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

Fifteenth meeting of the Conference of the Parties
Doha (Qatar), 13-25 March 2010

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. PROPOSAL

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

Qualifying Criteria (Conf. 9.24 (Rev. CoP14)[1]

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.

With the possible exception of the Northeast Pacific (Alaska to California) coastal stock, all northern hemisphere stocks qualify under this criterion. Their marked decline in population size (to <10–30% of historic baseline) and/or rapid recent rates of decline meet CITES and FAO guidelines for the application of decline to commercially exploited aquatic species.

Annex 2a 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 fisheries are largely unmanaged and/or poorly monitored in several other parts of its range, where inter-national trade demand for its high value meat is likely to increase as a result of the closure of EU fisheries. Based on the past fisheries' development it can be projected that stocks not meeting the criterion A may experience similar decreases within the next decade, unless trade regulation through CITES provides an incentive to introduce sustainable management or to improve existing monitoring and management measures in order to provide a basis for non-detriment findings and legal findings.

Annex 2b A: The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2 (a), or in Appendix I, such that enforcement officers who encounter specimens of CITES-listed species, are unlikely to be able to distinguish between them.

Complex patterns of export, processing and re-export of meat make it difficult to distinguish readily products from different stocks, as only DNA analysis is available for identification of processed products. A split listing is not recommended as it “could facilitate IUU fishing for spiny dogfish” stocks listed in Appendix II, “with catches laundered as taken from non-listed stocks. Such an outcome would be clearly undesirable and had the potential to undermine the effectiveness of conservation and management efforts for spiny dogfish globally” (FAO 2007). Stocks that do not qualify under Annex 2a (see Table 9) are proposed for listing under Annex 2b A.

Annotation: The entry into effect of the inclusion of *Squalus acanthias* in Appendix II of CITES will be delayed by 18 months to enable Parties to resolve related technical and administrative issues, such as the development of stock assessments and collaborative management agreements for shared stocks and the possible designation of an additional Scientific or Management Authority.

[1] CITES Standing Committee 58 under point 43 [SC58 Sum. 7 (Rev. 1) (09/07/2009)] has asked Parties, as they prepared for the upcoming CoP15, to i. a. clearly define in their listing proposals how they interpreted and applied Resolution Conf. 9.24 (Rev. CoP14). This interpretation is outlined in Annex 4 to this proposal.

B. PROPONENT

Sweden, on behalf of the European Community's Member States acting in the interest of the European Community*

C. SUPPORTING STATEMENT

Figure 1. Spiny dogfish *Squalus acanthias*

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 2
1.6 Common names:
English Spiny dogfish, spurdog, piked dogfish
French Aiguillat commun
Danish Pighaj
Italian Spinarolo
German Dornhai
Spanish Mielga, galludos, cazón espinozo, espineto, espinillo, tiburón espinozo, tollo, tollo de cachos

2. Overview

2.1 Spiny dogfish (*Squalus acanthias*) is a small migratory shark of temperate shelf seas. It is among the most vulnerable species of shark to over-exploitation by fisheries, because of its aggregating habit, late maturity, low reproductive capacity, longevity, long generation time and extremely low intrinsic rate of population increase, and falls into FAO's lowest productivity category for commercially exploited aquatic species.

2.2 To meet international market requirements, fisheries often target aggregations of mature (usually pregnant) females, which make up only a small proportion of the total stock. Stock assessments and other metrics of abundance (e.g. catch per unit effort and landings) document major depletion of several major northern hemisphere stocks, which qualify under the decline guidelines for listing in the CITES Appendices. Rising international market demand and the regu-lation or closure of depleted traditional fisheries are increasing pressures on other stocks. It can be projected that this will extend the pattern of serial stock depletion to other regions, unless fisheries and trade management action is taken.

2.3 International trade, primarily to satisfy EU market demand for high value meat, is the key driver of unsustainable *S. acanthias* exploitation worldwide. In 2000, the EU consumed >20,000t of *S. acanthias* (>11,000t from catches, >9,000t imported live weight). In 2006, Member States landed only 2,483t. EU fisheries presumably will close or reduce bycatch to 142t in 2010. Declared wholesale import price is rising. If EU consumption remains constant, international trade must supply >80% of EU consumption in 2009 and almost 100% in 2010. Consumer concern over stock sustainability is rising. Certification of fisheries and imports could be provided by CITES *non detriment findings* (NDFs). Other important markets include China (Hong Kong), Mexico, Thailand, Japan, Australia. Fins and some other products (liver oil, skin, cartilage) also enter international trade. Species-specific trade recording is very poor. DNA tests are available for traded products.

2.4 In 2009 NEAFC closed high seas fisheries for *S. acanthias.* EU target fisheries were closed in 2006. Management measures elsewhere have changed little since FAO (2007) noted that "the fisheries management record for *S. acanthias* is poor to extremely poor throughout the world... areas in which [it] is harvested need to be closely monitored to ensure that catches remain sustainable". Species-specific monitoring of landings is very poor. Only a few States manage fisheries in some regions, usually in a limited part of the range of straddling or shared migratory stocks. In many cases, this management is inadequate to reverse current declining trends and to ensure future sustainable fisheries.

2.5 An Appendix II listing is proposed for *S. acanthias* in accordance with Article II, 2 (a) and (b) of the Convention and Res. Conf. 9.24 (Rev. CoP14). Past and ongoing marked population declines in several Northern Hemisphere stocks, increased regulation of these fisheries and high international market demand are now driving fisheries elsewhere. These also need to be listed in order to prevent IUU fishing for depleted stocks listed in Appendix II and laundering of these catches as taken from unlisted stocks. "Such

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

an outcome would be clearly undesirable and had the potential to undermine the effectiveness of conservation and management efforts for spiny dogfish globally" (FAO 2007).

2.6 An Appendix II listing for *S. acanthias* will ensure that future international trade is supplied by sustainably managed, accurately recorded fisheries. NDFs and legal findings for exports will encourage effective fisheries management and monitoring, including the development of joint management for shared stocks, and address consumer concerns in the EU and worldwide. Improved collection of data on international trade will support catch data and stock assessments, thus complementing and reinforcing traditional fisheries management measures.

3. Species characteristics

3.1 Distribution

Squalus acanthias occurs in temperate and boreal waters of 0–12°C, with 6–11°C preferred (Campana *et al.* 2007), in the range States and FAO Areas listed in Annex 3. Fig. 2 illustrates global distribution and major current and historic fishing grounds. It is most common in coastal and shelf waters (10–200m) and targeted by fisheries inside 200-nautical mile Exclusive Economic Zones (EEZ). Distinct populations or meta-populations (groups of spatially separated groups or populations that interact at some level (Campana *et al.* 2007)) are separated by deep ocean, tropical waters, or polar regions. Some stocks undertake seasonal migrations, including trans-boundary and even trans-oceanic crossings (Campana *et al.* 2007; Fisheries Agency of Japan 2003; Hammond & Ellis 2005; Hanchet 1988; McFarlane & King 2003; NEFSC 2006; Templeman 1954, 1984; Wallace *et al.* 2009).

3.2 Habitat

This continental shelf species usually swims in large schools just above the seabed, from the intertidal to the shelf slope in waters 10–200m deep. Small juveniles may be pelagic. Dogfish usually migrate offshore in winter, into deeper warmer water off the edge of the continental shelf or in basins, returning to warm shelf waters in summer. Mature females move furthest inshore and aggregations are taken in target and bycatch coastal fisheries. Some stocks migrate into higher, cooler latitudes in summer. (Aasen 1962; Campana *et al.* 2007; Castro 1983; Compagno 1984; DFO 2007a; Fisheries Agency of Japan 2003; Hammond & Ellis 2005; Hanchet 1988; McMillan & Morse 1999; McEachran & Branstetter 1989; Ministry of Fisheries (NZ) 2008; Stehlik 2007.)

3.3 Biological characteristics

Squalus acanthias is widely acknowledged to be among the slowest-growing, latest maturing and longest-lived of sharks, with the lowest known intrinsic rate of population increase of any marine fish and longest known gestation of any vertebrate (Cortés 2002; ICES 2006; Nammack *et al.* 1985; NEFSC 2006; Smith *et al.* 1998; Taylor & Gallucci 2009). It is highly vulnerable to fisheries and very slow to recover from over-exploitation, particularly if mature females (of highest value in international trade) are targeted. Life history characteristics vary considerably between stocks (Table 2). Maximum age is 50 years in the Northwest Atlantic (NEFSC 2006) and over 80 years in the North Pacific (McFarlane and King 2003), with some estimates of 100 years (Compagno 1984). Larger females give birth to bigger litters of larger pups with higher survival rates (Whitehead *et al.* 1984; NEFSC 2006); a 100cm TL female carries on average four times as many embryos as a 70cm TL female (Campana *et al.* 2007). Fisheries have caused demographic changes in the Northeast Pacific stock (Taylor and Gallucci 2009). FAO (2001) warned that other risk factors should also be considered when evaluating CITES proposals, including selectivity of removals; age, size or stage structure of a population; social structure, including sex ratio; and vulnerability at different life stages (e.g. during migration or spawning). All of the above risk factors apply to Spiny dogfish, which aggregate in schools of pregnant females that are easily located by fishers and where the selective removal of the mature females can lead to reproductive failure. FAO (2007) noted that the "loss of large reproductive females and changes in the sex ratio under exploitation may represent an additional risk factor for some populations of this species, particularly given the potential impact on recruitment".

3.4 Morphological characteristics

A slender smooth-skinned dogfish (Fig. 1), grey, often with white spots, and a spine in front of each dorsal fin.

3.5 Role of the species in its ecosystem

Small *Squalus acanthias* feed on planktonic crustaceans and squid. Diet switches with increasing size to a variety of bony fishes and some invertebrates (Compagno 1984; ASMFC 2002; Stehlik 2007). Its abundance does not appear to affect the recruitment of groundfish (Link *et al.* 2002 in NEFSC 2006, Bundy 2003). Very slow growth and low metabolic rate indicate that it does not consume large quantities of prey (Compagno 1984).

4. Status and trends

4.1 Habitat trends

Coastal development, pollution, dredging and bottom trawling affect the coastal or benthic habitats upon which *S. acanthias* and their prey are dependent (ASMFC 2002).

4.2 Population size

"Effective population size" (Resolution Conf. 9.24 (Rev. CoP14) Annex 5), is the number or biomass of mature females[2], particularly in heavily fished populations dominated by males[3]. Stock assessments usually estimate mature female spawning stock biomass (SSB). If not, conversions below follow Wallace *et al.* (in press 2009)[4].

Northeast Atlantic: *S. acanthias* population size was estimated at between 100,000 and 500,000 mature individuals by Heessen (2003) (Fig. 3). Mature females targeted by fisheries likely comprised no more than 25% of this total: 25,000 to 125,000 individuals[3]. The fishery closed too recently to support recovery.

Northwest Atlantic: Wallace *et al.* (in press 2009) estimate ~3.6 million mature females in Canadian waters, ~3.5 million on the Scotian Shelf and ~78,000 on Georges Bank[4] (a stock shared by the US and Canada). The SSB of the US Atlantic population has rebuilt since the end of the 1990s, with a 75% probability that it is above the target SSB of 167,800t (reduced from 200,000t) at 194,600t (ASMFC 2008a, Rago and Sosebee 2008, Fig. 4), representing ~65 million mature females at 3kg (NEFSC 2006). Stock projections indicate that the SSB will inevitably begin declining again to a low around 2017, because poor pup recruitment since 1997 means that aging females will not be replaced over the coming decade by maturing juveniles (Fig. 5, ASMFC 2008a).

Mediterranean and Black Sea: Mediterranean biomass was estimated as 6,700t (~350,000 fish averaging 2kg), concentrated in the Northern Adriatic and South Aegean (Serena *et al.* 2005 & in press 2009, Fig. 13). Less than 10% of individuals captured were mature, indicating a population of no more than 170,000 mature females[3]. Black Sea biomass was estimated at ~60,000t, with about six million juveniles aged four years old recruited annually to the fished stock (Fig. 18, Daskalov 1997) and 90,000t (Fig. 19, Prodanov *et al.* 1997). A more recent estimate (source unknown) is ~100,000t (Dr B. N. Kotenev, *in litt*. 2006), or 50 million sharks (average 2kg each), likely including some 2.5 million mature females.

Northeast Pacific: Biomass in the Vancouver area is estimated at ~40t total biomass and 30 million individuals, with a similar biomass in Alaska: ~2–3 million mature females in total (Wallace *et al.* in press 2009).

Northwest Pacific: No known assessments of spawning stock biomass. Based on a similar area of habitat and history of unmanaged fisheries collapse, numbers of mature females may be similar to the Northeast Atlantic (see above).

Southern hemisphere: FAO (2007) extrapolated from a rough estimate of 100,000t biomass on the Argentinean shelf to a total population of 50 million. Argentina estimated 137.000t *S. acanthias* at their continental shelf in 2007 (INIDEP 2009a). This could equate to some 2.5 to 5 million mature females, at 5–10% of the total, excluding stocks on smaller areas of shelf off Uruguay and southern Brazil. It must be stated that reliable estimation of stocks may be influenced by seasonsal shifts and/or annual variability in the ocean current regime prevailing in the area, thus hindering interannual comparison of abundance indexes, particularly if only a small portion of the species distribution range is considered. New Zealand Ministry of Fisheries (2008) produced the first stock assessment in New Zealand, but was unable to produce any estimate of total biomass. Biomass estimated in three important areas totalled 36,000t (~1 million mature females).

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[2] It is noted that this aspect of the FAO guidance for evaluating commercially exploited aquatic organisms for listing in CITES (FAO 2001) is highly relevant.

[3] The expected ratio of individual mature males to female Spiny dogfish is 2:1, because males mature much earlier than females. The present ratio in the heavily fished US Atlantic population is 4:1 (Rago and Sosebee 2008).

[4] During 1978 to 2002, mature females (≥80 cm) on average comprised 2.7% of the total estimated [Scotian Shelf] population whereas mature males (≥60 cm) comprised 66.1%. On George's Bank, the percentage of mature females in the sampled population averaged 3.8% from 1986 to 2003, and 6.1% in 2003. (Wallace *et al.* in press 2009).

4.3 Population structure

S. acanthias is often migratory and usually strongly segregated by age and by sex. Mature animals may comprise only 10% of the total population, in a male:female ratio of 2:1 (unfished[3]).Their aggregating habit makes it easy for good catches to be obtained, even from a seriously depleted stock, with valuable large pregnant females targeted on inshore feeding grounds. Target fisheries for females result in a very unnatural population structure. Between 1988 and 2002, 93% of landings in US Atlantic waters were female, and in six of those years the ratio was over 99% (ASMFC 2003). The female population is now concentrated between 75 and 95cm (Fig. 6), with very few over 100cm or immatures below 70cm. Removal of the largest females greatly reduces pup production, because small recently mature females bear small litters of small pups with low survival rates. Very poor juvenile recruitment (Fig. 7) leads to a heightened risk of stock collapse (NEFSC 2006, Rago and Sosebee 2008). *S. acanthias* are also caught as small as 50cm long (~4–5 years old), and fully recruited into the Northeast Atlantic fishery at ~70–80cm (~8 years old) (Heessen 2003), before females mature. Taylor and Gallucci (2009) describe demographic changes in the Northeast Pacific population following intensive fishing in the 1940s: faster growth to maturity at a smaller size and larger litters. This increased the population growth rate by only 1%.

Campana *et al.* (2007) determined that only part of the Northwest Atlantic population undertakes regular North–South seasonal migrations, others may only migrate occasionally. They concluded that these dogfish "have many characteristics of a metapopulation, whereby some dogfish aggregations colonize or depart Canadian waters *en masse* at periodic multi-year intervals, and then remain resident for many years at a time." Taylor (2008) noted similar characteristics in the Northeast Pacific. This complicates stock assessment and fisheries management.

4.4 Population trends

Population trends (see Tab. 1) are presented in the context of Annex 5 of Conf. 9.24 (Rev. CoP14) which defines "a marked historical extent of decline' as a percentage decline to 5%–30% of the baseline[5], depending upon the productivity of the species and a 'marked recent rate of decline' as a percentage decline of 50% per cent or more within the last 10 years or three generations, whichever is the longer". Estimated generation time for *S. acanthias* is 25–40 years (Tab. 2). The timescale against which recent declines should be assessed is 75 to 120 years, greater than the historic baseline for most stocks. Trends in mature females must be considered where possible, since the male:female ratio can reach 4:1 (Rago and Sosebee 2008). There is usually a correlation between declines in landings, declining catch per unit effort (CPUE), and reduced biomass. Where no stock assessments are available, CPUE and landings are used as metrics of population trends, although the aggregating habit of *S. acanthias* means that these can remain high for declining stocks until populations are very seriously depleted. Better fishery-independent metrics of stock status include overall population size structure (e.g. Fig. 6) or proportion of catches containing large numbers of individuals (e.g. Fig. 11).

Incomplete species-specific records hamper analysis of trends. FAO sometimes records *S. acanthias* as 'dogfish nei (Squalidae)' (e.g. U.S. Atlantic catches, Fig. 10) or other 'shark' categories. Turkey reports no *S. acanthias*, despite taking 85% of the Black Sea catch of 2000t (Dr Kotenev, *in litt*. 2006), but reports large catches of 'smooth-hounds'.

The most important 20th Century *S. acanthias* fisheries were in Northeast Atlantic, Northwest Pacific and Northeast Pacific shelf seas; all harvested ≥50,000t/year at their peak, prior to collapse. Northwest Atlantic landings peaked recently at under 30,000t/year before entering management. Mediterranean and Black Seas fisheries were smaller. Most of the southern hemisphere fisheries are more recent and smaller scale. Regional population or fisheries trends are described below, drawing upon FAO data, stock assessments, Shark Assessment Reports, and IUCN Red List documentation (Fordham 2005; Fordham *et al.* 2006). Tab. 8 summarizes global and regional Red List assessments.

4.4.1 <u>Northeast Atlantic</u>

One stock is considered for management purposes. Landings peaked at ~50,000t in 1972, decreased steeply from the mid 1980s, and by 2006 were only 7% of the peak (Tab. 3). Occurrence and frequency of large catches in fishery-independent surveys also fell (Fig. 11, ICES WGEF 2006, 2009). Analytical stock assessments (Heessen 2003; Hammond and Ellis 2005) determined that the stock has declined to between 2% and 11% of initial biomass in recent years (e.g. Fig. 12). ICES WGEF (2006) concluded that current

[5] Annex 5 deems a decline to 5–20% of baseline to be more appropriate for consideration of listing marine species in Appendix I, and between 5% and 10% above this for considering listing in Appendix II.

depletion levels range from 5.2–6.6% relative to 1905 and from 5.2–7.1% relative to 1955, and warned that the stock is in danger of collapse. The Iberian Peninsula stock may be distinct. Landings per unit effort in the Basque trawl fleet have declined steeply in recent years (ICES WGEF 2006). Landings from Portuguese waters declined 51% between 1987 and 2000 (DGPA, 1988–2001), with future projections of a further 80% decline of landed biomass over three generations due to stock depletion, without reduced exploitation effort (Rui Coelho *in litt*, in Fordham *et al.* 2006). However, EU target fisheries closed in December 2006.

4.4.2 Northwest Atlantic

Foreign fleets fished off the US and Canadian coast from the early 1960s to mid 1970s. Landings peaked at 25,620t in 1974 then declined. US landings rose from a few hundred tonnes in the late 1970s to around 4500t during 1979–1989, then to 27,200t in 1996, supplying European market demand. Although quota management significantly reduced US landings to 1,000–3,000t since 2001, Canadian landings have risen to an average of 2,500t since 2000 (Fig. 20). Concern that this combination of catches could be unsustainable if they are being taken from a shared stock will be addressed by the 1st Transboundary Resource Assessment Committee (TRAC) assessment shortly before CoP 2010.

