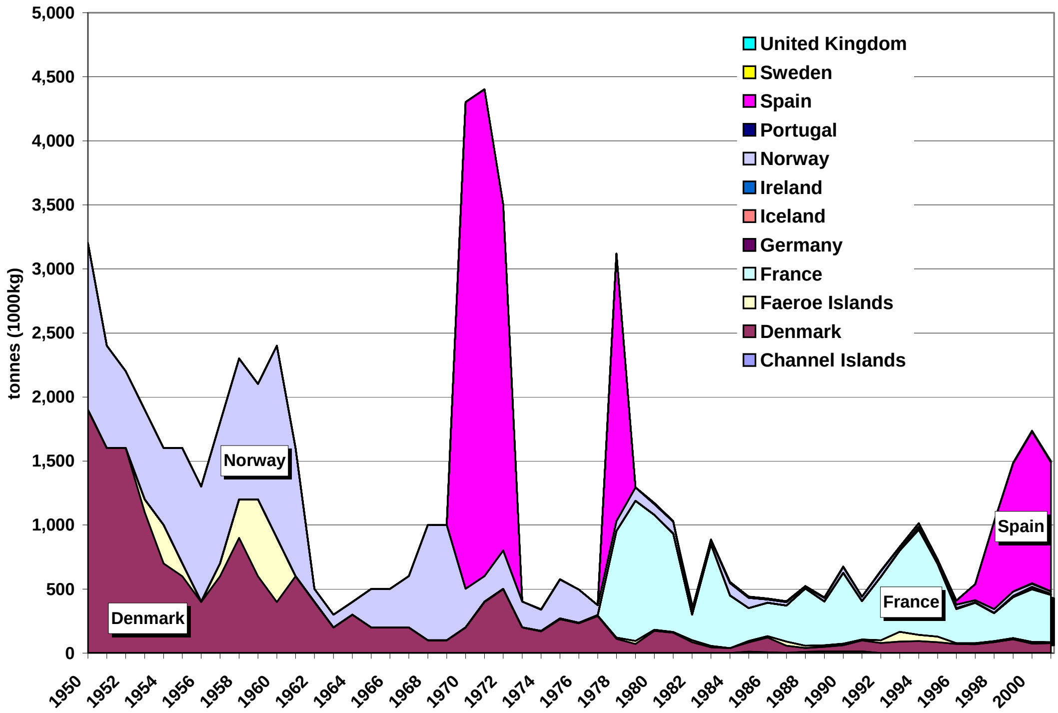


Figure 8. **Total reported landings of porbeagle shark (*Lamna nasus*) (tonnes) by country, in the Northeast Atlantic region, from 1950 to 2001.**
(*Source*: FAO via FishBase).
NB: This graph excludes pre-1950s landings reported from the Northeast Atlantic. These peaked at 3884t in 1933 and again at about 6000t in 1947 before falling rapidly.

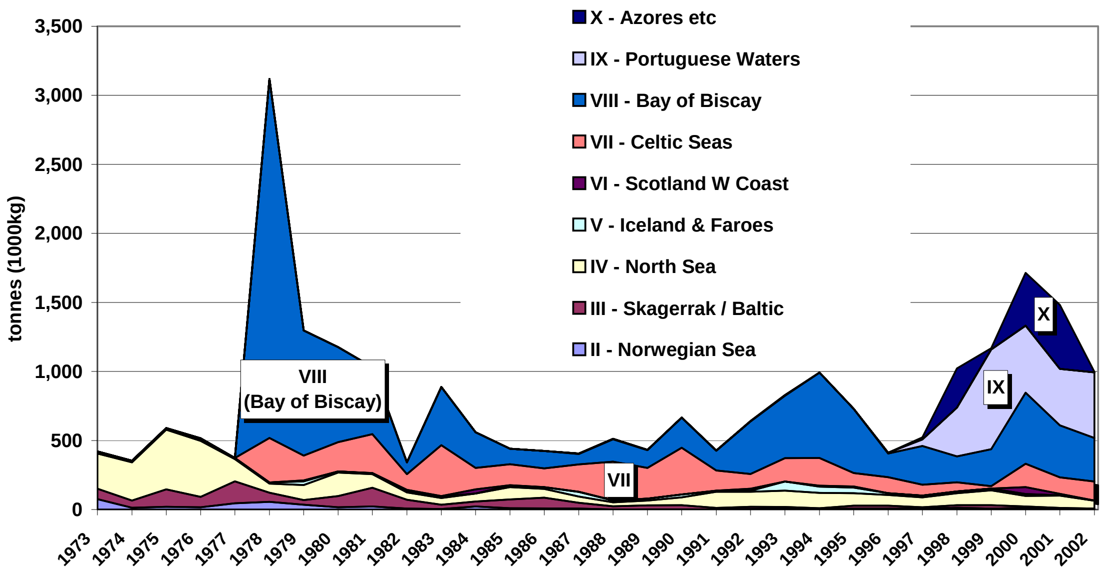


Figure 9. **Total reported landings of porbeagle shark (*Lamna nasus*) (t) by ICES Area within the Northeast Atlantic, from 1973 to 2002.**
(*Source*: ICES Statlant Fisheries Statistics, downloaded in November 2003).
See map of the ICES fishing areas in Figure 3.

