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Squalus acanthias, Spiny Dogfish

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Chondrichthyes	Squaliformes	Squalidae

Taxon Name: *Squalus acanthias* Linnaeus, 1758

Regional Assessments:

- Europe
- Mediterranean

Infra-specific Taxa Assessed:

- *Squalus acanthias* (Australasia subpopulation)
- *Squalus acanthias* (Black Sea subpopulation)
- *Squalus acanthias* (Mediterranean subpopulation)
- *Squalus acanthias* (Northeast Atlantic subpopulation)
- *Squalus acanthias* (Northwest Atlantic subpopulation)
- *Squalus acanthias* (South America subpopulation)
- *Squalus acanthias* (Southern Africa subpopulation)

Common Name(s):

- English: Spiny Dogfish, Cape Shark, Piked Dogfish, Spurdog
- French: Aiguillat commun
- Spanish: Cazón Espinoso, Espinillo, Galludo, Mielga

Taxonomic Source(s):

Eschmeyer, W.N., Fricke, R. and van der Laan, R. (eds). 2016. Catalog of Fishes: genera, species, references. Updated 1 March 2016. Available at: http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp. (Accessed: 1 March 2016).

Taxonomic Notes:

While there are reported subpopulations of *Squalus acanthias* (Linnaeus, 1758) elsewhere in the world, the North Pacific subpopulation is now considered a separate species, *Squalus suckleyi* (Girard, 1854) (see Ebert *et al*. 2010). Further taxonomic studies on this genus are required, including in relation to Mediterranean and Black Sea subpopulations. In Europe, three subpopulations are inferred to occur.

Assessment Information

Red List Category & Criteria: Vulnerable A2bd+3bd ver 3.1

Year Published: 2016

Date Assessed: March 13, 2016

Justification:

The Spiny Dogfish or Spurdog (*Squalus acanthias*) is a small demersal shark of temperate continental shelf seas worldwide (although the North Pacific form is now considered a separate species: the North

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Pacific Spiny Dogfish, *Squalus suckleyi*). Most stocks are highly migratory, but there is no regional fisheries management for the species. Management is in place in only a few range states and in only a limited part of the range of highly migratory stocks. Although naturally abundant, this is one of the more vulnerable species of shark to over-exploitation by fisheries because of its late maturity, low reproductive capacity, longevity, long generation time (25 to 40 years) and hence a very low intrinsic rate of population increase (2 to 7% per annum).

Population segregation and an aggregating habit make mature (usually pregnant) females highly vulnerable to fisheries even when stocks are seriously depleted. This aggregating habit also means that catch per unit effort (CPUE) is not an adequate indicator of stock status; high CPUE can be maintained even when populations are severely depleted. Some targeted *Squalus acanthias* fisheries have been documented for over 100 years. Fisheries stock assessments report a decline in total biomass of >95% from baseline in the Northeast Atlantic, where catch effort is effectively unlimited. Mediterranean and Black Sea stocks are also unmanaged, with a >60% decline reported in a Black Sea stock assessment for 1981 to 1992. There has been a decline in biomass of mature females of 75% in just 10 years in the Northwest Atlantic, where US federal efforts to manage the stock are hampered by high bycatch, continued exploitation in Canadian Atlantic waters, and regular defiance of scientific advice by US Atlantic states. European demand continues to fuel markets around the world. Unregulated and expanding target and bycatch fisheries take spiny dogfish in South America (Europe reports imports from this region), where population declines are reported. New Zealand manages the species, which is taken in target and bycatch fisheries, through its Quota Management System. There is only limited fishing pressure in Australia and South Africa, with most catches discarded.

Based on evidence of declines in various parts of the species' range, and ongoing over-exploitation by target and bycatch fisheries, it is inferred that there has been a decline of >30% in the global population over the last 75 years (approximately three generations for this species). If these threats continue unabated, the species is expected to declines at a similar rate over the next three generations. The Spiny Dogfish is therefore assessed as Vulnerable.