Regular stock assessments determine trends in US biomass and stock structure (NEFSC 2006; Sosebee and Rago 2006; Rago and Sosebee 2008). Abundance and biomass indices increased from the early 1970s to1992, in response to the establishment of 200 mile EEZs and reduced fishing pressure in the 1970s. Biomass declined after 1993 with target fishing for mature females (Fig. 6 and 21). Female spawning stock biomass (SSB) peaked at about 250,000t in 1990, declined >80% to less than 100,000t (= $B_{threshold}$, under the first Spiny Dogfish Management Plan) in 1999, then increased to 194,600t (greater than a reduced SSB Target) in 2008 (Figs. 4–5). Average mature (>80cm) female length fell from 94cm in the 1980s–early 1990s to 84cm (Fig. 6). Litter sizes fell and average pup length declined from 30cm to 27cm, reducing survival rates. Average weight of females halved from 4kg in 1987 to 2kg in 2000, but is now rising again. Immature female biomass is falling because recruitment of pups was at a record low during 1997–2003 and has recovered only slightly since then (Fig. 7). The ratio of mature males to mature females has increased from 2:1 to 4:1. Mature male biomass is stable and immature male biomass is rising (survival of discards is high, e.g. Rulifson 2007), masking the status of the spawning stock. There are a number of concerns with this stock (Teiko Saito, Acting Assistant Director, International Affairs, US Fish and Wildlife Service *in litt*. to Jochen Flasbarth, 15th April 2009): The size frequency of the female population is concentrated between 75 and 95cm, with very few above 100cm or below 70cm. The sex ratio is skewed towards males. The Atlantic States Marine Fisheries Commission (2008) warns that “spawning stock is projected to decline sharply around 2017 due to a persistent trend of low recruitment that began in 1997” (aging adult females will not be replaced by the very small numbers of pups born since 1997). There is concern that projections of future biomass (Fig. 5) include assumptions about pup survivorship and selectivity of gear that may be optimistic. There is still danger of stock collapse if fishing mortality is not carefully regulated.

Stocks in Canadian waters show fairly similar trends to that in the US, increasing from the early 1980s to early 1990s, to around 500,000t of trawlable biomass (>25,000t mature female biomass), then declining to ~300,000t, with no estimate of mature female biomass. The shared stock on Georges Bank declined steeply after 1992. The Scotian shelf stock is high but variable. The small isolated southern Gulf of St Lawrence stock, established in 1985, is declining and may disappear due to lack of recruitment (Campana *et al.* 2007).

4.4.3 Northwest Pacific

S. acanthias were fully exploited in the Sea of Japan since before 1897. Fisheries are described by Taniuchi (1990) and the Fisheries Agency of Japan (2003, 2008). Harvests from 1927 to 1929 were 7,500 to 11,250t, accounting for 17–25% of Japan’s overall catch. Catches decreased from over 50,000t in 1952 to 10,000t in 1965 (Fig. 22). Offshore trawl catches exceeded 700t in 1974–1979, then fell to 100–200t in the late 1990s and up to 2001. Recent catches have averaged <200t in the Pacific and <100t in the Sea of Japan. A longline fishery in Amori prefecture has taken catches of ~250t in recent years. The trend in landings is ~99% decline from over 50,000t in the 1950s. *S. acanthias* CPUE fell around 80–90%, from 8–28 ‘units’ in the 1970s to 1–5 between 1995 and 2001. Catch rates in Danish seines and bull trawls fell 90% from 100–200kg per haul in the mid 1970s to 10–20kg per haul in the late 1990s. Fig. 23 presents CPUE and fishing effort for a number of Japanese Spiny dogfish fisheries. Fisheries Agency of Japan (2003) reported that the current stock level is extremely low. Effort has since risen, resulting in a slight increase in offshore trawl and longline fishery landings (JFA 2008), and the stock may be decreasing further. Russia does not target this species, but bycatch is increasing (Kotenev *in litt*. 2006). *S. acanthias* makes up 16.8% of the shark bycatch in salmon gillnet fisheries (Nakano 1999). Dogfish are landed in Korea, but no species-specific data are available.

4.4.4 Northeast Pacific

Historic (1940) biomass is estimated at 300,000–500,000t (Ketchen 1969) or 392,000–549,000t (Taylor 2008). An intensive fishery in the 1940s peaked at 50,000t/year, caused a 60% decline in abundance in three years in a gillnet fishery (Barraclough 1948 cited in Taylor 2008) and reduced the stock by an estimated 40–70% (Wood *et al.* 1979). Synthetic production of vitamin A led to the collapse of the liver oil market. Landings fell to <3000t in 1949 and remained low for two decades (Ketchen 1986, Bonfil 1999). Demographic changes in the depleted population have increased its intrinsic rate of population growth by 1% (Taylor and Gallucci 2008). The fishery recommenced in 1975, supplying meat to Europe. The last stock assessment in 1987 (Saunders 1988) was based on incorrect life history data (Taylor 2008). Overall stock size and level of recovery is uncertain. Biomass estimates for 2004 range from <30% of the 1935 stock, to substantial recovery from the 1940s fishery (Taylor 2008). There are two discrete inshore stocks, in the Strait of Georgia and Puget Sound, and a coastal stock extending from Alaska to Baja California but centred in Canadian waters. Commercial CPUE fell in Puget Sound in the 1990s; this stock is considered to be at a low level of abundance (Palsson *et al.* 1997; Wallace *et al.* in press 2009). Biomass in the Southern Strait of Georgia was possibly slightly higher in 2001 than 1997, but there has been a substantial population decline since 1987 (Palsson *et al.* 2003). CPUE appears stable in the Strait of Georgia longline fishery, but mean fish size and fecundity has fallen and 80% of landings in the commercial fishery are juveniles. Only 40% of the quota is being landed (King and McFarlane in press 2009). Declines in CPUE, abundance, percentage of sets with *S. acanthias* and female size are reported from Hecate Strait and adjacent waters in northern British Columbia (Figs. 24, 25 and 26) – but low abundance indices coincide with high abundance in the Gulf of Alaska (Fig. 27). Wallace *et al.* (in press 2009) consider the stock to be stable. Canadian Pacific catches are ~5,000–7,000t, at 30–50% of the quota. Less than 1,000t/yr is reported by the US.

4.4.5 Mediterranean Sea

FAO aggregates data for the Mediterranean and Black Sea. There is considerable under-reporting. *S. acanthias* and other small sharks are usually recorded as ‘smooth-hounds nei’ or ‘dogfish sharks nei’. Landings (Fig. 14) increased during the late 1970s and 1980s as the fishery developed and declined steeply in the 1990s. Most catches are reported by Italy and Turkey (Fig. 15) and classified as ‘smooth-hounds nei’. Neither country reports Spiny dogfish landings to FAO, although Italy fishes small sharks in the northern Adriatic where *S. acanthias* is common (Figure 13) and Turkey fishes small sharks in the northern Aegean (Kabasal 1998) and Black Sea (Figures 16 and 17). There were no statistically significant abundance trends in eastern basin surveys (Serena *et al.* 2005; Jukic-Peladic *et al.* 2001), but *S. acanthias* has declined greatly in the western Mediterranean and is now very rare. Balearic fishermen abandoned a 1970s directed fishery for Spiny dogfish following significant declines in abundance in bottom longlines and gillnets during the early 1980s (Gabriel Morey, Direcció General de Pesca, Balearic Islands, in Fordham *et al.* 2006). Aldebert (1997) reported a decline in landings from the 1980s in the western basin. No *Squalus* were recorded in the Balearics by the 1994–2004 MEDITS trawl survey, and very few records elsewhere in the western basin (Fig. 13).

4.4.6 Black Sea

Data for *S. acanthias* in the Black Sea are also incomplete (Fig. 16). Most of Turkey’s landings are from the Black Sea (Kabasal 1998, Düzgüne *et al.* 2006). Artisanal fisheries operated before the 1970s. Fishing effort increased significantly from 1979 as prices rose and trawling was introduced, mainly targeting 8–19 year old dogfish (Prodanov *et al.* 1997). Analytical stock assessments (Prodanov *et al.* 1997; Daskalov 1997; Figs. 18 and 19) indicate that the Black Sea stock increased as top predators declined and primary productivity increased to 1981 then decreased 40–60% to 60,000–90,000t in 1992. Algal blooms affected northwest shelf fisheries in late 1980s/early 1990s, and the Ukrainian fleet declined in the early 1990s. The analytical basis for a reported stock recovery to ~100,000t (Dr Kotenev, VNIRO, *in litt*. 2006) was not provided. Turkey is the only State still operating a significant fishery for Spiny dogfish in the Black Sea and reportedly now lands ~85% of the Black Sea catch of 2000t (Dr Kotenev, *in litt*. 2006). Turkish statistics record peak landings at over 11,000t in 1980-84, followed by fluctuations and a decline of over 95% to 430t (Turkish State Statistic Institute, 1971-2004; Düzgüne *et al.* 2006).

4.4.7 Southwest Atlantic

S. acanthias has long been a common discarded bycatch of demersal fisheries in this region (Cousseau and Perrota 2000, Canete *et al.* 1999). Landings are not always recorded by species, but in categories such as Cazon and Gatuzo that may include Spiny dogfish and other small sharks, potentially hampering analysis of trends. Very few landings are reported under the recently introduced logbook code for Spiny dogfish. Massa *et al.* (2004) and García de la Rosa *et al.* (2004) appear to identify a significant drop in abundance of *S. acanthias* in Argentinean waters compared with a study by Otero *et al.* (1982), but the trends are unclear. Massa *et al.* (2007) identified localised declines of Spiny dogfish in some coastal areas (an 80% decline in Bonaersense and 50% in Central region), but found no clear abundance trend on the southern Patagonian shelf where the biomass is highest. Figure 31 illustrates estimates of biomass in the Patagonian Region.

Table 1. Summary of population and catch trend data						
Area	Year	Basis	Index	Trend	Source	Reliability*
Northeast Atlantic	1905–2005	Analytical stock assessment	Model estimates of biomass	93.4–94.8% depletion since 1905 92.9–93.4% depletion since 1955	ICES WGEF 2006	5
	1985–2005	Mean values	CPUE	>75% decline since 1985	ICES WGEF 2008	4
Western Mediterranean	1957–1995	Trawl surveys and landings	Occurrence	Decline from 1980s	Aldebert 1997	3-4
	1970s–1980s	Fisher interviews & trawl surveys	Occurrence	1970s target fishery closed in '80s. No survey records in '90s.	Fordham *et al.* 2006, Serena 2005	3-5
Eastern Mediterranean	1948–2002	Trawl surveys	Biomass	No trend	Serena 2005, Jukic-Peladic 2001	4
	1980–2006	Catch data	Landings data, Turkey (includes Black Sea?)	90% reduction from >10,000 to <1,000 *per annum*	FAO Fishstat	2
Black Sea	1981–1992	Analytical stock assessment	Model estimate of biomass	60% decline	Prodanov *et al.* 1997	5
	1979–1992	Analytical stock assessment	Model estimates of biomass, recruitment	40% decline	Daskalov 1997	5
	1979–1992	Catch data	All landings data	65% decline from >12,000 to <4,000 *per annum*	Prodanov *et al.* 1997	2
	1980–2004	Catch data	Turkish landings data	95% decline from 11,000t to 430t	Düzgüne *et al.* 2006	2
Northwest Atlantic US	1988–2005	Analytical stock assessment	Swept area biomass	75% decline in SSB† 1988–2005 80% decline in SSB 1990–2005	NEFSC 2006	5
	2004–2008	Analytical stock assessment	Swept area biomass	Temporary recovery in female SSB to 80% of 1990 level	ASFMC 2008	5
	1987–2005	Analytical stock assessment	Surveys	50% decline in average weight of females	NEFSC 2006	5
	2010–2017	Analytical stock assessment	Spawning stock biomass projection	60–80% decline in female SSB projected due to poor recruitment	ASFMC 2008 (Fig. 5)	4
Northwest Atlantic Canada	1980s–2007	Trawl surveys	Biomass	Increase early 1980s to 1990s, 40% decline to present. SSB an unquantified decline since 1980s.	Campana *et al*. 2007	5
Northwest Pacific	1952–2000s	Official catch data	Landings	>99% decline from ~60,000t to ~550t	Fisheries Agency of Japan 2003, 2004, 2008. Taniuchi 1990	2
	1970–1990s	Surveys and fisheries records	CPUE	80–90% decline in trawl and seine fisheries		4
Northeast Pacific	1940s	Catch data	Landings	90% decline from 50,000t to <3,000t.	Ketchen 1969, Taylor 2008	2
	1940s	Commercial fishery data	CPUE	60% decline in gillnet fishery in three years	Barraclough 1948, Taylor 2008	3–4
	1940s		Stock assessment	40–70% decline in biomass	Wood *et al*. 1979	5
	1980–200?	Commercial and survey data?	CPUE?	Puget Sound stock at low level - *Information not yet obtained*.	Palsson in press	3–4?
	1970s–2000s	Longline surveys and fishery,	CPUE, proportion of mature females	Strait of Georgia: Biomass low, no CPUE trend, 65–80% decline in nos. of mature females caught	Palsson *et al.* 2003, King & McFarlane in press	3–4
	1984–2003	Trawl & longline surveys,	CPUE, proportion of mature females	Hecate Strait: Decrease in CPUE and presence in sets; >95% decline in mature females	Wallace *et al*. in press 2009	4
	1980s–2004	Trawl & longline surveys	Biomass and catch rates	Increasing or stable in Alaska	Wallace *et al*. in press 2009	4
Southwest Pacific (NZ)	1990s – 2007	Trawl survey	CPUE	No trend	MoF NZ 2008	4
Southwest Atlantic (Argentina)	1991–2007	Trawl surveys	Biomass	20% decrease in Bonaerense, 50% decrease in Central Region no trend in Southern Region	Massa et al. 2007	4
	1978–2008	Scientific surveys	Biomass (?)	Stable in Patagonia (Fig. 31)	National Shark Action Plan of Argentina (2009)	4?

†Female spawning stock biomass *From FAO (2007)

4.4.8 Australasia

Domestic demand for *S. acanthias* meat is low (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), probably due to better reporting. Catch rates and trawl survey biomass indices are largely stable or increasing (Manning *et al.* 2004, Sullivan *et al.* 2005, Ministry of Fisheries 2006). *S. acanthias* were introduced to the New Zealand Quota Management System in 2004 because of pressures from a target fishery exporting to Asian and Europe, discarded bycatch and its vulnerability to over-fishing, The total allowable commercial catch is 12,660t, slightly above earlier landings. Annual catches during 2004–2007 were only 7,180–8,311t (Ministry of Fisheries 2008).

4.4.9 South Africa

Spiny dogfish are considered a nuisance by South African fishermen and not targeted; 99–100% of trawl bycatch is discarded. There may be a bycatch in the Namibian hake fishery, but no landings are reported. (Fordham 2005.)

4.5 Geographic trends

Squalus acanthias has vanished from the Western Mediterranean during the past 30 years (see 4.2., 4.4.5.). Stocks have appeared and disappeared in some parts of the Canadian Atlantic shelf (Campana *et al.* 2007).

5. Threats

The principal threat to this species worldwide is over-exploitation, particularly when mature females are targeted. FAO (2007) warned that, the "loss of large reproductive females and changes in the sex ratio under exploitation may represent an additional risk factor for some populations of this species, particularly given the potential impact on recruitment". Recruitment failure was reported for several years in US Atlantic waters. Survival rates are high if unwanted bycatch is returned alive to the sea in good condition (Rulifson 2007).

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. Mature females are preferentially targeted because they meet the minimum market size requirements while males normally do not (Salsbury 1986). Their flesh is of high value in Europe. Some earlier fisheries were driven by demand for liver oil, prior to the production of synthetic vitamin A.

5.2 Incidental fisheries

S. acanthias occurs as bycatch in many gillnet, longline and trawl fisheries. Bycatch and discards are generally unreported. NEFSC (2006) noted high levels of bycatch in the Northwest Atlantic, estimating that the mean of discards (16,700t) was more than double that of U.S. reported landings (7200t). Rulifson (2007) reported a 55% mortality rate for dogfish caught in gillnets and 0% for those caught in trawls. US National Marine Fisheries Service estimates 50% mortality for discards from otter trawls and 30% from gillnets. Massa *et al.* (2002) estimated that *S. acanthias* abundance fell in the Southwest Atlantic when fisheries for other species intensified. This reasoning has been denied by the Argentinean Government (R. Sanchez, National Director of Fishery Planning, personal communication, Sept. 2009). Because discards affect all size classes and survival is often high, this has a smaller impact upon stock status than target fisheries for mature females.

6. Utilisation and trade

Catch and trade in *S. acanthias* are relatively well-documented compared to most other sharks, partly due to the long history of domestic and international utilization of its oil, meat and fins. Species-specific recording is inconsistent, however, and global trade data are not comprehensive for this species. Annex 4 provides additional information on imports to the EU and traditional national utilisation within Europe, including unpublished data sources.

6.1 National utilisation

Spiny dogfish meat, derived from commercial target fisheries or bycatch, is consumed fresh, frozen or smoked in Europe, Japan, South America - except Argentina - and, to a lesser extent, New Zealand, Australia and North America. Markets favour large mature females. The main products utilised are backs (the product left after removing head, guts, skin, fins and belly flaps, sometimes used for fillets), the belly flaps from large females, fins (including tails) and liver oil (Salsbury 1986). Landings may be used to produce fishmeal and fertiliser if markets for human consumption are not available (Compagno 1984). Cartilage and hides are sometimes utilised, and whole specimens for scientific teaching purposes.

Belly flaps from the largest females are smoked and marketed as *Schillerlocken* (Rose 1996), a delicacy retailing at around EUR 36/kg in Germany. Consumer resistance is occurring because of high prices and concerns over sustainability. The British Columbia hook and line fishery, which exports all catches, is currently undergoing Marine Stewardship Council (MSC) assessment. Fisheries and trade certification would improve product marketing in Europe.

Backs are widely consumed, particularly in the UK where *S. acanthias* is known as *rock salmon, huss* or *huss tail*, and used mainly in fish and chips. It retails for around EUR 36/kg. In Germany, meat is sold as *See-Aal* (sea eel). In France, fresh meat is sold as *aiguillat commun* or *saumonette d'aiguillat* at about EUR 10/kg. In Sweden, fresh dogfish retails at between EUR 9–14/kg but is relatively uncommon. In Japan, Spiny dogfish is used in sashimi and surimi, and market price is about EUR 7/kg. US seafood industry groups have promoted *S. acanthias* fillets under the name "cape shark" (Fordham 2005).

Recreational catches of *S. acanthias* became a significant proportion of total US landings from 2001 (NEFSC 2006), but account for less than 10% of New Zealand's total Spiny dogfish catch (Ministry of Fisheries Science Group 2008).

6.2 Legal trade

There are no global trade data for *S. acanthias*, which is included by FAO in various generic shark trade groupings. Most is reported in the commodity categories 'Dogfish (Squalidae) fresh or chilled' and 'Dogfish (Squalidae) frozen', but these categories contain data for species other than *S. acanthias*[6], so are not meaningful for this analysis. Trade and processing chains for meat may involve a number of different countries. For example, unprocessed (round) product from Atlantic Canada may be sent to the United States for processing, then exported to Europe (Salsbury 1986). Some of the major traders, including the EU (traditionally the major market for and predominant importer of *S. acanthias*) and the US (a significant exporter), do record imports and exports of some types of Spiny dogfish meat. The US records fresh and frozen dogfish exports, all of which are *S. acanthias*. The EU uses the Customs Harmonised System, called Combined Nomenclature (CN), with two commodity codes:

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

Canada, like most major exporters, classifies *S. acanthias* exports as "Dogfish and other sharks". This component of total shark landing values was small prior to 1999 (DFO 2007b), but now makes up most of the total Canadian shark quota and, because the entire *S. acanthias* catch is exported, the majority of dogfish and shark exports.