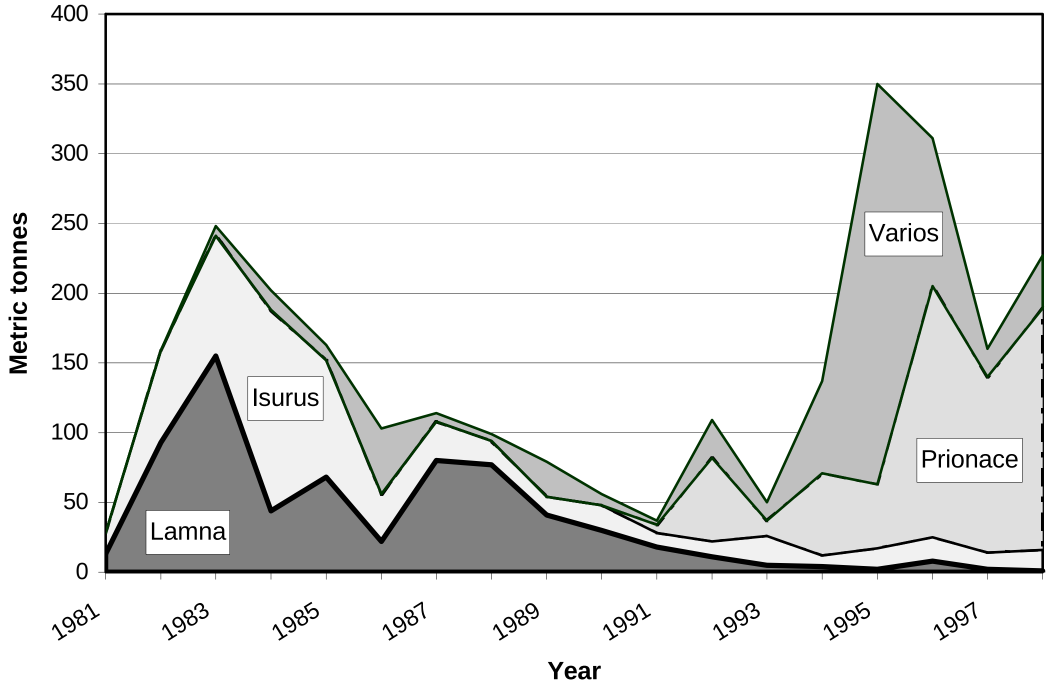


Figure 10. Sharks landed by the Uruguayan long line fleet, 1981-1998.
(Source: Domingo undated).
('*Lamna*' is *Lamna nasus*, porbeagle shark. 'Varios' includes eight species of large sharks.)

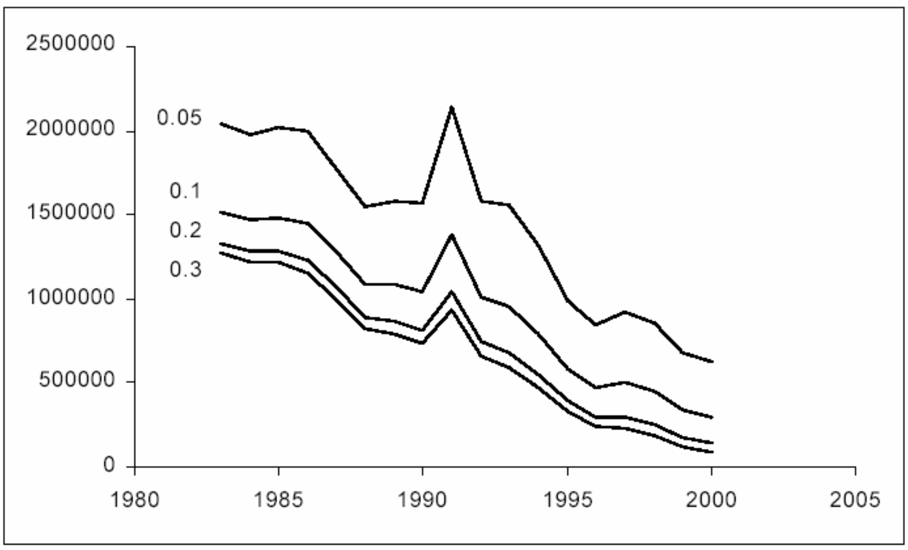


Figure 13. Trends in total population numbers of mature fish in the Northeast Atlantic, estimated using a Separable Virtual Population Analysis, with each line representing a different assumption for terminal F (0.05–0.3).
(Source Figure 6.4.1.14 in HEESSEN 2003.)

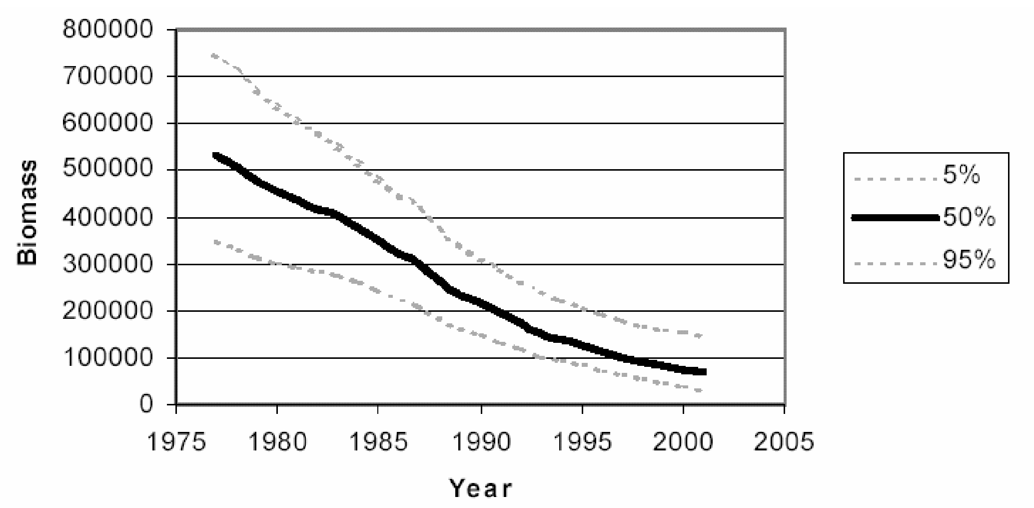


Figure 14. Estimated biomass time-series for spiny dogfish in the Northeast Atlantic, 1977–2001.
(Source Figure 6.4.1.17 in HEESSEN 2003.)

