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6th Meeting of the ISC
23-27 March, 2006
La Jolla, California, U.S.A.

Letter from Dr. von Gadow requesting support for CITES Appendix II listing of the Spiny Dogfish and the Porbeagle (sharks)[1]

March 2006

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[1]Working document prepared for the **Sixth Meeting of the International Scientific Committee on Tuna and Tuna-like Species in the North Pacific Ocean (ISC), March 23-27, 2006, La Jolla, California, U.S.A.** Document should not be cited without permission of the authors.

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für Umwelt, Naturschutz
und Reaktorsicherheit

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Bonn, 28 February 2006

Dear Sir or Madam,

I am writing to you to ask you to join our common response to the ongoing international trade in shark species. Particular focus lies on the shark species *Lamna nasus* and *squalus acanthias,* two species which also occur in German territorial waters. Being significantly involved in the utilization and trading of these species, Germany conducted a survey on the question whether inclusion of the two species in Appendix II of CITES might be justified in view of the large scale of utilization observed.

The result of our data collection has been incorporated in a provisional proposal which is attached to this letter. In addition please find a draft resolution and two draft annotations dealing with implementation aspects of the listing of the two shark species.

We would value the views of your a regional Fisheries Management Organization involved in the conservation of marine species in the distribution territories of the two shark species on a potential CITES listing of these taxa.

The text of the proposals is still under further development. This refers especially to the sections on POPULATION SIZE AND TREND as well as UTILISATION AND TRADE (including Landing Data) as we are trying to include the most recent data available.

Any information you may have on the recent development of these issues will be most welcome. In order to allow a timely decision well ahead of the submission deadline we would greatly appreciate receiving your comments by April 30, 2006.

However, the final decision as to whether an official proposal will be presented to the 14th Conference of the Parties of the CITES Convention is subject to the comments of the range states and to prior approval by the Member States of the European Union.

Thank you very much for taking the time to consult with us on these important issues. I am looking forward to receiving your comments and would be grateful if you could support proposals in the upcoming deliberations.

Yours sincerely

Dr. von Gadow
(For the Ministry for the Environment,
Nature Conservation and Nuclear Safety)

Enclosures.: 5

cc:
European Commission
Member States of the European Union
Cites Secretariat
FAO

DRAFT
Proposal Annotation and Decision
regarding the inclusion of the Spiny Dogfish in Appendix II CITES

DRAFT Annotation to the listing of spiny dogfish *Squalus acanthias* on Appendix II of CITES

The entry into effect of the inclusion of spiny dogfish *Squalus acanthias* on Appendix II of CITES will be delayed by 12 months to enable Parties to resolve the related technical and administrative issues, such as the possible designation of an additional Management Authority.

DRAFT Decision of the Conference of the Parties concerning spiny dogfish *Squalus acanthias*

13.XX The Animals Committee, in consultation with the United Nations Food and Agriculture Organisation (FAO) and other relevant experts, will examine both legal and illegal trade in *Squalus acanthias* and report at the 15th meeting of the Conference of the Parties on any trade measures that may be required, including establishment of specific quotas or other trade restrictions for *Squalus acanthias*, in order to maintain the level of exports of the species below the level that would be detrimental to its survival in the wild.

DRAFT
Proposal Annotation and Decision
regarding the inclusion of the Porbeagle in Appendix II CITES

DRAFT Annotation to the listing of porbeagle *Lamna nasus* on Appendix II of CITES

The entry into effect of the inclusion of porbeagle *Lamna nasus* on Appendix II of CITES will be delayed by 12 months to enable Parties to resolve the related technical and administrative issues, such as the possible designation of an additional Management Authority.

DRAFT Decision of the Conference of the Parties concerning porbeagle *Lamna nasus*

13.XX The Animals Committee, in consultation with the United Nations Food and Agriculture Organisation (FAO) and other relevant experts, examine trade in *Lamna nasus* and reports at the 15th meeting of the Conference of the Parties on any trade measures that may be required, including establishment of specific quotas or other trade restrictions for *Lamna nasus*, in order to maintain the level of exports of the species below the level that would be detrimental to its survival in the wild;

DRAFT

Resolution of the Conference of the Parties

concerning porbeagle *Lamna nasus*

<u>Conservation and trade in porbeagle *Lamna nasus*</u>

RECALLING the decision of the Parties to include *Lamna nasus* in Appendix II of the Convention, in accordance with Article II, paragraph 2(a), for the Atlantic and Arctic stocks and in accordance with Article II, paragraph 2(b), for the Indo-Pacific and Southern Ocean stocks;

CONCERNED about the conservation status of *Lamna nasus* as specimens of this species are slow-growing and long-lived with a life history that makes them particularly vulnerable to overexploitation;

AWARE that *Lamna nasus* represents a very valuable renewable biological and economic resource;

AWARE that *Lamna nasus* is subject to commercial harvesting in waters within the area covered by Regional Fisheries Organisations (RFOs), such as the International Commission for the Conservation of Atlantic Tunas (ICCAT), and that some of these RFOs have adopted resolutions related to shark species, in order for instance to monitor the level of by-catch;

ACKNOWLEDGING that the United Nations Food Agriculture Organisation (FAO) is the international body responsible for the management of fisheries resources;

AWARE that FAO has adopted an International Plan of Action (IPOA) for the conservation and management of sharks and that, following FAO recommendations, several countries have adopted a National Plan of Action (NPOA) for sharks;

AFFIRMING that international trade in *Lamna nasus* taken in contravention or in the absence of regulatory measures undermines the conservation of the species and the efforts of States, including those that have adopted an NPOA as recommended under FAO IPOA:

CONCERNED that the lack of monitoring and control of international trade in *Lamna nasus* poses an ongoing and substantial threat to the species in the wild and that strengthened international cooperation between range as well as non-range States, and fishing States is required to provide necessary information to regulate the trade in the species and its parts and derivatives, as support to existing and future management measures adopted by the relevant national authorities and international organisations, and to ensure the effective conservation of *Lamna nasus*;

RECOGNISING that, under international law, coastal States exercise sovereignty, sovereign rights and jurisdiction over maritime areas as set out in the United Nations Convention on the Law of the Sea (UNCLOS) signed at Montego Bay, Jamaica, on 10 December 1982;

RECALLING that Article IV, paragraph 6(a), of CITES requires, as a condition for granting a certificate of introduction from the sea, that a Scientific Authority of the State of introduction has advised that the introduction from the sea of specimens originating from waters outside the jurisdiction of the State of introduction, will not be detrimental to the survival of the species concerned;

RECALLING that Article IV, paragraph 2(a), of the Convention requires, as a condition for granting an export permit that a Scientific Authority of the State of export has advised that the export will not be detrimental to the survival of the species concerned, including for specimens introduced from the sea;

CONSCIOUS of the need to develop procedures to provide for the effective implementation of Article IV, paragraph 2,3, 6(a) and 7of the Convention, for the purposes of regulating trade in *Lamna nasus*;

THE CONFERENCE OF THE PARTIES TO THE CONVENTION

URGES Parties to consult, when appropriate, with FAO and/or the relevant RFO before issuing a certificate of introduction from the sea for specimens of the species *Lamna nasus* harvested in waters not under the jurisdiction of any State;

RESOLVES that, for the issuance of a certificate of introduction from the sea for specimens of *Lamna nasus*, a finding that the introduction will not be detrimental to the survival of the species should only be made where a Management Authority of the State of introduction verifies that the specimens have not been harvested in waters under the jurisdiction of a coastal State in contravention of the applicable laws of that coastal State and have been taken in a manner that is consistent with the long-term conservation and sustainable harvesting of the species;

RECOMMENDS that Parties inform the CITES Secretariat about legal exporters of *Lamna nasus* and that importing countries be particularly vigilant in controlling the unloading of products of *Lamna nasus*;

DIRECTS the Secretariat to establish procedures whereby CITES can cooperate with FAO and RFOs for the purpose of exchanging information relevant to the regulation of trade in and harvesting of *Lamna nasus*, enhancing synergies between these organisations and CITES, as well as facilitating consultations on introduction from the sea;

DIRECTS the Secretariat to share with the relevant RFOs any information it collects regarding the illegal trade in *Lamna nasus*; and

URGES all Parties and non-Parties to CITES, which are involved in catch of or trade in *Lamna nasus*, to take measures individually as well as collectively, including through RFOs and other international bodies, to prevent unsustainable fishing and illegal trade in *Lamna nasus*, and to report to the CITES Secretariat on any developments regarding this issue.

Lamna nasus Proposal
Draft of February 2006 for CITES Consultation Process

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

Fourteenth Meeting of the Conference of Parties
2–15 June 2007
Netherlands

Amendments to Appendices I and II of CITES

A. PROPOSAL

Inclusion of *Lamna nasus* (Bonnaterre, 1788) in Appendix II in accordance with Article II 2(a)

Qualifying Criteria (Conf. 9.24 (Rev. CoP13) Annex 2a)

A. *It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future.*

North Atlantic and Mediterranean stocks of *Lamna nasus* qualify for listing under this criterion, because of the long-term extent of decline for this low productivity exploited aquatic species.

B. *It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences.*

Lamna nasus is or has been subjected to unsustainable target fisheries in parts of its range, because of its high value meat that enters international trade. Without trade regulation, other stocks are likely to experience similar declines to those described above.

Annotation

The entry into effect of the inclusion of *Lamna nasus* on Appendix II of CITES will be delayed by 12 months to enable Parties to resolve the related technical and administrative issues, such as the possible designation of an additional Management Authority.

B. PROPONENT

Federal Republic of Germany, on behalf of the Member States of the European Community.

C. SUPPORTING STATEMENT

1. Taxonomy

1.1 Class:	Chondrichthyes (Subclass: Elasmobranchii)	
1.2 Order:	Squaliformes	
1.3 Family:	Squalidae	
1.4 Species:	*Lamna nasus* (Bonnaterre, 1788)	
1.5 Scientific synonyms:	See Annex 1	
1.6 Common names:	English:	porbeagle
	French:	requin-taupe commun
	Spanish:	marrajo sardinero; Cailón marrajo, moka, pinocho
	Italian:	talpa
	German:	Heringshai
	Danish:	sildehaj
	Swedish:	hábrand; sillhaj
	Japanese:	mokazame

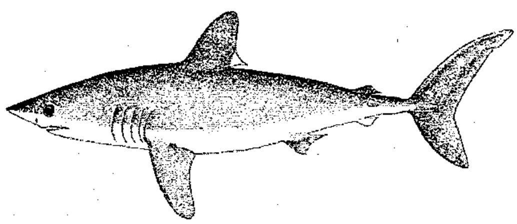

Figure 1. Porbeagle *Lamna nasus*
(*Source*: FAO Species Identification Sheet)

2. Overview

2.1 The large warm-blooded porbeagle shark (*Lamna nasus*) occurs in temperate North Atlantic and southern ocean waters. It is relatively slow growing, late maturing, and long-lived, bears small litters of pups and has an intrinsic rate of population increase of just 5–7% per annum. These characters make it highly vulnerable to over-exploitation in fisheries.

2.2 *Lamna nasus* meat is high quality and high value, particularly in the European Union (EU). Its large fins are valuable. It is taken in target fisheries and is also an important retained and utilised component of the bycatch in pelagic longline fisheries. Meat and fins enter international trade, but are generally not recorded at species level. Other products are less fully utilised. A highly efficient DNA test is available for parts and derivatives in trade.

2.3 Unsustainable North Atlantic target *Lamna nasus* fisheries are well documented. These depleted stocks severely; landings fell from thousands of tonnes to a few hundreds in under 50 years. Very few data are available for southern hemisphere stocks, which are a high value target and bycatch of longline fisheries, but there has been a recent ~90% decline in Uruguayan longline bycatch.

2.4 Northwest Atlantic stock assessments document a decline in stock biomass to 11–17%, total abundance to 21–24% and numbers of mature females to 12–15% of virgin levels. Management since 2002 has maintained a relatively stable population, but with a slight decline in mature females. There is no stock assessment for the more heavily fished and unmanaged Northeast Atlantic and Mediterranean populations, which are likely to be more seriously depleted.

2.5 Management based on stock assessment and scientific advice has been in place in the Canadian EEZ since 2002. Quotas in European Community waters apply only to the Faeroe Islands and Norway, are not science-based, greatly exceed total landings by these States and have no management impact. Scientific advice in 2005 for a zero quota throughout the Northeast Atlantic was not adopted. New Zealand introduced quota management in 2004. Regional Fishery Organisations (RFOs) are not managing high seas *Lamna nasus* stocks.

2.6 An Appendix II listing is proposed for *Lamna nasus* in accordance with Article II, 2(a) and Conf. 9.24 (Rev. CoP13). The North Atlantic stocks have experienced significant population declines, but only one is managed. Information is lacking on the Southern Ocean stocks of *Lamna nasus*, but they are also exploited, largely unmanaged, and their products enter international trade.

2.7 *Lamna nasus* meets 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). Available data indicate that stocks have exceeded the qualifying level of 20% or less of historic baseline for Appendix I listing under the FAO guidelines.

2.8 The 2006 IUCN Red List assessment for *Lamna nasus* is **Vulnerable** globally. The Northeast Atlantic and Mediterranean stocks are **Critically Endangered**, the Northwest Atlantic stock **Endangered**, and southern oceans stocks **Near Threatened**.

2.9 An Appendix II listing for *Lamna nasus* will regulate and monitor future international trade, ensuring that it is supplied by sustainably managed, accurately recorded fisheries maintained at levels that are not detrimental to the status of exploited wild populations and the survival of the species. These trade controls will complement and reinforce traditional fisheries management measures, thus also contributing to implementation of the UN FAO International Plan of Action for the Conservation and Management of Sharks.

3. Species characteristics

3.1 Distribution

Lamna nasus is usually recorded over the continental shelves from close inshore (especially in summer) to far offshore, where it is often associated with submerged banks and reefs. Range States are listed in Annex 2. FAO Fisheries Areas are 21, 27, 31, 34, 37, 41, 47, 48, 51, 57, 58, 81 and 87. Its distribution is illustrated in Figure 2 and can be summarised as follows (Compagno 2001):
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; Mediterranean (not Black Sea); Morocco, Madeira, and Azores;

Northwest Atlantic: Greenland, Canada, United States, and Bermuda;
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.

3.2 Habitat

Lamna nasus is an active, warm-blooded epipelagic shark inhabiting boreal and temperate waters, sea temperature 2–18°C, preferring 5–10°C in the Northwest Atlantic (Campana and Joyce 2004, Svetlov 1978). They are most common on continental shelves from near the surface to depths of 200m, but have occasionally been caught at depths of 350–700m. They range from close inshore (especially in summer), to far offshore (where they are often associated with submerged banks and reefs). They occur singly, in shoals, and in feeding aggregations. Northern stocks segregate (at least in some regions) by age, reproductive stage and sex and adults undertake seasonal sex-specific north-south migrations. Mature *L. nasus* are rarely seen in winter and early spring in the Northwest Atlantic, with monthly catches exhibiting a seasonal and sex-specific spring migration of mature sharks along the coast and outer edge of the Scotian Shelf from the Gulf of Maine towards the mating grounds off southern Newfoundland and the approaches to the Gulf of St. Lawrence, but pupping grounds are unknown. Smaller immature sharks resident on the Scotian Shelf appear not to undertake the same extensive migrations. (Campana *et al.* 1999, 2001, Campana and Joyce 2004, Compagno 2001, Jensen *et al.* 2002.) The Mediterranean may be a nursery ground (IUCN Red List assessment).

3.3 Biological characteristics

Lamna nasus is warm-blooded, growing and maturing faster than many cold-blooded sharks, but still, however, relatively slow growing and late maturing, long-lived and bearing 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.

Life history characteristics vary between stocks (Table 2). *L. nasus* in the North Atlantic reach a maximum length of 355cm, weight of 230kg, and age of 26–45 years. Females mature at an age of 13 years and total length of 217–259cm in the Northwest Atlantic, but at only 185–202cm (or a fork length of 170–180cm, Francis and Duffy 2005) in the southern hemisphere. Males mature at eight years old and a smaller size (165cm TL or fork length 140–150cm) in New Zealand waters. (Campana *et al.* 2002 a, b, Compagno 2001, Fischer 1987, Francis and Duffy 2005, Francis *et al.* in press, Jensen *et al.* 2002, Natanson *et al.* 2002.) Natanson *et al.* (2002) and Campana *et al.* (2002) validated the age and growth of the exploited North West Atlantic population and reported a maximum age of 26 years. However, they estimated longevity might be as high as 46 years in an unfished population.

L. nasus produce litters of 1–5 pups (usually four), 65–80cm long after an 8–9 month pregnancy. They may breed every year, or some may breed on alternate years. Birth occurs in spring off Europe, spring-summer off North America and winter in Australasia and the Eastern Pacific off Chile. (Aasen 1963, Acuña *et al.* unpublished data cited in IUCN Red List documentation, Compagno 1984a, Francis and Stevens 2000, Francis *et al.* in press, Gauld 1989, Jensen et al. 2002.)

Prey species are predominantly pelagic fish and squid in deepwater, and pelagic and demersal teleost fishes in shallow water (Compagno 1984a, Joyce *et al.* 2002).

3.4 Morphological characteristics

Heavy cylindrical body, two spineless dorsal fins (first originates over abdomen, well in front of pelvic fin origins) and an anal fin. Vertebral axis extends into long upper tail lobe. Strong keels on caudal peduncle, short secondary keels on base, crescent-shaped tail. Conical head, fairly short conical snout, five long and broad gill openings (rear two in front or above pectoral fin origin), large mouth extending behind eyes, nostrils free from mouth, no barbels or grooves. Very small spiracles well behind eyes. Dark grey or blackish dorsal surface. First dorsal fin with a very distinctive white patch on lower free trailing edge. Underside white in northern hemisphere, but with underside of snout is dark and some dusky blotches on abdomen in adults in the southern hemisphere.

3.5 Role of the species in its ecosystem

As with many other large shark species, *L. nasus* is an apex predator, occupying a position near the top of the marine food web (it feeds on some small sharks, but not on marine mammals). In the Northwest Atlantic, pelagic fish and squid are the main diet in deep water, and pelagic and demersal fish in shallow water (Joyce *et al.* 2002). 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. It has few predators other than humans, but orcas and white sharks may take this species (Compagno 2001).

4. <u>Status and trends</u>

4.1 Habitat trends

Critical habitats for this species and threats to these habitats are unknown. High levels of heavy metals (particularly mercury) bioaccumulate and may be bio-magnified in top oceanic predators, but their impacts on *L. nasus* population fitness is unknown. Effects of climatic changes on world ocean temperatures, pH and related biomass production could potentially impact *L. nasus* populations.

4.2 Population size

The only stock for which population size data are available is in the Northwest Atlantic. The most recent stock assessments (DFO 2005, Gibson and Campana 2006) have estimated the total population size for this stock as 188,000-191,000 sharks (21-24% of virgin numbers; possibly 800,000 to 900,000 fishes) and 9,000-13,000 female spawners (12-15% of virgin abundance, which might have been 60,000 to 110,000 mature females). The long history of unmanaged fisheries and declining landings in the Northeast Atlantic implies smaller population numbers in this region. Southern hemisphere population size is unknown.

4.3 Population structure

The population structure of exploited populations is unnatural. Large mature females are not well represented in heavily fished, depleted stocks (e.g. Campagna *et al.* 2001). Age estimations for *L. nasus* greater than 15 years are unvalidated, but they are unlikely to attain much over half of their potential longevity of possibly 45 years. Although extensive long-distance migrations occur within North Atlantic stocks (see section 3.2), which appear to be thoroughly mixed, there is apparently no (or extremely limited) genetic exchange between the northwest and northeast Atlantic populations. Tagging studies in the Northwest Atlantic by Norwegian, American and Canadian researchers identified mainly short to moderate (1,500km) movements along the edge of the continental shelf. *L. nasus* tagged off the UK have been recaptured off Spain, Denmark and Norway, travelling up to 2,370 and a shark tagged off Ireland moved 4,260km (Campana *et al.* 1999, Kohler and Turner 2001, Stevens 1976 & 1990.) The population structure of the southern hemisphere population(s) is unknown.

4.4 Population trends

The estimated generation time for *L. nasus* (defined as the average reproductive age of females in an unfished population) is between 20 and 25 years in the North Atlantic (females mature at 13 years and have an estimated longevity of 45 years), possibly less in the Southern Oceans. The three-generation period against which declines must be assessed (Annex 5, CoP9.24, Rev. CoP13) is therefore some 60 to 75 years, which equal to if not greater than the historic baseline for most stocks.

The North Atlantic is the major reported source of world catches (Figure 5), with detailed long-term fisheries trend data recorded. Landings here have exhibited marked declining trends over the past 60-70 years (see below) during a period of rising fishing effort and market demand for this highly valuable species and improved fisheries technology. Very few data are available from the southern oceans.

Stock assessments are available for only the Northwest Atlantic stock (Campana *et al.* 1999 2001 2002 2003, Gibson and Campana 2006). These illustrate a correlation between steep declines in landings for this highly valuable species and declining biomass in an unmanaged fishery. They also indicate a correlation between recent declining catch per unit effort (CPUE) and declining stock size. CPUE and landings are therefore used here as indicators of population trends in the absence of stock assessments, while recognizing that other factors may also affect catchability.

Table 1. Summary of population trend data

Year	Location	Data used	Trend	Source
1947–1960	Northeast Atlantic	Norwegian and Danish landings	>60% reduction in 13 years	Gauld 1989
1960–1990s	Northeast Atlantic	Norwegian landings	>95% reduction in 30 years	Gauld 1989
1950s–1990	Northeast Atlantic	Danish landings	~95% reduction in 40 years	Gauld 1989
1970s–1990s	Northeast Atlantic	French landings	30-40% reduction in 20 years	Landings data
1964-1970	Northwest Atlantic	Norwegian landings	~90% reduction in 10 years	Landings data
1964-1970	Northwest Atlantic	Stock assessment	75% reduction in 6 years	Canadian DFO
1990s	Northwest Atlantic	Catch rates	>50% reduction in >10 years	Canadian DFO
1992-2000	Northwest Atlantic	Catch rates	90% reduction in mature sharks, 70% reduction in immature sharks	Canadian DFO
1961-2000	Northwest Atlantic	Biomass	Reduction to 11-17% of virgin biomass	Canadian DFO, 2001 assessment
2004/05	Northwest Atlantic	Total abundance	Currently at 21-24% of virgin numbers	Canadian DFO, 2005 assessment
2004/05	Northwest Atlantic	Mature female abundance	Currently at 12-15% of virgin abundance	Canadian DFO, 2005 assessment
1981-1998	Southwest Atlantic	CPUE by pelagic tuna longlines	Decline of 80-90% in 10-15 years	Domingo (undated)

4.4.1 Northeast Atlantic

Lamna nasus has been fished in this region by many European countries, principally Denmark, France, Norway and Spain (Figure 7). Norway began a target longline fishery for *L. nasus* in the 1930s. Landings reached their first peak of 3,884t in 1933. About 6,000t were taken in 1947, when the fishery reopened after the Second World War, followed by a progressive drop in landings to between 1,200–1,900t 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 (see below). 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 7).