While the catch of the 27 EU Member States has declined (Tab. 4), their combined catch of 2,483t (live weight) still accounted for about 15% of the total catch reported to the FAO in 2006, prior to closure of the EU fishery in 2007. In addition, the EU imported a further 4,177t (processed weight) of *S. acanthias* in 2007. Using a conversion factor of 1.33[7], EU imports in 2006 equated to around 5 500t live weight, suggesting that the total supply on the EU market in 2006 was about 8,000t. This is a 60% decline since 2000, when the EU consumed over 20,000t (landings >11,000t, imports >7,280t, Tabs. 4–6). Very little product is exported or re-exported from EU Member States to outside the EU. All EU market demand for *S. acanthias* must be met from imports in coming years, but reported EU imports of *S. acanthias* have been falling (Tab. 5 and Fig. 28) as catches declined in exporting countries. Over the same period, declared wholesale unit value of imports increased very slightly from EUR 2.43/kg to EUR 2.62/kg.

Major sources of reported *S. acanthias* imports into the EU are the US, Canada and Norway (Tab. 5, Fig. 28). U.S. and Norwegian supplies have declined, but Canada's importance has increased. Morocco and New Zealand have also increased reported exports to the EU since 1999; however Morocco's exports decreased after a peak of 529t in 2005. Those of New Zealand declined from a peak of around 450t in 2002, then

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[6] A comparison of import data for Spiny dogfish by EU member countries with FAO import data for the two FAO dogfish categories indicated that FAO data exceeds the EU data significantly, suggesting that the FAO data includes a substantial quantity of product other than Spiny dogfish.

[7] FAO conversion factor for chondrichthyes, fresh, chilled. gutted

increased in 2005. The EU imported at least 74% of US *S. acanthias* exports in 2007, with exports also going to Thailand, China (Hong Kong), Mexico, Japan, and Australia.

The three top suppliers (USA, Canada, Norway) of Spiny dogfish product to the EU over the last decade (see Tab. 5) and other suppliers (Argentina, Chile, New Zealand) report landings of *S. acanthias* to FAO, but others do not. This partly may be due to poor identification and species level recording of landings. Roughly 40 to 80% of Argentina's 'shark' exports have entered the EU in the past six years. Products imported as *S. acanthias* may have included other small sharks, *Galeorhinus galeus* ('Cazon') and *Mustelus schmitti* ('Gatuzo'), or *Squalus* may have been landed as Cazon or Gatuzo (G.Chiaramonte, *in litt*. to the IUCN Shark Specialist Group, April 2006). The value of *S. acanthias* landings has increased in recent years as these former target species became depleted. The vast majority of Argentina's exports of *Squalidae* sharks are as frozen products (Fig. 29). Since 2008, Argentina records S. acanthias on the species-specific level (as *Tiburon Espinoso*) and modified their customs regulations to track back landings in more detail (R. Sanchez et al. in press, 2009). Spiny dogfish fins have been traded internationally (Salsbury 1986), for example from the US to China, Taiwan and Canada, and from Canada to Hong Kong. However, trade is generally not recorded at species level, only under a generic Customs code that specifies form (dried, salted, unsalted, frozen *etc*.), therefore data on global imports of *S. acanthias* fins are not readily available. However, records for commodity codes for 'Dogfish and other sharks' indicates that all reported imports are frozen product, which is then re-exported to China.

6.3 Parts and derivatives in trade

S. acanthias meat is the most desirable and important product in trade and the main driver for target fisheries. It takes the form of backs, belly flaps (*Schillerlocken*, only produced from large females) and fillets (which can also be taken from smaller males). It is usually transported frozen or fresh, occasionally smoked or dried. Fins and tails enter international trade in bulk, but are of not usually recorded by species. Cartilage and livers (or liver oil) are traded widely, for example exported from the US to France, Italy, Switzerland and Taiwan, for medicinal purposes (NEFSC 2006). Hides can be processed into leather (Vannuccini 1999). Teeth and jaws may, very occasionally, be traded.

6.4 Illegal trade

There are no legally binding regulatory measures concerning catch or trade of *S. acanthias* at national or international level and no trade transaction, including transhipment, is illegal. Even where directed shark fishing is prohibited (e.g. in Alaska), trade in products of shark bycatch is legal, unlimited, and likely comprises large volumes of *S. acanthias*.

6.5 Actual or potential trade impacts

Long established demand from international markets is the driving economic force behind most *S. acanthias* fisheries globally (see 6.2), and has directly impacted stocks of this species (see 4.4). Unregulated international trade into EU Member States from range States with inadequately managed fisheries is now the main threat to this species, particularly since the closure of EU fisheries. Fisheries that formerly caught *S. acanthias* as bycatch and largely discarded it are now moving towards landing and exporting its valuable products, likely driving further depletions.

7. <u>Legal instruments</u>

7.1 National

Although some range States have included the species in their Red List, national biodiversity legislation is not known to be in force to conserve *S. acanthias* or its habitats, or for trade regulation (see below for fisheries management).

7.2 International

Northern hemisphere stocks are listed in Appendix II of the Convention on the Conservation of Migratory Species (CMS). CMS is currently developing an instrument for the conservation of migratory sharks, which may in due course stimulate conservation actions for the species. The OSPAR Convention for the Protection of the Marine Environment of the North-east Atlantic includes *S. acanthias* in its list of Annex V Threatened and/or Declining Species and Habitats and will consider proposals for actions, measures and monitoring in 2009. *S. acanthias* is currently (2009) proposed for inclusion in Annex III (list of species whose exploitation should be regulated) of the Barcelona Convention's Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean.

8. Species management

8.1 Management measures

The International Plan of Action for the Conservation and Management of Sharks urges all States with shark fisheries to implement conservation and management plans, but these measures are voluntary; fewer than 20 States have produced Shark Assessment Reports or Shark Plans. NEAFC has prohibited fisheries for *S. acanthias* (see below), but most Regional Fisheries Organisations focus on pelagic fisheries and bycatch and will not regulate this demersal species.

8.1.1 Northeast Atlantic

The EU Common Fishery Policy manages EU fish stocks through a system of total allowable catch (TAC or annual catch quotas) and reduction of fishing capacity. The large North Sea *S. acanthias* fishery has been under TAC management since 1988, with TAC reductions in 2002 and annually since 2004. ICES recommended closure of the target fishery and mini-misation of bycatch in 2005 (ACFM 2005), advice adopted by the Council of Ministers in December 2006, by closing all target fisheries and adopting a 5% bycatch TAC throughout EU waters. The TAC was further reduced in 2008 and halved in 2009 to 1422t, with the intention of limiting bycatch to 142t in 2010. A 100cm TL maximum landing size protects mature females. Council Regulation (EC) No. 1185/2003 prohibits the removal of shark fins and discarding of the body by EC vessels in all waters and other vessels in EC waters. The Community Plan of Action (CPOA) for the Conservation and Management of Sharks (2009) should help to rebuild depleted shark stocks fished by the EC fleet, including *S. acanthias*. Measures outlined in the CPOA will be implemented at Community and Member State level and the Community will seek their endorsement by all relevant RFMOs. Norway banned fishing and landing of Spiny dogfish in the Norwegian EEZ and international waters in ICES areas I-XIV in 2007, although bycatch must be landed. Only small inshore vessels (<28 m long) are allowed to fish for Spiny dogfish with traditional gear inshore and in territorial waters. The fishery may be closed when catches reach the previous year's level. A 70cm minimum landing size is intended to enable *S. acanthias* to mature before capture. In 2008 the North-East Atlantic Fisheries Commission (NEAFC) adopted ICES advice and prohibited Spiny dogfish fisheries within the NEAFC Regulatory Area in 2009, also recommending that its Contracting Parties take equivalent conservation measures within waters under their national jurisdiction (NEAFC Recommendation VIII 2008).

8.1.2 Northwest Atlantic

In Canada, rising landings led to the introduction of a directed catch quota of 3,200t in 2002, capping and allocating catches to fixed gear licenses and trawl vessels at historic levels pending investigation of sustainable exploitation levels. The quota was reduced to 2,500t in 2004. Catches exceeded quota only in 2002. A five year commercial data collection programme ended in 2006 and is reported in DFO (2007a) and Campana *et al.* (2007). This will be used to guide future management decisions, including collaborative stock assessment and management with the US. Canada's National Shark Plan was adopted in 2007. US federal agencies and the US Atlantic State Fisheries Commission have managed *S. acanthias* since 2000, following a decade of intense unregulated fishing and the development of the first US management plan. 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 has been occurring at unsustainable levels nearshore, particularly in Massachusetts. The stock has recovered slightly since 2004, when fishing limits were the same in federal and state waters, trip limits discouraged targeting, landings were 50% below those in 2003 and less than 40% of the quota was taken. Increases in state waters quotas and trip limits following the partial recovery in 2004 have allowed target fishing to recommence. However, the Atlantic States Marine Fisheries Commission (2008) warns that "spawning stock is projected to decline sharply around 2017 due to a persistent trend of low recruitment that began in 1997" (Fig. 5). Rebuilding will take another 15–30 years.

8.1.3 Northeast Pacific

US and Canada both conduct cooperative surveys for Northeast Pacific *S. acanthias*, but there is no coordinated, international management for the stock (Camhi 1999). West coast US stocks are minimally managed despite increasing interest in fisheries off Alaska and Washington State. Federal management of *S. acanthias* fisheries in the US North Pacific commenced in 2006 with trip limits pending stock assessment and development of quotas. Off Alaska, they are regulated under an "other species" TAC. Washington State includes *S. acanthias* in bottomfish management plans, but there are few species-specific measures. The directed fishery is subject to mesh restrictions and a pupping ground has been closed to fisheries. The Canadian Spiny dogfish fishery has been managed since 2006 under a pilot Integrated Fisheries Management Plan for six commercial groundfish fisheries in British Columbia. The objective is to improve management through bycatch monitoring, reduced discarding and improved monitoring. Individual vessel quotas have been introduced for trawl (32%) and hook and line (68%) dogfish fisheries and a temporary quota for bycatch. Canadian catches have ranged between 4,000t to 5,000t in recent years, under a 15,000t TAC based on 1987 biomass estimates and rates of population increase now known to be incorrect (Wallace *et al.* in press). The British Columbia hook and line fishery is currently undergoing full assessment for Marine Stewardship Council certification.

8.1.4 Northwest Pacific

No management of *S. acanthias*. Japan monitors shark stocks and will recommend, when necessary, the introduction of shark resource conservation and management measures (Japanese Fisheries Agency 2003).

8.1.5 Southern hemisphere

New Zealand has included *S. acanthias* in its Quota Management System (QMS) since 2004. Landings have never reached the TAC of 12,660t. Shark Plans have been adopted by several South American States, including Argentina (2009), Chile and Uruguay (2008). Argentina set up new guidelines to deepen the control and surveillance of fishing activity and closed large areas to fisheries to protect juveniles (Fig. 30). This area coincides with the area of maximum concentration of the Spiny dogfish as shown in the literature (i.e. García de la Rosa et al., 2004). Argentina increased the number of observers on vessels catching sharks and has applied a Satellite Monitoring Systems for its industrial fleet.

8.2 Population monitoring

Population monitoring requires routine monitoring of catches (essential when catch limits are set), collection of reliable data on indicators of stock biomass, and good knowledge of biology and ecology. Most States do not record catch, bycatch and discard data at species level for *S. acanthias* (or other sharks), making stock assessments almost impossible. Relatively good landings data are available for only a few major fisheries in the North Atlantic, North Pacific and New Zealand. Commercial landings, research data and stock assessments in States where monitoring takes place indicate that many managed and unmanaged stocks are seriously depleted. Similar appraisals cannot be undertaken where monitoring data are not available. Accurate trade data provide a means of confirming landings and compliance with catch levels, allow new catching and trading States to be identified, and provide information on trends in trade. Trade data for Spiny dogfish are, however, poorly reported. A CITES listing would provide a reliable mechanism to track trends in *S. acanthias* catch and trade (Lack 2006).

8.3 Control measures

8.3.1 International

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 authorities on a voluntary basis. In the EU *S. acanthias* codes are used for economic reasons, whereas in most importing and exporting States, import of frozen *S. acanthias* is grouped with other shark products under a less specific code, HS 0303 7500, which does not allow estimation of trade at species level.

8.3.2 Domestic

A few domestic fisheries management measures are delivering sustainable *S. acanthias* harvests; others have failed to do so (see 8.1) because restrictive catch limits were introduced too late to prevent stock depletion. Even where catch quotas are established, no trade measures prevent the sale or export of landings in excess of quotas and international trade demand appears to have driven unsustainable exploitation in some US Atlantic State waters. Otherwise, the usual hygiene regulations apply to control of domestic trade and utilisation. Although a listing in Appendix II of CITES would not prevent unsustainable fisheries, it would prevent the export of products from such a fishery and restrict incentives for unsustainable exploitation where domestic market demand is limited.

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

Argentina protects reproductive aggregations of sharks and rays during the summer in the Argentine-Uruguayan Common Fishing Zone, and the area known as El Rincón in the Argentine EEZ (see Sánchez et al. 2009 in press, for details). No other States are known to have identified and protected critical *S. acanthias* habitat, although some habitat is incidentally protected from disturbance inside in marine protected areas or static gear reserves.

9. Information on similar species

Whole *Squalus acanthias* are readily identifiable from other members of this genus. With regard to meat, the product most commonly traded for this species, *S. acanthias* is found in the same processing and retail markets as catsharks *Scyliorhinus* spp., smooth-hounds *Mustelus* spp., and Tope Shark *Galeorhinus galeus*. There are indications (see section 4.4.7) that *S. acanthias* could be supplementing exports of *Mustelus* spp. (gatuzo) and *G. galeus* (cazon) exports from depleted South American stocks. There are likely to be difficulties associated with the identification of some *S. acanthias* products, where fillets and trunks are marketed and transported with those of other small sharks. Identification guides will differentiate between the most common meat products of *S. acanthias* and other species and can readily be backed by the use of genetic identification tools for enforcement purposes (see section 11.2.2).

10. Consultations

All 62 range states of *Squalus acanthias* have been addressed within the consultation process. Thirteen responses had been received by end August 2009. In addition FAO as well as RFMOs have also been contacted. Additional information and recommendations received by this process have been considered.

11. Additional remarks

11.1 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.

11.2 Implementation issues

11.2.1 CITES Authorities

It would be most appropriate for the Scientific Authority for this species to be advised by a fisheries expert. They would need to be capable of making a non-detriment finding based upon stock assessments and a fishery management plan that defines sustainable harvest levels (e.g. quotas).

11.2.2 Identification of products in trade

It will be important to utilise species-specific commodity codes and identification guides for this species' meat, to distinguish it from other small sharks that may be marketed as more valuable *S. acanthias* (particularly in the EU). The preparation of improved visual guides for *S. acanthias* trunks may be necessary. DNA testing is available and can be used to confirm identification and product origin for enforcement purposes. Several research laboratories are working on species and stock identification (Pank *et al.* 2001, Shiviji *et al.* 2002, Chapman *et al.* 2003, Keeney and Heist 2003, Stoner *et al.* 2002) and NOAA's Marine Forensic Laboratory in the US has developed a global collection of *S. acanthias* samples for identification not only of the species but also regional stocks (methodology is described in Greig *et al.* 2005). Cost per sample processed starts from US$20–60, depending upon condition of sample, less for large numbers, with results available within a week from receipt of sample.

11.2.3 Non-detriment findings

CITES AC22 Doc. 17.2 provides first considerations on non-detriment findings for shark species. In 2008 further contributions have been made on practical tools for making NDFs. A document prepared by the Spanish Scientific Authority (García-Núñez 2008) reviews the management measures and fishing restrictions established by international organisations related to the conservation and sustainable use of sharks, offering some guidelines and a guide of useful resources. It also adapts to elasmobranch species the checklist prepared for making NDF by IUCN (Rosser & Haywood 2002). On a similar approach, the outcome of the Expert Workshop on Non-Detriment Findings (Anonymous 2008) points to the information considered essential for making NDF for sharks and other fish species, and also proposes logical steps to be taken when facing this task. Management for *S. acanthias* would ideally be based upon stock assessments and scientific advice on sustainable harvest levels (e.g. quotas) or technical measures, under standard fisheries management practices applied in New Zealand and some North American waters. Other States wishing to export *S. acanthias* products would also need to develop and implement sustainable fisheries management plans, and would need to ensure that all States fishing the same stocks implement and enforce equally precautionary conservation and management measures.

12. <u>References</u> (see Annex 5)

Annex 1 –List of Tables and Figures

(Pagination refers to the following pages, unless otherwise indicated)

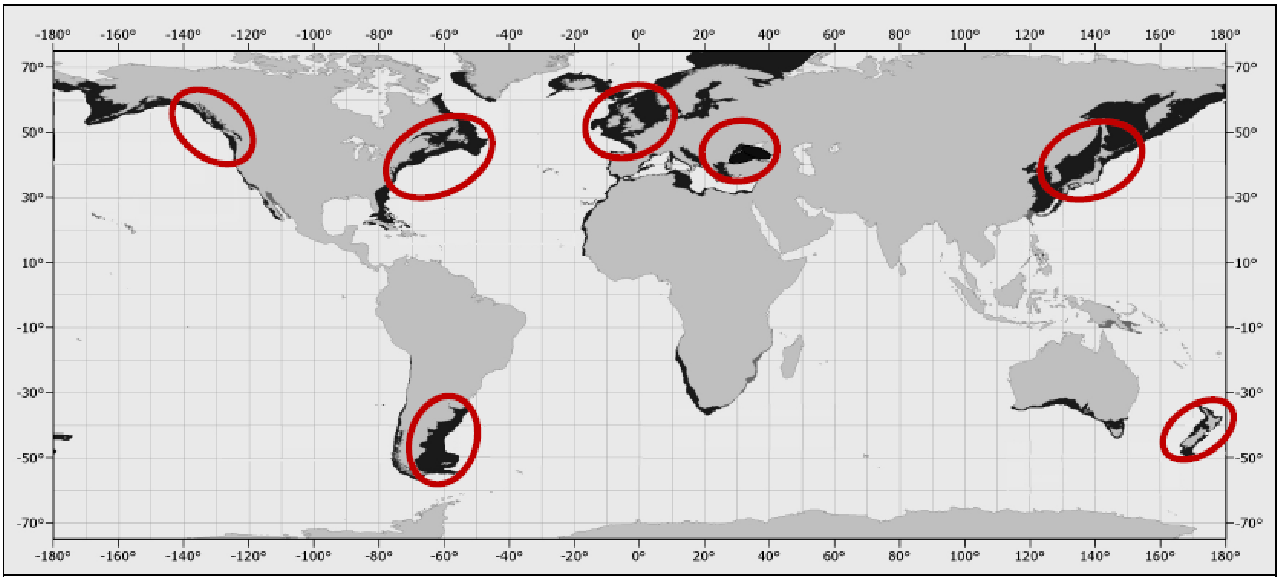


Figure 2. Global distribution of *Squalus acanthias* Spiny dogfish (black) as shown in distribution map of FAO (2003) and major fishing grounds (red circles).

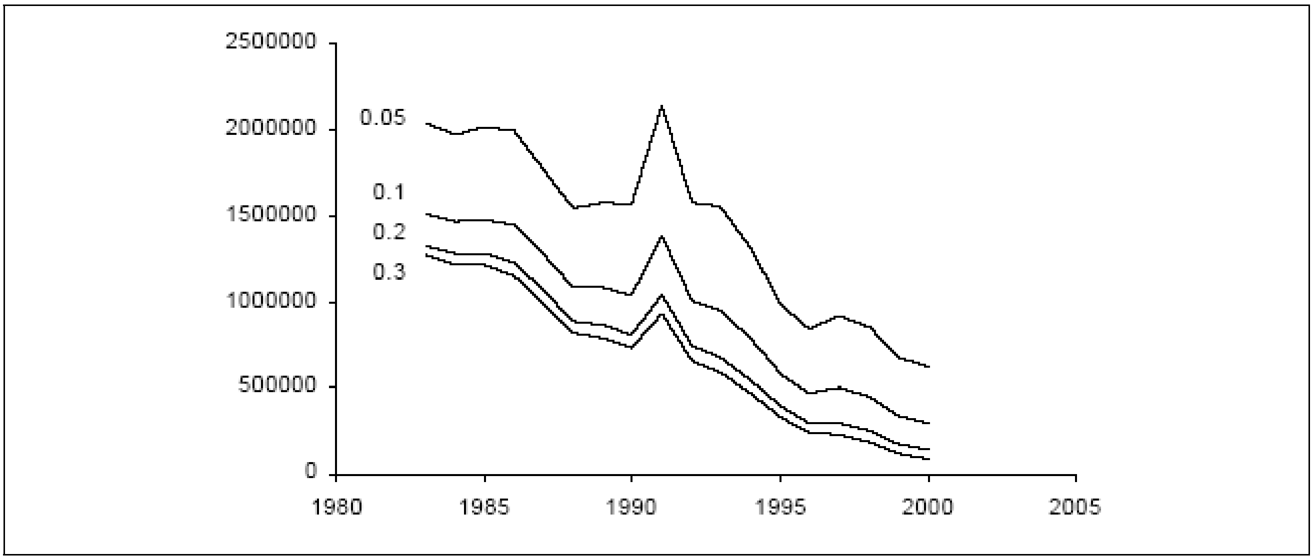


Figure 3. Trends in total population numbers of mature *Squalus acanthias* in the Northeast Atlantic estimated using a Separable VPA analysis of the catch numbers at age data. Each line represents a different assumption for terminal F (0.05–0.3) on the reference age in the final year. (Source: Figure 6.4.1.14, Heessen 2003.)