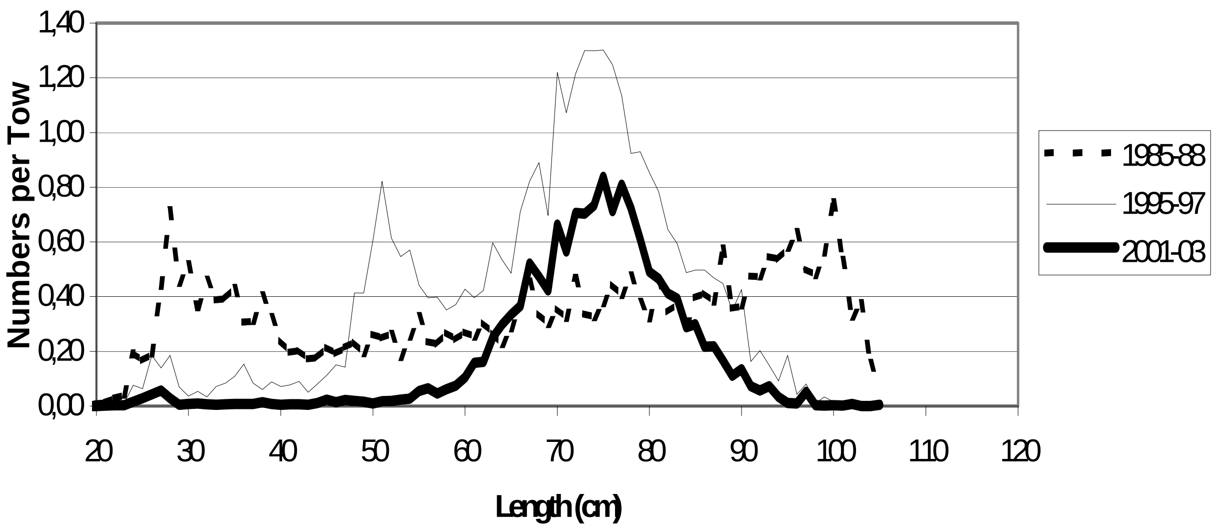


Figure 15. Comparison of size frequencies in female spiny dogfish (*Squalus acanthias*) in fishery-independent spring surveys in the Northwest Atlantic 1985–1997.
(Source: SARC 2003.)

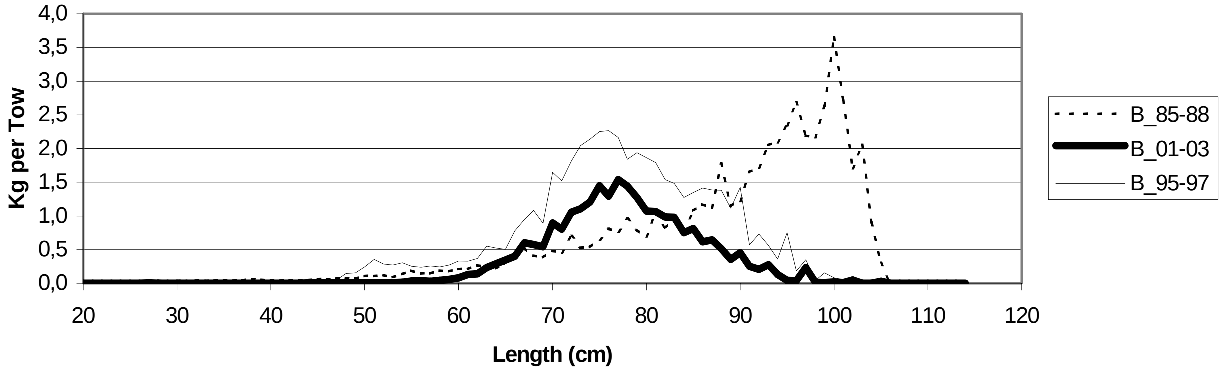


Figure 16. Biomass (kg) at length group of female spiny dogfish (*Squalus acanthias*) per tow in fishery-independent spring surveys in the Northwest Atlantic 1985–1997.
(Source: SARC 2003.)