Geographic Range

Range Description:

The Spiny Dogfish is a boreal and temperate cosmopolitan species with principal subpopulations found in the Northeast and Northwest Atlantic, the Southeast Pacific and Southwest Atlantic off South America, the Southeast Atlantic off South Africa, and the Southwest Pacific and Eastern Indian off the southern coasts of Australia and New Zealand (Compagno 1984).

Country Occurrence:

Native: Albania; Algeria; Argentina; Australia (South Australia); Bahamas; Belgium; Bosnia and Herzegovina; Brazil; Bulgaria; Canada; Chile (Juan Fernández Is.); Croatia; Cuba; Cyprus; Denmark; Egypt; Faroe Islands; France; Georgia; Germany; Greece; Greenland; Iceland; Israel; Italy; Lebanon; Libya; Malta; Mauritania; Monaco; Montenegro; Morocco; Namibia; Netherlands; New Zealand; Norway; Portugal; Romania; Senegal; Slovenia; South Africa; Spain; Sweden; Syrian Arab Republic; Tunisia; Turkey; Ukraine; United Kingdom; United States (Georgia); Uruguay; Western Sahara

FAO Marine Fishing Areas:

Native: Atlantic - western central, Atlantic - southwest, Atlantic - southeast, Atlantic - northwest, Atlantic - northeast, Atlantic - eastern central, Indian Ocean - eastern, Mediterranean and Black Sea - , Pacific - southeast, Pacific - southwest

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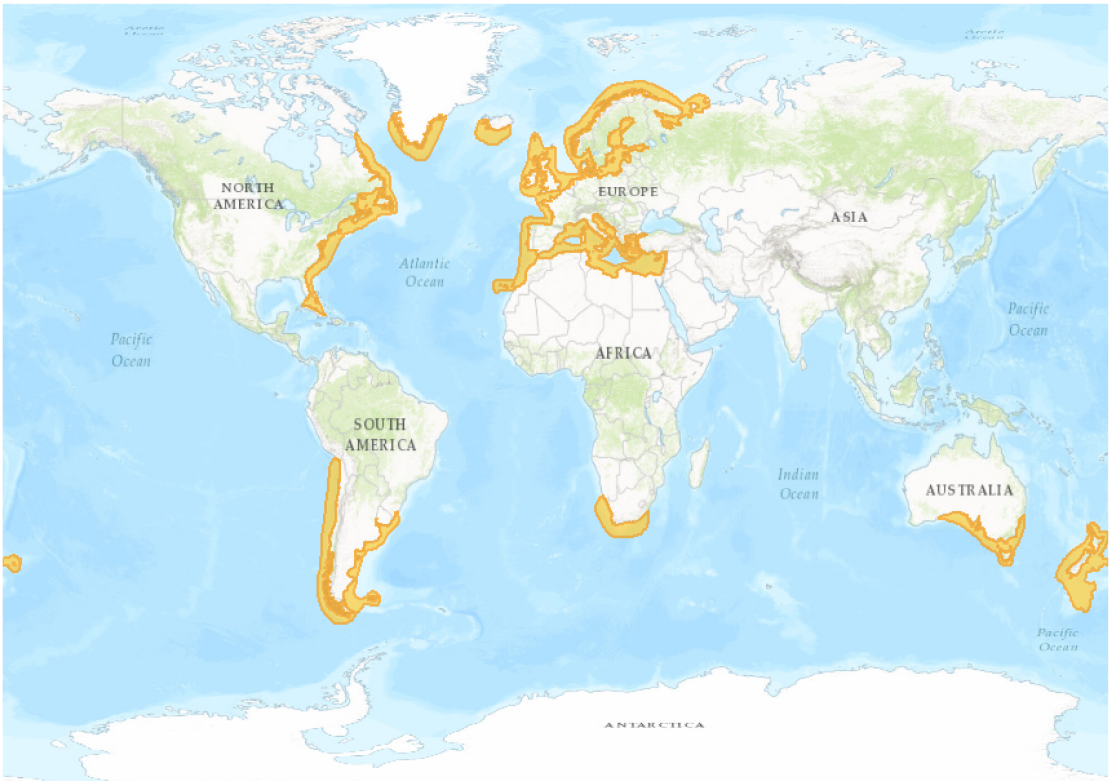
Distribution Map