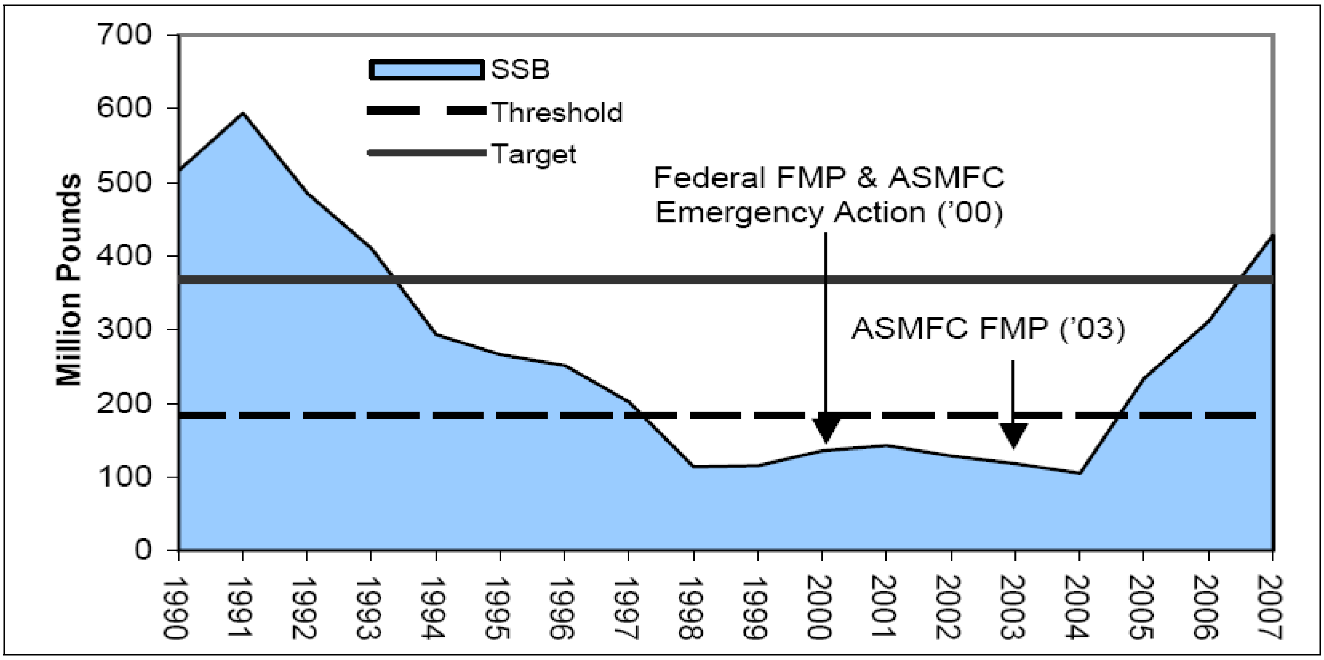


Figure 4. Northwest Atlantic Spiny Dogfish Female Spawning Stock Biomass (>=80 cm), 1990–2007. Source: ASMFC 2008, from updated NEFSC Spiny Dogfish Stock Assessment (Rago and Sosebee 2008). This figure illustrates the ~80% decrease in female spawning stock biomass (SSB) from 1991 to early 2000s, caused by removal of large females. SSB increased following implementation of the Federal Management Plan (FMP) in 2000 and the ASMFC Fishery Management Plan in 2003, as juvenile females matured and entered the spawning stock.

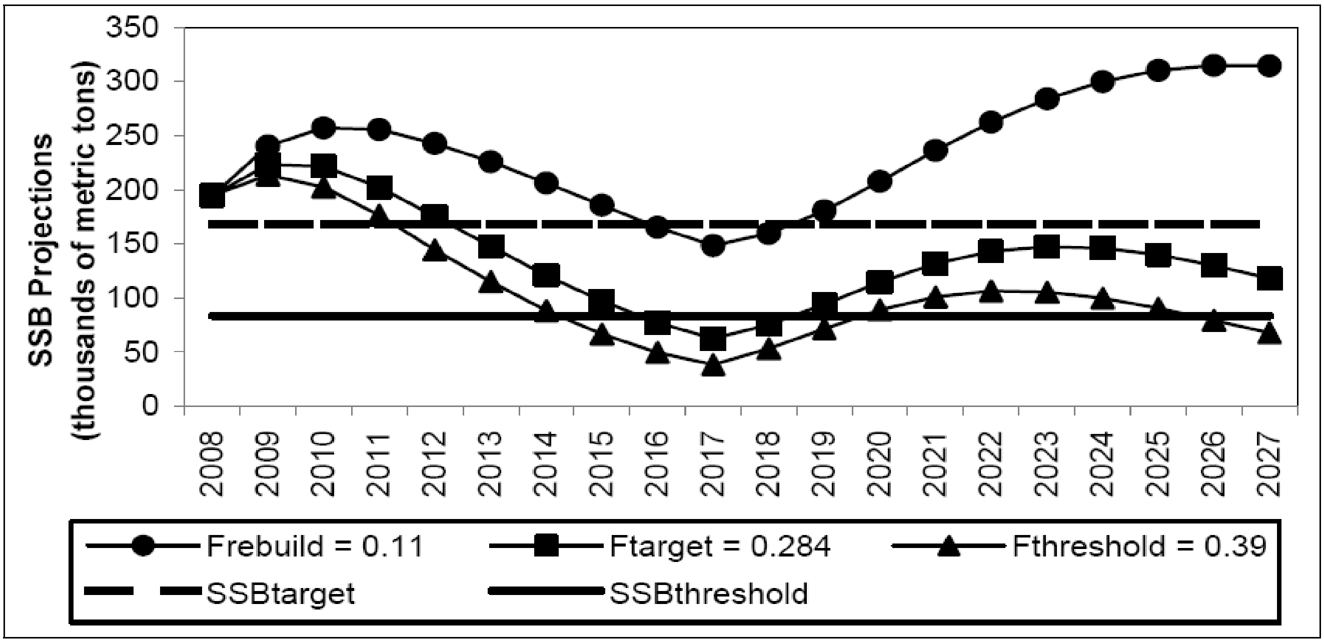


Figure 5. Northwest Atlantic Spiny Dogfish Spawning Stock Biomass Projections (>=80 cm) Source: ASMFC 2008, based on updated NEFSC Spiny Dogfish Stock Assessment (Rago and Sosebee 2008). This figure illustrates the future oscillations in the stock that will occur as the present population of adults increases in weight with individual growth, then declines to a low point in 2017 as these adults die and the last decade's low recruitment (see Figure 7) feeds into the adult population. Different declines vary with fisheries mortality. Current fishing rate is low – slightly higher than 'Frebuild'. All scenarios assume that pup survival will remain at average long term values and are optimistic if pup survival is lower. This assumption is dangerous because pup survival from young small females is below average. Rebuilding will only continue once new recruits begin to contribute to the population.

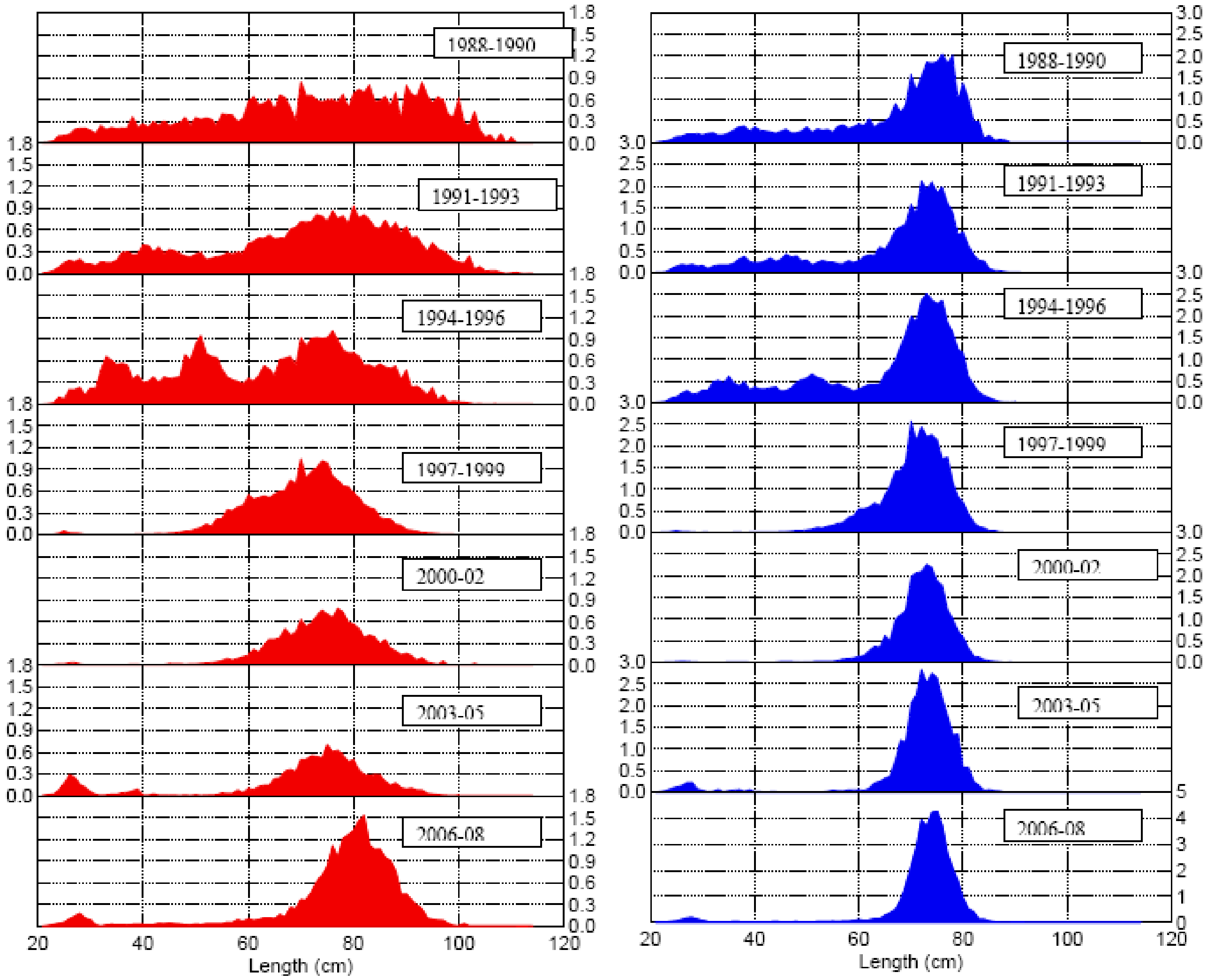


Figure 6. Number of female (left) and male (right) *Squalus acanthias* per tow in the NEFSC R/V spring bottom trawl survey (NW Atlantic) by three year period, 1988–2008. (Source Rago and Sosebee 2008). Note different scales for each sex and the scale change in the bottom right. This illustrates the removal of the largest females, which reach maturity at ~82cm/16 years old. Both sexes are affected by the recruitment failure caused by the lack of mature females after 1997 (see Figure 7). Adult male biomass (not taken in the commercial fishery) has increased steadily to a current high level, but will soon decline steeply.

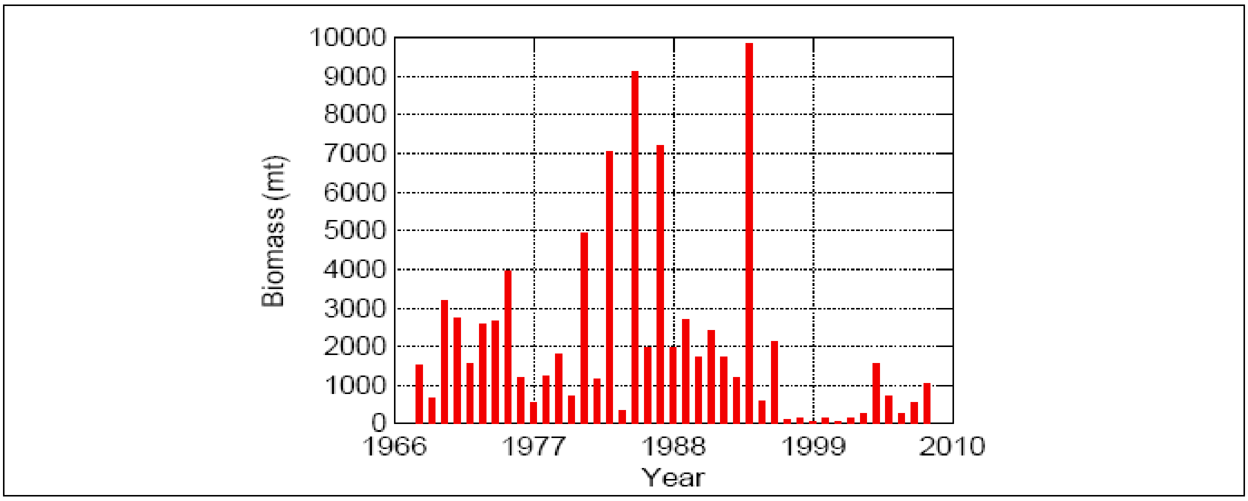


Figure 7. Swept area biomass of spiny dogfish recruits (<1yr old and <36cmTL), 1968–2008, based on NEFSC spring bottom trawl survey (Northwest Atlantic), both sexes combined. Source Sosebee and Rago 2008. This illustrates recruitment failure from 1997 and recent low pup production.

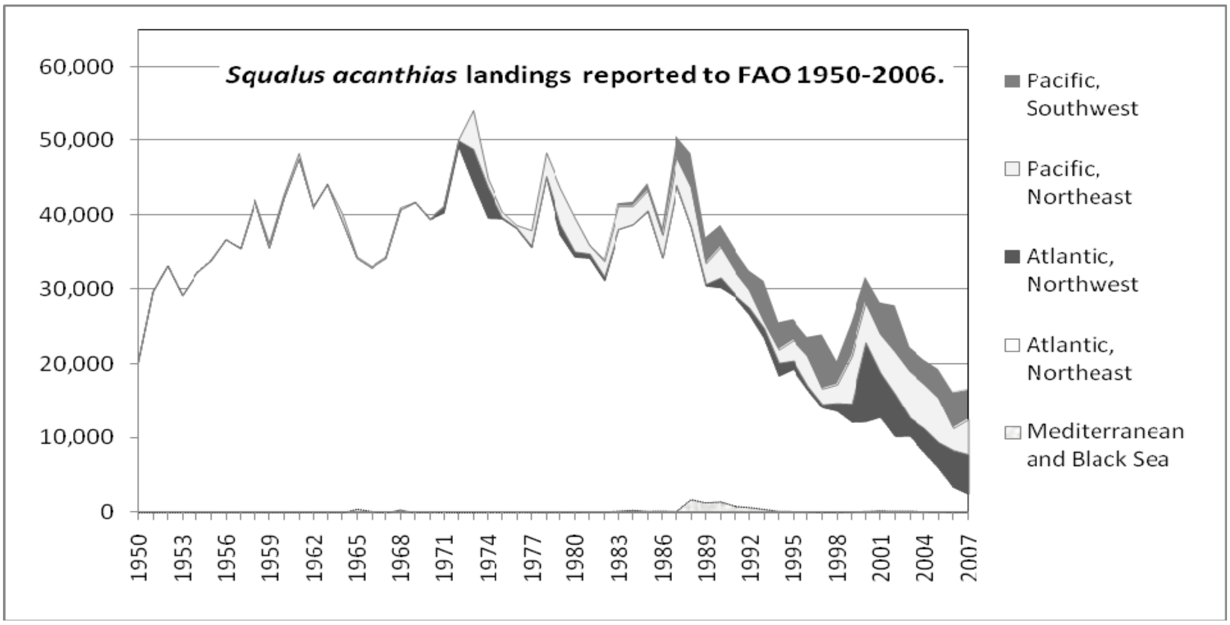


Figure 8. Landings of *Squalus acanthias* (tonnes) reported by FAO fishing area, 1950 to 2007
Source: FAO Fishstat 2008. Key shows fishing areas visible on the graphic. Data exclude catches of *S. acanthias* reported as other small shark species (smooth-hounds, dogfishes nei *etc*. See Figures 9 & 10.

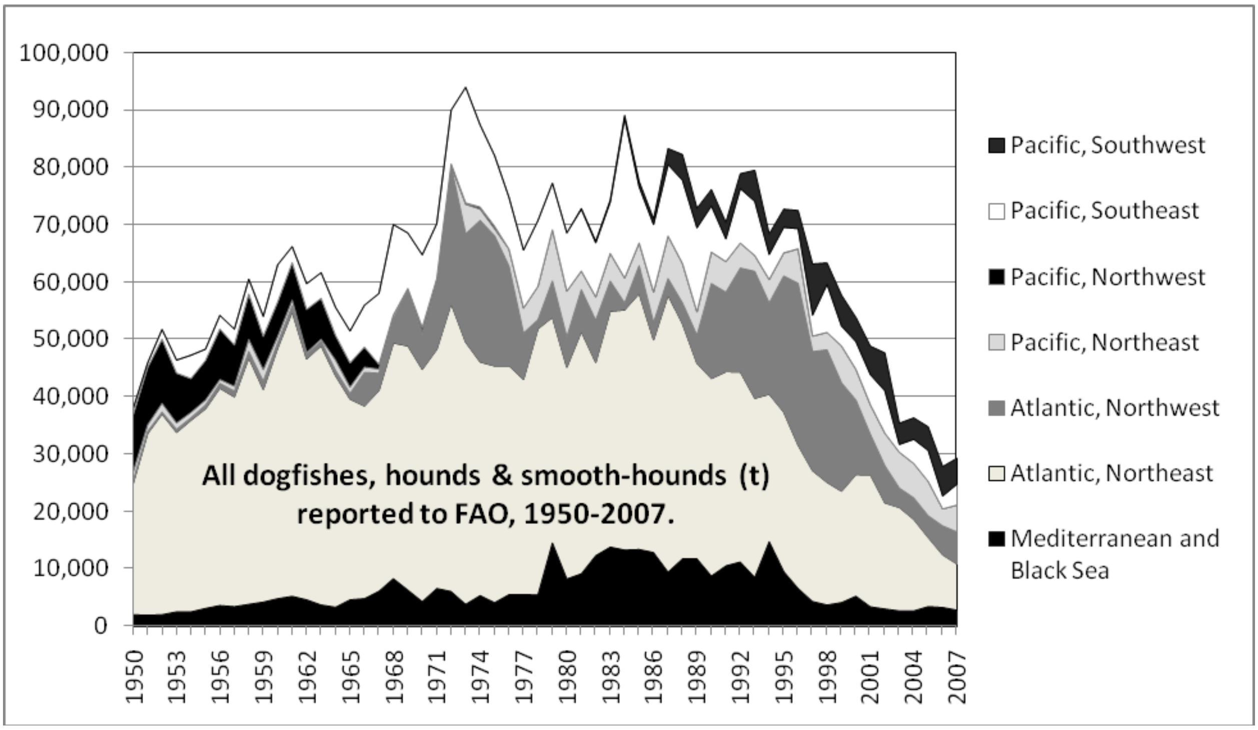


Figure 9. Landings of all small sharks (*Squalus acanthias* and other dogfishes and smooth-hounds) (tonnes) reported by FAO fishing area, 1950 to 2007. *Source*: FAO Fishstat 2008. These data include important landings of *S. acanthias* from the US Northwest Atlantic, Mediterranean and Black Sea, possibly also Southeast and Northwest Pacific. Landings from the Northeast Atlantic include other species (e.g. catsharks, smooth-hounds and some deepwater dogfishes). Key only shows fishing areas visible on the graphic.