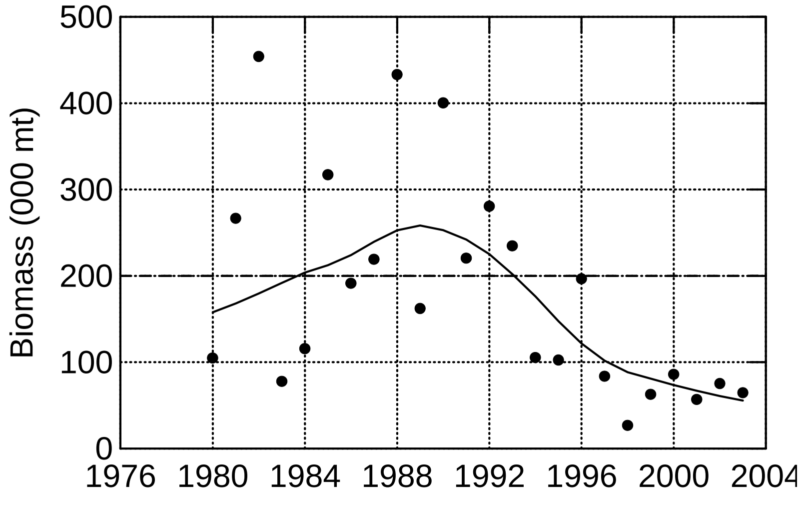


Figure 17. Swept Area biomass (thousand tonnes) of mature females (>80cm total length) from fishery-independent surveys, 1976–2003 in the Northwest Atlantic.
(Source SARC 2003).

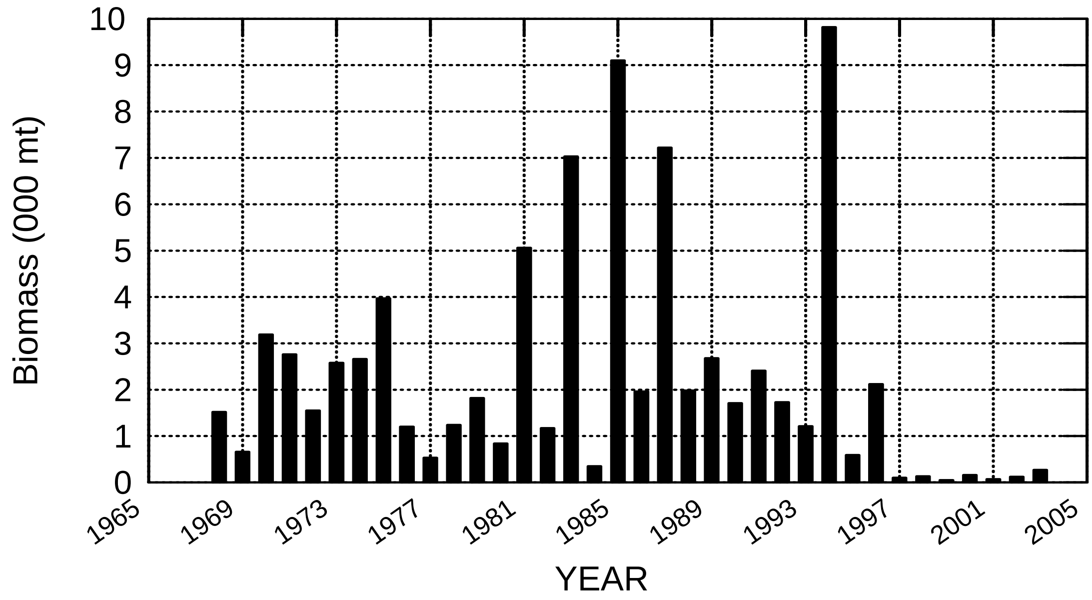


Figure 18. Swept Area biomass (thousand tonnes) of spiny dogfish pups from fishery-independent surveys, 1968–2003 in the Northwest Atlantic.
(Source SARC 2003).

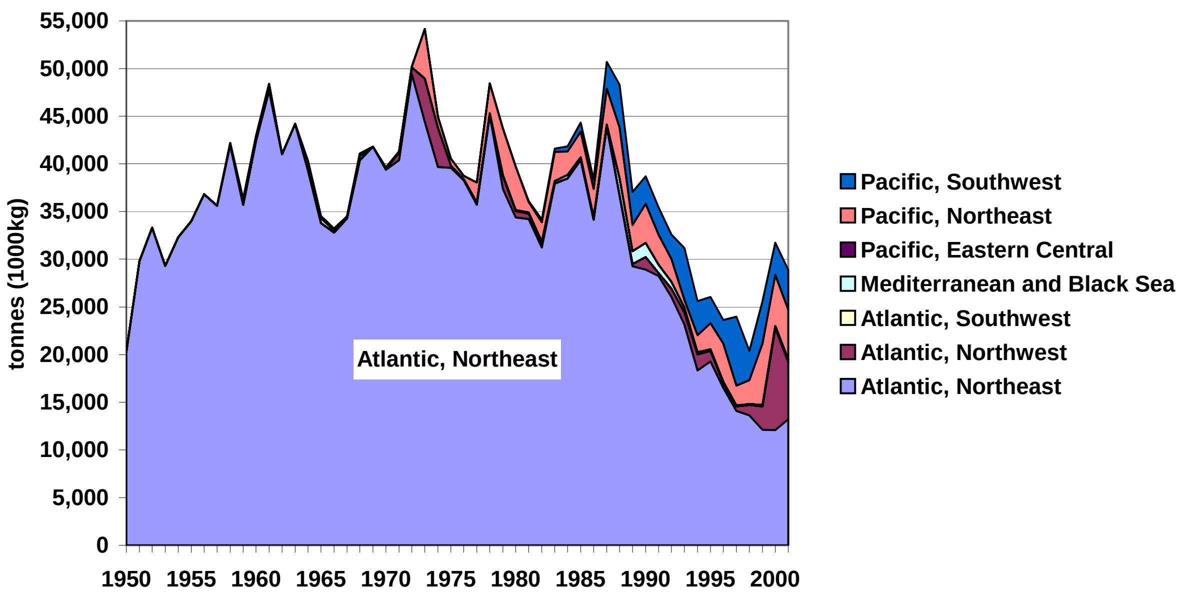


Figure 19. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported by FAO fishing area from 1950 to 2001.
(*Source*: FAO Fishstat 2003.)