French and Spanish longliners have operated directed fisheries for *L. nasus* since the 1970s. Reported landings from the main French fishing grounds in the Celtic Sea and Bay of Biscay decreased from over 1,092t in 1979 to 3-400t in the late 1990s. Spanish vessels appear to have taken *L. nasus* 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 7) represents huge variations in catches, possibly the result of 'boom and bust' fisheries removing different segments of the stock, or inconsistent reporting. Bonfil (1994) estimated that 50t of *L. nasus* 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), directed at the more abundant blue shark, also landed about 30t of mainly *L. nasus* 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 FAO statistics (Figure 7)).

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 8). This is attributed to a decline in heavily fished and depleted inshore populations and redirection of effort to previously lightly exploited offshore stocks.

ICES ACFM (2005) noted: "The directed fishery for porbeagle [in the Northeast Atlantic] stopped in the late 1970s due to very low catch rates. Sporadic small fisheries have occurred since that time. The high market value of this species means that a directed fishery would develop again if abundance increased. There are no indications of stock recovery."

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. The IUCN Red List assessment for the Northeast Atlantic is **Critically Endangered**, taking into account past, ongoing and estimated future reductions in population size exceeding 90%.

4.4.2 Mediterranean Sea

Lamna nasus has virtually disappeared from Mediterranean records. In the North Tyrrhenian and Ligurian Sea Serena and Vacchi (1997) reported only 15 specimens of *L. nasus* during a few decades of observation. Soldo and Jardas reported only nine records of this species in the Eastern Adriatic since the end of 19th century until 2000. Since then there have been only a few new records (A. Soldo unpublished data). Orsi Relini and Garibaldi (2002) reported two newborn *L. nasus* caught as bycatch of the swordfish longline fishery in the Western Ligurian Sea. A young porbeagle, likely newborn, was reported in the central Adriatic Sea (Orsi Relini and Garibaldi 2002). A young specimen aged 1-17 months was caught by a big-game fisher in the central Adriatic (Marconi and De Maddalena 2001). These records indicate a possible nursery area in Central Mediterranean. No *L. nasus* were caught during research into bycatch in the western Mediterranean swordfish longline fishery (De La Serna *et al.* 2002). Just 15 specimens were caught during research conducted in 1998-1999 on bycatch of sharks in large pelagic fisheries; these catches were reported only in the southern Adriatic and Ionian Sea, mainly by driftnets (Megalofonou *et al.* 2000). Official statistics for Mediterranean area show that the only landings in the Mediterranean were 1t reported in 1996 by Malta (FAO 2002). The IUCN Red List assessment for the Mediterranean stock is **Critically Endangered**, on the basis of past, ongoing and estimated future reductions in population size exceeding 90%.

4.4.3 Northwest Atlantic

Targeted *Lamna nasus* fishing started in 1961 in the Northwest Atlantic, following depletion of the Northeast Atlantic stock, when the fleet of Norwegian shark longliners switched their operations to the coast of New England and Newfoundland (Figure 6). Catches increased rapidly from about 1,900t in 1961 to more than 9,000t in 1964 (Figure 5). By 1965 many 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 4a). Faeroese fishing vessels reported smaller landings during this period and throughout the 1970s and 1980s (Figure 5). 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 offshore and several inshore Canadian vessels entered the targeted Northwest Atlantic fishery during the 1990s. Catches of 1,000–2,000 t/year throughout much of this decade 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 4a 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. A subsequent stock assessment in 2005/06 indicated that total population numbers remained relatively stable between 2002 and 2005, although female spawners declined slightly (Gibson and Campana 2006, DFO 2005). There is a small quota (92t) for *L. nasus* in the US EEZ, which is presumed to be part of the same stock.

The IUCN Red List categorises Northwest Atlantic *S. acanthias* as **Endangered**, on the basis of estimated reductions in population size exceeding 70% that have now ceased through management.

4.4.4 Southern Hemisphere

Porbeagle landings from the Southern Hemisphere are only reported to FAO by New Zealand in the Pacific southwest: 21t in 1997, and 150-300t per year between 1998-2003 (Sullivan *et al.* 2005). These are minor in comparison with those in the North Atlantic (Figure 5), although actual catches must be much higher than this.

The only trend data identified for southern stocks are records of declining captures of *L. nasus* by the Uruguayan pelagic tuna longline fleet during 1981–1998 (Domingo undated, Table 3). During the 1980s, only the two most valuable shark species were retained for their meat: *L. nasus* and mako *Isurus oxyrinchus*, representing about 10% of the total catch and peaking at 150t and 100t landed, respectively, in 1984. 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 now also being retained in large quantities (Figure 9). This was accompanied by a decrease in CPUE from 110kg/1,000 hooks (1988) to 1kg/1000 (1999) in the Uruguayan tuna and swordfish fleet. This is not, however, necessarily due to population declines, because changes in the distribution and depth of fishing operations and an increase in mean temperatures of water masses in the area had also occurred (A. Domingo pers. comm. cited in the IUCN Red List Assessment). 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).

The IUCN Red List categorises South Ocean stocks of *L. nasus* as **Near Threatened.**

4.5 Geographic trends

No information is available on any changes in the geographic range of *Lamna nasus*, 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).

5. Threats

The principal threat to *Lamna nasus* worldwide is over-exploitation, in target and bycatch fisheries, with many products entering international trade. Much of the following information is taken from the 2006 IUCN Red List assessment (www.redlist.org)

5.1 Directed fisheries

As described above, intensive directed fishing for the valuable meat of *L. nasus* sharks has been the major cause of population declines during the twentieth century, but it is also a valuable and utilised bycatch of longline pelagic fisheries for other species, such as swordfish and tuna (Buencuerpo *et al.* 1998). *L. nasus* is also an important 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). ICES ACFM (2005) noted: "The directed fishery for porbeagle [in the Northeast Atlantic] stopped in the late 1970s due to very low catch rates. Sporadic small fisheries have occurred since that time. The high market value of this species means that a directed fishery would develop again if abundance increased."

5.2 Incidental fisheries

Lamna nasus bycatch is a valuable secondary target of many fisheries, particularly longline fisheries, but also gill nets, driftnets, pelagic and bottom trawls, and handlines. The high value of its meat means that the whole carcass is usually retained and utilised. 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)). ICES ACFM (2005) noted: "effort has increased in recent years in pelagic longline fisheries for bluefin tuna (Japan, Republic of Korea and Taiwan Province of China) in the North East Atlantic. These fisheries may take porbeagle as a by-catch. This fishery is likely to be efficient at catching considerable quantities of this species." Bycatch is often inadequately recorded in comparison with captures in target fisheries.

Despite the large amount of fishing activity that will result in *L. nasus* captures in the Southern Hemisphere, New Zealand is the only country that reports landings to FAO. Examples of important but largely unreported bycatch fisheries include the demersal longlines for Patagonian toothfish (*Dissostichus eleginoides*) in the southern Indian Ocean (Compagno 2001) and by the Argentinean fleet (Victoria Lichtstein, CITES Management Authority of Argentina, *in litt.* to TRAFFIC Europe, 27 October 2003); longline swordfish and tuna fisheries in international waters off the coasts of Argentina and Uruguay (Domingo undated); the Chilean artisanal and industrial longline swordfish *Xiphias gladius* fishery within and outside the Chilean EEZ, between 26-36ºS (E. Acuña unpublished data; Acuña *et al.* 2002). *Lamna nasus* is rare in warm currents off the South African coast, but taken as bycatch in colder waters.

6. <u>Utilisation and trade</u>

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 *L. nasus* 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 *L. nasus* 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).

6.1 National utilisation

According to Gauld (1989), *L. nasus* was one of the most valuable (by weight) marine species landed in Scotland in the 1980s. In 1997 and 1998 *L. nasus* 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 *L. nasus* 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".

Porbeagles may also 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 *L. nasus* 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.

6.2 Legal trade

Trade in *Lamna nasus* products is unregulated, and all is therefore legal. 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 also exports *L. nasus* meat to Italy (S. Campana *in litt.*). The EU is reported to export *L. nasus* 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 trade data arises from the lack of any customs code for *L. nasus* products in the customs Harmonised System or 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 *L. nasus* because they mix products of a variety of shark species and would therefore lead to incorrect conclusions. In Australia, data on exports of *L. nasus* to the US are grouped with mako sharks (Ian Cresswell, CITES Management Authority of Australia, *in litt.* to BMU, February 2004). *L. nasus* 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 *L. nasus* products will not be available. Currently, the scale and value of global consumption of the species cannot be assessed.

The main purpose of the proposed Appendix II listing for this species is to ensure that trade is, in future, supplied by sustainably managed, accurately recorded fisheries that are maintained at levels that will not be detrimental to the status of the wild populations that they exploit.

6.3 Parts and derivatives in trade

6.3.1 Meat

This is a very high value product, one of the most palatable and valuable of shark species, being traded in fresh and frozen form (see sections 6.1 and 6.2).

6.3.2 Fins

Among the ten nations recorded by FAO as trading in *L. nasus* 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 *L. nasus* 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 *L. nasus* 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).

6.3.3 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 *L. nasus* fisheries because of the high value of the species' meat (Vannuccini 1999).

6.4 Illegal trade

Because no legislation has been adopted by range States or trading nations to regulate national or international trade in *Lamna nasus*, as is the case for the large majority of countries involved in shark catch and by-catch, no fishery activity or trade transaction, including transhipment, is illegal.

6.5 Actual or potential trade impacts

The unsustainable *L. nasus* fisheries described above have been driven by the high value of the meat in national and international markets, including EU demand. Trade has therefore been the driving force behind depletion of populations in the North Atlantic and may potentially also threaten southern hemisphere populations.

7. Legal instruments

7.1 National

Porbeagle sharks are not yet known to have been awarded any legal status in any range state (their management status is described below). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated *L. nasus* as Endangered in 2004 (COSEWIC 2004). A decision is pending on whether or not to list it as endangered under the Canadian Species at Risk Act (SARA).

Kommentar [E1]: I'm VERY surprised that this paragraph was approved. It apparently represents the personal opinion of one person, not that of COSEWIC or DFO.

7.2 International

Lamna nasus is included on Annex 1 (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 has yet been achieved through UNCLOS.

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 (Anon. 2002). 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 *Lamna nasus* in the wider Atlantic because of its biological sensitivity, keystone importance and the severe decline in its population. This proposal was not adopted.

8. Species management

8.1 Management measures

Some range States have included the species in their Red List, including Germany and Sweden where *L. nasus* 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 *L. nasus* as a species of conservation concern in its response to the Convention on Biological Diversity in 1995.

Some RFOs have recently adopted shark resolutions to support improved recording or management of pelagic sharks taken as bycatch in the fisheries they manage. ICCAT has not yet included *L. nasus* as a target species for stock assessment or management.

8.1.1 Northeast Atlantic

The conservation and management of sharks 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'. EC Regulation 1185/2003 prohibits the removal of shark fins of this species, and subsequent discarding of the body. This regulation is binding on EC vessels in all waters and non-EC vessels in Community waters.

In 2005, the ICES Advisory Committee on Fisheries Management (ACFM 2005) remarked: "Given the apparent depleted state of this stock, no fishery should be permitted on this stock" and recommended a zero quota for the Northeast Atlantic in 2006. This advice was not adopted and there continues to be effectively unregulated fishing for this species, since the quotas in European Community waters that apply to the Faeroe Islands and Norway are not science-based, greatly exceed total landings by these States and do not result in reduced fishing effort.

8.1.2 Northwest Atlantic

The 1995 Canadian fisheries management plan limits the number of licenses, types of gear, fishing areas and seasons, prohibits finning, and restricts recreational fishing to catch-and-release only. Fisheries management plans for pelagic sharks in Atlantic Canada established non-restrictive catch guidelines of 1500t for *L. nasus* prior to 1997, followed by a provisional TAC of 1000t for the period 1997-1999, based largely on historic reported landings and the observation that recent catch rates had decreased (DFO 2001). Following two analytical stock assessments (Campana *et al.* 2001 & 1999), the Shark Management Plan for 2002-2006 reduced the TAC to 250t. This has caused total population numbers to remained relatively stable for 2002-2005, although female spawners declined slightly (Gibson and Campana 2006, DFO 2005). Population projections indicated that the population would recover if harvest rates were kept under 4% (~185 mt). There is also an annual quota of 92t in US waters under the Highly Migratory Species Fisheries Management Plan.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2004) has expressed concern that although the quota for 2002-2007 of 200-250t represents a substantial reduction from catches in the mid-1990s, even this amount now corresponds to a high exploitation rate because of the low population abundance and may not be sufficient to halt the *L. nasus* decline or to enable the population to recover, given that there is uncertainty in estimating F_{MSY} and the quota, the low number of mature animals remaining in the population, that at its current low abundance the population may experience depensation (Allee effects), and that reduction in fishing pressure is not always sufficient for population recovery (Hutchings 2001).

Kommentar [EZ]: I'm VERY surprised that this paragraph was approved. It apparently represents the personal opinion of one person, not that of COSEWIC or DFO.

8.1.3 Southern hemisphere
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 which has included *L. nasus* in its Quota Management System (QMS) since 2004, with the TAC currently set at 249t (Sullivan *et al.* 2005). There are presently no other management measures applicable to the Antarctic and Southern Ocean, since CCAMLR appears not to be monitoring or managing this species.

8.2 Population monitoring
Population monitoring requires routine monitoring of catches, collection of reliable data on the indicators of stock biomass and good knowledge of biology and ecology. In most States, however, catch, bycatch and discard data for *Lamna* and most other shark and ray species are not recorded at species level, making stock assessments and population evaluation almost impossible. Good landings data for *L. nasus* are available for only the Northwest Atlantic and New Zealand. Commercial landings and research survey data indicate that many stocks are seriously depleted.

8.3 Control measures
8.3.1 International
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 *L. nasus*.

The International Plan of Action (IPOA) for the Conservation and Management of Sharks urges all States with shark fisheries to implement conservation and management plans. However, this initiative is voluntary and only some States have produced Shark Assessment Reports or National Shark Plans. At the 22nd meeting of the CITES Animals Committee in July 2006, the Intersessional Shark Working Group will report on the situation in 2006. This information will then be added here.

8.3.2 Domestic
The few domestic measures adopted by a few States to ensure that exploitation become or remain sustainable are described in section 8.1 above. Otherwise, only the usual hygiene regulations apply to control of domestic trade and utilisation.

8.4 Captive breeding and artificial propagation
Not economically viable for commercial purposes, due to the slow reproductive and growth rates of this species. Some breeding may be occurring in specimens on public display in aquaria.

8.5 Habitat conservation
No efforts have been made to identify and protect critical *L. nasus* habitat, although some is incidentally protected from disturbance inside in marine protected areas or static gear reserves.

8.6 Safeguards

8.7 Control measures

8.7.1 International trade

Current international trade regulations concerning trade controls of *L. nasus* are almost non-existent, being limited to the usual hygiene measures for fishery products and/or to facilitate the collection of import duties. In most cases, *L. nasus* is lumped with other shark products under a general code for shark products, No. 0303 7500, which does not allow estimation of trade at species level.

8.7.2 Domestic measures

None. Even where *L. nasus* catch quotas have been established, such as in some North Atlantic countries, no trade measures prevent the sale or export of *L. nasus* landings in excess of quotas.

9. 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 *L. nasus* but is restricted to the North Pacific where *L. nasus* does not occur. The mako shark *Isurus oxyrinchus* may be misidentified as *L. nasus* 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, *L. nasus* 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 *L. nasus*, shortfin mako and longfin mako sharks (also silky, blue, sandbar and dusky sharks).

10. Consultations

To be included later.

11. Additional remarks

11.1 Assessment of *L. nasus* under FAO's recommended criteria for CITES listing

FAO note 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 (ref.). 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). *L. nasus* life history data presented in section 2.4 indicate that this species 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 stock assessments for one population and the declines described for other *L. nasus* fisheries indicate that this species qualifies for Appendix II under FAO as well as CITES listing criteria.

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

Information on the results of the recent CITES Workshop will be added as soon as they are available.

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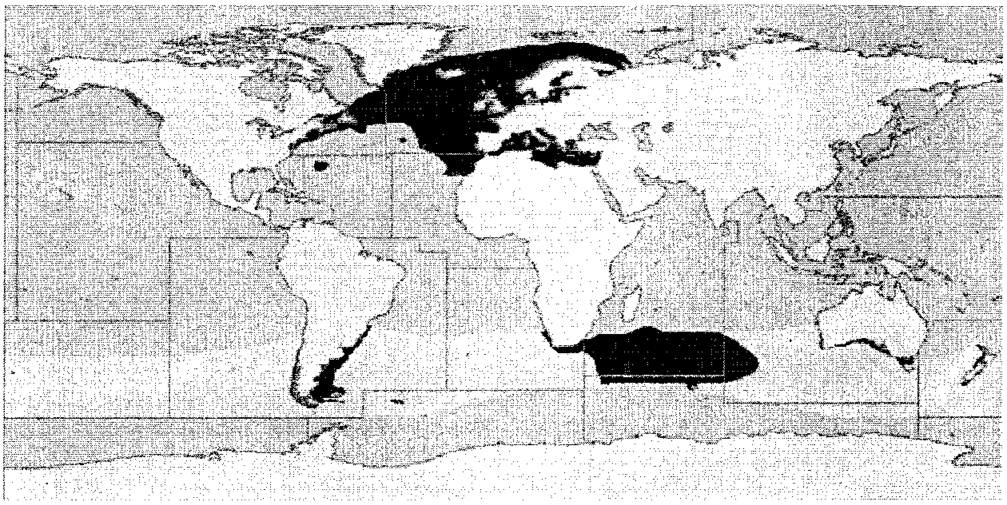

Figure 2. Global *Lamna nasus* distribution (*Source*: FAO 2003)

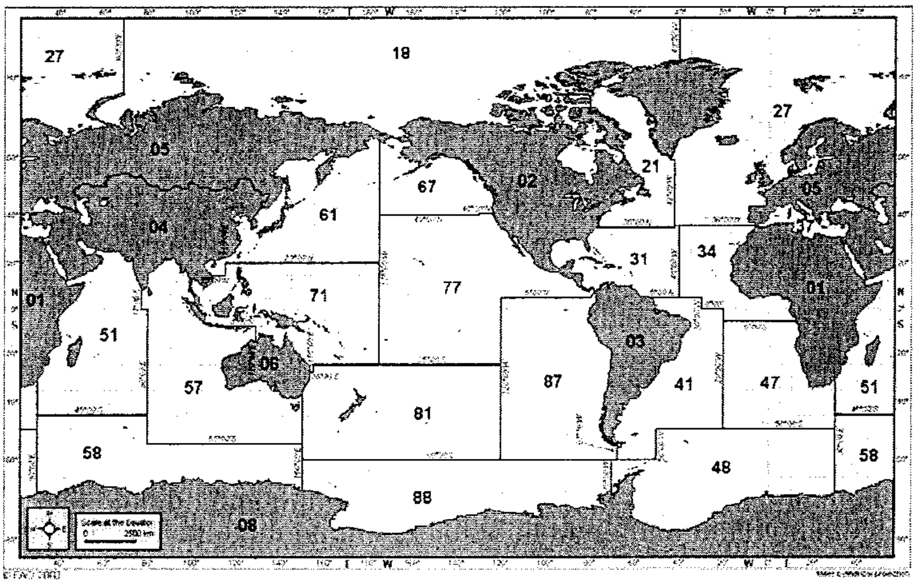

Figure 3. FAO fishing areas.

Lamna nasus catches are mostly taken in the Atlantic Northeast: Area 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 & 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

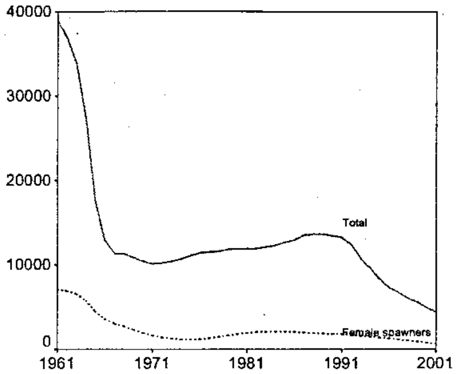

Figure 4a. Biomass (t) of the Canadian porbeagle stock, 1961 to 2000. (*Source*: Population model in DFO 2001)

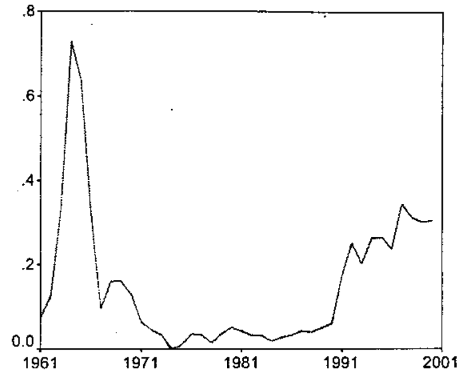

Figure 4b. Fishing mortality on Canadian porbeagle stock, 1961–2000. (*Source*: Population model in DFO 2001)

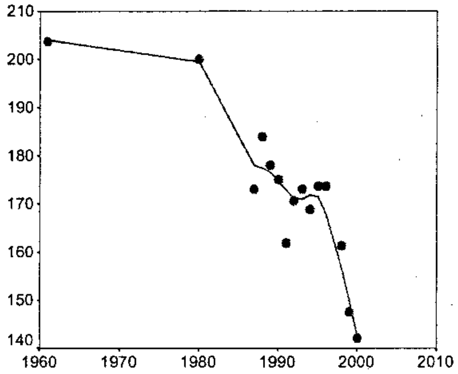

Figure 4c. Median fork lengths (cm) of porbeagles in the Canadian porbeagle fishery from 1961 to 2000. (*Source*: Population model in DFO 2001)

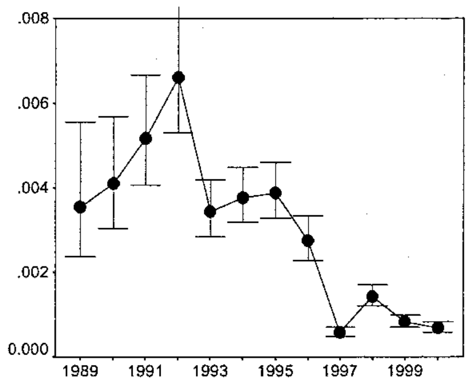

Figure 4d. Catch rates (standardised numbers of mature sharks per hook) in the Canadian porbeagle fishery, 1989 - 2000. (*Source*: Population model in DFO 2001)

Table 2. *Lamna nasus* life history parameters (various sources in text)

Age at maturity (years)	female:	13 years at 50% maturity (North Atlantic)
	male:	8 years at 50% maturity (North Atlantic)
Size at maturity (total length cm)	female:	195 cm (South Pacific), 245 cm (North Atlantic)
	male:	165 cm (South Pacific), 195 cm (North Atlantic)
Longevity (years)	female:	>26 in fished population, up to 46 years unfished (Northwest Atlantic)
	male:	
Maximum size (total length cm)	female:	≥355
	male:	≥260
Size at birth (cm)		68-78
Average reproductive age (years)*		20 – 25 years
Gestation time (months)		8-9 months
Reproductive periodicity		Annual
Average litter size		1-5 pups (average 4)
Annual rate of population increase		0.05-0.07
Natural mortality		0.10 (immatures), 0.15 (mature males), 0.20 (mature F) (Northwest Atlantic)

* This is the generation period required when using the population decline criterion for listing.