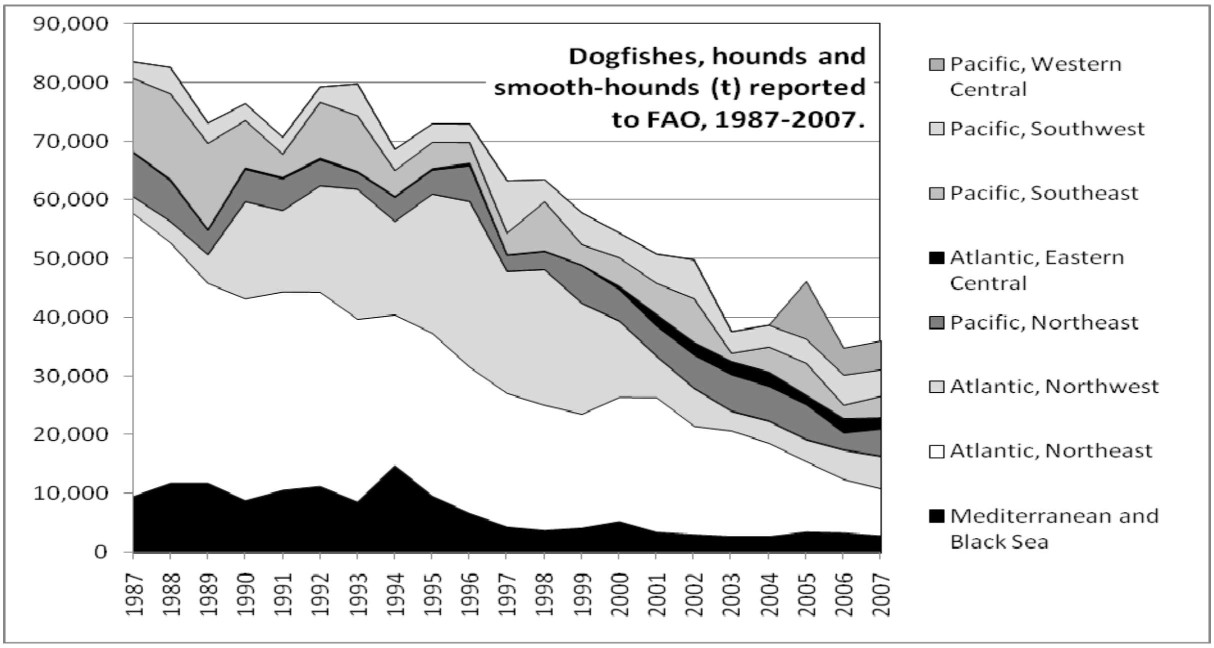
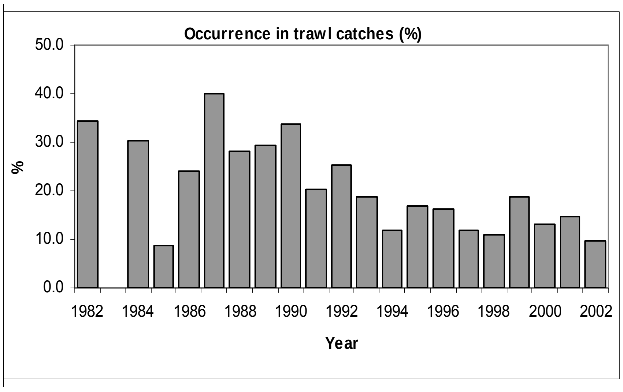
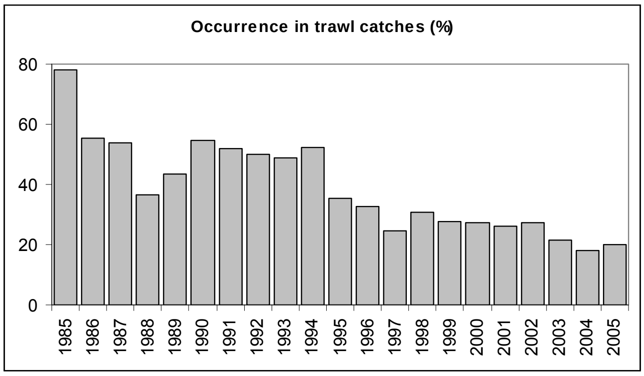


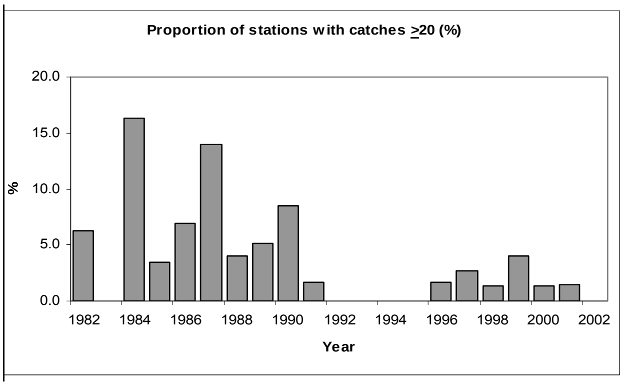
Figure 10. Landings of all small sharks (dogfishes, hounds and smooth-hounds) (tonnes) reported by FAO fishing area, 1987 to 2007. *Source*: FAO Fishstat 2008. *S. acanthias* landings in US NW Atlantic are reported as **'dogfish nei'**; Turkey (and Italy?) report *S. acanthias* as smooth-hounds. NE Atlantic landings include catsharks, smooth-hounds and deepwater dogfishes. Key shows fishing areas visible on the graphic.



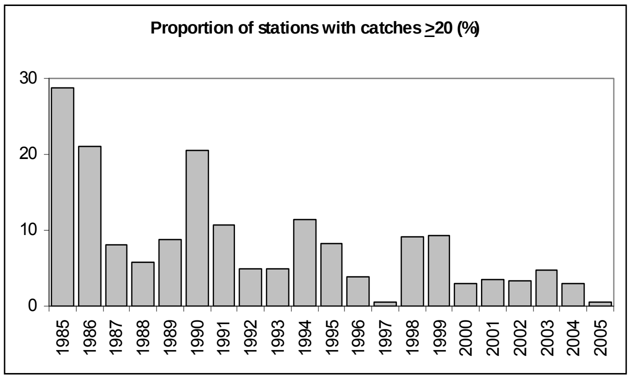
a) Percentage occurrence in trawl catches



c) Percentage occurrence in trawl catches



b) Stations with catches ≥ 20 fish/hr (%)



d) Stations with catches ≥ 20 fish/hr (%)

Figure 11. Fishery-independent trends in the Northeast Atlantic *Squalus acanthias* stock. a–b: English Celtic Sea groundfish survey (1982-2002). c–d survey hauls in the Scottish west coast survey (1985-2005). Source: ICES WGEF 2006, reproduced in ICES WGEF 2009. The aggregating nature of *S. acanthias* limit the reliability of CPUE data as a metric of abundance, because large catches can occur even when the stock is seriously depleted. Percentage occurrence in catches and proportion of catches with more than a small number of fishes are sometimes better indicators of stock depletion.

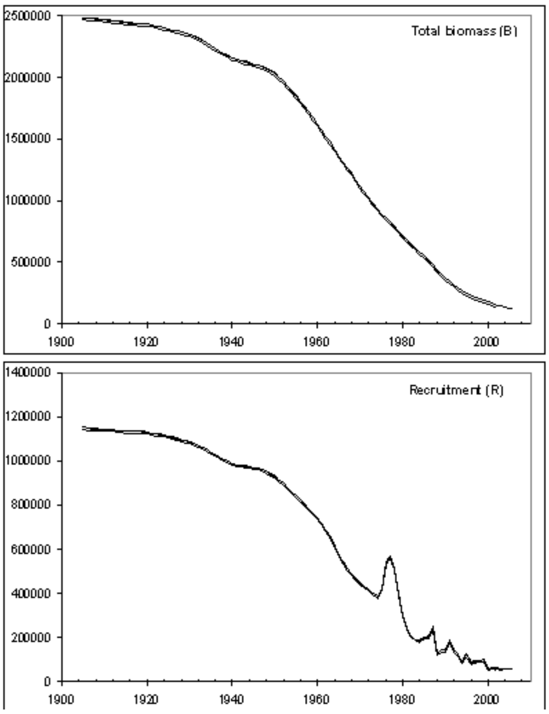


Figure 12. Biomass (above) and recruitment (below) trends for Northeast Atlantic *Squalus acanthias*, 1900–2005, from a population dynamic model. Source: ICES WGEF 2006.The close link between biomass and pup recruitment illustrates the importance of mature females to a healthy stock.

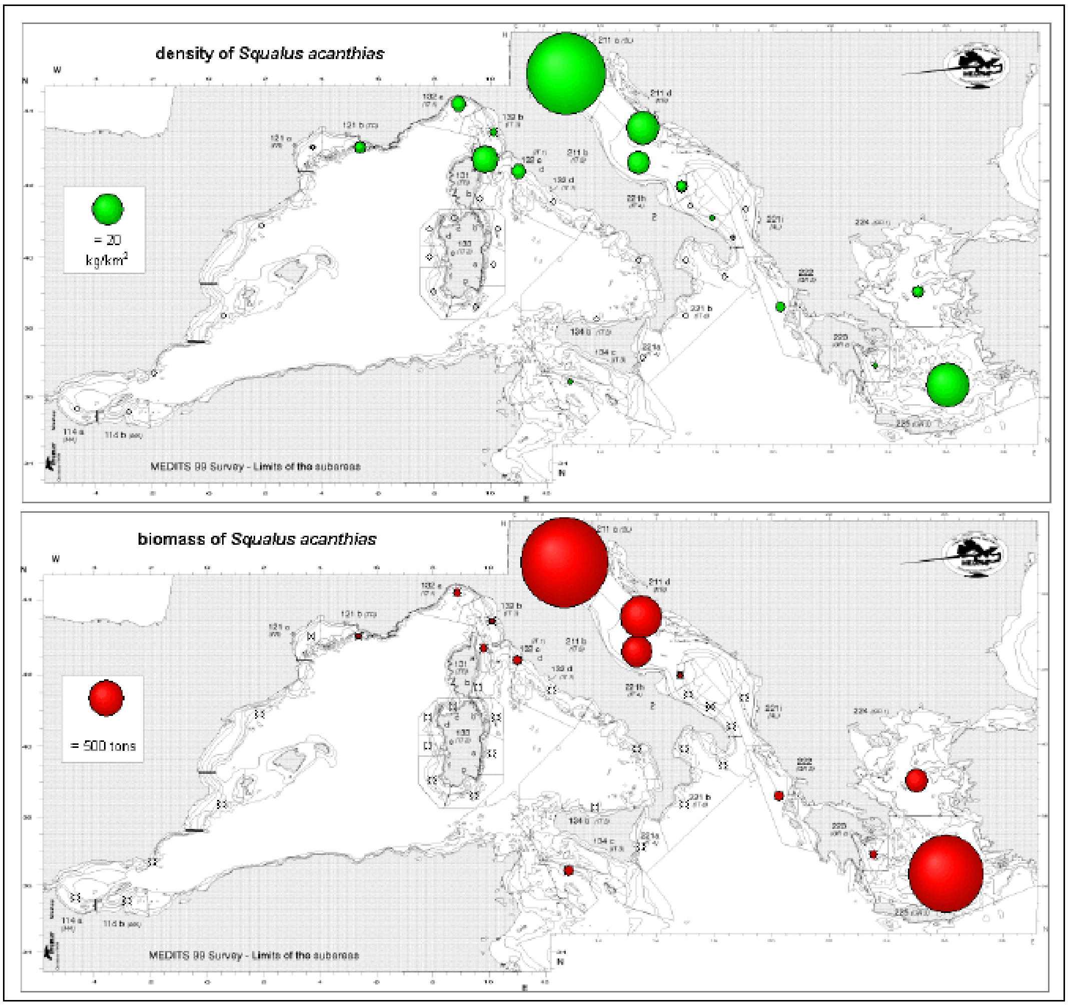


Figure 13. MEDITS density (above) and biomass (below) indices for *Squalus acanthias* in the Mediterranean (Source Serena *et al*. 2005).

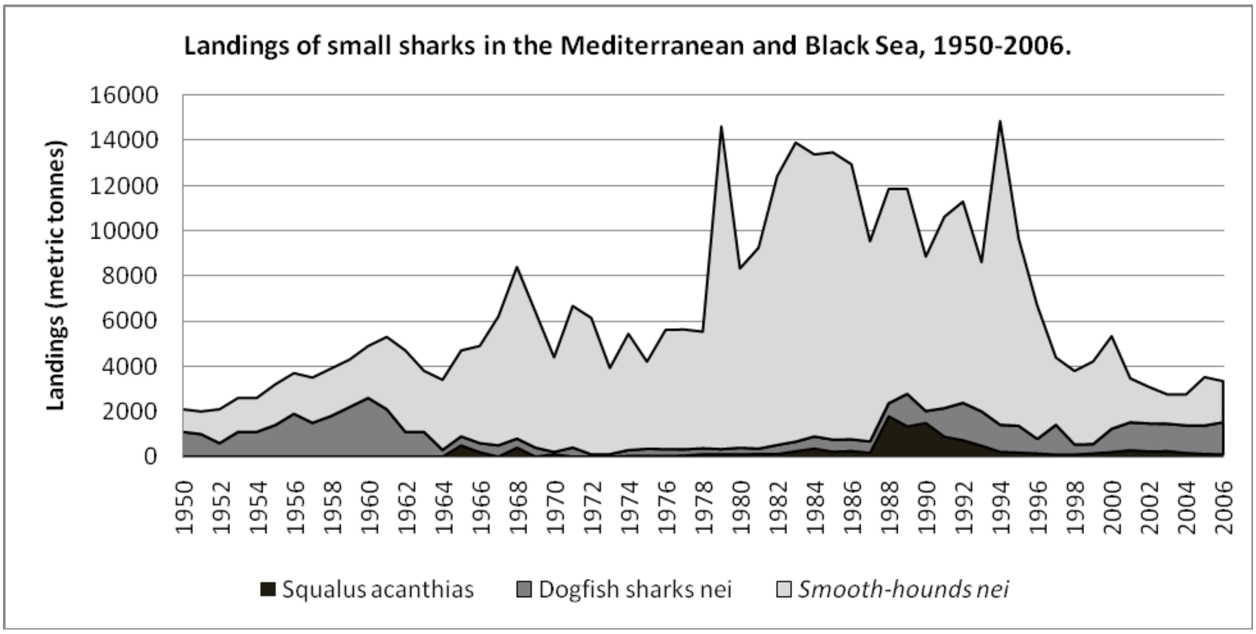


Figure 14. FAO records of landings (tonnes) of 'dogfish sharks nei', Smooth-hounds nei and *Squalus acanthias* from the Mediterranean and Black Sea, 1950–2007 (Source FAO Fishstat).

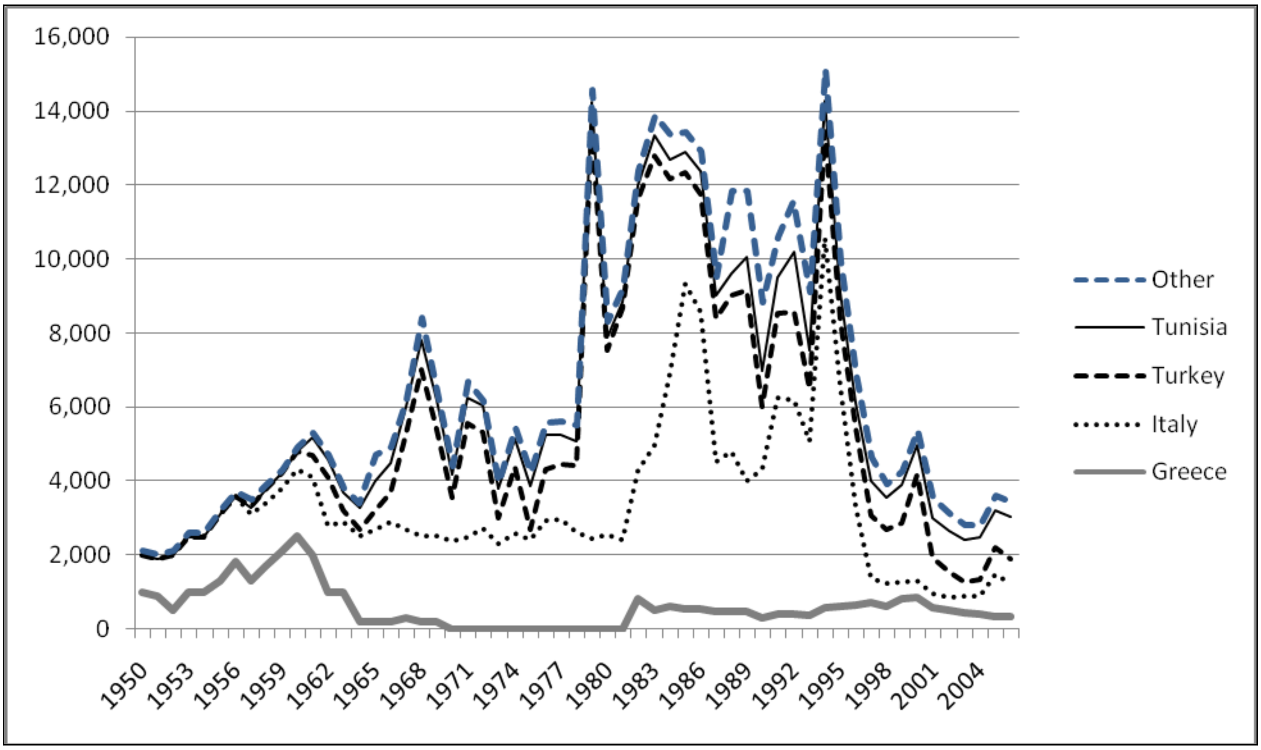
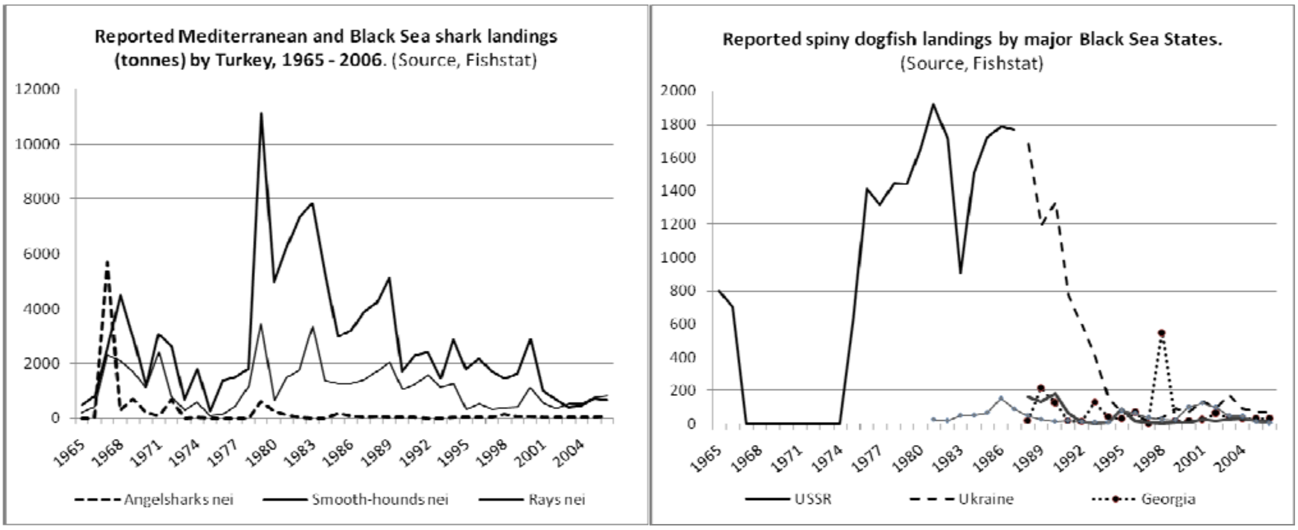


Figure 15. FAO records by country of landings (tonnes) of 'dogfish sharks nei', 'Smooth-hounds nei' and *Squalus acanthias* from the Mediterranean and Black Sea, 1950–2007 (Source FAO Fishstat).



a) Landings by Turkey

b) Landings by other major Black Sea fishing nations

Figure 16. Landings of sharks (tonnes/year) reported by major fishing nations in the Black Sea and adjacent Mediterranean, 1965 to 2007 (Source: FAO Fishstat – note different vertical scales.)