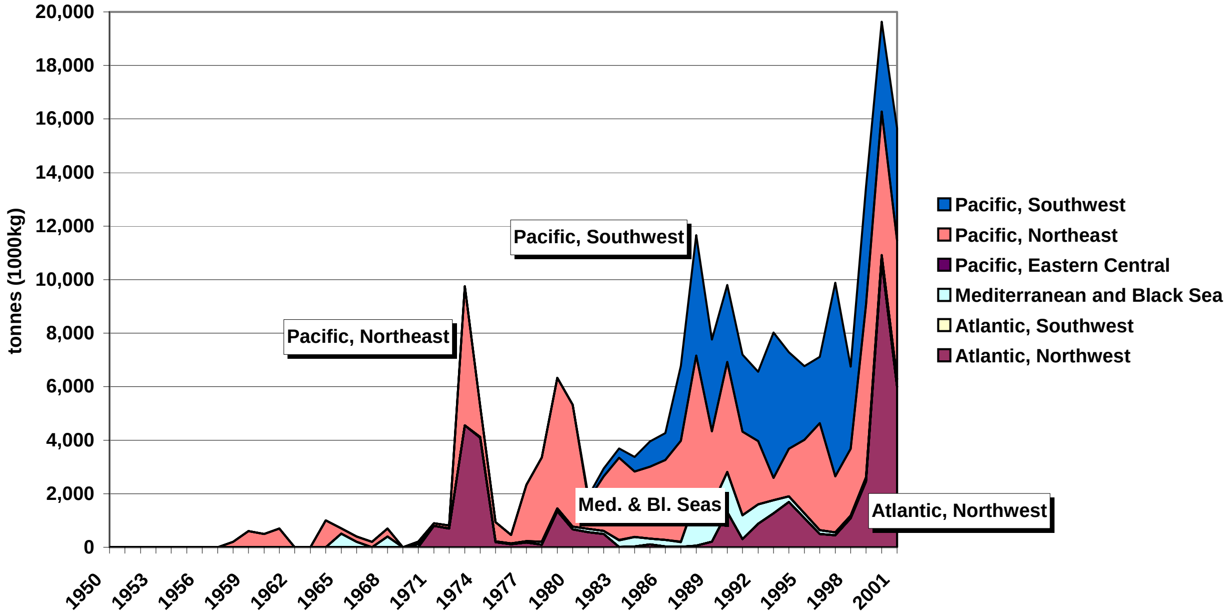


Figure 20. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by FAO fishing area, excluding the Atlantic Northeast.
(*Source*: FAO Fishstat 2003).

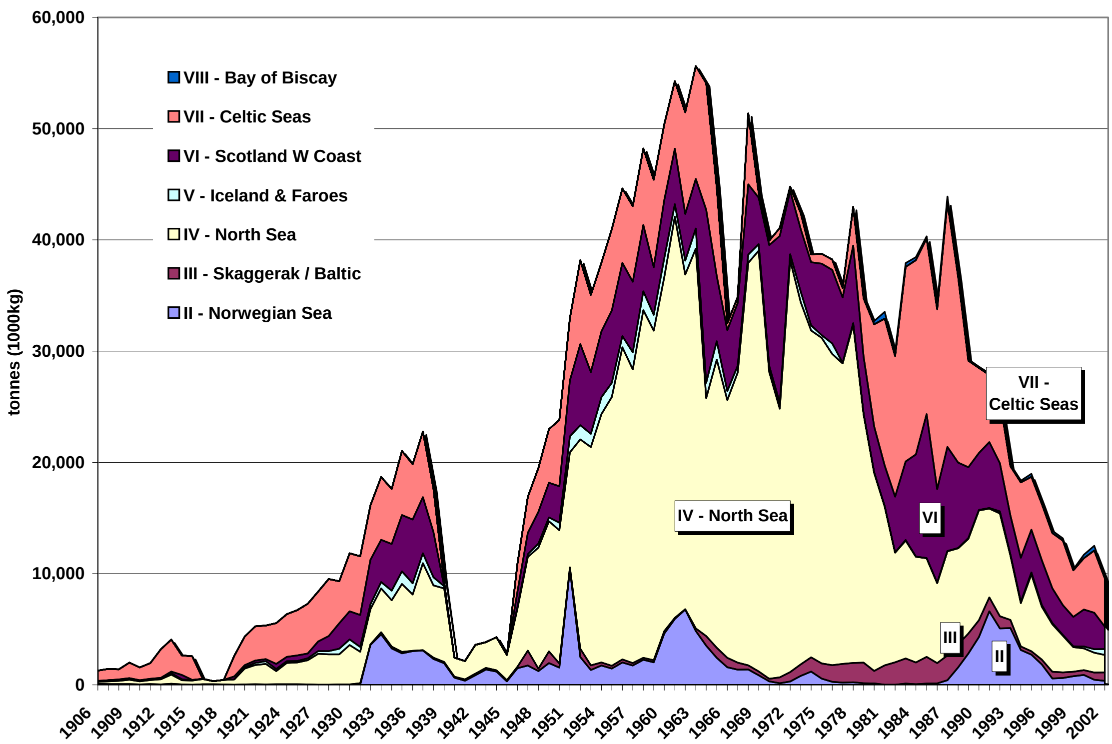


Figure 21. Total landings reported of spiny dogfish (*Squalus acanthias*) (tonnes) by ICES fishing area, in the Northeast Atlantic, from 1906 to 2002, excluding areas with negligible catches (I, IX, X, XII and XIV).
(*Sources*: 1906-1972 from HEESSEN, 2003; 1973-2002 from ICES Statlant Fisheries Statistics Database, November 2003).