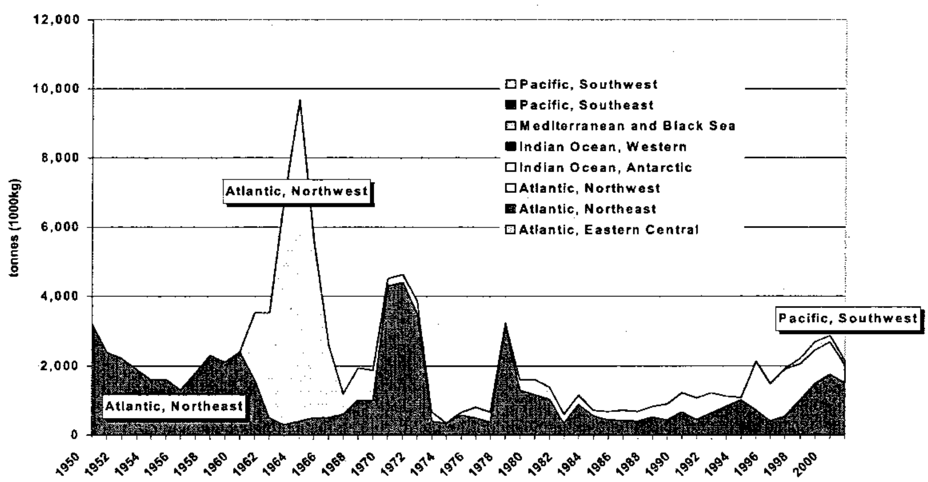

Figure 5. Total world reported landings of porbeagle shark (*Lamna nasus*) (t) by FAO fishing area from 1950 to 2001. See Figure 3 for map of FAO fishing areas.

(*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.

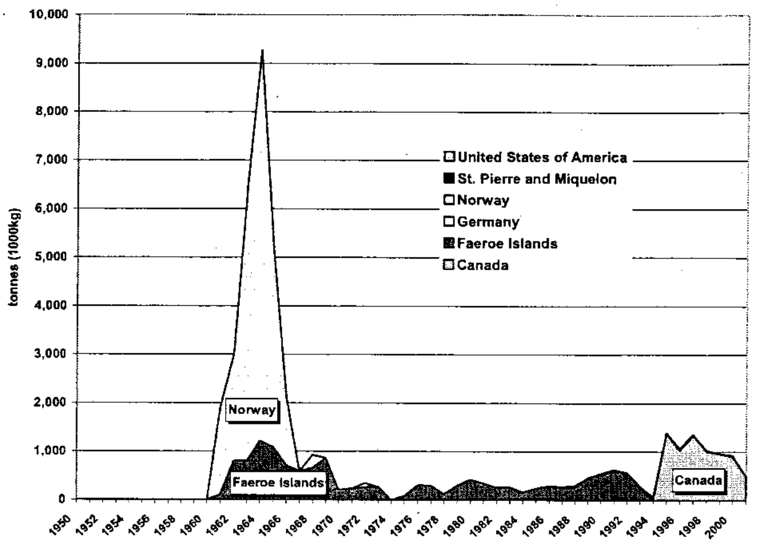

Figure 6. Total reported landings of porbeagle shark (*Lamna nasus*) (in tonnes or 1000kg) by country, in the Northwest Atlantic region, from 1950 to 2001. (*Source*: FAO via FishBase)

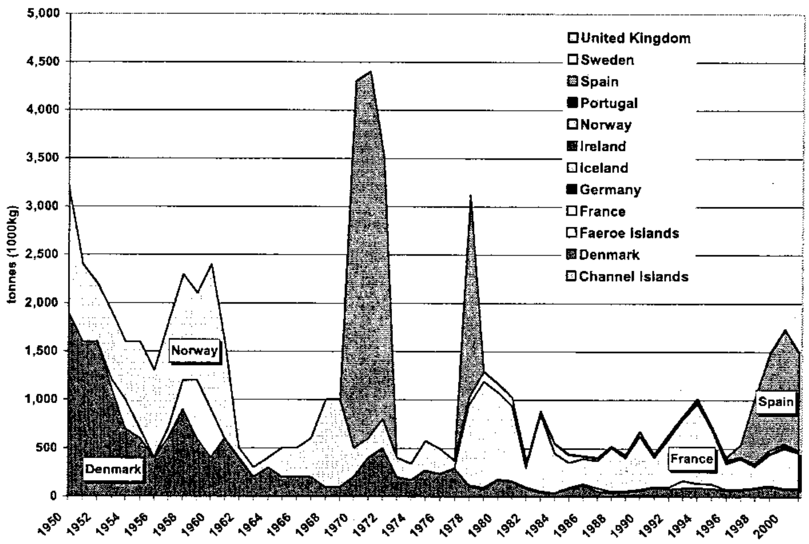

Figure 7. Total reported landings of porbeagle shark (*Lamna nasus*) (tonnes) by country, in the Northeast Atlantic region, from 1950 to 2001. (*Source*: FAO via FishBase).

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.

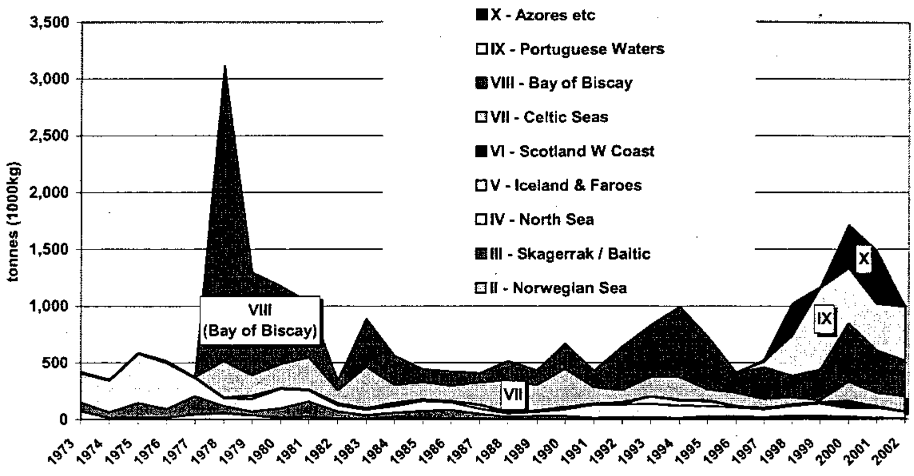

Figure 8. Total reported landings of porbeagle shark (*Lamna nasus*) (t) by ICES Area within the Northeast Atlantic (FAO Area 27), from 1973 to 2002. (*Source*: ICES Statlant Fisheries Statistics, downloaded in November 2003).

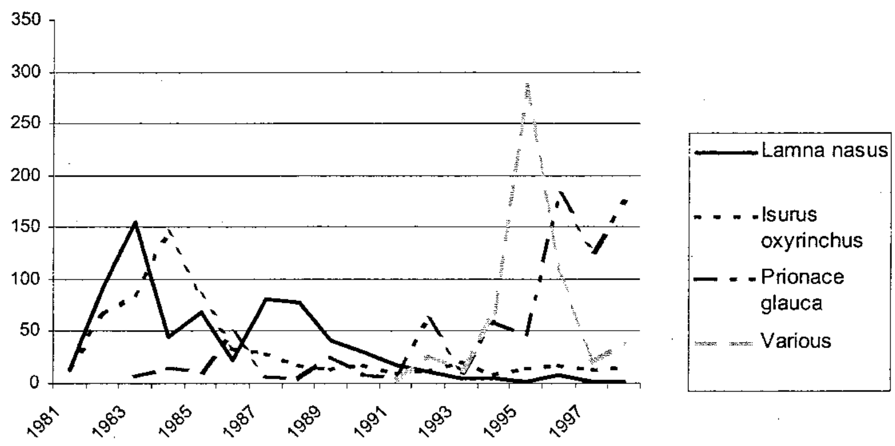

Figure 9. Sharks landed by the Uruguayan long line fleet, 1981-1998. (Source: Domingo undated). ('Varios' includes eight species of large sharks.)

Table 3. Sharks landed by the Uruguayan long line fleet, 1981-1998. (Source: Domingo undated). ('Varios' includes eight species of large sharks.)

Year	*Isurus oxyrinchus*	*Lamna nasus*	*Prionace glauca*	Various
1981	15	13		
1982	66	93		
1983	86	155	7	
1984	144	44	14	
1985	84	68	11	
1986	34	22	47	
1987	28	80	6	
1988	17	77	5	
1989	13	41	25	
1990	18	30	8	
1991	10	18	6	3
1992	11	11	60	27
1993	21	5	11	13
1994	8	4	59	66
1995	15	2	46	287
1996	17	8	180	106
1997	12	2	126	20
1998	15	1	173	38

Annex 1.

Scientific synonyms of *Lamna nasus*

(*Source*: FAO Species Identification Sheet 2003)

- *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.

Annex 2.

Range States – Countries where *Lamna nasus* has been recorded
(Source Compagno 2001)

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

Squalus acanthias **Proposal**
Draft of February 2006 for CITES Consultation Process

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

Fourteenth Meeting of the Conference of Parties
2–15 June 2007
Netherlands

Amendments to Appendices I and II of CITES

A. PROPOSAL

Inclusion of *Squalus acanthias* Linnaeus, 1758 in Appendix II in accordance with Article II 2(a)

Qualifying Criteria (Conf. 9.24 (Rev. CoP13) Annex 2a)

A. It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future.

The North and Southwest Atlantic, Mediterranean, Black Sea and Northwest Pacific stocks of *Squalus acanthias* clearly qualify for listing under this criterion, taking into account the long term extent of decline and/or the recent rates of decline for this low productivity commercially exploited aquatic species. Indeed, several stocks have already experienced long term and/or recent marked declines to 5–20% of baseline.

B. It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences.

Squalus acanthias is subjected to unsustainable fisheries in several other parts of its range, with most products exported to Europe. High market demand and value has caused opposition to sustainable management proposals in some States. Without trade regulation, other stocks are likely to experience similar declines to those described above.

Annotation

The entry into effect of the inclusion of *Squalus acanthias* on Appendix II of CITES will be delayed by 12 months to enable Parties to resolve the related technical and administrative issues, such as the possible designation of an additional Management Authority.

B. PROPONENT

Federal Republic of Germany, on behalf of the Member States of the European Community.

C. SUPPORTING STATEMENT

1. Taxonomy

1.1 Class:	Chondrichthyes (Subclass: Elasmobranchii)	
1.2 Order:	Squaliformes	
1.3 Family:	Squalidae	
1.4 Species:	*Squalus acanthias* Linnaeus, 1758	
1.5 Scientific synonyms:	See Annex 1	
1.6 Common names:	English	spiny dogfish, spurdog, piked dogfish
	Spanish	mielga, galludos, cazón espinozo, tiburón espinozo, espineto, espinillo, tollo, tollo de cachos,
	French	aiguillat commun
	Danish	pighaj
	Italian	spinarolo
	German	Dornhai

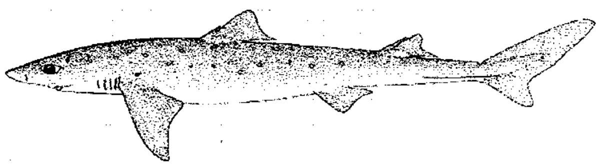

Figure 1. Spiny dogfish *Squalus acanthias*
(*Source*: FAO Species Identification Sheet, 2003)

2. Overview

2.1 The spiny dogfish (*Squalus acanthias*) is a small temperate water shark of shelf seas in the northern and southern hemispheres. Although naturally abundant, it is one of the more vulnerable species of shark to over-exploitation by fisheries because of its late maturity, low reproductive capacity, longevity, long generation time (25-40 years) and hence a very low intrinsic rate of population increase (2-7% *per annum*). Its aggregating habit makes it vulnerable to fisheries. Most stocks are highly migratory.

2.2 *Squalus acanthias* meat is highly valued, particularly in Europe, with European market demand driving fisheries that preferentially target aggregations of mature (usually pregnant) females. The small fins enter international trade. Other products (liver oil, cartilage, skin) are less fully utilised.

2.3 Some target *S. acanthias* fisheries have been documented for over 100 years. Stock assessments document declines of 75% in the Northwest Atlantic in just ten years and over 95% from baseline in the Northeast Atlantic. Catch per unit effort and landings data from these and other regions indicate that some other stocks may have experienced a range of similar levels of decline. Elsewhere, increased fishing effort during a period of rising international market demand infers that other stocks are under similar pressure and directly impacted by international trade demand for their products.

2.4 Management is in place in only a few States in a few regions and, in the majority of these, in only a limited part of the range of highly migratory stocks. In most cases, current management continues to be inadequate to reverse current declining trends and to ensure future sustainable fisheries. No Regional Fishery Organisation (RFO) is managing fisheries for this species.

2.5 An Appendix II listing is proposed for *S. acanthias* in accordance with Article II, 2(a) and Conf. 9.24 (Rev. CoP13). Past and ongoing marked population declines in several Northern Hemisphere stocks, combined with high market demand, are driving fishing pressure on several unmanaged Indo-Pacific stocks that are now beginning to supply international markets.

2.6 *Squalus acanthias* meets the guidelines suggested by FAO for the listing of commercially exploited aquatic species. With an intrinsic rate of population increase of 0.023 to 0.07 and a generation time of >25 years, 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 stock declines 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 these FAO guidelines.

2.7 The IUCN Red List assessment for this species is **Vulnerable** globally. North Atlantic, North Pacific and South American stocks are all Threatened (**Vulnerable, Endangered** or **Critically Endangered**)

2.8 An Appendix II listing for *S. acanthias* will regulate and monitor future international trade, ensuring that it is supplied by sustainably managed, accurately recorded fisheries maintained at levels that are not detrimental to the status of exploited wild populations and the survival of the species. These trade controls will complement and reinforce traditional fisheries management measures, thus also contributing to implementation of the UN FAO International Plan of Action for the Conservation and Management of Sharks.

3. Species characteristics

3.1 Distribution

Spiny dogfish *Squalus acanthias* occurs in temperate and boreal waters of 7-8°C to 12-15°C in both northern and southern hemispheres (see Figure 2). Although highly migratory, sometimes crossing ocean basins (Templeman, 1954, 1984), its distribution is fragmented into distinct populations separated by deep ocean, tropical waters, or polar regions. The species has been recorded in the range States listed in Annex 2. It is most common in coastal waters and is 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. Some populations are largely sedentary, others migrate long distances, but genetic exchange between Northeast and Northwest Atlantic populations is considered very limited (Hammond and Ellis 2002).

3.2 Habitat

This is a continental shelf species, occurring from the intertidal to the shelf slope. 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.

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). Mating and breeding migrations in New Zealand are described by Hanchet (1988). Other mating grounds are unknown.

3.3 Biological characteristics

Squalus acanthias is very long-lived, slow-growing and late maturing, with limited reproductive capacity and one of the lowest population growth rates calculated for any shark species. Smith *et al.* (1998) considered this species to have the lowest intrinsic rebound potential of 26 shark species analyzed, at 2.3% annual rate of population increase from maximum sustainable yield (MSY) in the Northeast Pacific. Other estimates are: 4-7% population increase in the Northeast Atlantic (Heessen 2003), and annual mortality of 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 35 to 40 years (Northwest Atlantic males and females, respectively, Nammack *et al.* 1985), 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 and 37 years at liberty had grown an average of only 3.3mm and 2.7mm per year, to 78 and 90cm long respectively (Anon, 2002), suggesting that the larger individual was considerably older than 40 years (growth rates slow markedly after maturity is reached).

The reproduction cycle of *S. acanthias* 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, Whitehead *et al.*, 1984), at a sex ratio of 1:1. Pups are 18-33cm long at birth; females mature at 75–100cm (depending upon stock). The maximum observed sizes of spiny dogfish (males and females respectively) were 100 and 160cm in the Northwest Pacific, 107 and 130cm in the Northeast Pacific, 86 and 108cm in the Northwest Atlantic, 83 and 110cm in the Northeast Atlantic (Ketchen 1972, Heessen 2003). Anon. 2002 reported a 90cm male in the Northeast Atlantic, Fischer *et al.* (1987) a 200cm female in the Mediterranean, and spiny dogfish achieve larger sizes in the Black Sea (Compagno 1984). Table 1 summarises these life history parameters.

3.4 Morphological characteristics

A slender smooth-skinned dogfish with grey to bluish-grey dorsal surface, lighter to white below, often with white spots on its sides. No conspicuous black blotches on fins. Dorsal fins, dusky or plain in adults, but with black apices and white posterior margins and free rear tips in young. First dorsal fin low, origin usually behind or sometimes over pectoral free rear tips, with a very short slender spine with origin well behind pectoral free rear tips. Second dorsal fin much smaller than first, strongly falcate, with larger, stouter spine. Pectoral fins with shallowly concave posterior margins and narrowly rounded rear tips have light posterior margins in adults. Pelvic fins are smaller than pelvics. No anal fin. Strong ventral caudal (tail) lobe, no subterminal caudal fin notch, strong lateral keels on caudal peduncle. Narrow head, relatively long pointed snout, short transverse mouth, low bladelike cutting teeth, no medial barbel on anterior nasal flaps. Spiracles large and close to eyes. Body cylindrical in cross section. Although genus *Squalus* is under review (Compagno in preparation), *S. acanthias* poses no taxonomic problems (its identifying characters are underlined), although its distribution overlaps with some other *Squalus* species.

3.5 Role of the species in its ecosystem

Squalus acanthias feeds mainly on a variety of bony fishes, such as herring, haddock and cod (ASMFC 2003), and some invertebrates (Compagno 1984). It is eaten by some larger sharks and marine mammals (Compagno 1984). Its abundance does not appear to affect the recruitment of groundfish (Link *et al.* 2002 in ASMFC 2003, Bundy 2003) and its very slow growth and low metabolic rate imply that it does not consume large quantities of prey compared with warm-blooded shark species.

4. Status and trends

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

4.2 Population size
There are no firm estimates of total population numbers for any stocks of *S. acanthias*. Stock assessments have been undertaken for populations in the Northeast Atlantic, Northwest Atlantic and Black Sea, but these usually evaluate biomass rather than numbers of mature individuals. Most population information is therefore presented in section 4.4, Population trends.

4.2.1 Northeast Atlantic
The DELASS (Development of Elasmobranch Assessments, EC DG Fish Study Contract 99/055, Heessen 2003) stock assessment used a Separable VPA to estimate trends in the total population number of mature fish in the stock that ranges from the Barents Sea to the northern Bay of Biscay. The results of such assessments depend heavily upon several uncertain biological parameters, so a range of possible assumptions was applied. These indicated that the total population of mature fish had declined to between 500,000 and 100,000 by 2000 (see Figure 5). This decline continues. The biomass (of the entire stock, not just matures) is likely significantly less than 100,000 t.

4.2.2 Northwest Atlantic
Data on population size not yet available.

4.3 Population structure
This species is highly migratory and tends to segregate by age and by sex. This means that it is possible for fishers to target preferentially the most valuable part of the stock (the large pregnant females) as they undertake predictable seasonal migrations through fishing grounds. Their aggregating habit makes it 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 (~4–5 years old), and are fully recruited in the Northeast Atlantic fishery at lengths of approximately 70-80cm (~8 years old) (Heessen 2003). Female spiny dogfish are, therefore, exploited before they reach maturity at 74–94cm. As a result, a natural population structure is unlikely to exist in most regions where this species is commercially fished. Not only are mature females depleted but, as a result, pup production is also extremely low (small recently mature females bear small litters of small pups with lower survival rates).

4.4 Population trends

The generation time for *S. acanthias* (defined in Table 2 as the average reproductive age of females in an unfished population) is uncertain and varies between populations, but is certainly greater than 25 years, and possibly as high as 40 years. The three-generation period against which declines must be assessed (Annex 5, CoP9.24, Rev. CoP13) is therefore some 75 to >100 years, which is also equivalent or very close to the historic baseline.

Stock assessments are available for only a few stocks. These show a correlation between recent declines in landings and catch per unit effort (CPUE), and relative stock size; CPUE and landings are therefore used here as indicators of population trends in the absence of stock assessments.

Globally, the most important 20th Century *S. acanthias* fisheries were in Northeast Atlantic shelf seas; these stocks are now also the most depleted. According to FAO, 89% of spiny dogfish landings reported in 1950–2001 (excluding miscellaneous sharks, *etc.*) were taken in this region (Figure 6). Landings were sustained at 30-50,000 tonnes (1 tonne (t) = 1000kg) *per annum* for most of the 1960s, '70s and '80s, but have decreased steeply since the mid 1980s (Figures 8 to 10; Tables 2 & 4), while those in other regions have mostly increased (Figures 6 & 7; Table 1a). By 2004, Northeast Atlantic reported landings had dropped significantly compared to their historical FAO-reported peak of nearly 50,000 t[1], taken in 1972 (Table 1b), and the peak recorded by ICES (Figure 9).

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 Japan (e.g. Taniuchi 1990) are apparently not included in FAO statistics. Landings reported 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 7; Table 1a). Landings reported 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 1b).

Much of the following descriptions of regional population trends are from Fordham (2005) and the IUCN Shark Specialist Group's Red List assessment of **Vulnerable** (globally) for *S. acanthias* (www.redlist.org [*publication due May 2006]*). The fisheries that drove these trends are described in Annex 3.

4.4.1 Northeast Atlantic
A single stock ranges from the Barents Sea to the northern Bay of Biscay. Landings data have been recorded since 1906 (Annex 3) and very detailed biological investigations were undertaken during the 1950s and 1960s, as a result of which Holden (1968) warned that part of the stock was over-exploited. These data were used in recent stock assessments applying a Bayesian assessment approach based on a Schaefer stock production model, and incorporating other relevant data (Hammond and Ellis 2002, Heessen 2003). The conclusions were that most landings since 1946 have definitely been above maximum sustainable yield (MSY), that it is "50% probable that the stock has been depleted to below 6% of its carrying capacity and 97.5% probable that the current population is below 11% of *K*. There is even a 7% chance that the population has been depleted below 3% of *K*" (Hammond and Ellis 2002). 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 (Heessen 2003). See Figures 3 to 5. Scientific advice from ICES to close the fishery in 2006 was not taken (see section 8.1.1).

The Iberian Peninsula stock is likely distinct from the above stock. Official fisheries statistics for landings of *S. acanthias* from Portuguese waters have shown a decrease of 51% between 1987 and 2000 (DGPA, 1988-2001); future projections predict a further 80.3% decline of landed biomass over the next three generations due to stock depletion, without reduced exploitation effort (no management is envisaged).

The IUCN Red List assessment for the Northeast Atlantic is **Critically Endangered**, taking into account past, ongoing and estimated future reductions in population size exceeding 90%.