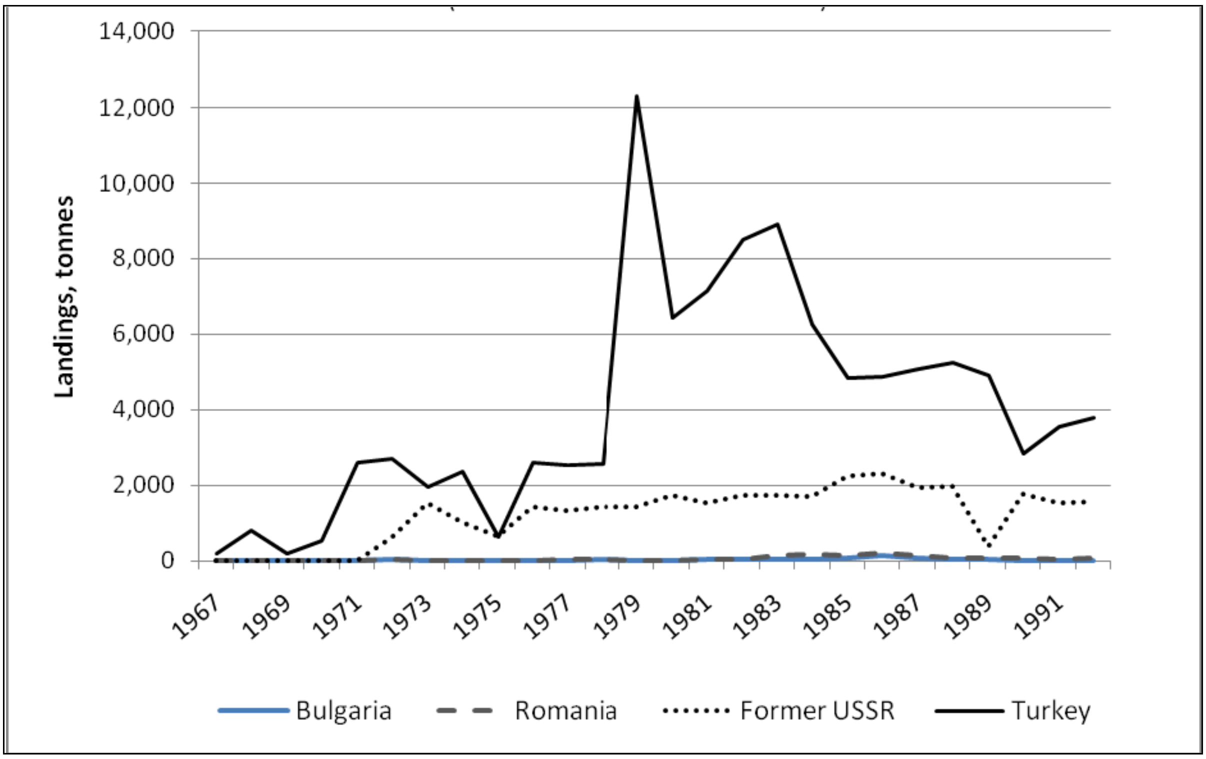


Figure 17. Landings of *Squalus acanthias* (tonnes/year) in the Black Sea during 1967–1992. (Source: Prodanov *et al*. 1997)

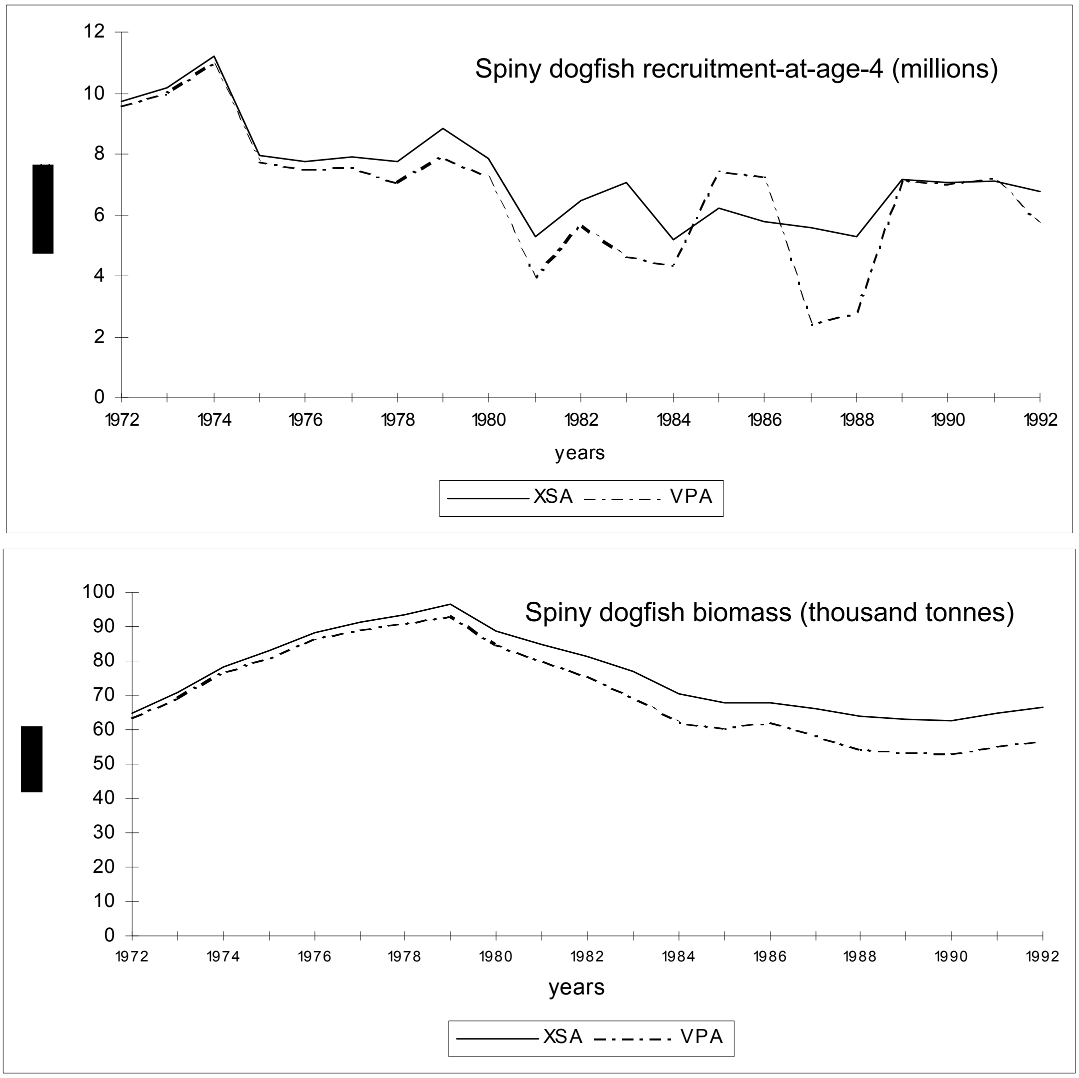


Figure 18. Black Sea spiny dogfish recruitment-at-age-4 (top) and biomass (bottom), 1972–1992. Source Daskalov 1997. From Extended Survivor Analysis (XSA) and Virtual Population Analysis (VPA) with *ad hoc* tuning.

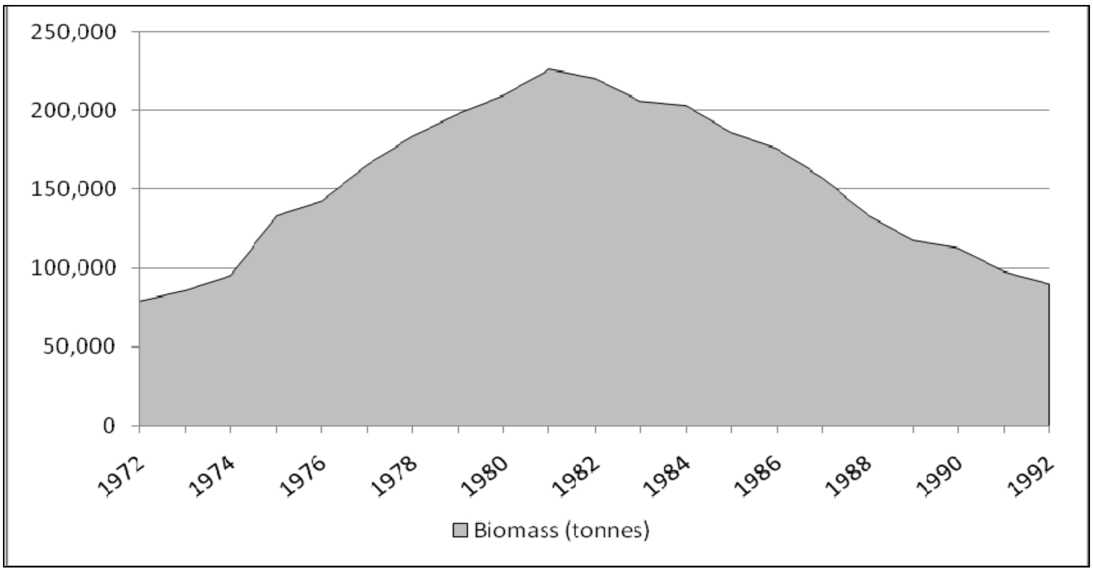


Figure 19. Biomass of *Squalus acanthias* (tonnes) in the Black Sea from 1972–1992. (Source: Prodanov *et al*. 1997)

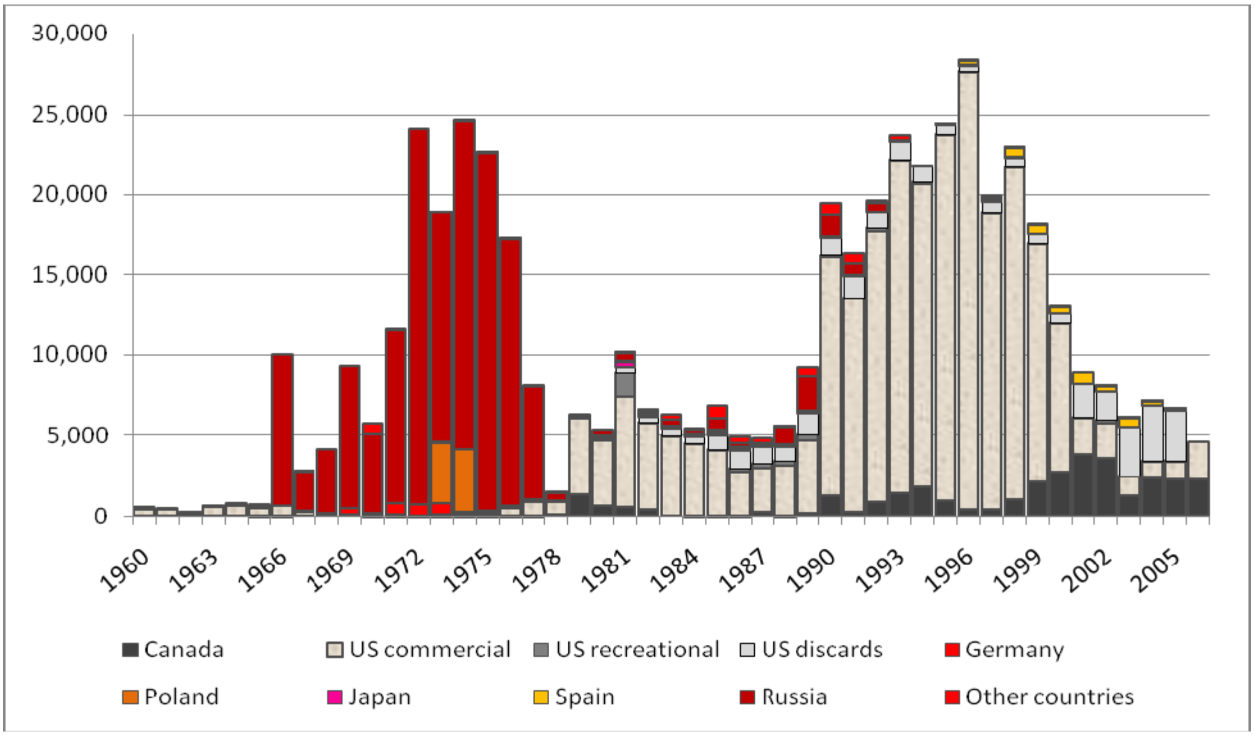


Figure 20. Reported landings (tonnes) of spiny dogfish by country by year in NAFO Areas 2–6, Northwest Atlantic. (Source: DFO 2008)

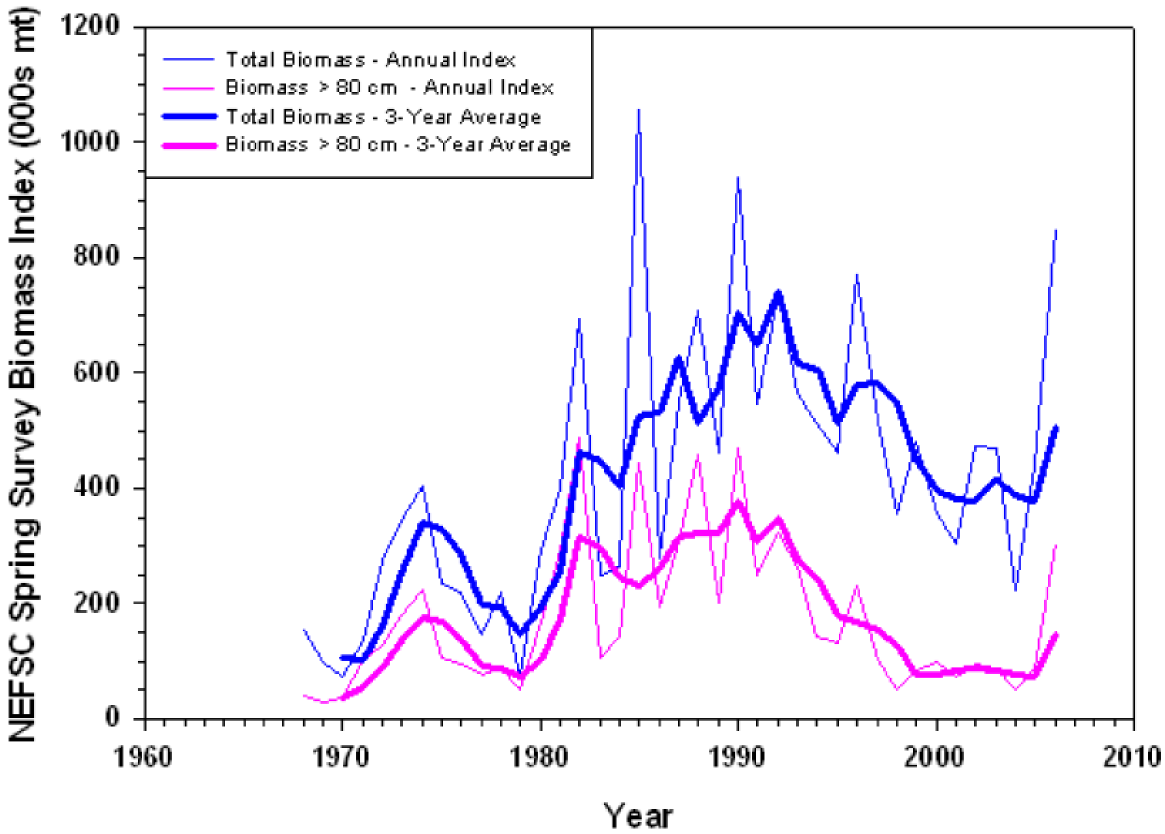


Figure 21. Trends in total biomass (000s t) and biomass of mature spiny dogfish >=80cm (000s t) in the US Atlantic. Source: Sosebee and Rago 2006, NEFSC spring survey. These data demonstrate that the fishery during the 1990s mainly harvested mature females >80 cm long.

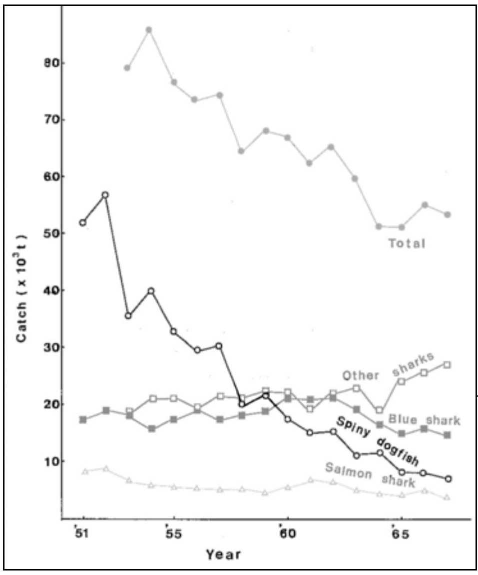
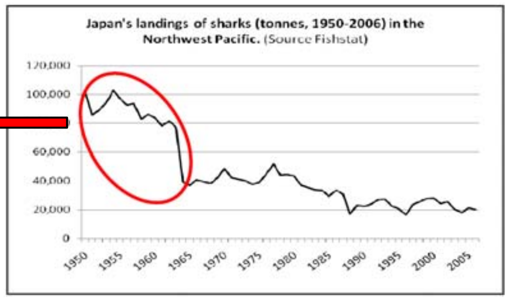


Figure 22. Landings of Spiny dogfish and other sharks by Japan in the Northwest Pacific.

Left: 1950–1967 (Tanuichi 1990).

Below: all species, 1950–2006, including spiny dogfish and 10,000–15,000t/year of pelagic sharks (FAO Fishstat).