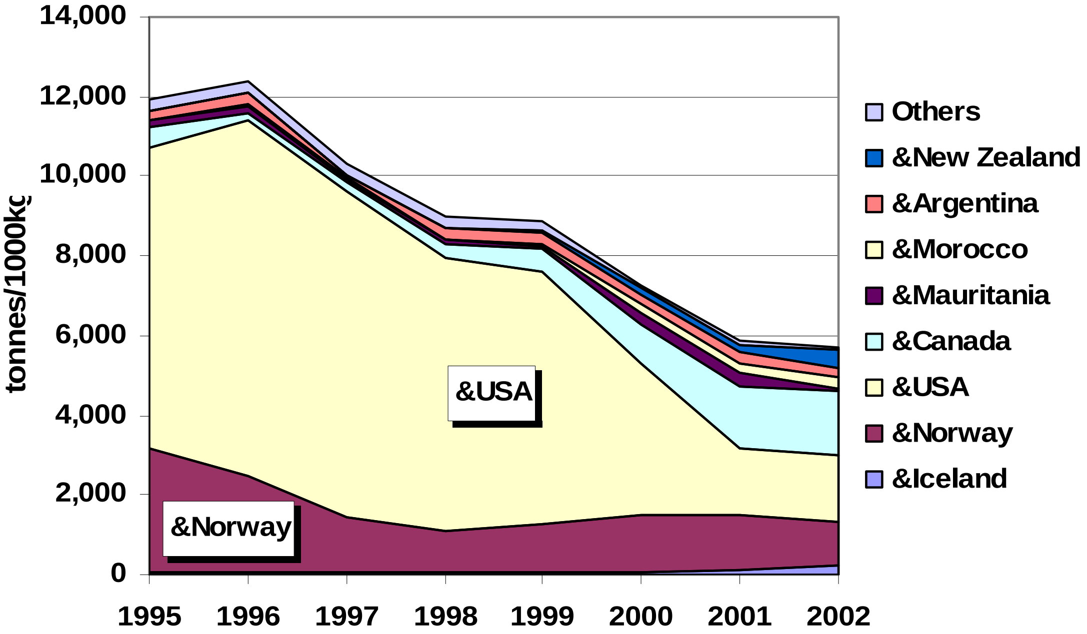


Figure 22. Origin of EU imports* of fresh or chilled (CN Code: 0302 6520) and frozen (CN Code: 0303 7520) 'Dogfish of the species *Squalus acanthias*'
(*Source*: Eurostat 2003)

* Excluding EU Member States, such as Germany – one of the main EU importers (ref. 3.2), that do not use the special CN codes for recording 'Dogfish' products separately, and lump them with all other shark species under a more general code, e.g. 0303 7500, as does Japan.

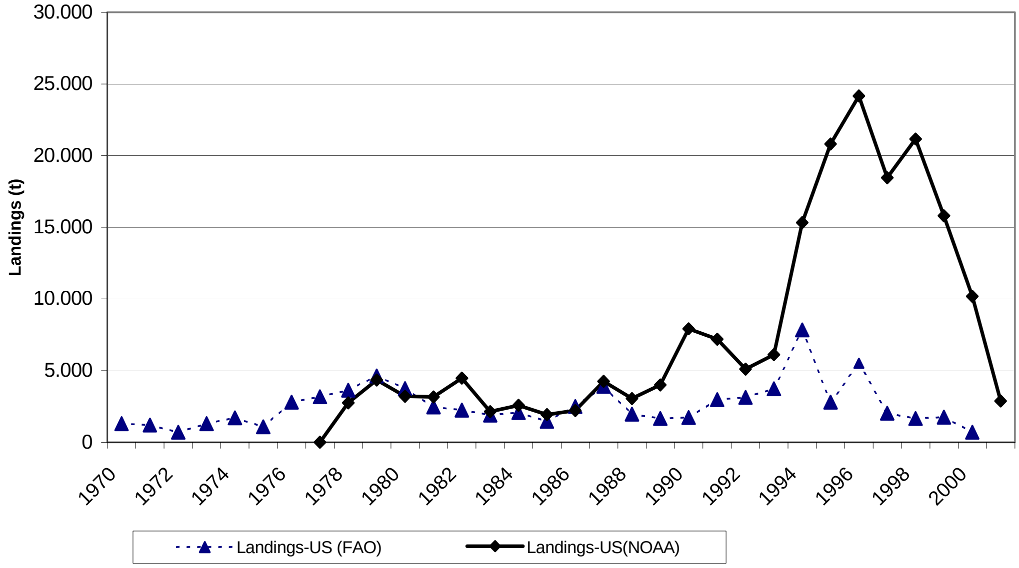


Figure 23. Comparison of FAO data on US landings
(source Fishstat capture production database)
and USA National Marine Fisheries Service data
(source commercial fisheries landings database at www.st.nmfs.gov).