4.4.2 Mediterranean Sea and Black Sea
Squalus acanthias occurred in 5% of MEDITS trawls. It is very rare in the western Mediterranean, but one of the most abundant elasmobranchs in the eastern basin with an estimated biomass of 6,700t throughout the MEDITS area. No statistically significant abundance trend was identified during 1994–2004 (Serena *et al.* 2005). Jukic-Peladic *et al.* (2001) do not report any significant change in occurrence of *S. acanthias* in the Adriatic between 1948 and 1998, but Aldebert (1997) reports a decline in landings from the 1980s in the western basin. Anecdotal evidence from fishermen interviews in the Balearics also indicates that the directed fisheries of the 1970s ceased as a result of significant declines in abundance in bottom longlines and gillnets from the early 1980s (Gabriel Morey, personal communication cited in IUCN Shark Specialist Group red list assessment); MEDITS did not record *Squalus* in the Balearics.

There is a target fishery for spiny dogfish in the Black Sea. Fishing intensity and landings increased significantly from 1979 as prices rose, mainly targeting fish aged 8–19 years. A stock assessment (Virtual Population Analysis) indicates that the exploited Black Sea stock rose until 1981, when it reached

[1] There are considerable discrepancies between FAO data and data available from states or regional fisheries organisations, with FAO data 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) report 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 11). National data are more accurate, but can be harder to obtain.

226,700t, then decreased 60% to about 90,000t in 1992 (Prodanov *et al.* 1997). Landings data are incomplete in the last few years of this time series. The fishery continues. None of these fisheries are regulated.

The IUCN Red List assessment for Mediterranean and Black Sea *S. acanthias* is **Endangered**, on the basis of past, ongoing and estimated future reductions in population size exceeding 50%.

4.4.3 Northwest Atlantic
This population 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. Target domestic fisheries subsequently became established in the late 1970s/early 1980s to export *S. acanthias* to European markets and led to even greater depletion. US federal efforts to enable the stock to rebuild are hampered by high catches in Atlantic state and Canadian waters. There has since been a documented 75% decrease in mature female biomass. 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 to 1985-1988 and a 75% reduction in biomass of the mature females preferentially targeted by this fishery. Average weight of landed females halved from 4kg in 1987 to 2kg in 2000. Low pup abundance has continued for seven consecutive years. The 2001 pup estimate was the lowest in the 33-year time series for the fifth consecutive year. 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. 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).

The IUCN Red List categorises Northwest Atlantic *S. acanthias* as **Endangered**, on the basis of estimated reductions in population size exceeding 50%.

4.4.4 Western North Pacific
Japanese coastal and offshore fisheries (longline, trawl & gillnet) have historically taken large amounts of *S. acanthias* and catch per unit effort (CPUE) and landings from these fisheries have shown similar patterns of decline to those in the North Atlantic. Catches dropped from more than 50,000t in 1952 to only 10,000t in 1965 (Taniuchi 1990). The Government of Japan Fisheries Agency (2003) reported the following trends. Offshore trawl catches of *S. acanthias* 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 may indicate that stocks have declined to a similar extent during this period. In the Sea of Japan, *S. acanthias* 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%. This may represent a further decrease in an already depleted stock. *S. acanthias* also make up 16.8% of the shark bycatch associated with salmon gillnet fisheries (Nakano 1999). There is no stock assessment, but CPUE declines indicate depletion to significantly less than 50% of baseline, fishing pressure continues, and there is no management is in place to enable the stock to rebuild.

The IUCN Red List categorises this stock as at least **Endangered**, noting that it may prove to be Critically Endangered once a full regional review can be undertaken.

4.4.5 Northeast Pacific
Former intensive fisheries for *S. acanthias* in this region have collapsed twice during the past 100 years, in 1910 and in the late 1940s. This stock is likely still to be reduced to around 50% of baseline, but should be recovering under current low exploitation pressures in most of its range. In 1944, spiny dogfish supported the most valuable Canadian west coast fishery (Ketchen 1986). British Columbia 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 now the only US Pacific state with a directed spiny dogfish fishery, mostly in Puget Sound.

In 1995, this 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). Although *S. acanthias* is the predominant shark species taken off Alaska, which banned directed shark fishing in 1998, this is as bycatch from the region's groundfish fisheries and 90% is discarded (Camhi 1999). Catch rates have, however, increased 20-fold in the Gulf of Alaska in the late 1990s and five-fold in Prince William Sound in recent years (NMFS 2000).

The IUCN Red List categorises Northeast Pacific *S. acanthias* as **Vulnerable**, on the basis of an estimated reduction in population size greater than 30%.

4.4.6 <u>South America</u>
Squalus acanthias has, with other *Squalus* species, long been a common bycatch species in demersal fisheries in this region, but until recently was primarily discarded (Cousseau and Perrota (2000), Cañete *et al.* (1999)). Massa *et al.* (2002) analysed the impact of rising fishing effort from 1994 to 1999 in coastal areas of Argentina and Uruguay, based on biomass indices of chondrichthyan species, and identified a greater than 50% drop in abundance of spiny dogfish. With rising market demand in Europe, it is possible that these species may now become a more important coastal commercial species on the southeastern coast of South America (Uruguay and Argentina), where demand and fishing effort is increasing, there is no bycatch control, and landings have decreased (Van Der Molen *et al.* 1998). Commercial targeting of *S. acanthias* probably commenced around 2001, replacing declining landings of other depleted coastal sharks, particularly *Mustelus schmittii* and *Galeorhinus galeus* (Chiaramonte in lit. 2003). Landings are not, however, recorded by species or even by genus, seriously hampering analysis of trends.

The IUCN Red List categorises South American stocks of *S. acanthias* as **Vulnerable**, based on an estimated ongoing reduction in population size greater than 30%.

4.4.7 <u>Australasia</u>
Domestic demand for *S. acanthias* meat is low in Australia (Last and Stevens 1994). Reported New Zealand landings increased from 3,000–4,000 t during the 1980s to 7,000–11,000 t from the mid 1990s to the mid 2000s (Manning *et al.* 2004, Sullivan *et al.* 2005). However, some (if not most) of the apparent increase was probably a result of better reporting. It is not known if this level of fishing is sustainable, but catch rate analyses and trawl survey biomass indices show no sign of significant declines; indeed one of the main NZ stocks has shown a 5-fold biomass increase since 1991 (Manning *et al.* 2004, Sullivan *et al.* 2005). Recent anecdotal reports indicating increased demand for dogfish off New Zealand, with industry publications encouraging fishermen to land rather than discard the species, have been attributed to depletion of the Northwest Atlantic stock and increasing demand for imports to that region. Recognising this cumulative pressure from targeted fishery as well as discarded by-catch and the high vulnerability of the species to over-fishing, spiny dogfish were introduced to the New Zealand Quota Management System in October 2004 with a TAC of 12,660 t (M. Francis, pers. comm.).

4.4.8 <u>South Africa</u>
Spiny dogfish are considered a nuisance by South Africa fishermen and are not targeted commercially. Some 99–100% of the trawl bycatch of this species is discarded. (Smale pers. comm., in Fordham 2005).

The IUCN Red List assesses Australasian and South African stocks of *S. acanthias* as **Least Concern**.

4.5 Geographic trends
Squalus acanthias seems to have vanished from Western Mediterranean fisheries during the past 30 years (see section 4.2.2).

5. <u>Threats</u>

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.

5.1 Directed fisheries
This is a valuable commercial species in many parts of the world, caught in bottom trawls, gillnets, line gear, and by sports fishers using 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 locally as scientific specimens for teaching purposes.

5.2 Incidental fisheries

Because it occurs in many areas where gill nets, longlines and trawls are used, these gears catch *S. acanthias*. Those with small mesh size may kill young individuals, which will not reach the retail market and may not appear in catch records if discarded (ASMFC 2003, Anon. 2003, 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 12). In the Southwest Atlantic, a study undertaken in Argentina and Uruguay estimated that the abundance of spiny dogfish populations dropped by 50% in just four years following the intensification of fishing activities, particularly the coastal whitemouth croaker *Micropogonias furnieri* fishery (Massa *et al.* 2002). Although bycatch impacts spiny dogfish, it is generally unreported and not included in national fisheries statistics.

6. <u>Utilisation and trade</u>

Compared to most other shark species, catch and trade in *S. acanthias* 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 9). Formerly also important for liver oil, it is now targeted primarily for its meat.

6.1 National utilisation

Spiny dogfish meat, derived from commercial target fisheries and landed bycatch, is eaten in Europe, Japan, South America and, to a lesser extent, in New Zealand and Australia (where it is considered coarse). 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 *S. acanthias* under the more palatable name "cape shark" (Fordham 2005).

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. For example, *S. acanthias* 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). *Squalus* heads are used as bait for other fisheries, in Morocco for instance (Fischer *et al.* 1987).

6.2 Legal trade

This species is recorded by its main importing countries under the customs Harmonised System, called Combined Nomenclature in the European Union (EU). The two product codes used are:

- 03026520 for 'Fresh or chilled dogfish of the species *Squalus acanthias*'
- 03037520 for 'Frozen dogfish of the species *Squalus acanthias*'.

Based on FAO and customs data (Eurostat import data and US customs export data) demonstrate that, in 2001, the EU represented the world largest market for spiny dogfish meat, consuming at least 65% of the world reported landings (Tables 1a and 5). 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% *S. acanthias*) 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 11). As European spiny dogfish stocks decline, demand is being met by imports from 25 countries, including emerging South American, African and Pacific suppliers (Table 5) 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 1b), and EU imports from Argentina that were recorded under the customs codes for *S. acanthias* in Eurostat (Table 5) for 2001. There are also discrepancies between Argentinean export data (which are not recorded at species level), and the imports noted above. The discrepancies between customs export and import data (Figure 11 & Table 5) and landings reported to FAO (Figure 7) by the same countries, indicate a lack of accurate reporting to FAO by some Members and possibly some misreporting/misidentification of species in trade.

Japanese imports of fresh *S. acanthias* meat 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).

Among the 20 nations recorded by FAO as trading in *S. acanthias* products, only Japan, New Zealand, South Africa and the United Kingdom reported exports of fins of this species (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.

The main purpose of the proposed Appendix II listing for this species is to ensure that trade is, in future, supplied by sustainably managed, accurately recorded fisheries that are maintained at levels that will not be detrimental to the status of the wild populations that they exploit.

6.3 Parts and derivatives in trade

Squalus acanthias meat is the most desirable and important product in trade and the main driver for target fisheries. It is usually transported frozen or fresh, occasionally smoked or dried. Other products are of lesser importance. The fins are utilised and must, therefore, enter international trade in large quantities but because of their relatively small size they are of low value and generally unrecorded. Trade in fins and tails is reported from the USA to China, Taiwan and Canada. Cartilage and livers (or liver oil) are also traded widely, for example being exported from USA to France, Italy, Switzerland and Taiwan where they are used for medicinal purposes (ASMFC 2003). Vannuccini (1999) reports hides being processed into leather and livers extracted. Teeth and jaws may also, very occasionally, be traded.

6.4 Illegal trade

In the absence of legally binding regulatory measures concerning catch or trade of *S. acanthias* 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, including transhipment, is illegal. 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.

6.5 Actual or potential trade impacts

Since foreign markets are in most cases the driving economic force behind *S. acanthias* fisheries around the world (see section 6.2, Figure 11; Table 5), unregulated international trade into European States 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 this species' populations. Fisheries that formerly caught *S. acanthias* as by-catch and largely discarded it are now moving towards landing and exporting its valuable products.

7. Legal instruments

7.1 National

National biodiversity legislation is not known to be in force for the purposes of conserving *S. acanthias* or its habitats, or regulation of trade. (Fisheries management measures are covered in section 8.) Some countries, for instance Sweden (E. Menhert, 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 *S. acanthias*. Some range States have included the species in their Red List; the species is listed as Vulnerable in Germany (Binot *et al.* 1998).

7.2 International

There are no international instruments for the conservation of *S. acanthias*; it is not listed on any international wildlife or fisheries agreement and has no international legal status. 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). Belgium responded to an invitation for member States to submit proposals for inclusion on this list in 2001 by nominating *S. acanthias* in the North Sea on the basis that it is a sensitive species and had declined significantly in their national waters, but it has not been added to the OSPAR list.

8. Species management

8.1 Management measures

Some RFOs have recently adopted shark resolutions to support improved recording or management of pelagic sharks taken as bycatch in the fisheries they manage. *S. acanthias* is not pelagic and are highly unlikely to be covered by these measures.

8.1.1 Northeast Atlantic

The conservation and management of sharks 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'. The first Total Allowable Catch (TAC – or annual catch quota) for *S. acanthias* was established in 1988 for this species, but only in the North Sea, a small part of the European waters used by this stock, and based on historic landings, not on scientific advice. Despite regular reductions, the TAC massively exceeded recent North Sea landings until end 2004 (Table 3), when the TAC for 2005 was reduced by 74% after only 25% uptake in 2004. Despite this major reduction, uptake of the 2005 TAC by the UK (which has the largest North Sea fisheries for this species) was less than 53% (information on EU uptake of the TAC in 2005 will be added when available). In 2005 the ICES Advisory Committee on Fisheries Management (ACFM 2005) reported: "All experimental assessments indicate that the stock is at a record low level. Frequency of occurrence of spurdog in trawl surveys has declined and although large shoals are still caught, the frequency of these has declined. The level of exploitation is unknown, but the continuous decline in landings indicates that fishing mortality has been, and continues to be well above sustainable levels." ACFM advised the European Fisheries Commission and December Council of Ministers that urgent measures, including closure of fisheries, were needed to prevent a collapse of the stock. They noted that stock is depleted and may be in danger of collapse. Target fisheries should not be permitted to continue, and bycatch in mixed fisheries should be reduced to the lowest possible level. They recommended that a TAC should cover all areas where *S. acanthias* are caught in the Northeast Atlantic (not just the North Sea) and this should be zero in 2006. Instead, the North Sea TAC for 2006 was reduced by only 15% and no other parts of the fishery are regulated. Norway manages its

S. acanthias fishery with a minimum landing size intended to enable sharks to mature before capture. This is of limited value for a migratory stock unmanaged elsewhere in its range.

8.1.2 Northwest Atlantic
Spiny dogfish fisheries are managed by Canadian and USA federal agencies and US Atlantic States.

In Eastern Canada, the first quota and management measures for spiny dogfish were put in place in around 2001/2, following some years of significantly increasing landings. These capped and allocated catches and bycatch at historic levels pending investigation of sustainable exploitation levels. Industry opposed these caps and exceeded the 2002 quota by 40%, while a programme of five years of data collection commenced in preparation for a stock assessment.

The first US management plan specifically for *S. acanthias* 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.

8.1.3 Northeast Pacific
USA and Canada conduct cooperative surveys for Northeast Pacific *S. acanthias*, but there is no coordinated, international management for the stock (Camhi 1999). *S. acanthias* fisheries in the US North Pacific receive minimal management. Off Alaska, they are regulated under an "other species" TAC (Alaska NMFS report 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. Concern over large catches in pupping grounds prompted closure of East Sound. In British Columbia they have been broadly managed through groundfish regulations since 1978, but only through TACs that are not science-based, significantly exceed recent landings, and do not restrict fishing effort.

8.1.4 Northwest Pacific
No management. Japan monitors shark stocks and will recommend, when necessary, the introduction of measures for the conservation and management of shark resources (CITES AC19 Doc.18.3).

8.1.5 Southern hemisphere
New Zealand has included *S. acanthias* in its Quota Management System (QMS).

8.2 Population monitoring
Population monitoring requires routine monitoring of catches, collection of reliable data on the indicators of stock biomass and good knowledge of biology and ecology. In most States, however, catch, bycatch and discard data for *Squalus* and most other shark and ray species are not recorded at species level, making stock assessments and population evaluation almost impossible. Relatively good landings data for *S. acanthias* are available for only a few major fisheries in the North Atlantic (Heessen 2003, Prodanov *et al.* 1997, ASMFC 2003, SARC 2003, NMFS 2003), North Pacific and New Zealand. Commercial landings and research survey data indicate that many stocks are seriously depleted.

8.3 Control measures
8.3.1 International
The International Plan of Action (IPOA) for the Conservation and Management of Sharks urges all States with shark fisheries to implement conservation and management plans. However, this initiative is voluntary and only some States have produced Shark Assessment Reports or National Shark Plans. At the 22nd meeting of the CITES Animals Committee in July 2006, the Intersessional Shark Working Group will report on the situation in 2006. This information will then be added here.

8.3.2 Domestic
Although several range States (China, Greenland and Cyprus, *in litt.* to the German Ministry of Environment (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, BMU), 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.

8.4 Captive breeding and artificial propagation
Not economically viable for commercial purposes, due to the slow reproductive and growth rates of this species. Some breeding may be occurring in specimens on public display in aquaria.

8.5 Habitat conservation
No efforts have been made to identify and protect critical *S. acanthias* habitat, although some is incidentally protected from disturbance inside in marine protected areas or static gear reserves.

8.6 Safeguards

8.7 Control measures
8.7.1 International trade
Current international trade regulations concerning trade controls of *S. acanthias* are almost non-existent, being limited to the usual hygiene measures for fishery products and/or to facilitate the collection of import duties. The specific customs codes for frozen and fresh or chilled *S. acanthias* (see 6.2) were established primarily to monitor exports and imports and enable tariffs to be collected (these are 6% in the EU). However, these codes are used by customs services on a voluntary basis. While in the EU, *S. acanthias* codes are used for economic reasons, in most States (Japan for instance), import of frozen *S. acanthias* is lumped with other shark products under a less specific code, No. 0303 7500, which does not allow estimation of trade at species level.

8.7.2 Domestic measures
None. Even where *S. acanthias* catch quotas have been established, such as in some North Atlantic countries, no trade measures prevent the sale or export of *S. acanthias* landings in excess of quotas.

9. Information on Similar Species

Although genus *Squalus*, characterised by the absence of an anal fin and the presence of two dorsal fins, each with a sharp spine, is under review (Compagno in preparation). *Squalus acanthias* is one of the few species that poses no taxonomic problems and is readily identifiable when whole (see 3.4). In contrast, it is uncertain how many species occur within the other two main *Squalus* species groups (Compagno 1984 and 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 primarily marketed in the north and the latter in the south of Europe. It also appears to be replacing *Galeorhinus galeus* imports from South America.

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 *S. acanthias*, for which samples have already been collected from Northeast and Northwest Atlantic specimens (Heessen 2003). DNA testing for the identification of *S. acanthias* 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 *S. acanthias* is being jointly developed by Mound Desert Island Biological Laboratory (MDIBL) and the Washington University Genome Sequencing Centre (*in litt.*, 7 December 2003).

10. Consultations

To be included later.

11. Additional remarks

11.1 Assessment of the spiny dogfish under FAO's recommended criteria for CITES listing

FAO note 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 (CoP13 Inf documents). 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). *S. acanthias* 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. Some stock assessments and other declines described for several *S. acanthias* fisheries are taken as an indicator of declining population size to 5-10% of historic baseline.

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

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

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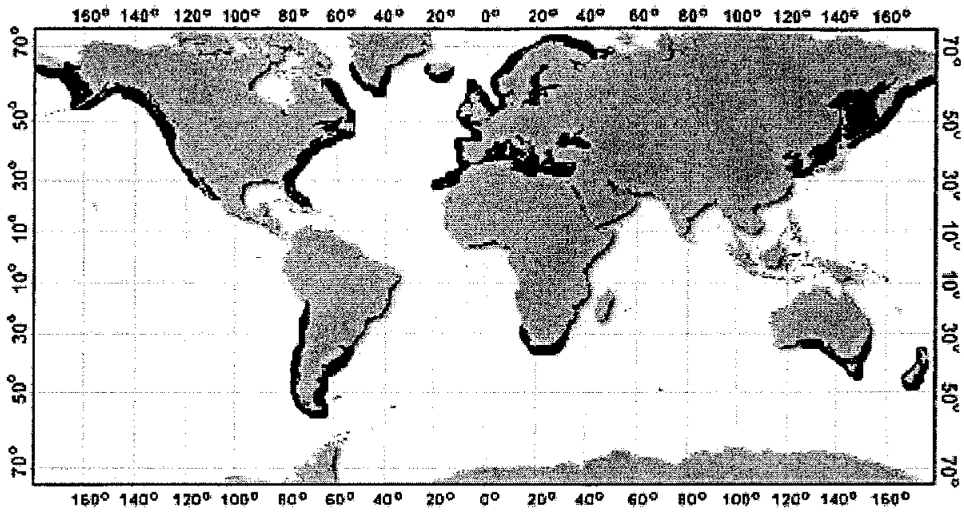

Figure 2. Global *Squalus acanthias* Spiny Dogfish distribution (*Source*: FAO 2003)

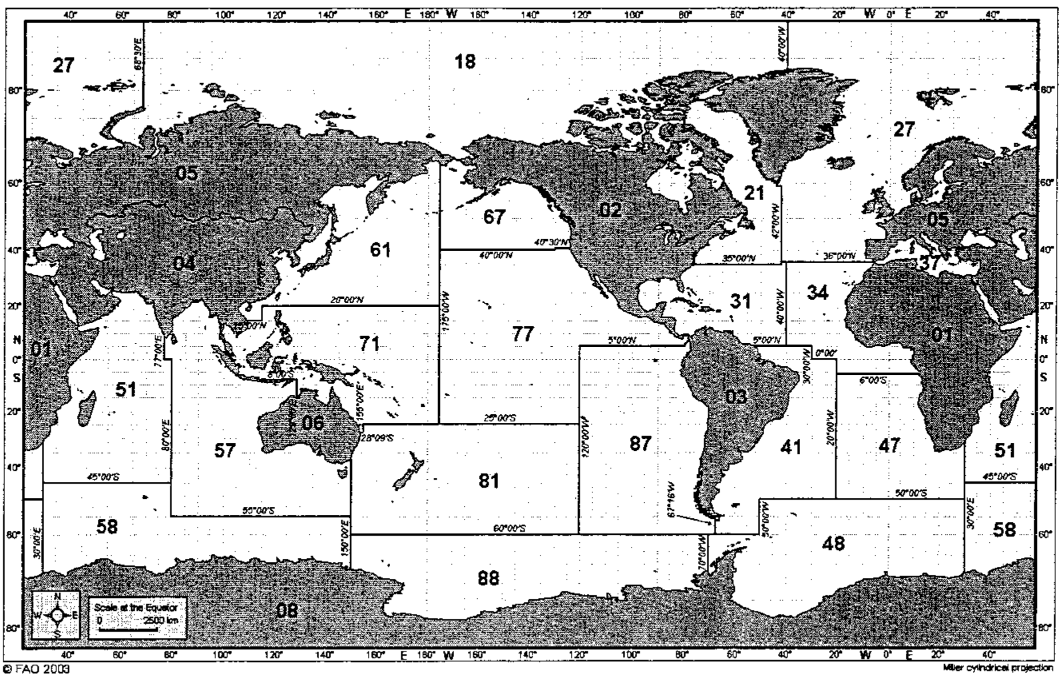

Figure 3. FAO fishing areas.