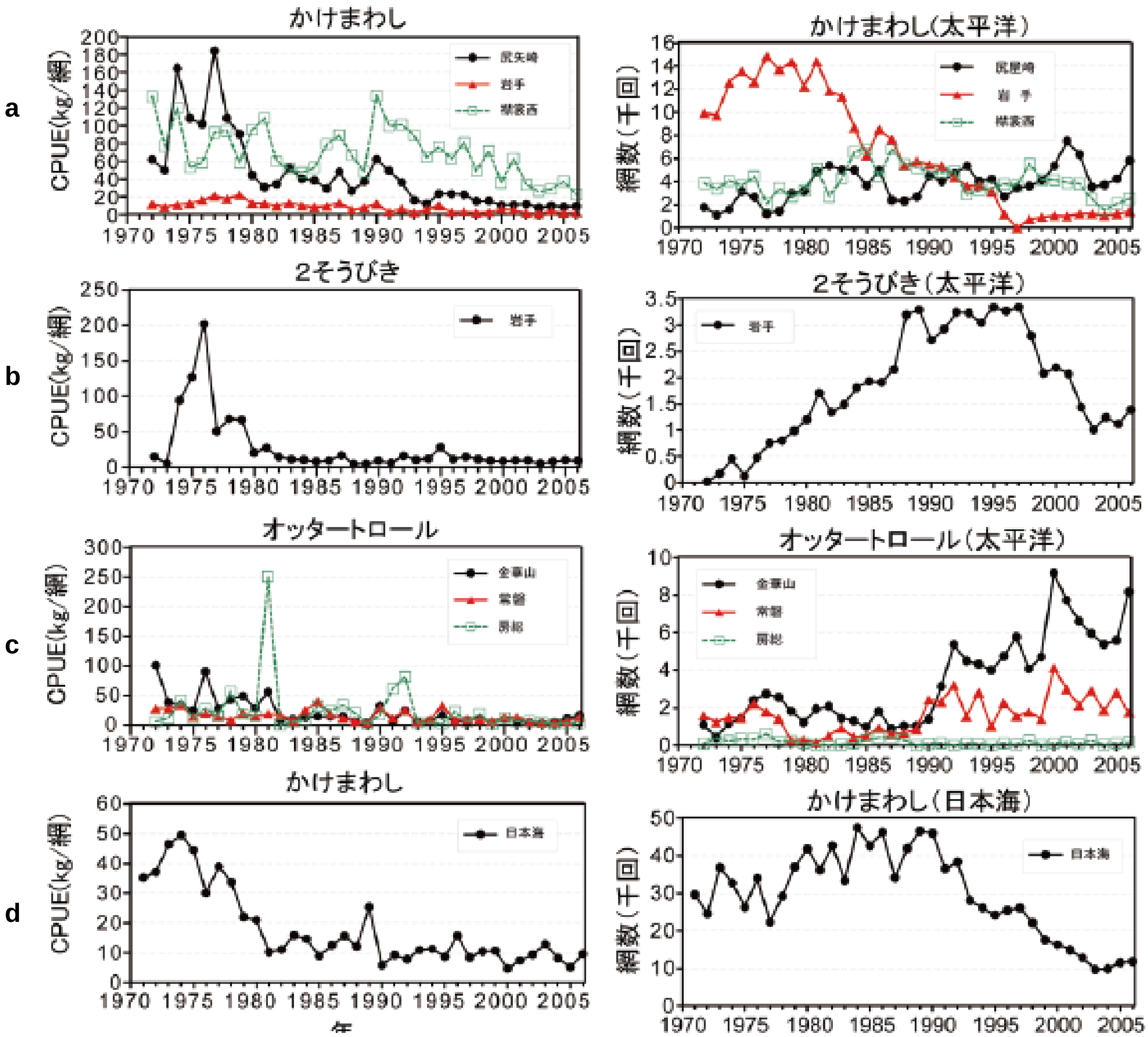


Figure 23. Catch per unit effort (left) and fishing effort (right) in Japanese offshore spiny dogfish fisheries, 1970 to 2006. a: Kakemawashi bottom trawl, Hokkaido, Amori, Iwate (Pacific). b: Pacific pair trawl. c: Pacific otter trawl. d: Kakemawashi bottom trawl, Sea of Japan. Source JFA 2008.

Figure 24. Trends in the abundance of spiny dogfish from Hecate Strait trawl surveys between 1984 and 2003 using (A) mean catch per unit effort (CPUE, kg/h); and (B) mean CPUE (kg/set); and (C) percentage of sets with spiny dogfish. Error bars represent 95% confidence intervals around the mean.

Source: Wallace *et al*. in press 2009.

Mean catch rates (A & B) and percentage of sets with spiny dogfish (C) in 2003 were at an historic low. Because 2003 was the last year of the survey, it is not possible to know whether this indicates a decline or an anomaly in data collection. The high values for CPUE in 1989 can be the result of a very small number of large hauls of mature females.

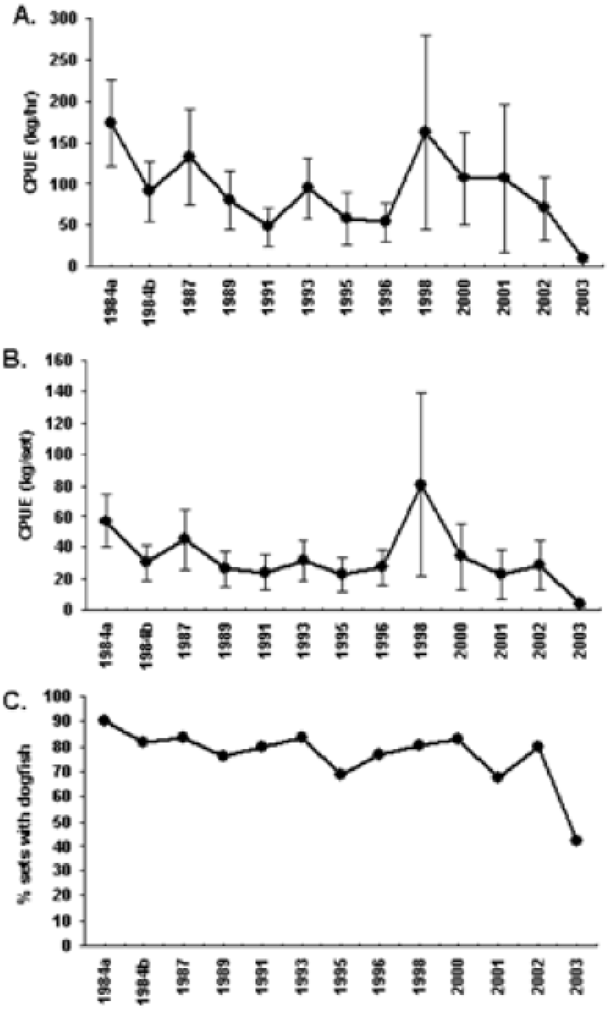
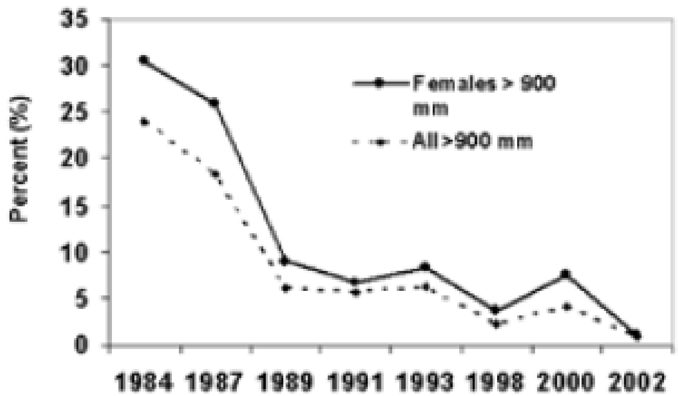


Figure 25. Percentage of spiny dogfish above 90cm in length found in the Hecate Strait trawl survey, 1984–2002. Note female size at 50%

maturity is ~94cm.

Source: Wallace *et al*. in press 2009.



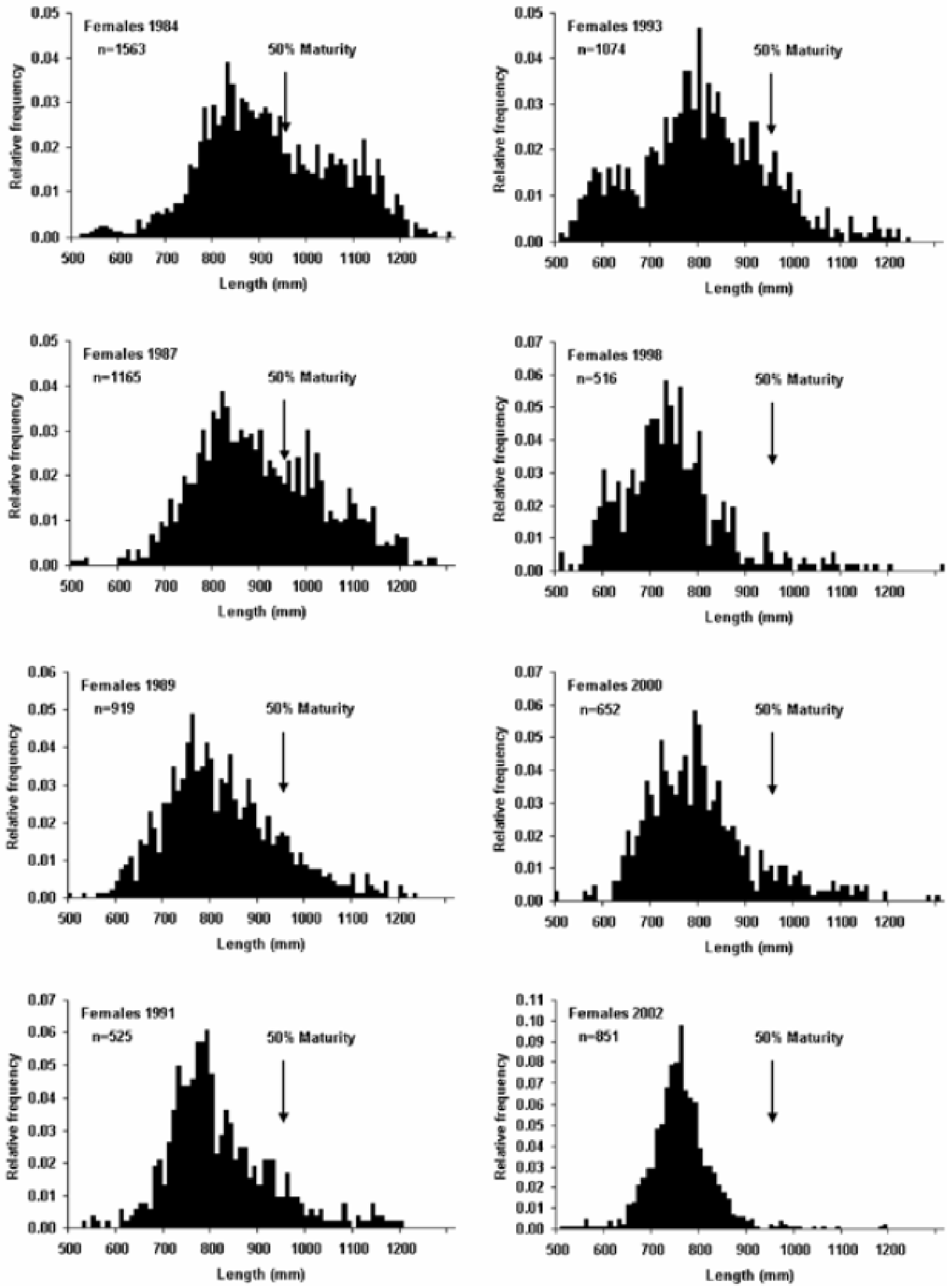


Figure 26. Relative length-frequencies of female spiny dogfish sampled in the Hecate Strait trawl survey from 1984 – 2002 (1984–1991 (left), 1992–2002 (right)). Source: Wallace *et al*. in press 2009. This shows a marked contraction in stock size structure, with the decline and disappearance of mature females (aged >23–30 years) from the population, and a decline in the smallest juveniles. Pup production would have declined with the loss of mature females.

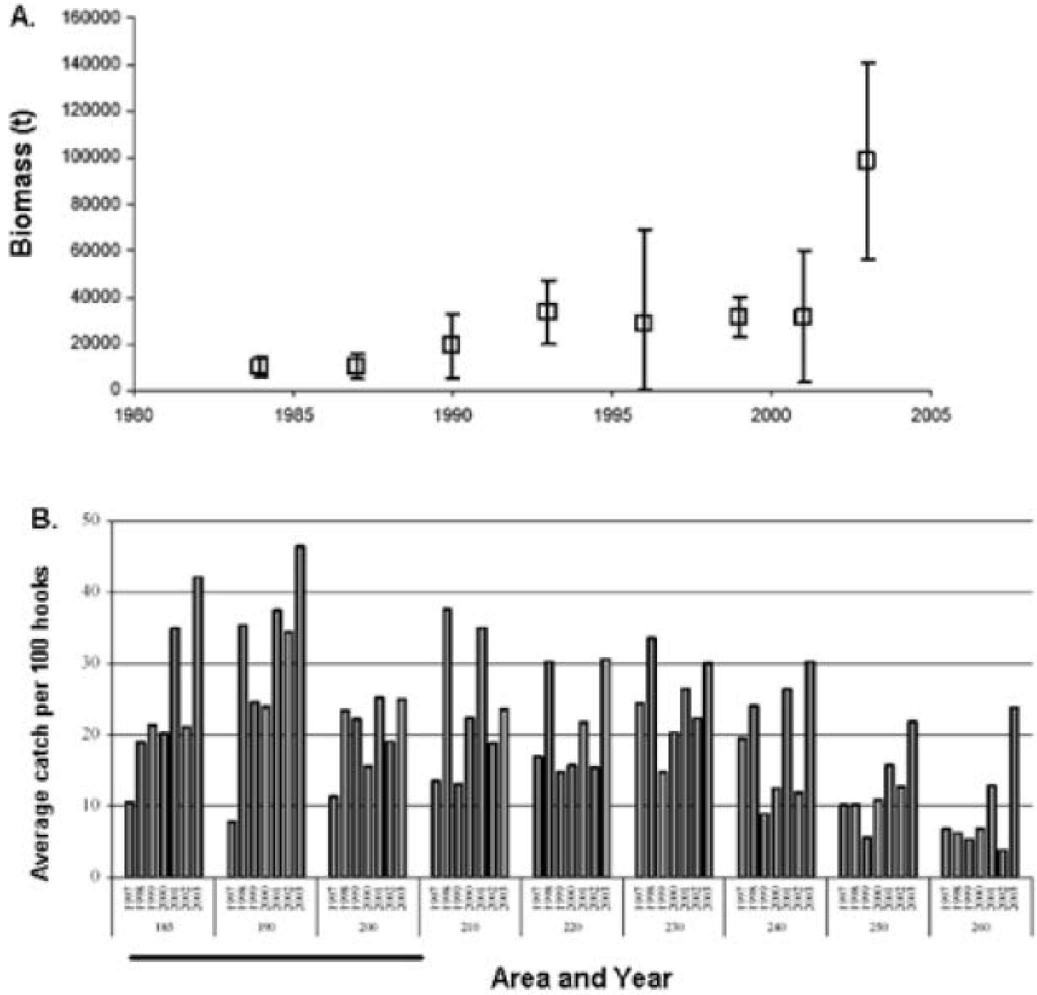


Figure 27. Trends in the abundance of spiny dogfish in Gulf of Alaska 1980–2005 from (A) biomass estimates (t) derived from the AFSC bottom trawl survey (error bars represent 95% confidence intervals); and (B) catch rates in the IPHC set survey. Waters adjacent to Canada off southeast Alaska are represented by IPHC areas 185, 190, and 200. Figure modified from Courtney *et al*. 2004 and presented in Wallace *et al*. 2009 in press.

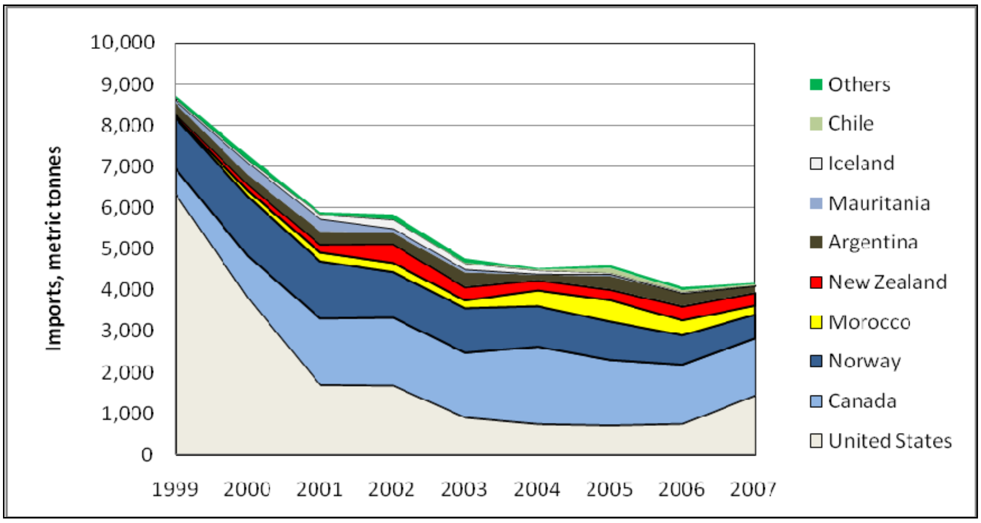


Figure 28. Origin of EU imports* of fresh or chilled (CN Code: 0302 6520) and frozen (CN Code: 0303 7520) ‘Dogfish of the species *Squalus acanthias*’, 1999–2007. *Source*: Eurostat 2006.
(*Excluding EU Member States)

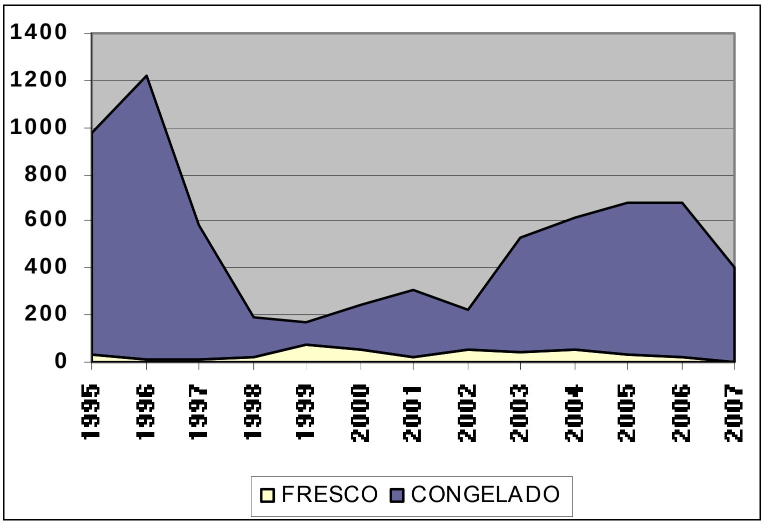


Figure 29. Exports (tonnes) of fresh (fresco) and frozen (congelado) 'shark' from Argentina, 1995–2007. (Source: Ministry of Fisheries and Agriculture, Argentina.)