IX. ANNEX: TABLES

Table 1a. Scientific synonyms of *Lamna nasus*

- *Squalus glaucus* Gunnerus, 1768
  (not S. glaucus Linnaeus, 1758 = Prionace glauca);
- *Squalus cornubicus* Gmelin, 1789;
- *Squalus pennanti* Walbaum, 1792 (alsoLamna pennanti, Desvaux, 1851);
- *Squalus monensis* Shaw, 1804;
- *Squalus cornubiensis* Pennant, 1812;
- *Squalus selanonus* Walker, in Leach, 1818;
- *Selanonius walkeri* Fleming, 1828;
- *Lamna punctata* Storer, 1839;
- *Oxyrhina daekayi* Gill, 1862;
- *Lamna philippi* Perez Canto, 1886;
- *Lamna whitleyi* Philipps, 1935

Table 1b. Scientific synonyms of *Squalus acanthias*

- *Squalus spinax* Olivius, 1780 (not Linnaeus, 1758 = *Etmopterus spinax*);
- *Squalus fernandinus* Molina, 1782;
- *Acanthias antiguorum* Leach, 1818;
- *Acanthias vulgaris* Risso, 1826;
- *Acanthias americanus* Storer, 1846;
- *Spinax mediterraneus* Gistel, 1848;
- *Spinax (Acanthias) suckleyi* Girard, 1854;
- *Acanthias sucklii* Girard, 1858 (error for suckleyi ?);
- *Acanthias linnei* Malm, 1877;
- *Acanthias lebruni* Vaillant, 1888;
- *Acanthias commun* Navarette, 1898;
- *Squalus mitsukurii* Tanaka, 1917 (not Jordan & Fowler, 1903);
- *Squalus wakiyae* Tanaka, 1918;
- *Squalus kirki* Phillipps, 1931;
- *Squalus whitleyi* Phillipps, 1931;
- *Squalus barbouri* Howell-Rivero, 1936.

(Source: FAO Species Identification Sheet 2003)

Table 2a.

Range States – Countries where *Lamna nasus* has been recorded

Albania
Algeria
Antarctica
Argentina
Australia (New South Wales; Queensland; South Australia; Tasmania; Victoria; Western Australia)
Azores Is. (Portugal)
Belgium
Bermuda
Brazil
Canada (New Brunswick; Newfoundland; Nova Scotia; Prince Edward Island)
Canary Islands
Cape Verde
Channel Islands (UK)
Chile
Croatia
Cyprus
Denmark
Egypt
Faeroe Islands
Falkland Islands (Malvinas)
Finland
France
France (Corse)
French Polynesia
Germany
Gibraltar
Greece (East Aegean Is.; Kriti)
Greenland
Iceland
Ireland
Isle of Man
Israel
Italy (Sardinia; Sicilia)
Kerguelen Is.
Lebanon
Libya
Madeira Islands (Portugal)
Malta
Monaco
Morocco
Netherlands
New Zealand
Norway
Portugal
Russian Federation
Slovenia
South Africa
South Georgia and the South Sandwich Islands
Spain
Sweden
Syria
Tunisia
Turkey
United Kingdom (England, Wales, Scotland, Northern Ireland)
United States of America (Maine; Massachusetts; New Jersey; New York; Rhode Island; South Carolinas?)
Uruguay
Yugoslavia

Table 2b.

Range States – Countries where *Squalus aquanthias* has been recorded

Albania
Algeria
Antarctica
Argentina
Australia (New South Wales; Queensland; South Australia; Tasmania; Victoria; Western Australia)
Azores Is. (Portugal)
Belgium
Bermuda
Brazil
Canada (New Brunswick; Newfoundland; Nova Scotia; Prince Edward Island)
Canary Islands
Cape Verde
Channel Islands (UK)
Chile
Croatia
Cyprus
Denmark
Egypt
Faeroe Islands
Falkland Islands (Malvinas)
Finland
France
France (Corse)
French Polynesia
Germany
Gibraltar
Greece (East Aegean Is.; Kriti)
Greenland
Iceland
Lebanon
Libyan Arab Jamahiriya
Lithuania
Malta
Mauritius
Mexico
Monaco
Morocco
Namibia
Netherlands
New Zealand
Norway
Philippines?
Poland
Portugal
Romania
Russian Federation
Serbia and Montenegro
Slovenia
South Africa
Spain
Sweden
Syrian Arab Republic
Tunisia
Turkey
Ukraine
United Kingdom (England, Wales, Scotland, Northern Ireland, Isle of Man, Channel Islands)
Uruguay
USA
Western Sahara
Yugoslavia

Table 3. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) from 1950 to 2001 by FAO fishing area

a) From 1992 to 2001

FAO Area	No. of fishing countries	Total catch (tonnes)	% of world total catch	2001 catch as % of period peak
Atlantic, Northeast	16	1 722 318	89%	**27%**
Atlantic, Northwest	8	42 003	2%	56%
Atlantic, Southwest	1	1	0%	0%
Mediterranean & Black seas	7	11 262	1%	16%
Pacific, Eastern Central	1	116	0%	12%
Pacific, Northeast	3	92 945	5%	**80%**
Pacific, Southwest	1	58 862	3%	58%
Total	**37**	1 927 507	100%	53%

b) From 1950 to 2001

FAO Area	No. of fishing countries	Total catch (tonnes)	% of world total catch	2001 catch as % of period peak
Atlantic, Northeast	16	1 722 318	89%	**27%**
Atlantic, Northwest	8	42 003	2%	56%
Atlantic, Southwest	1	1	0%	0%
Mediterranean & Black seas	7	11 262	1%	16%
Pacific, Eastern Central	1	116	0%	12%
Pacific, Northeast	3	92 945	5%	**80%**
Pacific, Southwest	1	58 862	3%	58%
Total	**37**	1 927 507	100%	53%

(Source: FAO via Fishbase).