Spiny dogfish catches are mostly taken in the Atlantic Northeast: Area 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 & 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

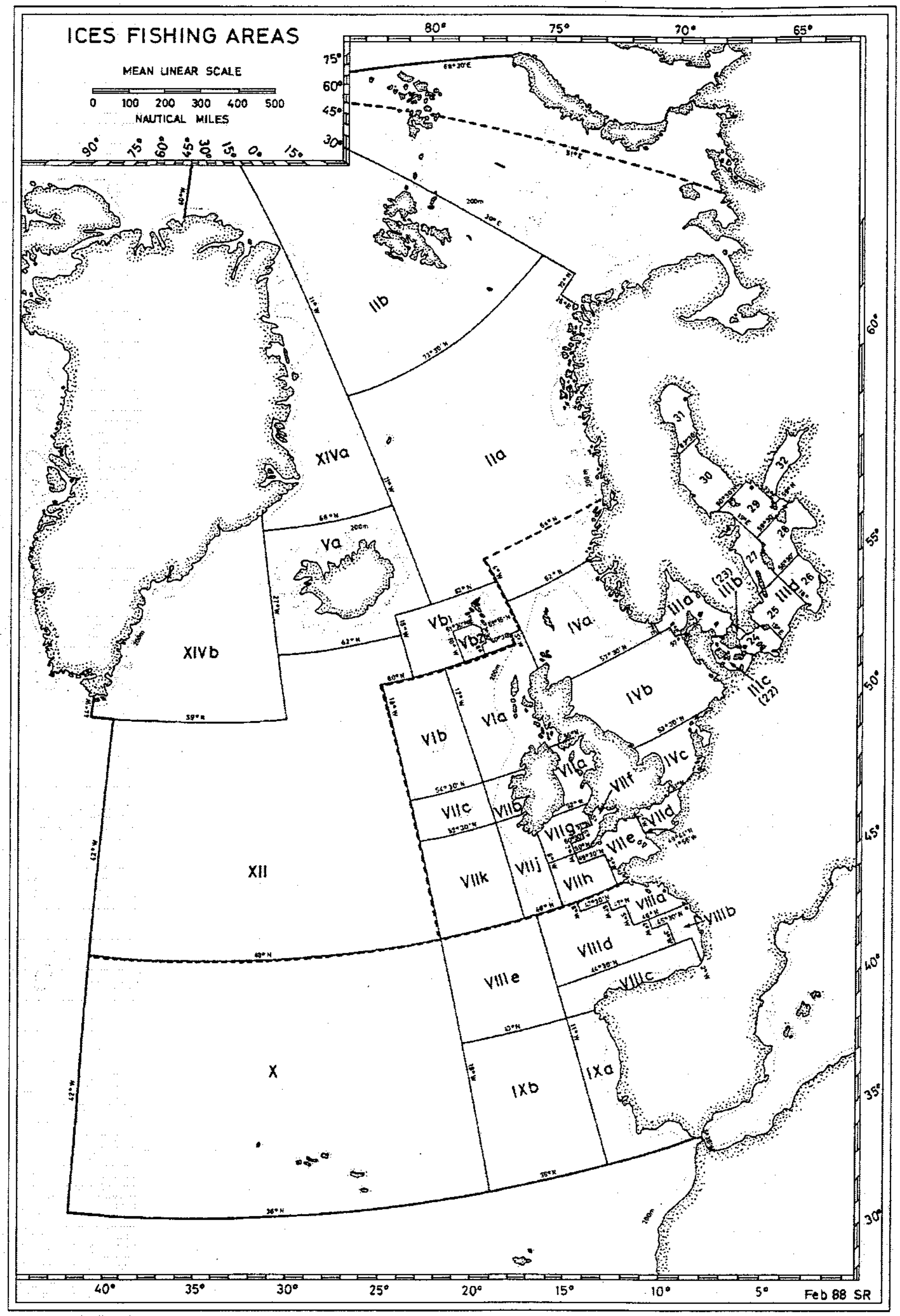

Figure 4. ICES fishing areas in the Atlantic Northeast.

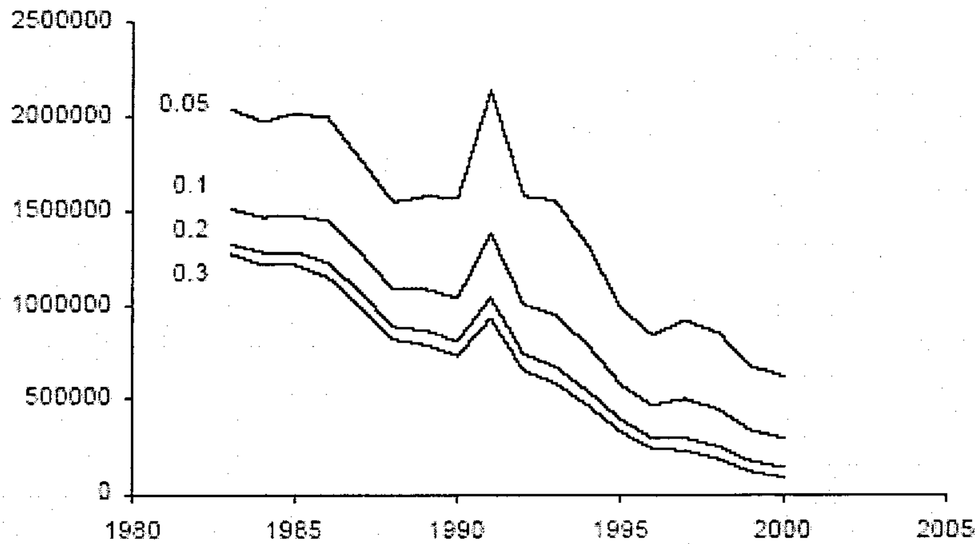

Figure 5. Trends in total population numbers of mature fish estimated using a Separable VPA analysis of the catch numbers at age data. Each line represents a different assumption for terminal F (0.05 - 0.3) on the reference age in the final year. Source: Figure 6.4.1.14, Heessen 2003.

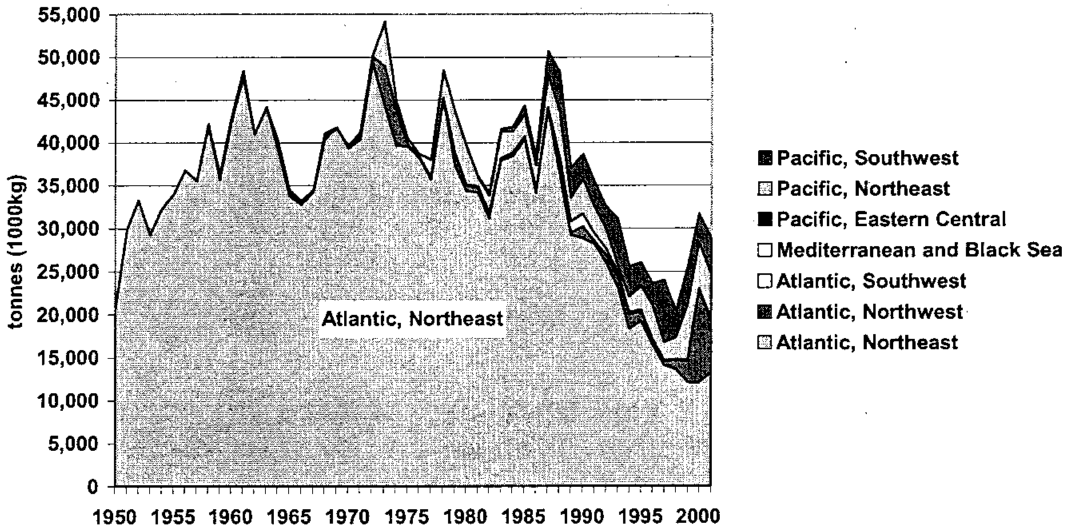

Figure 6. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported by FAO fishing area from 1950 to 2001 (*Source*: FAO via Fishbase).

Table 1. *Squalus acanthias* life history parameters (various sources in text)

Age at maturity (years)	female:	12 (NW Atlantic); 23 (NE Pacific); 15 (NE Atlantic)
	male:	6 (NW Atlantic)/ 14 (NE Pacific)
Size at maturity (total length cm)	female:	75 (NWA); 93.5 (NEP); 83 (NEA); 70-100 (Mediterranean)
	male:	60 (NW Atlantic); 59 (Australia); 59-72 (Mediterranean)
Longevity (years)	female:	40 (NW Atlantic)
	male:	35 (NW Atlantic)
Maximum size (total length cm)	female:	124 (NW Atlantic); 160 (N Pacific); 200 (Mediterranean)
	male:	100 (NW Atlantic)
Size at birth (cm)		20-33
Average reproductive age (years)*		Unknown, but over 25 years; ~40 years in NE Pacific.
Gestation time (months)		18–22
Reproductive periodicity		biennial (no resting stage, litters are born every two years)
Average litter size		1–20 pups (2–15 NW Atlantic, 2–11 Med), increases with size of female
Annual rate of population increase		2.3 % (N. Pacific)
Natural mortality		0.092 (NMFS – NW Atlantic)

Table 2. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by FAO fishing area (*Source*: FAO via Fishbase).

a) From 1992 to 2001

12.1 Area	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Atlantic, Northeast	26,040	23,155	18,334	19,281	16,508	14,102	13,634	12,098	12,092	13,228
Atlantic, Northwest	880	1,272	1,691	1,086	495	454	1,082	2,456	10,702	5,996
Atlantic, Southwest	0	0	0	0	0	0	0	0	0	0
Mediterranean & Black seas	727	485	213	182	144	96	97	143	204	287
Pacific, Eastern Central	1	3	1	1	0	1	5	24	8	3
Pacific, Northeast	2,356	830	1,776	2,744	4,000	2,100	2,501	6,439	5,363	5,181
Pacific, Southwest	2,592	5,429	3,601	2,753	2,477	7,232	3,064	4,409	3,362	4,192
TOTAL	**32,596**	**31,174**	**25,616**	**26,047**	**23,624**	**23,985**	**20,383**	**25,569**	**31,731**	**28,887**

b) From 1950 to 2001

12.1.1 FAO Area	No. of fishing countries	Total catch (tonnes)	% of world total catch	2001 catch as % of period peak
12.1.2 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%

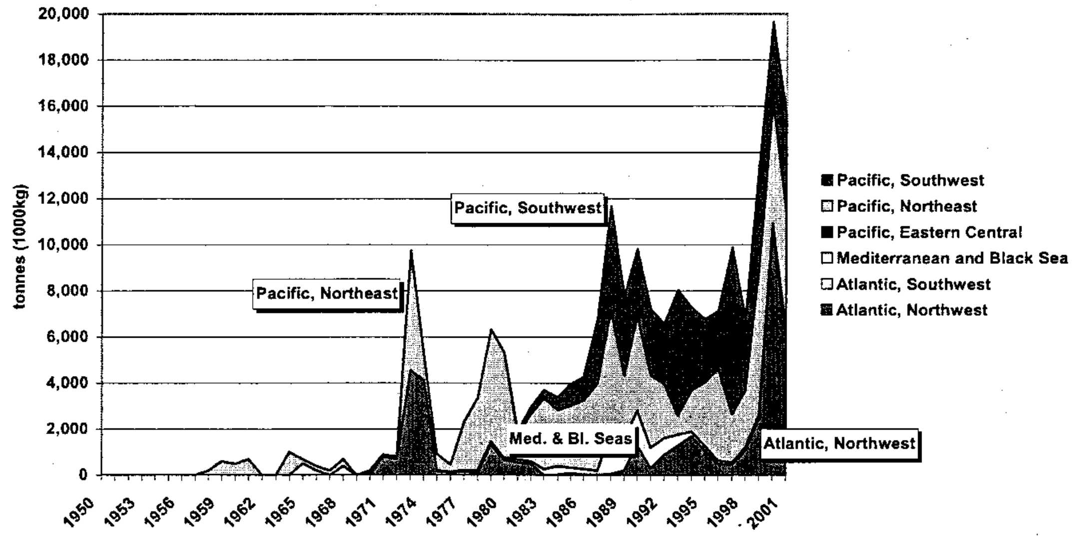

Figure 7. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by FAO fishing area, <u>excluding the Atlantic Northeast</u> (*Source*: FAO via Fishbase).

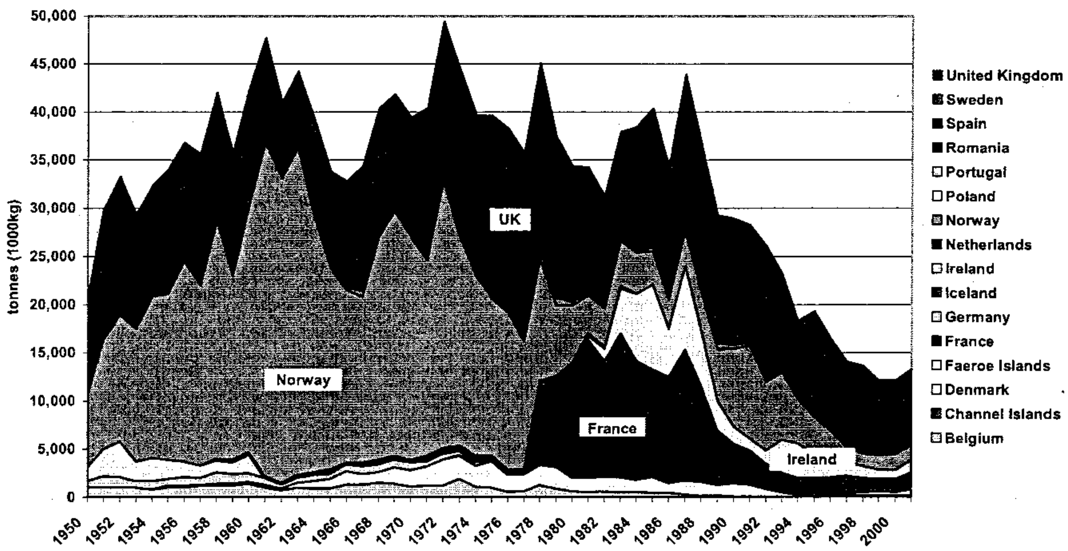

Figure 8. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by country in the Atlantic Northeast, from 1950 to 2001 (*Source*: FAO via Fishbase).

Table 3. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported to FAO, by country in the Northeast Atlantic. (*Source*: FAO via Fishbase).

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%**

Figure 9. 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).

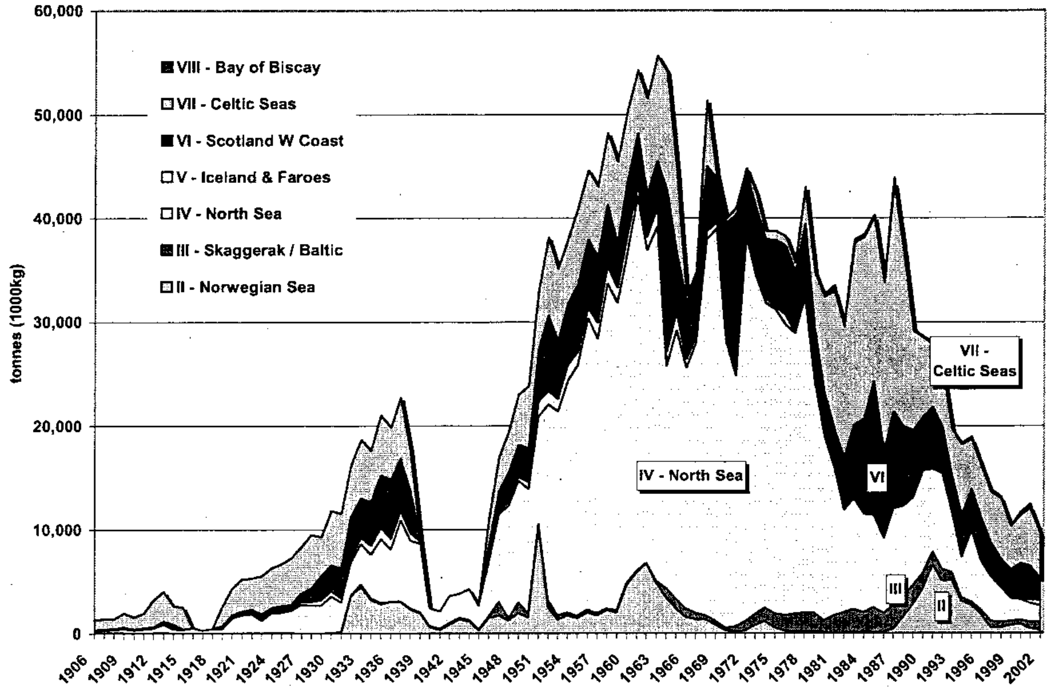

Table 3. Comparison between total reported landing and quotas for spiny dogfish in the European Community (EC) and UK North Sea waters* (tonnes)

		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
13. UK	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

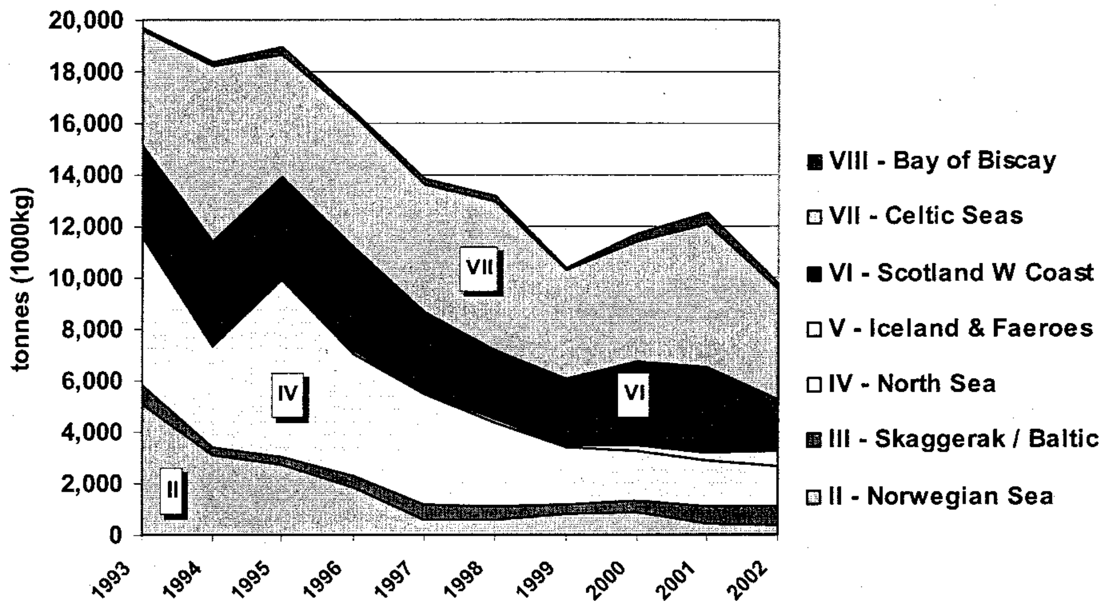

Figure 10. Total landings of spiny dogfish (*Squalus acanthias*) (tonnes) by ICES fishing areas, in the Northeast Atlantic region, from 1980 to 2002
(*Sources*: ICES Statlant Fisheries Statistics Database, November 2003).

Table 4. 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).

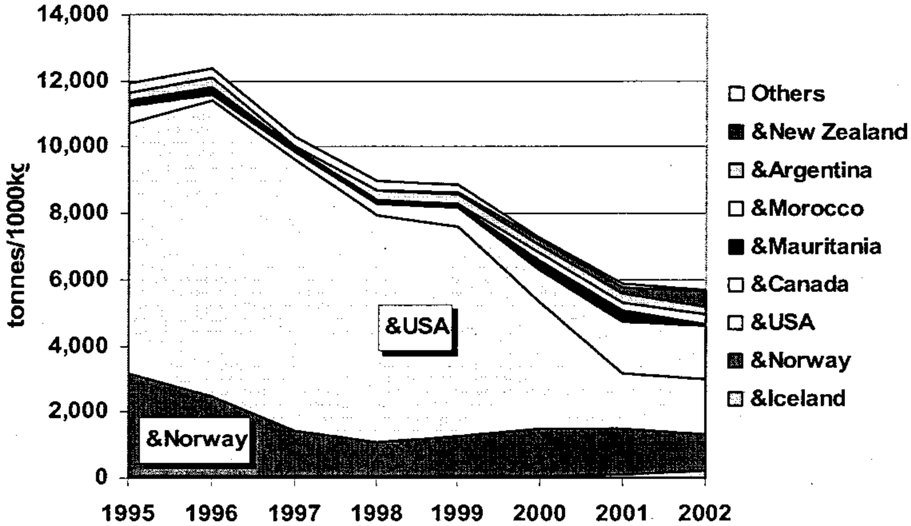

Figure 11. Origin of EU imports* of fresh or chilled (CN Code: 0302 6520) and frozen (CN Code: 0303 7520) 'Dogfish of the species *Squalus acanthias*'

(*Source*: Eurostat 2003)

* Excluding EU Member States, such as Germany –one of the main EU importer (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.

Table 5. 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)

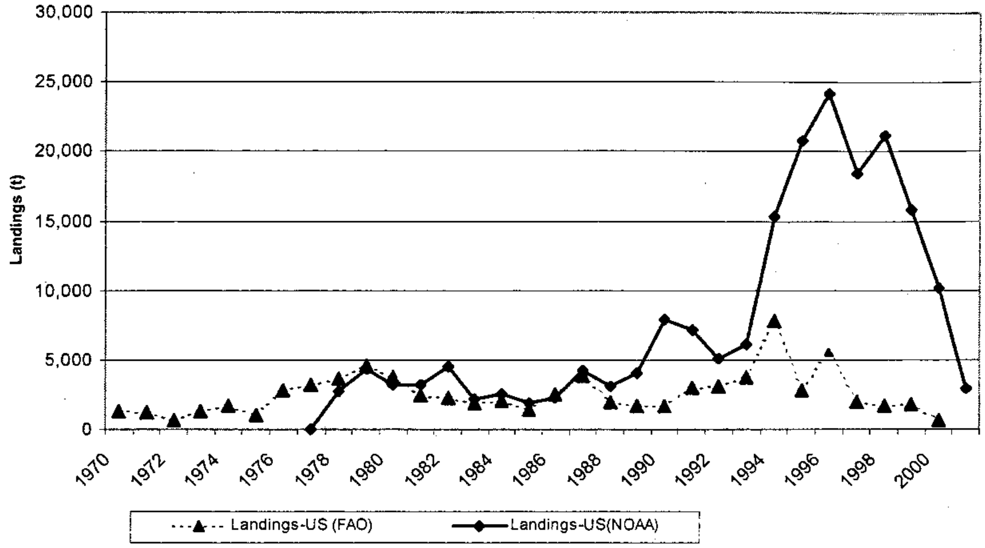

Figure 12. Comparison between US landings data recorded by FAO (source Fishstat capture production database) and US landings data reported by NOAA – National Oceanographic and Atmospheric Administration of NMFS –US National Marine Fisheries Service data (source commercial fisheries landings database at **www.st.nmfs.gov**).

Annex 1.

Scientific synonyms of *Squalus acanthias*

(*Source*: FAO Species Identification Sheet, 2003)

- *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.

Annex 2.

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

Alaska (USA)
Albania
Algeria
Angola
Argentina
Australia
Belgium
Canada
Canary Islands
Chile
China
Cuba
Cyprus
Denmark
Egypt
Estonia
Faeroe Islands
Falkland Islands (Malvinas)
Finland
France
French Polynesia (Kerguelen)
Gabon
Georgia
Germany
Greece
Greenland
Iceland
Ireland
Israel
Italy
Japan
Kerguelen Islands
Korea, Democratic People's Republic of
Korea, Republic of
Latvia
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

Annex 3. Descriptions of fisheries

13.1.1 Northeast Atlantic

The spiny dogfish fishery is by far the most important of the directed fisheries for elasmobranchs in the Northeast Atlantic (Figures 2 & 3). 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 by-catch in trawl fisheries. Other European countries make smaller landings (see Figure 7 and Tables 2a & b). Available studies indicate that there is a single Northeast Atlantic unit stock (Heessen, 2003). 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 (Figures 7 to 9).