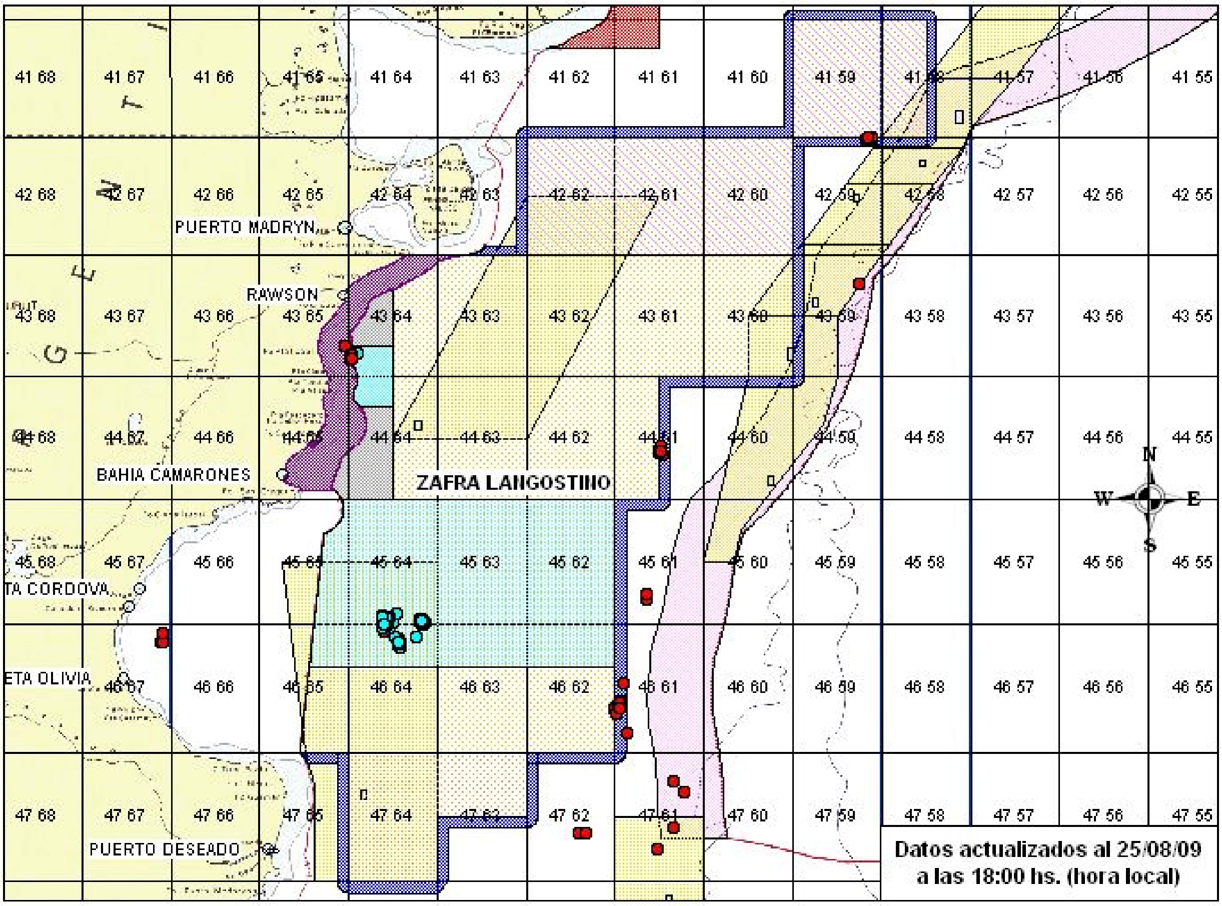


Figure 30. Protection zone ZVP provided by Argentina (*Res. SAGPyA Nº 265/2000 y posteriores*). Blue line (width: 5 miles) surrounds the zone towards north, east and south. Innocent sailing, e.g. crossing the area at full speed, is not forbidden. Red dots: fishing vessel, bottom trawl. Blue dot: fishing vessel, beam trawl, prospecting the migration of shrimp shoals under the supervision of INIDEP (Source: Ministry of Fisheries and Agriculture, Argentina.) An update (twice a day) could be seen at www.sagpya.mecon.gov.ar/sagpya/pesca/pesca_maritima/05-monitoreo_satelital/zee.php

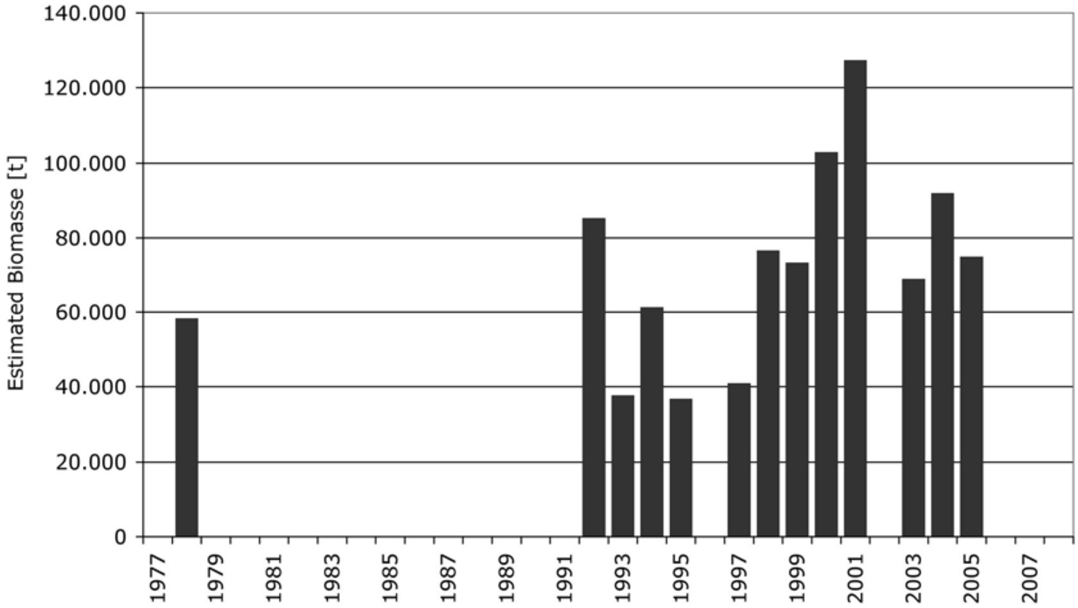


Figure 31. Biomass of *Squalus acanthias* (t) estimated for the Region of Patagonia between 1978 and 2005 by the Ministry of Fisheries and Agriculture, Argentina. (Data Source: Plan de acción nacional para la conservación y el manejo de condrictios (Tiburones, Rayas y Quimeras) en la Republica Argentina, 2009)

Table 2. *Squalus acanthias* life history parameters (various sources in text)

Age at maturity (years)	female:	16 (NW Atlantic); 23–32 (NE Pacific); 15 (NE Atlantic)
	male:	10 (NW Atlantic)/ 14 (NE Pacific)
Size at maturity (total length cm)	female:	82 (NWA); 94 (NEP); 83 (NEA); 70 (Mediterranean)
	male:	64 (NW Atlantic); 59 (Australia); 59 (Mediterranean)
Longevity (years)	female:	40–50 (NW Atlantic), >80 yrs (NW Pacific), or up to 100 years
	male:	35 (NW Atlantic)
Maximum size (total length cm)	female:	110–124 (N Atlantic); 130–160 (N Pacific); 200 (Med), 111 (NZ)
	male:	83–100 (N Atlantic); 100–107 (N Pacific); 90 (NZ)
Size at birth (cm)		18–33
Average reproductive age *		Unknown, but over 25 years; ~40 years in NE Pacific.
Gestation time		18–22 months
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); 4–7% (NE Atlantic)
Natural mortality		0.092 (NW Atlantic), 0.1 (0.3 for very old/young fish) (NE Atlantic)

Table 3. Landings of spiny dogfish (*Squalus acanthias*) (tonnes) reported by FAO fishing area (*Source*: FAO FIGIS).

a) From 1950 to 2006

FAO Area	No. of fishing countries	Total catch (tonnes)	% of world total catch	2006 catch as % of period peak
Atlantic, Northeast	16	1,759,163	86.53%	7.02%
Atlantic, Northwest	8	61,422	3.02%	44.45%
Atlantic, Southwest	1	114	0%	0%
Mediterranean & Black Seas	7	12,119	1%	5.93%
Pacific, Eastern Central	1	193	0%	60.00%
Pacific, Northeast	3	119,854	5.90%	49.26%
Pacific, Southwest	1	80,186	3.94%	66.34%
Total	**37**	2,033,051	100%	29.72%

b) From 1997 to 2006

FAO Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Atlantic, Northeast	14,101	13,634	12,098	12,093	12,616	10,065	10,109	8,021	5,927	3,347
Atlantic, Northwest	452	1,081	2,456	10,701	5,995	5,697	2,422	3,132	3,400	4,757
Atlantic, Southwest	-	-	-	-	-	-	-	-	-	113
Mediterranean and Black Sea	95	97	143	204	287	231	245	166	121	106
Pacific, Eastern Central	<0.5	5	24	8	3	17	11	28	8	15
Pacific, Northeast	2,100	2,501	6,439	5,363	5,181	5,691	6,268	5,974	6,009	2,960
Pacific, Southwest	7,232	3,064	4,409	3,362	4,192	6,186	3,233	3,241	3,866	4,798
Total	**23,980**	**20,382**	**25,569**	**31,731**	**28,274**	**27,887**	**22,288**	**20,562**	19,331	16,096

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

a) From 1997 to 2006

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	15	17	10	11	13	23	12	13	21	17
Channel Isl.	-	-	-	-	-	-	-	-	-	-
Denmark	196	126	131	146	156	256	233	219	151	122
Faeroe Islands	212	356	484	354	.	.	.	.	-	-
France	1,708	1,410	1,192	1,097	1,333	1,138	1,110	1,129	1,096	847
Germany	-	-	45	188	303	119	98	140	140	7
Iceland	106	78	57	109	136	276	231	141	82	74
Ireland	1,407	1,259	962	880	1,301	1,293	.	.	.	.
Netherlands	-	-	-	28	39	27	9	25	30	24
Norway	1,567	1,293	1,461	1,644	1,425	1,130	1,119	1,054	1,003	790
Poland	-	-	-	-	-	-	-	-	-	-
Portugal	2	2	21	2	3	4	4	9	6	10
Romania	-	-	-	-	-	-	-	-	-	-
Spain	<0.5	27	94	372	363	359	201	17	96	102
Sweden	197	140	114	124	238	270	275	244	170	148
UK	8,691	8,926	7,527	7,138	7,306	5,170	6,817	5,030	3,132	1,206
TOTAL	14,101	13,634	12,098	12,093	12,616	10,065	10,109	8,021	5,927	3,347

b) From 1950 to 2006

Country	Total catch (tonnes)	% of regional catch	2006 catch as % of period peak
Belgium	37,799	2.15%	0.89%
Channel Islands	2	0.00%	0.00%
Denmark	50,556	2.87%	4.51%
Faeroe Islands	1,975	0.11%	0.00%
France	161,776	9.20%	5.71%
Germany	21,009	1.19%	0.58%
Iceland	2,308	0.13%	26.81%
Ireland	89,495	5.09%	0.00%
Netherlands	8,985	0.51%	3.44%
Norway	694,849	39.50%	2.28%
Poland	<0.5	0.00%	0.00%
Portugal	100	0.01%	0.00%
Romania	3	0.00%	0.00%
Spain	1,631	0.09%	27.42%
Sweden	16,431	0.93%	15.85%
United Kingdom	672,244	38.21%	6.20%
Total	1,759,163	100.00%	6.78%

Table 5: Countries supplying Spiny dogfish *Squalus acanthias* (fresh and chilled, and frozen combined) to the EU (tonnes). (*Source:* Eurostat, 2008)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
United States	6,334	3,808	1,696	1,679	910	753	721	759	1,446	18,106
Canada	620	1,017	1,605	1,648	1,559	1,862	1,574	1,422	1,373	12,681
Norway	1,239	1,450	1,396	1,109	1,090	993	938	720	580	9,514
Morocco	25	144	219	230	197	388	529	370	232	2,334
New Zealand	71	152	195	457	319	244	251	336	305	2,329
Argentina	253	232	310	263	342	120	315	307	140	2,281
Mauritania	66	292	307	110	82	26	50	2	15	950
Iceland	52	70	108	221	151	95	45	41	23	806
Chile	0	0	16	5	22	24	117	49	35	267
Others	76	131	50	125	103	31	66	72	30	684
TOTAL	8,736	7,294	5,902	5,846	4,775	4,534	4,607	4,080	4,177	49,952

Table 6: EU imports of Spiny dogfish *Squalus acanthias* (fresh and chilled, and frozen combined) by EU Member State (tonnes), 1999–2007. (*Source:* Eurostat 2008).

	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
France	3,742	2,828	1,524	1,690	1,349	1,485	877	1,082	1,655	16,232
United Kingdom	1,579	825	979	1,098	759	876	837	685	718	8,357
Denmark	1,147	1,359	1,279	983	908	753	620	530	382	7,960
Italy	701	876	688	460	423	137	374	271	144	4,073
Belgium	349	433	359	614	309	191	641	572	407	3,875
Netherlands	621	368	293	374	329	180	124	177	256	2,723
Germany	404	322	389	241	307	265	249	170	112	2,458
Spain	39	91	219	233	223	432	536	372	268	2,414
Sweden	72	105	109	107	153	211	301	185	231	1,473
Czech Republic	2	43	37	29	0	0	0	0	0	111
Greece	41	31	23	14	0	1	0	0	0	110
Slovenia	0	0	0	0	0	1	46	0	0	47
Portugal	0	0	0	0	0	0	0	35	0	35
Bulgaria	9	0	0	2	1	1	0	0	4	17
Malta	0	0	0	0	10	0	0	0	0	10
Poland	0	0	0	0	0	3	0	0	0	3
Luxembourg	0	0	0	0	2	0	0	0	0	2
Lithuania	0	0	0	0	0	0	1	0	0	2
Latvia	0	0	0	0	2	0	0	0	0	2
TOTAL	8,706	7,281	5,900	5,843	4,775	4,534	4,607	4,080	4,177	49,902

Table 7: United States exports of *Squalus acanthias,* fresh and frozen, 1999–2007 (tonnes) (*Source:* NMFS database)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
Germany	1,010	1,690	1,032	250	350	339	527	614	462	6,274
France	1,951	1,518	454	217	196	149	126	358	923	5,892
Belgium	461	488	234	299	169	99	35	53	202	2,040
Netherlands	520	350	152	159	154	157	167	125	194	1,978
Thailand	162	270	421	267	219	104	147	111	217	1,918
United Kingdom	871	430	120	100	45	57	86	59	112	1,880
China - Hong Kong	303	106	8	326	248	135	0	20	44	1,190
Italy	193	149	60	105	3	31	34	19	10	604
Mexico	45	21	57	92	30	113	173	27	0	558
Japan	254	88	20	95	31	19	0	0	0	507
Australia	12	35	79	94	110	69	31	3	62	495
Georgia	0	0	0	0	0	45	0	0	0	45
Afghanistan	0	0	0	0	0	0	0	27	7	34
Others	418	295	65	23	0	15	66	82	345	1,309
TOTAL	6,200	5,439	2,702	2,029	1,554	1,331	1,392	1,416	2,233	24,296

Table 8. IUCN Red List Assessments for Spiny dogfish *Squalus acanthias*
***(Source:* Fordham et al. 2006)**

Region	Red List Assessment
Global	Vulnerable
Northeast Atlantic	Critically Endangered
Mediterranean Sea	Endangered
Black Sea	Vulnerable
Northwest Atlantic	Endangered
Northeast Pacific	Vulnerable
Northwest Pacific	Endangered (it may prove to be Critically Endangered once a full regional review can be undertaken)
South America	Vulnerable
Australasia and Southern Africa	Least Concern

Table 9. Summary of qualifying CITES listing criteria for *Squalus acanthias* stocks

Stock	Qualifying criteria		
	Annex 2a A	Annex 2a B	Annex 2b A
Northeast Atlantic	√		
Western Mediterranean	√		
Eastern Mediterranean		√	
Black Sea		√	
Northwest Atlantic – USA	√		
Northwest Atlantic – Canada		√	
Northwest Pacific – Japan	√		
Northwest Pacific – Russia		√	
Northeast Pacific – Alaska			√
Northeast Pacific – Hecate Strait	√		
Northeast Pacific – Puget Sound	√		
Northeast Pacific – Georgia Strait	√		
Southwest Pacific – New Zealand			√
Southwest Atlantic - Argentina			√

Annex 2.

Scientific synonyms of *Squalus acanthias*

(*Source*: FAO Species Identification Sheet)

- *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 3.

Range States and areas where *Squalus acanthias* has been recorded (Source: Compagno 1984 and feed back by consultation with range states).

Alaska (USA)
Albania
Algeria
Angola
Argentina
Australia
Belgium
Bosnia & Herzegovina
Canada
Canary Islands (Spain)
Chile
China
Croatia
Cuba
Cyprus
Denmark
Egypt
Faeroe Islands (Denmark)
Falkland/Malvinas Islands*
Finland
France
Gabon
Georgia
Germany
Greece
Greenland
Iceland
Ireland
Israel
Italy
Japan
Kerguelen Islands (French Overseas Territory)
Korea, Democratic People's Republic of
Korea, Republic of
Latvia
Lebanon
Libyan Arab Jamahiriya
Lithuania
Malta
Mauritius
Mexico
Monaco
Montenegro
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
Uruguay
USA
Western Sahara

FAO Fisheries Areas: 21, 27, 31, 34, 37, 41, 47, 57, 61, 67, 77, 81 and 87.

* A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands/Islas Malvinas

Annex 4

EU CONSIDERATIONS ON using the CRITERIA FOR AMENDMENT OF APPENDICES I AND II for COMMERCIALLY EXPLOITED AQUATIC SPECIES with regard to *Squalus acanthias*

CITES Standing Committee 58 [SC58 Sum. 7 (Rev. 1) point 43 (09/07/2009)] has asked Parties, as they prepare for CoP15, to clearly define in their listing proposals how they have interpreted and applied Resolution Conf. 9.24 (Rev. CoP14).

Interpreting the Text of Annex 2 a with regard to *Squalus acanthias*

The proponents have carefully considered the FAO's views on how CITES Parties should interpret the criteria in Resolution Conf. 9.24 (SC 58 Inf. 6), and the interpretation suggested by the CITES Secretariat (SC 58 Doc. 43). In the view of the proponents, the definition of the term "decline" given in Annex 5 of Resolution Conf. 9.24 and the Footnote "Application of decline for commercially exploited aquatic species" is clearly relevant for Criterion A of Annex 2 a, and we have interpreted it according to the guidelines and the footnote.

Criterion A of Annex 2 a states that a species should be included in Appendix II “to avoid it becoming eligible for inclusion in Appendix I in the near future". According to Article II Paragraph 1 of the Convention, it shall be included in Appendix I if it is "threatened with extinction". According to Annex 1 of Res. Conf. 9.24 (Biological criteria for Appendix I), a species is threatened with extinction if it meets or is likely to meet at least one of the criteria A, B or C, with C specifying "a marked decline in the population size in the wild [...]". This term "decline" used in Criterion C for Appendix I is then further defined in Annex 5 (Definitions, explanations and guidelines) and specified for commercially exploited aquatic species in the above mentioned footnote.

By contrast, Criterion B of Annex 2 a does not refer to Appendix I. Criterion B states that a species should be included in Appendix II "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." Whether the Appendix I definition of "decline" is relevant for Criterion B has been subject to different interpretations. The proponents do not wish to enter into this general discussion through the present document. However, the proponents would like to underline that Criterion B represents the outcome of a rewording of the previous version of Paragraph B of Annex 2 a in Res. Conf. 9.24, which reads as follows:

> *"It is known, or can be inferred or projected, that harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by either*
>
> *i) exceeding, over an extended period, the level that can be continued in perpetuity; or*
>
> *ii) reducing it to a population level at which its survival would be threatened by other influences."*

In the criteria working group at Johannesburg (20th Animals Committee, 2004) it was recognized that Criterion B of Annex 2 a in its current version encompasses both meanings of the abovementioned original text, i.e. paragraph i) and ii). With respect to paragraph ii) of the original criterion, decline is relevant with respect to the special case of reducing a population to a level at which depensation might occur. Paragraph i) of the original criterion is a reference to long-term unsustainable harvesting that is known or might be inferred or projected, and to the detrimental impact that such harvesting has, or may have, on the species.

This represents the understanding of European Community Parties when the revised criteria were adopted, and the proponents feel that this remains a valid interpretation of this criterion.

Resolution Conf. 9.24 (Rev. CoP 14) also recognizes the importance of the application of the precautionary approach in cases of uncertainty and indicates that the definitions, explanations and guidelines provided in Annex 5 should be interpreted in a flexible manner, taking account of the specific features of each species considered. This was highlighted by the Standing Committee at its 58th meeting, and the proponents have interpreted the Resolution accordingly in their listing proposal for *Squalus acanthias*.

On this basis, with regard to the relevant stocks of *Squalus acanthias* referred to in the proposal, Criterion B of Res. Conf. 9.24 Annex 2a is regarded to be met because:

- This species is of very high biological vulnerability, falling within FAO's lowest productivity category, and takes decades to recover from depletion, even under fisheries management;
- Exploitation, particularly of aggregations of mature females, is driven primarily by trade demand for meat in European markets (where domestic fisheries have been closed);
- There is evidence of widespread and serious impacts of exploitation in much of this species' range, with several stocks depleted to the point where they qualify for listing in the CITES Appendices;
- As stocks decline of other small to medium-sized sharks and teleosts supplying EU markets, some fisheries are targeting previously lightly fished *Squalus acanthias* populations to meet this demand;
- Management of all stocks is a high priority. Regulation of international trade through CITES listing can supplement traditional management measures, thus providing a significant contribution to the conservation of this species and allaying consumer concerns over the sustainability of the *Squalus* fisheries that supply EU markets.

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