Table 4. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported to FAO, by country in the Northeast Atlantic.

a) From 1992 to 2001

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	56	47	21	14	16	15	17	10	11	13
Denmark	800	486	211	146	142	196	126	131	146	156
Faeroe Islands	0	0	0	308	51	212	356	484	354	613
France	2,406	1,911	1,661	1,349	1,719	1,708	1,410	1,192	1,097	1,333
Germany	56	8	0	0	0	0	0	45	188	303
Iceland	181	109	97	166	157	106	78	57	109	136
Ireland	1,383	3,424	3,624	2,435	2,095	1,407	1,259	962	880	1,301
Netherlands	0	0	0	0	0	0	0	0	28	39
Norway	7,114	6,945	4,546	3,939	2,749	1,567	1,293	1,461	1,643	1,424
Spain	0	0	0	0	0	1	27	94	372	363
Sweden	230	188	95	104	154	197	140	114	124	238
United Kingdom	13,812	10,032	8,072	10,815	9,423	8,691	8,926	7,527	7,138	7,306
TOTAL	**26,038**	**23,150**	**18,327**	**19,276**	**16,506**	**14,100**	**13,632**	**12,077**	**12,090**	**13,225**

b) From 1950 to 2001

Country	**Total catch (tonnes)**	**% of regional total catch**	**2001 catch as % of period peak**
Belgium	37 713	2%	1%
Denmark	49 575	3%	6%
Faeroe Islands	2 591	0%	100%
France	156 456	9%	9%
Germany	20 505	1%	25%
Iceland	1506	0%	75%
Ireland	88 202	5%	15%
Netherlands	8 871	1%	6%
Norway	689 751	40%	**4%**
Spain	857	0%	98%
Sweden	15 329	1%	25%
United Kingdom	650 889	38%	38%
Total	**1 722 318**	100%	**27%**

(Source: FAO via Fishbase).

Table 5. Comparison between total reported landing and quotas for spiny dogfish in the European Community (EC) and UK North Sea waters* (tonnes)

	1999			2000			2001			2002			2003	2004
	Total reported landings *	Quota in EC North Sea waters	Quota as % of reported landings	Total reported landings *	Quota in EC North Sea waters	Quota as % of reported landings	Total reported landings *	Quota in EC North Sea waters	Quota as % of reported landings	Total reported landings *	Quota in EC North Sea waters	Quota as % of reported landings	EC North Sea Quota	EC North Sea Quota **
North Sea waters	5,262	8,870	169%	5,705	8,870	155%	5,702	8,870	156%	3,313	7,100	214%	5,840	4,472
	1,653	7,177	434%	1,291	7,177	556%	1,006	7,177	713%	1,013	5,745	567%	4,413	3,617
UK as % to EC		81%			81%			81%			81%		76%	81%

* ICES areas IIIa, IV and VIa and b
** Proposed quota, still to be adopted, for 2004

Table 6. Total landings of *Squalus acanthias* by combined ICES fishing areas (tonnes)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
II - Norwegian Sea	5,102	3,123	2,725	1,853	581	607	779	894	461	356
III - Skaggerak / Baltic	735	315	292	421	598	510	393	433	639	762
IV - North Sea	5,771	3,907	6,908	4,745	4,269	3,290	2,227	1,954	1,796	1,568
V - Iceland & Faeroes	110	102	167	167	107	81	58	172	307	541
VI - Scotland W Coast	3,482	3,983	3,847	4,027	3,129	2,670	2,648	3,317	3,284	2,001
VII - Celtic Seas	4,451	6,767	4,762	5,047	4,947	5,807	4,176	4,608	5,581	4,357
VIII - Bay of Biscay	74	151	264	194	240	208	98	327	431	212
IX - XIV - Portugal & Atlantic	6	7	9	2	14	106	43	34	116	2
TOTAL	**19,731**	**18,355**	**18,975**	**16,456**	**13,886**	**13,279**	**10,422**	**11,738**	**12,615**	**9,799**

(Sources: ICES Statlant Fisheries Statistics Database, November 2003).

Table 7. Countries supplying spiny dogfish to the EU (tonnes)

	1995	1996	1997	1998	1999	2000	2001	2002
&Iceland	30.50	72.50	66.60	47.70	31.90	70.40	107.20	220.80
&Norway	3,132.10	2,415.90	1,393.90	1,064.50	1,238.70	1,446.70	1,395.70	1,107.60
&USA	7,581.20	8,938.30	8,181.20	6,817.40	6,316.60	3,760.90	1,670.70	1,664.10
&Canada	469.20	144.90	227.50	370.20	598.90	1,003.40	1,568.70	1,610.00
&Morocco	25.00	17.20	30.90	32.10	50.70	216.50	231.50	247.50
&Mauritania	167.90	205.60	52.00	90.40	65.60	291.90	304.70	90.50
&Argentina	204.40	312.70	68.00	255.70	253.30	231.70	309.80	262.70
&New Zealand	28.80	5.40	18.00	15.20	71.00	151.70	194.60	448.20
Others	286.50	294.30	280.60	279.40	260.80	95.00	80.00	64.00
Total	**11,925.60**	**12,406.80**	**10,318.70**	**8,972.60**	**8,887.50**	**7,268.20**	**5,862.90**	**5,715.40**

(Source: Eurostat, 2003)