According to Heessen (2003), between 1950 and 1970, Norwegian longliners working north of Bergen took 70% of the total international landings from the Northeast Atlantic. The main fishing grounds were off the west coast of Norway in winter-spring and on the banks north of Scotland in summer-autumn. This fishery collapsed in 1978 following an increase in fishing effort with automatic longline baiting and handling systems. Norwegian reported landings to FAO in 2001 were only 4% of their historic maximum taken in 1961 (Tables 2a & b).

French trawlers have also fished spiny dogfish since 1977 (Figure 7), working from the Faeroes south to northern Biscay, and by long-lining in the Celtic Sea and the western English Channel. Most of the French landings since 1979 have come from the Celtic Sea, where catches peaked at 6-8000t in 1981-84, and fell below 1000t by 1993. Similar patterns were observed in the English Channel, the North Sea, the west coast of Scotland, the Irish Sea and the west of Ireland. Overall, French landings decreased from just below 15,000t in 1983 to 1333t in 2001. French reported landings to FAO in the early 2000s were only 9% of their historic peak (Figure 7; Tables 2a & b).

Today, based on landings reported to the International Council for the Exploration of the Seas (ICES), the main fishing grounds for spiny dogfish are in the North Sea (ICES area IV), Northwest Scotland (area VI) and the Celtic Sea (VII), all of which have reported substantial reduction in landings from former peaks (Figure 8). Scottish and other UK trawlers and seiners have fished for spiny dogfish in these waters both as directed and by-catch fisheries since World War II. Landings by Scottish vessels accounted for 43% of the total of 16,000t landed from the Northeast Atlantic in 1996. For the overall period 1950 to 2001, UK vessels caught 38% of the total landings from the Northeast Atlantic (Table 2). UK landings in 2001 were 55% of the total reported landings from the Northeast Atlantic. According to the 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 8).

Northwest Atlantic

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 are 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). 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 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).

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).

Northeast Pacific

Spiny dogfish have been fished in British Columbia (Canada) for over 4000 years. 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. The fishery has since been constrained by low demand (Bonfil 1999) and spiny dogfish are now considered to be a minor, mostly by-catch, component of the region's groundfish fisheries. Only a few vessels currently target them. Trawlers take roughly 40% of regional landings and discard significant amounts (Bonfil 1999).

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).

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

Although there are only limited data on landings from the Mediterranean, some catch reduction has been observed (Aldebert 1997). Overall, the stock seems likely to be in a better state than in the Northeast Atlantic. There is a target fishery for 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. A stock assessment (Virtual Population Analysis) indicates that the exploited stock rose until 1981, when it reached 226,700t, then decreased 60% to about 90,000t in 1992 (Prodanov *et al.* 1997). Landings data are incomplete in the last few years of this time series. 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 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%. This may be a further decrease in an already depleted stock.

Australasia

Considered coarse, spiny dogfish meat is little valued in Australia (Last and Stevens 1994). Tasmanian recreational gillnet fisheries take substantial amounts (Simpfendorfer, pers. comm. in Fordham 2005). FAO data for 1977-1989 show a significant increase in spiny dogfish 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 2005) and reported landings increased from 3273t in 1991-1992 to 13,076t in 2001-2002 (Anon. 2003), possibly driven by growing exports to the EU (Figure 10, Table 5). 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. 2003).

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. 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, CITES Management Authority of Argentina, *in litt.* to TRAFFIC Europe, 27 October 2003). Discrepancies between South American exports of spiny dogfish (Figure 10; Table 5) and landings reported to FAO (Figure 6) by the same countries, suggest a lack of accurate reporting to FAO by some Members.

South Africa

Spiny dogfish are considered a nuisance by South Africa 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 2005).

Squalus acanthias **Proposal**
Draft of February 2006 for CITES Consultation Process

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

Fourteenth Meeting of the Conference of Parties
2–15 June 2007
Netherlands

Amendments to Appendices I and II of CITES

A. PROPOSAL

Inclusion of *Squalus acanthias* Linnaeus, 1758 in Appendix II in accordance with Article II 2(a)

Qualifying Criteria (Conf. 9.24 (Rev. CoP13) Annex 2a)

A. *It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future.*

The North and Southwest Atlantic, Mediterranean, Black Sea and Northwest Pacific stocks of *Squalus acanthias* clearly qualify for listing under this criterion, taking into account the long term extent of decline and/or the recent rates of decline for this low productivity commercially exploited aquatic species. Indeed, several stocks have already experienced long term and/or recent marked declines to 5–20% of baseline.

B. *It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences.*

Squalus acanthias is subjected to unsustainable fisheries in several other parts of its range, with most products exported to Europe. High market demand and value has caused opposition to sustainable management proposals in some States. Without trade regulation, other stocks are likely to experience similar declines to those described above.

Annotation

The entry into effect of the inclusion of *Squalus acanthias* on Appendix II of CITES will be delayed by 12 months to enable Parties to resolve the related technical and administrative issues, such as the possible designation of an additional Management Authority.

B. PROPONENT

Federal Republic of Germany, on behalf of the Member States of the European Community.

C. SUPPORTING STATEMENT

1. Taxonomy

1.1 Class:	Chondrichthyes (Subclass: Elasmobranchii)	
1.2 Order:	Squaliformes	
1.3 Family:	Squalidae	
1.4 Species:	*Squalus acanthias* Linnaeus, 1758	
1.5 Scientific synonyms:	See Annex 1	
1.6 Common names:	English	spiny dogfish, spurdog, piked dogfish
	Spanish	mielga, galludos, cazón espinozo, tiburón espinozo, espineto, espinillo, tollo, tollo de cachos,
	French	aiguillat commun
	Danish	pighaj
	Italian	spinarolo
	German	Dornhai

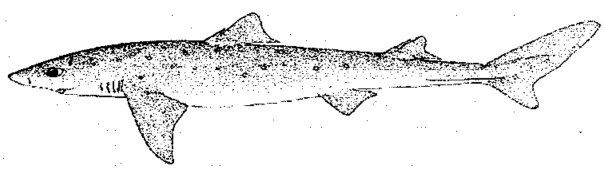

Figure 1. Spiny dogfish *Squalus acanthias*
(*Source*: FAO Species Identification Sheet, 2003)

2. Overview

2.1 The spiny dogfish (*Squalus acanthias*) is a small temperate water shark of shelf seas in the northern and southern hemispheres. Although naturally abundant, it is one of the more vulnerable species of shark to over-exploitation by fisheries because of its late maturity, low reproductive capacity, longevity, long generation time (25-40 years) and hence a very low intrinsic rate of population increase (2-7% *per annum*). Its aggregating habit makes it vulnerable to fisheries. Most stocks are highly migratory.

2.2 *Squalus acanthias* meat is highly valued, particularly in Europe, with European market demand driving fisheries that preferentially target aggregations of mature (usually pregnant) females. The small fins enter international trade. Other products (liver oil, cartilage, skin) are less fully utilised.

2.3 Some target *S. acanthias* fisheries have been documented for over 100 years. Stock assessments document declines of 75% in the Northwest Atlantic in just ten years and over 95% from baseline in the Northeast Atlantic. Catch per unit effort and landings data from these and other regions indicate that some other stocks may have experienced a range of similar levels of decline. Elsewhere, increased fishing effort during a period of rising international market demand infers that other stocks are under similar pressure and directly impacted by international trade demand for their products.

2.4 Management is in place in only a few States in a few regions and, in the majority of these, in only a limited part of the range of highly migratory stocks. In most cases, current management continues to be inadequate to reverse current declining trends and to ensure future sustainable fisheries. No Regional Fishery Organisation (RFO) is managing fisheries for this species.

2.5 An Appendix II listing is proposed for *S. acanthias* in accordance with Article II, 2(a) and Conf. 9.24 (Rev. CoP13). Past and ongoing marked population declines in several Northern Hemisphere stocks, combined with high market demand, are driving fishing pressure on several unmanaged Indo-Pacific stocks that are now beginning to supply international markets.

2.6 *Squalus acanthias* meets the guidelines suggested by FAO for the listing of commercially exploited aquatic species. With an intrinsic rate of population increase of 0.023 to 0.07 and a generation time of >25 years, 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 stock declines 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 these FAO guidelines.

2.7 The IUCN Red List assessment for this species is **Vulnerable** globally. North Atlantic, North Pacific and South American stocks are all Threatened (**Vulnerable**, **Endangered** or **Critically Endangered**)

2.8 An Appendix II listing for *S. acanthias* will regulate and monitor future international trade, ensuring that it is supplied by sustainably managed, accurately recorded fisheries maintained at levels that are not detrimental to the status of exploited wild populations and the survival of the species. These trade controls will complement and reinforce traditional fisheries management measures, thus also contributing to implementation of the UN FAO International Plan of Action for the Conservation and Management of Sharks.

3. Species characteristics

3.1 Distribution

Spiny dogfish *Squalus acanthias* occurs in temperate and boreal waters of 7-8°C to 12-15°C in both northern and southern hemispheres (see Figure 2). Although highly migratory, sometimes crossing ocean basins (Templeman, 1954, 1984), its distribution is fragmented into distinct populations separated by deep ocean, tropical waters, or polar regions. The species has been recorded in the range States listed in Annex 2. It is most common in coastal waters and is 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. Some populations are largely sedentary, others migrate long distances, but genetic exchange between Northeast and Northwest Atlantic populations is considered very limited (Hammond and Ellis 2002).

3.2 Habitat

This is a continental shelf species, occurring from the intertidal to the shelf slope. 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.

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). Mating and breeding migrations in New Zealand are described by Hanchet (1988). Other mating grounds are unknown.

3.3 Biological characteristics

Squalus acanthias is very long-lived, slow-growing and late maturing, with limited reproductive capacity and one of the lowest population growth rates calculated for any shark species. Smith *et al.* (1998) considered this species to have the lowest intrinsic rebound potential of 26 shark species analyzed, at 2.3% annual rate of population increase from maximum sustainable yield (MSY) in the Northeast Pacific. Other estimates are: 4-7% population increase in the Northeast Atlantic (Heessen 2003), and annual mortality of 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 35 to 40 years (Northwest Atlantic males and females, respectively, Nammack *et al.* 1985), 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 and 37 years at liberty had grown an average of only 3.3mm and 2.7mm per year, to 78 and 90cm long respectively (Anon, 2002), suggesting that the larger individual was considerably older than 40 years (growth rates slow markedly after maturity is reached).

The reproduction cycle of *S. acanthias* 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, Whitehead *et al.*, 1984), at a sex ratio of 1:1. Pups are 18-33cm long at birth; females mature at 75–100cm (depending upon stock). The maximum observed sizes of spiny dogfish (males and females respectively) were 100 and 160cm in the Northwest Pacific, 107 and 130cm in the Northeast Pacific, 86 and 108cm in the Northwest Atlantic, 83 and 110cm in the Northeast Atlantic (Ketchen 1972, Heessen 2003). Anon. 2002 reported a 90cm male in the Northeast Atlantic, Fischer *et al.* (1987) a 200cm female in the Mediterranean, and spiny dogfish achieve larger sizes in the Black Sea (Compagno 1984). Table 1 summarises these life history parameters.

3.4 Morphological characteristics

A slender smooth-skinned dogfish with grey to bluish-grey dorsal surface, lighter to white below, often with white spots on its sides. No conspicuous black blotches on fins. Dorsal fins, dusky or plain in adults, but with black apices and white posterior margins and free rear tips in young. First dorsal fin low, origin usually behind or sometimes over pectoral free rear tips, with a very short slender spine with origin well behind pectoral free rear tips. Second dorsal fin much smaller than first, strongly falcate, with larger, stouter spine. Pectoral fins with shallowly concave posterior margins and narrowly rounded rear tips have light posterior margins in adults. Pelvic fins are smaller than pelvics. No anal fin. Strong ventral caudal (tail) lobe, no subterminal caudal fin notch, strong lateral keels on caudal peduncle. Narrow head, relatively long pointed snout, short transverse mouth, low bladelike cutting teeth, no medial barbel on anterior nasal flaps. Spiracles large and close to eyes. Body cylindrical in cross section. Although genus *Squalus* is under review (Compagno in preparation), *S. acanthias* poses no taxonomic problems (its identifying characters are underlined), although its distribution overlaps with some other *Squalus* species.

3.5 Role of the species in its ecosystem

Squalus acanthias feeds mainly on a variety of bony fishes, such as herring, haddock and cod (ASMFC 2003), and some invertebrates (Compagno 1984). It is eaten by some larger sharks and marine mammals (Compagno 1984). Its abundance does not appear to affect the recruitment of groundfish (Link *et al.* 2002 in ASMFC 2003, Bundy 2003) and its very slow growth and low metabolic rate imply that it does not consume large quantities of prey compared with warm-blooded shark species.

4. Status and trends

4.1 Habitat trends

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

4.2 Population size

There are no firm estimates of total population numbers for any stocks of *S. acanthias*. Stock assessments have been undertaken for populations in the Northeast Atlantic, Northwest Atlantic and Black Sea, but these usually evaluate biomass rather than numbers of mature individuals. Most population information is therefore presented in section 4.4, Population trends.

4.2.1 Northeast Atlantic

The DELASS (Development of Elasmobranch Assessments, EC DG Fish Study Contract 99/055, Heessen 2003) stock assessment used a Separable VPA to estimate trends in the total population number of mature fish in the stock that ranges from the Barents Sea to the northern Bay of Biscay. The results of such assessments depend heavily upon several uncertain biological parameters, so a range of possible assumptions was applied. These indicated that the total population of mature fish had declined to between 500,000 and 100,000 by 2000 (see Figure 5). This decline continues. The biomass (of the entire stock, not just matures) is likely significantly less than 100,000 t.

4.2.2 Northwest Atlantic

Data on population size not yet available.

4.3 Population structure

This species is highly migratory and tends to segregate by age and by sex. This means that it is possible for fishers to target preferentially the most valuable part of the stock (the large pregnant females) as they undertake predictable seasonal migrations through fishing grounds. Their aggregating habit makes it 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 (~4–5 years old), and are fully recruited in the Northeast Atlantic fishery at lengths of approximately 70-80cm (~8 years old) (Heessen 2003). Female spiny dogfish are, therefore, exploited before they reach maturity at 74–94cm. As a result, a natural population structure is unlikely to exist in most regions where this species is commercially fished. Not only are mature females depleted but, as a result, pup production is also extremely low (small recently mature females bear small litters of small pups with lower survival rates).

4.4 Population trends

The generation time for *S. acanthias* (defined in Table 2 as the average reproductive age of females in an unfished population) is uncertain and varies between populations, but is certainly greater than 25 years, and possibly as high as 40 years. The three-generation period against which declines must be assessed (Annex 5, CoP9.24, Rev. CoP13) is therefore some 75 to >100 years, which is also equivalent or very close to the historic baseline.

Stock assessments are available for only a few stocks. These show a correlation between recent declines in landings and catch per unit effort (CPUE), and relative stock size; CPUE and landings are therefore used here as indicators of population trends in the absence of stock assessments.

Globally, the most important 20th Century *S. acanthias* fisheries were in Northeast Atlantic shelf seas; these stocks are now also the most depleted. According to FAO, 89% of spiny dogfish landings reported in 1950–2001 (excluding miscellaneous sharks, *etc.*) were taken in this region (Figure 6). Landings were sustained at 30-50,000 tonnes (1 tonne (t) = 1000kg) *per annum* for most of the 1960s, '70s and '80s, but have decreased steeply since the mid 1980s (Figures 8 to 10; Tables 2 & 4), while those in other regions have mostly increased (Figures 6 & 7; Table 1a). By 2004, Northeast Atlantic reported landings had dropped significantly compared to their historical FAO-reported peak of nearly 50,000 t[1], taken in 1972 (Table 1b), and the peak recorded by ICES (Figure 9).

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 Japan (e.g. Taniuchi 1990) are apparently not included in FAO statistics. Landings reported 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 7; Table 1a). Landings reported 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 1b).

Much of the following descriptions of regional population trends are from Fordham (2005) and the IUCN Shark Specialist Group's Red List assessment of **Vulnerable** (globally) for *S. acanthias* (www.redlist.org [*publication due May 2006*]). The fisheries that drove these trends are described in Annex 3.

4.4.1 Northeast Atlantic

A single stock ranges from the Barents Sea to the northern Bay of Biscay. Landings data have been recorded since 1906 (Annex 3) and very detailed biological investigations were undertaken during the 1950s and 1960s, as a result of which Holden (1968) warned that part of the stock was over-exploited. These data were used in recent stock assessments applying a Bayesian assessment approach based on a Schaefer stock production model, and incorporating other relevant data (Hammond and Ellis 2002, Heessen 2003). The conclusions were that most landings since 1946 have definitely been above maximum sustainable yield (MSY), that it is "50% probable that the stock has been depleted to below 6% of its carrying capacity and 97.5% probable that the current population is below 11% of *K*. There is even a 7% chance that the population has been depleted below 3% of *K*" (Hammond and Ellis 2002). 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 (Heessen 2003). See Figures 3 to 5. Scientific advice from ICES to close the fishery in 2006 was not taken (see section 8.1.1).

The Iberian Peninsula stock is likely distinct from the above stock. Official fisheries statistics for landings of *S. acanthias* from Portuguese waters have shown a decrease of 51% between 1987 and 2000 (DGPA, 1988-2001); future projections predict a further 80.3% decline of landed biomass over the next three generations due to stock depletion, without reduced exploitation effort (no management is envisaged).

The IUCN Red List assessment for the Northeast Atlantic is **Critically Endangered**, taking into account past, ongoing and estimated future reductions in population size exceeding 90%.

4.4.2 Mediterranean Sea and Black Sea

Squalus acanthias occurred in 5% of MEDITS trawls. It is very rare in the western Mediterranean, but one of the most abundant elasmobranchs in the eastern basin with an estimated biomass of 6,700t throughout the MEDITS area. No statistically significant abundance trend was identified during 1994–2004 (Serena *et al.* 2005). Jukic-Peladic *et al.* (2001) do not report any significant change in occurrence of *S. acanthias* in the Adriatic between 1948 and 1998, but Aldebert (1997) reports a decline in landings from the 1980s in the western basin. Anecdotal evidence from fishermen interviews in the Balearics also indicates that the directed fisheries of the 1970s ceased as a result of significant declines in abundance in bottom longlines and gillnets from the early 1980s (Gabriel Morey, personal communication cited in IUCN Shark Specialist Group red list assessment); MEDITS did not record *Squalus* in the Balearics.

There is a target fishery for spiny dogfish in the Black Sea. Fishing intensity and landings increased significantly from 1979 as prices rose, mainly targeting fish aged 8–19 years. A stock assessment (Virtual Population Analysis) indicates that the exploited Black Sea stock rose until 1981, when it reached

[1] There are considerable discrepancies between FAO data and data available from states or regional fisheries organisations, with FAO data 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) report 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 11). National data are more accurate, but can be harder to obtain.

226,700t, then decreased 60% to about 90,000t in 1992 (Prodanov *et al.* 1997). Landings data are incomplete in the last few years of this time series. The fishery continues. None of these fisheries are regulated.

The IUCN Red List assessment for Mediterranean and Black Sea *S. acanthias* is **Endangered**, on the basis of past, ongoing and estimated future reductions in population size exceeding 50%.

4.4.3 <u>Northwest Atlantic</u>
This population 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. Target domestic fisheries subsequently became established in the late 1970s/early 1980s to export *S. acanthias* to European markets and led to even greater depletion. US federal efforts to enable the stock to rebuild are hampered by high catches in Atlantic state and Canadian waters. There has since been a documented 75% decrease in mature female biomass. 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 to 1985-1988 and a 75% reduction in biomass of the mature females preferentially targeted by this fishery. Average weight of landed females halved from 4kg in 1987 to 2kg in 2000. Low pup abundance has continued for seven consecutive years. The 2001 pup estimate was the lowest in the 33-year time series for the fifth consecutive year. 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. 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).

The IUCN Red List categorises Northwest Atlantic *S. acanthias* as **Endangered**, on the basis of estimated reductions in population size exceeding 50%.

4.4.4 <u>Western North Pacific</u>
Japanese coastal and offshore fisheries (longline, trawl & gillnet) have historically taken large amounts of *S. acanthias* and catch per unit effort (CPUE) and landings from these fisheries have shown similar patterns of decline to those in the North Atlantic. Catches dropped from more than 50,000t in 1952 to only 10,000t in 1965 (Taniuchi 1990). The Government of Japan Fisheries Agency (2003) reported the following trends. Offshore trawl catches of *S. acanthias* 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 may indicate that stocks have declined to a similar extent during this period. In the Sea of Japan, *S. acanthias* 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%. This may represent a further decrease in an already depleted stock. *S. acanthias* also make up 16.8% of the shark bycatch associated with salmon gillnet fisheries (Nakano 1999). There is no stock assessment, but CPUE declines indicate depletion to significantly less than 50% of baseline, fishing pressure continues, and there is no management is in place to enable the stock to rebuild.

The IUCN Red List categorises this stock as at least **Endangered**, noting that it may prove to be Critically Endangered once a full regional review can be undertaken.

4.4.5 <u>Northeast Pacific</u>
Former intensive fisheries for *S. acanthias* in this region have collapsed twice during the past 100 years, in 1910 and in the late 1940s. This stock is likely still to be reduced to around 50% of baseline, but should be recovering under current low exploitation pressures in most of its range. In 1944, spiny dogfish supported the most valuable Canadian west coast fishery (Ketchen 1986). British Columbia 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 now the only US Pacific state with a directed spiny dogfish fishery, mostly in Puget Sound.

In 1995, this 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). Although *S. acanthias* is the predominant shark species taken off Alaska, which banned directed shark fishing in 1998, this is as bycatch from the region's groundfish fisheries and 90% is discarded (Camhi 1999). Catch rates have, however, increased 20-fold in the Gulf of Alaska in the late 1990s and five-fold in Prince William Sound in recent years (NMFS 2000).

The IUCN Red List categorises Northeast Pacific *S. acanthias* as **Vulnerable**, on the basis of an estimated reduction in population size greater than 30%.

4.4.6 South America
Squalus acanthias has, with other *Squalus* species, long been a common bycatch species in demersal fisheries in this region, but until recently was primarily discarded (Cousseau and Perrota (2000), Cañete *et al.* (1999)). Massa *et al.* (2002) analysed the impact of rising fishing effort from 1994 to 1999 in coastal areas of Argentina and Uruguay, based on biomass indices of chondrichthyan species, and identified a greater than 50% drop in abundance of spiny dogfish. With rising market demand in Europe, it is possible that these species may now become a more important coastal commercial species on the southeastern coast of South America (Uruguay and Argentina), where demand and fishing effort is increasing, there is no bycatch control, and landings have decreased (Van Der Molen *et al.* 1998). Commercial targeting of *S. acanthias* probably commenced around 2001, replacing declining landings of other depleted coastal sharks, particularly *Mustelus schmittii* and *Galeorhinus galeus* (Chiaramonte in lit. 2003). Landings are not, however, recorded by species or even by genus, seriously hampering analysis of trends.

The IUCN Red List categorises South American stocks of *S. acanthias* as **Vulnerable**, based on an estimated ongoing reduction in population size greater than 30%.

4.4.7 Australasia
Domestic demand for *S. acanthias* meat is low in Australia (Last and Stevens 1994). Reported New Zealand landings increased from 3,000-4,000 t during the 1980s to 7,000–11,000 t from the mid 1990s to the mid 2000s (Manning *et al.* 2004, Sullivan *et al.* 2005). However, some (if not most) of the apparent increase was probably a result of better reporting. It is not known if this level of fishing is sustainable, but catch rate analyses and trawl survey biomass indices show no sign of significant declines; indeed one of the main NZ stocks has shown a 5-fold biomass increase since 1991 (Manning *et al.* 2004, Sullivan *et al.* 2005). Recent anecdotal reports indicating increased demand for dogfish off New Zealand, with industry publications encouraging fishermen to land rather than discard the species, have been attributed to depletion of the Northwest Atlantic stock and increasing demand for imports to that region. Recognising this cumulative pressure from targeted fishery as well as discarded by-catch and the high vulnerability of the species to over-fishing, spiny dogfish were introduced to the New Zealand Quota Management System in October 2004 with a TAC of 12,660 t (M. Francis, pers. comm.).

4.4.8 South Africa
Spiny dogfish are considered a nuisance by South Africa fishermen and are not targeted commercially. Some 99–100% of the trawl bycatch of this species is discarded. (Smale pers. comm., in Fordham 2005).

The IUCN Red List assesses Australasian and South African stocks of *S. acanthias* as **Least Concern**.

4.5 Geographic trends
Squalus acanthias seems to have vanished from Western Mediterranean fisheries during the past 30 years (see section 4.2.2).

5. 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.

5.1 Directed fisheries
This is a valuable commercial species in many parts of the world, caught in bottom trawls, gillnets, line gear, and by sports fishers using 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 locally as scientific specimens for teaching purposes.

5.2 Incidental fisheries

Because it occurs in many areas where gill nets, longlines and trawls are used, these gears catch *S. acanthias*. Those with small mesh size may kill young individuals, which will not reach the retail market and may not appear in catch records if discarded (ASMFC 2003, Anon. 2003, 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 12). In the Southwest Atlantic, a study undertaken in Argentina and Uruguay estimated that the abundance of spiny dogfish populations dropped by 50% in just four years following the intensification of fishing activities, particularly the coastal whitemouth croaker *Micropogonias furnieri* fishery (Massa *et al.* 2002). Although bycatch impacts spiny dogfish, it is generally unreported and not included in national fisheries statistics.

6. <u>Utilisation and trade</u>

Compared to most other shark species, catch and trade in *S. acanthias* 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 9). Formerly also important for liver oil, it is now targeted primarily for its meat.

6.1 National utilisation

Spiny dogfish meat, derived from commercial target fisheries and landed bycatch, is eaten in Europe, Japan, South America and, to a lesser extent, in New Zealand and Australia (where it is considered coarse). 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 *S. acanthias* under the more palatable name "cape shark" (Fordham 2005).

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. For example, *S. acanthias* 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). *Squalus* heads are used as bait for other fisheries, in Morocco for instance (Fischer *et al.* 1987).

6.2 Legal trade

This species is recorded by its main importing countries under the customs Harmonised System, called Combined Nomenclature in the European Union (EU). The two product codes used are:

- 03026520 for 'Fresh or chilled dogfish of the species *Squalus acanthias*'
- 03037520 for 'Frozen dogfish of the species *Squalus acanthias*'.

Figure 9. 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).

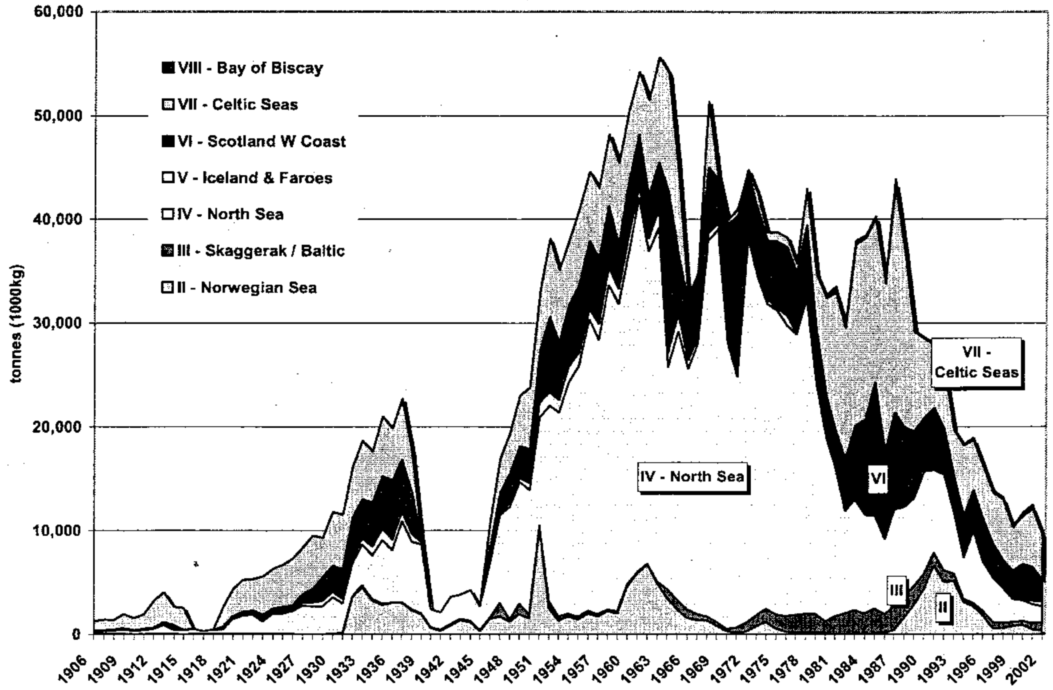

Table 3. Comparison between total reported landing and quotas for spiny dogfish in the European Community (EC) and UK North Sea waters* (tonnes)

		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
13. U K	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

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%. This may be a further decrease in an already depleted stock.

Australasia

Considered coarse, spiny dogfish meat is little valued in Australia (Last and Stevens 1994). Tasmanian recreational gillnet fisheries take substantial amounts (Simpfendorfer, pers. comm. in Fordham 2005). FAO data for 1977-1989 show a significant increase in spiny dogfish 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 2005) and reported landings increased from 3273t in 1991-1992 to 13,076t in 2001-2002 (Anon. 2003), possibly driven by growing exports to the EU (Figure 10, Table 5). 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. 2003).

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. 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, CITES Management Authority of Argentina, *in litt.* to TRAFFIC Europe, 27 October 2003). Discrepancies between South American exports of spiny dogfish (Figure 10; Table 5) and landings reported to FAO (Figure 6) by the same countries, suggest a lack of accurate reporting to FAO by some Members.

South Africa

Spiny dogfish are considered a nuisance by South Africa 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 2005).

Based on FAO and customs data (Eurostat import data and US customs export data) demonstrate that, in 2001, the EU represented the world largest market for spiny dogfish meat, consuming at least 65% of the world reported landings (Tables 1a and 5). 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% *S. acanthias*) 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 11). As European spiny dogfish stocks decline, demand is being met by imports from 25 countries, including emerging South American, African and Pacific suppliers (Table 5) 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 1b), and EU imports from Argentina that were recorded under the customs codes for *S. acanthias* in Eurostat (Table 5) for 2001. There are also discrepancies between Argentinean export data (which are not recorded at species level), and the imports noted above. The discrepancies between customs export and import data (Figure 11 & Table 5) and landings reported to FAO (Figure 7) by the same countries, indicate a lack of accurate reporting to FAO by some Members and possibly some misreporting/misidentification of species in trade.

Japanese imports of fresh *S. acanthias* meat 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).

Among the 20 nations recorded by FAO as trading in *S. acanthias* products, only Japan, New Zealand, South Africa and the United Kingdom reported exports of fins of this species (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.

The main purpose of the proposed Appendix II listing for this species is to ensure that trade is, in future, supplied by sustainably managed, accurately recorded fisheries that are maintained at levels that will not be detrimental to the status of the wild populations that they exploit.

6.3 Parts and derivatives in trade

Squalus acanthias meat is the most desirable and important product in trade and the main driver for target fisheries. It is usually transported frozen or fresh, occasionally smoked or dried. Other products are of lesser importance. The fins are utilised and must, therefore, enter international trade in large quantities but because of their relatively small size they are of low value and generally unrecorded. Trade in fins and tails is reported from the USA to China, Taiwan and Canada. Cartilage and livers (or liver oil) are also traded widely, for example being exported from USA to France, Italy, Switzerland and Taiwan where they are used for medicinal purposes (ASMFC 2003). Vannuccini (1999) reports hides being processed into leather and livers extracted. Teeth and jaws may also, very occasionally, be traded.

6.4 Illegal trade

In the absence of legally binding regulatory measures concerning catch or trade of *S. acanthias* 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, including transhipment, is illegal. 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.

6.5 Actual or potential trade impacts

Since foreign markets are in most cases the driving economic force behind *S. acanthias* fisheries around the world (see section 6.2, Figure 11; Table 5), unregulated international trade into European States 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 this species' populations. Fisheries that formerly caught *S. acanthias* as by-catch and largely discarded it are now moving towards landing and exporting its valuable products.

7. Legal instruments

7.1 National

National biodiversity legislation is not known to be in force for the purposes of conserving *S. acanthias* or its habitats, or regulation of trade. (Fisheries management measures are covered in section 8.) Some countries, for instance Sweden (E. Menhert, 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 *S. acanthias*. Some range States have included the species in their Red List; the species is listed as Vulnerable in Germany (Binot *et al.* 1998).

7.2 International

There are no international instruments for the conservation of *S. acanthias*; it is not listed on any international wildlife or fisheries agreement and has no international legal status. 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). Belgium responded to an invitation for member States to submit proposals for inclusion on this list in 2001 by nominating *S. acanthias* in the North Sea on the basis that it is a sensitive species and had declined significantly in their national waters, but it has not been added to the OSPAR list.

8. Species management

8.1 Management measures

Some RFOs have recently adopted shark resolutions to support improved recording or management of pelagic sharks taken as bycatch in the fisheries they manage. *S. acanthias* is not pelagic and are highly unlikely to be covered by these measures.

8.1.1 Northeast Atlantic

The conservation and management of sharks 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'. The first Total Allowable Catch (TAC – or annual catch quota) for *S. acanthias* was established in 1988 for this species, but only in the North Sea, a small part of the European waters used by this stock, and based on historic landings, not on scientific advice. Despite regular reductions, the TAC massively exceeded recent North Sea landings until end 2004 (Table 3), when the TAC for 2005 was reduced by 74% after only 25% uptake in 2004. Despite this major reduction, uptake of the 2005 TAC by the UK (which has the largest North Sea fisheries for this species) was less than 53% (information on EU uptake of the TAC in 2005 will be added when available). In 2005 the ICES Advisory Committee on Fisheries Management (ACFM 2005) reported: "All experimental assessments indicate that the stock is at a record low level. Frequency of occurrence of spurdog in trawl surveys has declined and although large shoals are still caught, the frequency of these has declined. The level of exploitation is unknown, but the continuous decline in landings indicates that fishing mortality has been, and continues to be well above sustainable levels." ACFM advised the European Fisheries Commission and December Council of Ministers that urgent measures, including closure of fisheries, were needed to prevent a collapse of the stock. They noted that stock is depleted and may be in danger of collapse. Target fisheries should not be permitted to continue, and bycatch in mixed fisheries should be reduced to the lowest possible level. They recommended that a TAC should cover all areas where *S. acanthias* are caught in the Northeast Atlantic (not just the North Sea) and this should be zero in 2006. Instead, the North Sea TAC for 2006 was reduced by only 15% and no other parts of the fishery are regulated. Norway manages its

S. acanthias fishery with a minimum landing size intended to enable sharks to mature before capture. This is of limited value for a migratory stock unmanaged elsewhere in its range.

8.1.2 Northwest Atlantic
Spiny dogfish fisheries are managed by Canadian and USA federal agencies and US Atlantic States.

In Eastern Canada, the first quota and management measures for spiny dogfish were put in place in around 2001/2, following some years of significantly increasing landings. These capped and allocated catches and bycatch at historic levels pending investigation of sustainable exploitation levels. Industry opposed these caps and exceeded the 2002 quota by 40%, while a programme of five years of data collection commenced in preparation for a stock assessment.

The first US management plan specifically for *S. acanthias* 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.

8.1.3 Northeast Pacific
USA and Canada conduct cooperative surveys for Northeast Pacific *S. acanthias*, but there is no coordinated, international management for the stock (Camhi 1999). *S. acanthias* fisheries in the US North Pacific receive minimal management. Off Alaska, they are regulated under an "other species" TAC (Alaska NMFS report 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. Concern over large catches in pupping grounds prompted closure of East Sound. In British Columbia they have been broadly managed through groundfish regulations since 1978, but only through TACs that are not science-based, significantly exceed recent landings, and do not restrict fishing effort.

8.1.4 Northwest Pacific
No management. Japan monitors shark stocks and will recommend, when necessary, the introduction of measures for the conservation and management of shark resources (CITES AC19 Doc.18.3).

8.1.5 Southern hemisphere
New Zealand has included *S. acanthias* in its Quota Management System (QMS).

8.2 Population monitoring
Population monitoring requires routine monitoring of catches, collection of reliable data on the indicators of stock biomass and good knowledge of biology and ecology. In most States, however, catch, bycatch and discard data for *Squalus* and most other shark and ray species are not recorded at species level, making stock assessments and population evaluation almost impossible. Relatively good landings data for *S. acanthias* are available for only a few major fisheries in the North Atlantic (Heessen 2003, Prodanov *et al.* 1997, ASMFC 2003, SARC 2003, NMFS 2003), North Pacific and New Zealand. Commercial landings and research survey data indicate that many stocks are seriously depleted.

8.3 Control measures
8.3.1 International
The International Plan of Action (IPOA) for the Conservation and Management of Sharks urges all States with shark fisheries to implement conservation and management plans. However, this initiative is voluntary and only some States have produced Shark Assessment Reports or National Shark Plans. At the 22nd meeting of the CITES Animals Committee in July 2006, the Intersessional Shark Working Group will report on the situation in 2006. This information will then be added here.

8.3.2 Domestic
Although several range States (China, Greenland and Cyprus, *in litt.* to the German Ministry of Environment (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, BMU), 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.

8.4 Captive breeding and artificial propagation
Not economically viable for commercial purposes, due to the slow reproductive and growth rates of this species. Some breeding may be occurring in specimens on public display in aquaria.

8.5 Habitat conservation
No efforts have been made to identify and protect critical *S. acanthias* habitat, although some is incidentally protected from disturbance inside in marine protected areas or static gear reserves.

8.6 Safeguards

8.7 Control measures
8.7.1 International trade
Current international trade regulations concerning trade controls of *S. acanthias* are almost non-existent, being limited to the usual hygiene measures for fishery products and/or to facilitate the collection of import duties. The specific customs codes for frozen and fresh or chilled *S. acanthias* (see 6.2) were established primarily to monitor exports and imports and enable tariffs to be collected (these are 6% in the EU). However, these codes are used by customs services on a voluntary basis. While in the EU, *S. acanthias* codes are used for economic reasons, in most States (Japan for instance), import of frozen *S. acanthias* is lumped with other shark products under a less specific code, No. 0303 7500, which does not allow estimation of trade at species level.

8.7.2 Domestic measures
None. Even where *S. acanthias* catch quotas have been established, such as in some North Atlantic countries, no trade measures prevent the sale or export of *S. acanthias* landings in excess of quotas.

9. Information on Similar Species

Although genus *Squalus*, characterised by the absence of an anal fin and the presence of two dorsal fins, each with a sharp spine, is under review (Compagno in preparation). *Squalus acanthias* is one of the few species that poses no taxonomic problems and is readily identifiable when whole (see 3.4). In contrast, it is uncertain how many species occur within the other two main *Squalus* species groups (Compagno 1984 and 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 primarily marketed in the north and the latter in the south of Europe. It also appears to be replacing *Galeorhinus galeus* imports from South America.

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 *S. acanthias*, for which samples have already been collected from Northeast and Northwest Atlantic specimens (Heessen 2003). DNA testing for the identification of *S. acanthias* 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 *S. acanthias* is being jointly developed by Mound Desert Island Biological Laboratory (MDIBL) and the Washington University Genome Sequencing Centre (*in litt.*, 7 December 2003).

10. Consultations

To be included later.

11. Additional remarks

11.1 Assessment of the spiny dogfish under FAO's recommended criteria for CITES listing

FAO note 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 (CoP13 Inf documents). 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). *S. acanthias* 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. Some stock assessments and other declines described for several *S. acanthias* fisheries are taken as an indicator of declining population size to 5-10% of historic baseline.

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

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

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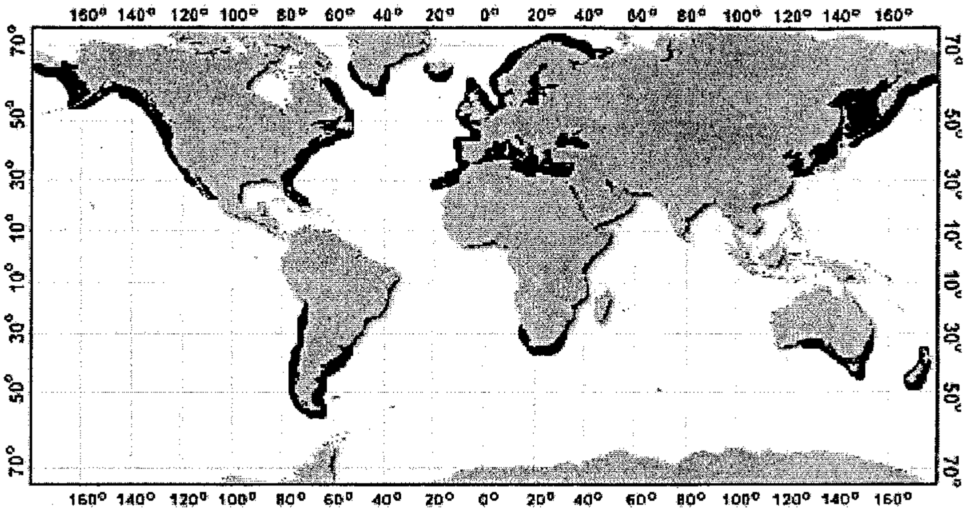

Figure 2. Global *Squalus acanthias* Spiny Dogfish distribution (*Source*: FAO 2003)

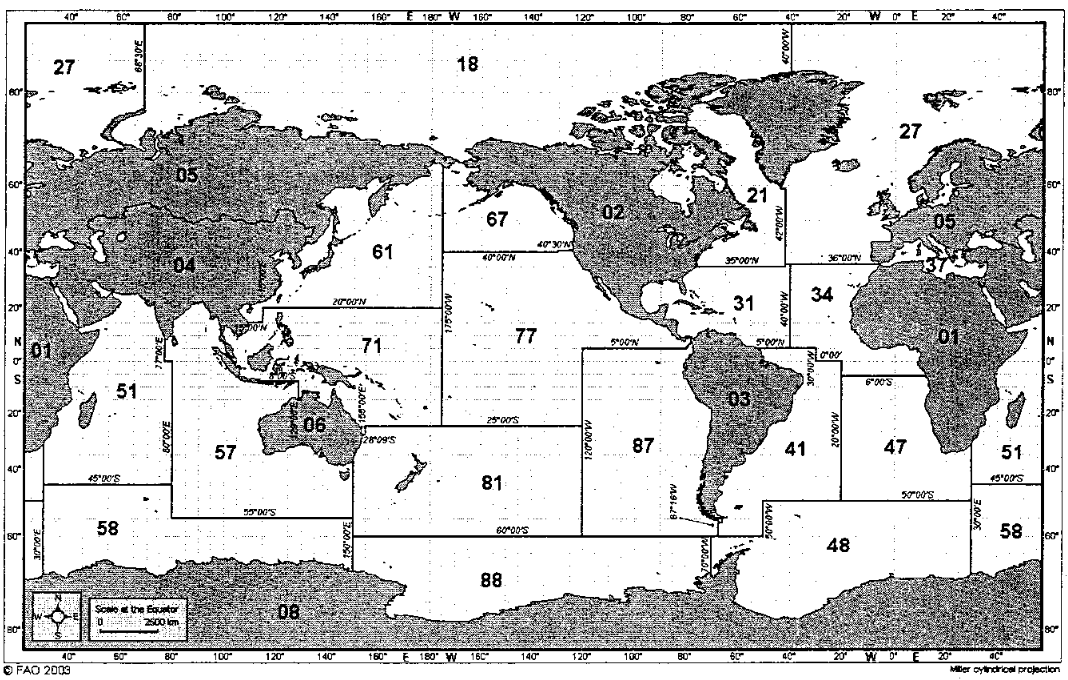

Figure 3. FAO fishing areas.

Spiny dogfish catches are mostly taken in the Atlantic Northeast: Area 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 & 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

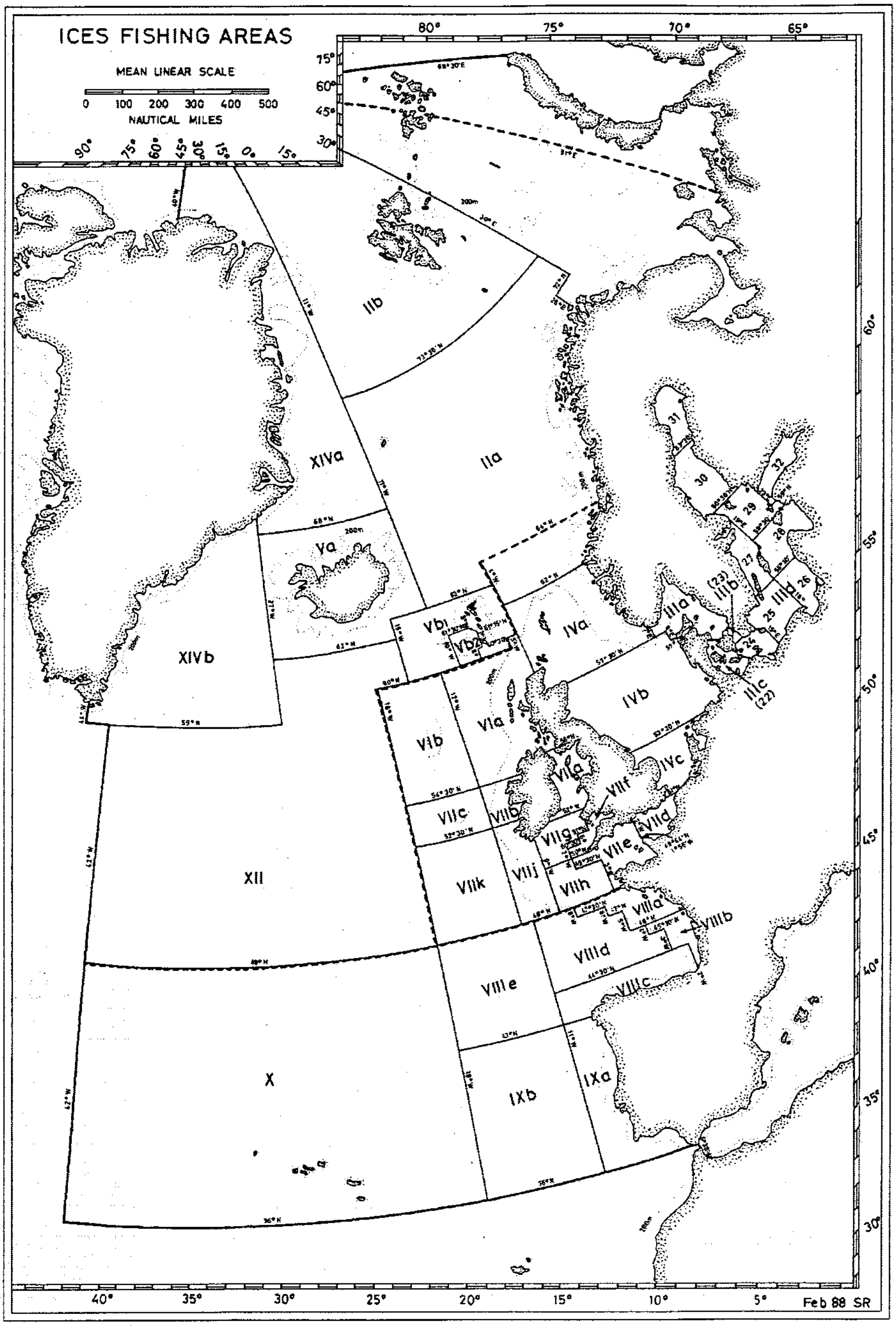

Figure 4. ICES fishing areas in the Atlantic Northeast.

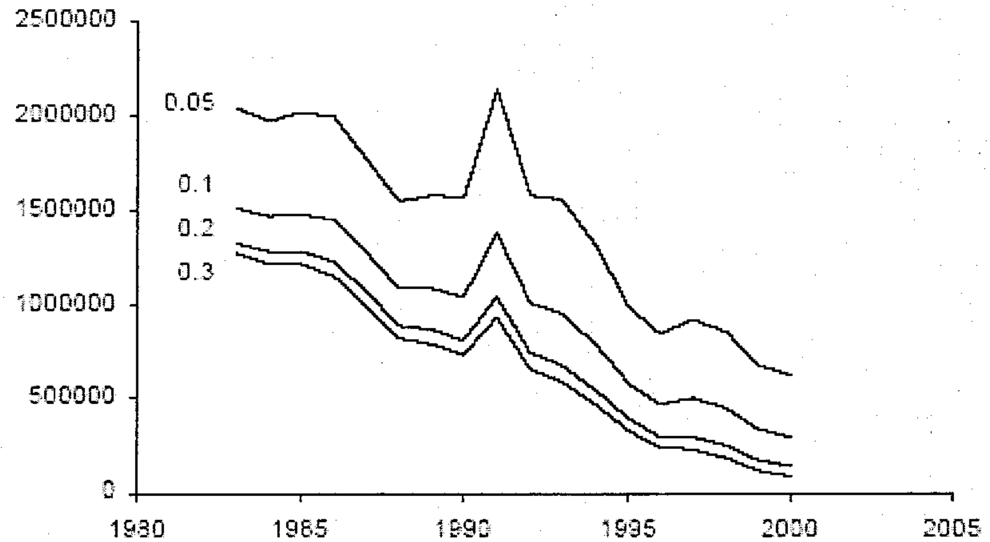

Figure 5. Trends in total population numbers of mature fish estimated using a Separable VPA analysis of the catch numbers at age data. Each line represents a different assumption for terminal F (0.05 - 0.3) on the reference age in the final year. Source: Figure 6.4.1.14, Heessen 2003.

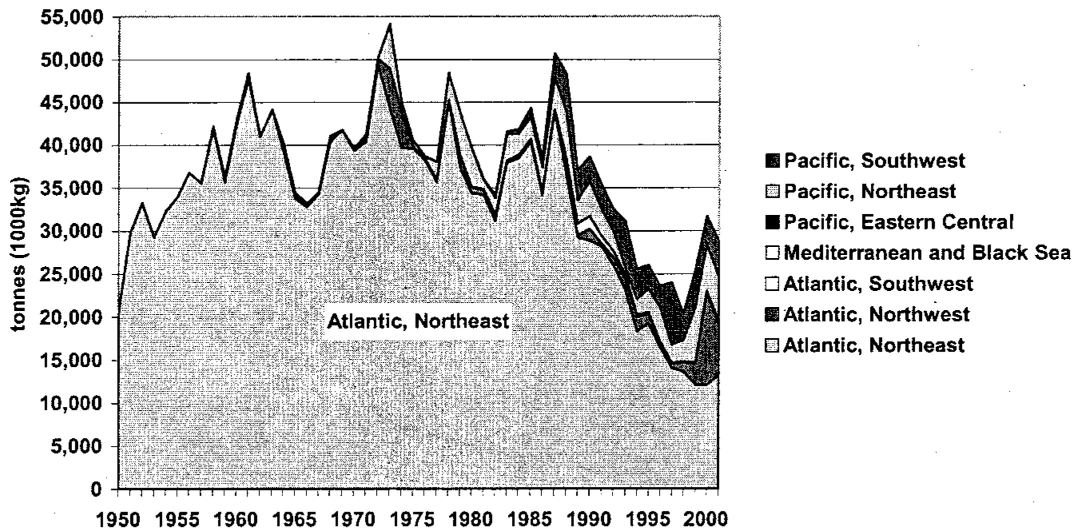

Figure 6. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported by FAO fishing area from 1950 to 2001 (*Source*: FAO via Fishbase).

Table 1. *Squalus acanthias* life history parameters (various sources in text)

Age at maturity (years)	female:	12 (NW Atlantic); 23 (NE Pacific); 15 (NE Atlantic)
	male:	6 (NW Atlantic)/ 14 (NE Pacific)
Size at maturity (total length cm)	female:	75 (NWA); 93.5 (NEP); 83 (NEA); 70-100 (Mediterranean)
	male:	60 (NW Atlantic); 59 (Australia); 59-72 (Mediterranean)
Longevity (years)	female:	40 (NW Atlantic)
	male:	35 (NW Atlantic)
Maximum size (total length cm)	female:	124 (NW Atlantic); 160 (N Pacific); 200 (Mediterranean)
	male:	100 (NW Atlantic)
Size at birth (cm)		20-33
Average reproductive age (years)*		Unknown, but over 25 years; ~40 years in NE Pacific.
Gestation time (months)		18–22
Reproductive periodicity		biennial (no resting stage, litters are born every two years)
Average litter size		1–20 pups (2–15 NW Atlantic, 2–11 Med), increases with size of female
Annual rate of population increase		2.3 % (N. Pacific)
Natural mortality		0.092 (NMFS – NW Atlantic)

Table 2. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by FAO fishing area (*Source*: FAO via Fishbase).

a) From 1992 to 2001

12.1 Area	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Atlantic, Northeast	26,040	23,155	18,334	19,281	16,508	14,102	13,634	12,098	12,092	13,228
Atlantic, Northwest	880	1,272	1,691	1,086	495	454	1,082	2,456	10,702	5,996
Atlantic, Southwest	0	0	0	0	0	0	0	0	0	0
Mediterranean & Black seas	727	485	213	182	144	96	97	143	204	287
Pacific, Eastern Central	1	3	1	1	0	1	5	24	8	3
Pacific, Northeast	2,356	830	1,776	2,744	4,000	2,100	2,501	6,439	5,363	5,181
Pacific, Southwest	2,592	5,429	3,601	2,753	2,477	7,232	3,064	4,409	3,362	4,192
TOTAL	**32,596**	**31,174**	**25,616**	**26,047**	**23,624**	**23,985**	**20,383**	**25,569**	**31,731**	**28,887**

b) From 1950 to 2001

12.1.1 FAO Area	**No. of fishing countries**	**Total catch (tonnes)**	**% of world total catch**	**2001 catch as % of period peak**
12.1.2 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%

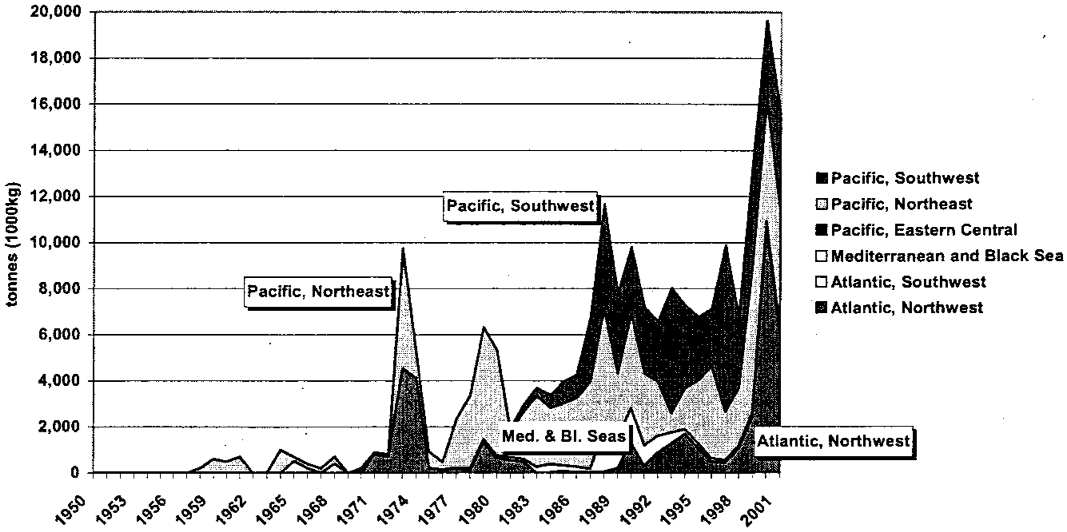

Figure 7. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by FAO fishing area, <u>excluding the Atlantic Northeast</u> (*Source*: FAO via Fishbase).

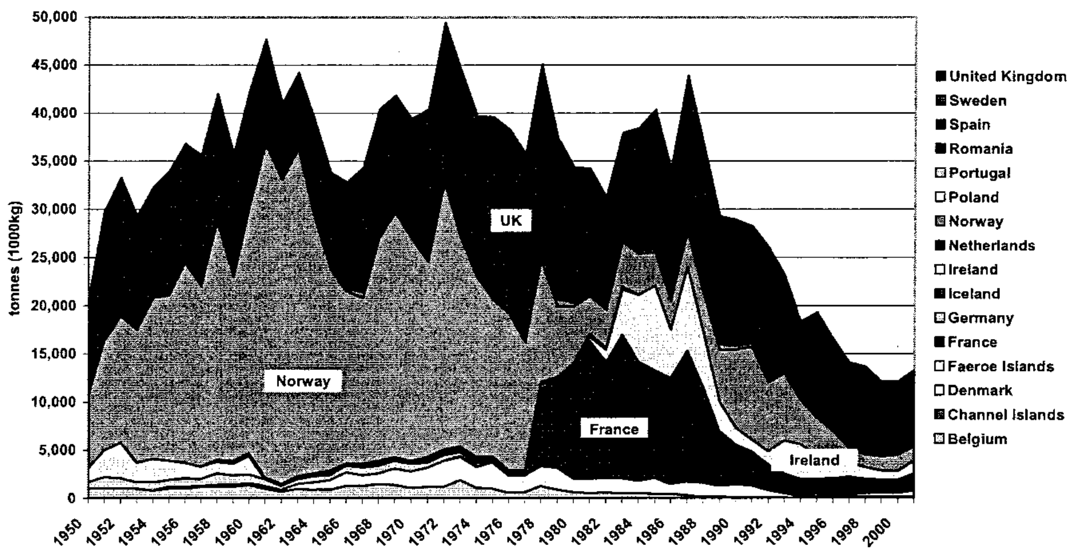

Figure 8. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) by country in the Atlantic Northeast, from 1950 to 2001 (*Source*: FAO via Fishbase).

Table 3. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported to FAO, by country in the Northeast Atlantic. (*Source*: FAO via Fishbase).

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%**

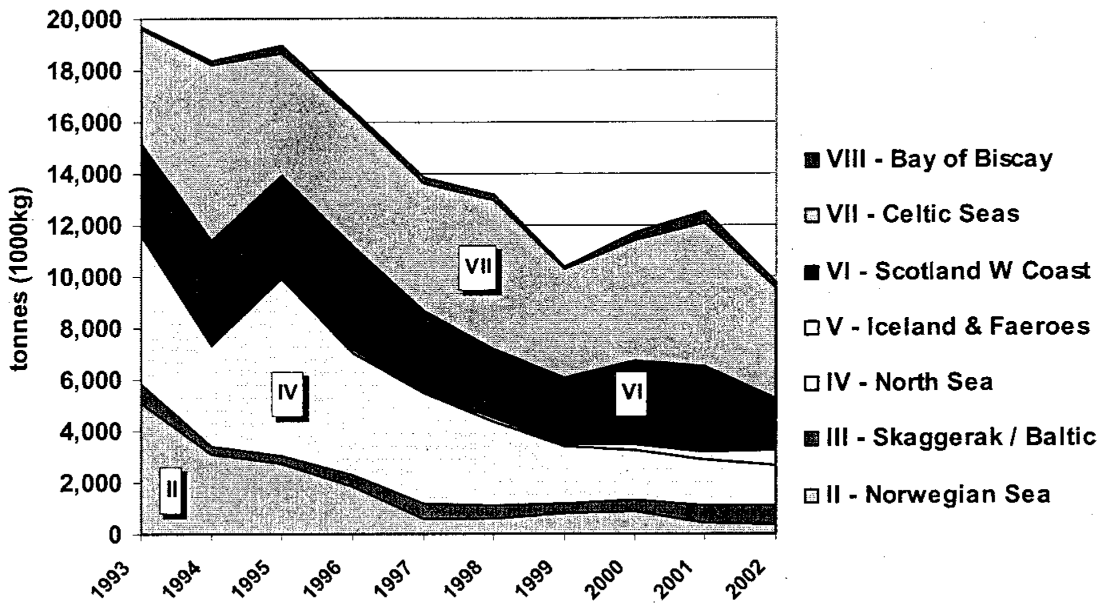

Figure 10. Total landings of spiny dogfish (*Squalus acanthias*) (tonnes) by ICES fishing areas, in the Northeast Atlantic region, from 1980 to 2002
(*Sources*: ICES Statlant Fisheries Statistics Database, November 2003).

Table 4. 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).

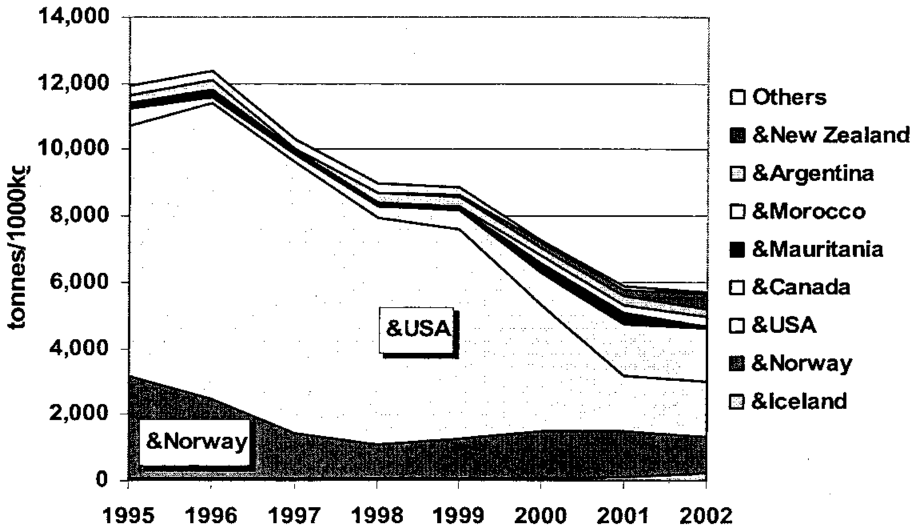

Figure 11. Origin of EU imports* of fresh or chilled (CN Code: 0302 6520) and frozen (CN Code: 0303 7520) 'Dogfish of the species *Squalus acanthias*'

(*Source*: Eurostat 2003)

* Excluding EU Member States, such as Germany –one of the main EU importer (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.

Table 5. 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)

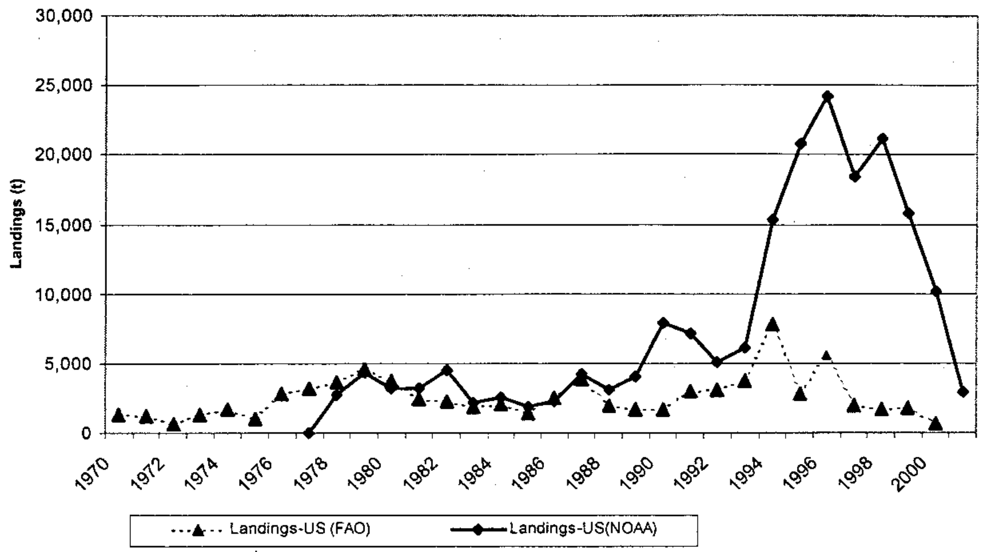

Figure 12. Comparison between US landings data recorded by FAO (source Fishstat capture production database) and US landings data reported by NOAA – National Oceanographic and Atmospheric Administration of NMFS –US National Marine Fisheries Service data (source commercial fisheries landings database at www.st.nmfs.gov).

Annex 1.

Scientific synonyms of *Squalus acanthias*

(*Source*: FAO Species Identification Sheet, 2003)

- *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.

Annex 2.

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

Alaska (USA)
Albania
Algeria
Angola
Argentina
Australia
Belgium
Canada
Canary Islands
Chile
China
Cuba
Cyprus
Denmark
Egypt
Estonia
Faeroe Islands
Falkland Islands (Malvinas)
Finland
France
French Polynesia (Kerguelen)
Gabon
Georgia
Germany
Greece
Greenland
Iceland
Ireland
Israel
Italy
Japan
Kerguelen Islands
Korea, Democratic People's Republic of
Korea, Republic of
Latvia
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

Annex 3. Descriptions of fisheries

13.1.1 Northeast Atlantic
The spiny dogfish fishery is by far the most important of the directed fisheries for elasmobranchs in the Northeast Atlantic (Figures 2 & 3). 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 by-catch in trawl fisheries. Other European countries make smaller landings (see Figure 7 and Tables 2a & b). Available studies indicate that there is a single Northeast Atlantic unit stock (Heessen, 2003). 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 (Figures 7 to 9).

According to Heessen (2003), between 1950 and 1970, Norwegian longliners working north of Bergen took 70% of the total international landings from the Northeast Atlantic. The main fishing grounds were off the west coast of Norway in winter-spring and on the banks north of Scotland in summer-autumn. This fishery collapsed in 1978 following an increase in fishing effort with automatic longline baiting and handling systems. Norwegian reported landings to FAO in 2001 were only 4% of their historic maximum taken in 1961 (Tables 2a & b).

French trawlers have also fished spiny dogfish since 1977 (Figure 7), working from the Faeroes south to northern Biscay, and by long-lining in the Celtic Sea and the western English Channel. Most of the French landings since 1979 have come from the Celtic Sea, where catches peaked at 6-8000t in 1981-84, and fell below 1000t by 1993. Similar patterns were observed in the English Channel, the North Sea, the west coast of Scotland, the Irish Sea and the west of Ireland. Overall, French landings decreased from just below 15,000t in 1983 to 1333t in 2001. French reported landings to FAO in the early 2000s were only 9% of their historic peak (Figure 7; Tables 2a & b).

Today, based on landings reported to the International Council for the Exploration of the Seas (ICES), the main fishing grounds for spiny dogfish are in the North Sea (ICES area IV), Northwest Scotland (area VI) and the Celtic Sea (VII), all of which have reported substantial reduction in landings from former peaks (Figure 8). Scottish and other UK trawlers and seiners have fished for spiny dogfish in these waters both as directed and by-catch fisheries since World War II. Landings by Scottish vessels accounted for 43% of the total of 16,000t landed from the Northeast Atlantic in 1996. For the overall period 1950 to 2001, UK vessels caught 38% of the total landings from the Northeast Atlantic (Table 2). UK landings in 2001 were 55% of the total reported landings from the Northeast Atlantic. According to the 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 8).

Northwest Atlantic
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 are 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). 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 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).

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).

Northeast Pacific

Spiny dogfish have been fished in British Columbia (Canada) for over 4000 years. 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. The fishery has since been constrained by low demand (Bonfil 1999) and spiny dogfish are now considered to be a minor, mostly by-catch, component of the region's groundfish fisheries. Only a few vessels currently target them. Trawlers take roughly 40% of regional landings and discard significant amounts (Bonfil 1999).

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).

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

Although there are only limited data on landings from the Mediterranean, some catch reduction has been observed (Aldebert 1997). Overall, the stock seems likely to be in a better state than in the Northeast Atlantic. There is a target fishery for 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. A stock assessment (Virtual Population Analysis) indicates that the exploited stock rose until 1981, when it reached 226,700t, then decreased 60% to about 90,000t in 1992 (Prodanov *et al.* 1997). Landings data are incomplete in the last few years of this time series. 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 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%. This may be a further decrease in an already depleted stock.

Australasia

Considered coarse, spiny dogfish meat is little valued in Australia (Last and Stevens 1994). Tasmanian recreational gillnet fisheries take substantial amounts (Simpfendorfer, pers. comm. in Fordham 2005). FAO data for 1977-1989 show a significant increase in spiny dogfish 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 2005) and reported landings increased from 3273t in 1991-1992 to 13,076t in 2001-2002 (Anon. 2003), possibly driven by growing exports to the EU (Figure 10, Table 5). 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. 2003).

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. 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, CITES Management Authority of Argentina, *in litt.* to TRAFFIC Europe, 27 October 2003). Discrepancies between South American exports of spiny dogfish (Figure 10; Table 5) and landings reported to FAO (Figure 6) by the same countries, suggest a lack of accurate reporting to FAO by some Members.

South Africa

Spiny dogfish are considered a nuisance by South Africa 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 2005).