Squalus acanthias



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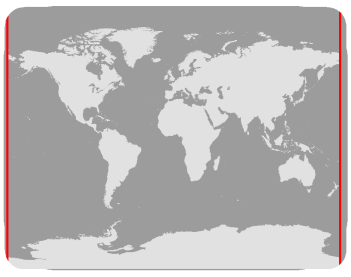
NE DD LC NT VU VULNERABLE EN CR EW EX

Range

Extant (resident)

Compiled by:
IUCN Shark Specialist Group



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

Little mixing occurs between subpopulations.

Current Population Trend: Decreasing

Habitat and Ecology **(see Appendix for additional information)**

The Spiny Dogfish is found from the intertidal zone to depths of 900 m, but mostly <200 m (at least in the Mediterranean). Usually coastal and demersal, they migrate north and south as well as near shore and offshore in 7 to 15°C water (Compagno 1984).

The Spiny Dogfish is lecithotrophic viviparous. Pups measure between 20 and 30 cm total length (TL) at birth (Castro 1983). Fecundity increases with size (Templeman 1944, Nammack *et al*. 1985). Castro (1983) reported that, in the North Atlantic, dogfish pup offshore in deepwater wintering grounds, while Templeman (1944) suggested mature females off Newfoundland pup inshore January through May.

Spiny Dogfish prey opportunistically on a variety of small fish and invertebrates (Castro 1983). Aside from humans, adult dogfish have few enemies. They are eaten by larger sharks, large bony fishes, seals, and killer whales (Castro 1983, Compagno 1984). Although dogfish are regularly blamed for preying heavily on economically valuable groundfish, stomach content analyses reveal that most groundfish are uncommon in dogfish diets and the amount of groundfish removed by dogfish is a small fraction of fishery removal and stock sizes (Link *et al*. 2002).

Spiny Dogfish are highly migratory, travelling in large, dense 'packs', segregated by size and sex. Primarily epibenthic, they are not known to associate with any particular habitat (McMillan and Morse 1999). They are thought to mate in winter (Castro 1983, Compagno 1984). In Australia, breeding occurs in large bays and estuaries (Last and Stevens 1994), while North Atlantic mating grounds are still unknown.

Spiny Dogfish reach maturity late and are very long-lived. Nammack *et al*. (1985) reported that individuals in the Pacific grow more slowly and larger than those in the Atlantic. Life history characteristics are summarized below.

Systems: Marine

Use and Trade

This species is utilised extensively for its meat, fins and other products.

Threats **(see Appendix for additional information)**

The principal threat to this species worldwide is over-exploitation, by target and bycatch fisheries. This is a valuable commercial species in many parts of the world, caught in bottom trawls, gillnets, line gear, and by rod and reel.

France was the largest importer of dogfish meat within the EU from 1990-1994, importing an annual average of 5,000 tonnes (98% spiny) with the UK as their top European supplier. During 1988-1994, Norway was the largest of nine non-EU suppliers to the EU of fresh or chilled spiny dogfish, followed by

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the US. As European stocks decline, demand is being met by frozen imports from 25 countries, dominated by the US and Argentina.

According to the Food and Agricultural Organization (FAO), dogfish catches reached a peak in 1972 (73,500 t) then declined and stabilized in a range between 36,000 and 51,000 t in the 1990s. Most of the catch reported to FAO comes from the North Atlantic, with minor amounts reported from the Mediterranean and Black Seas. There are, however, some data discrepancies: in 1999, the US landed nearly 15,000 t of spiny dogfish and 9,800 t was landed from ICES areas, most of this by the UK fleet (UK fisheries statistics report over 9,000 t landed), yet FAO reports 1999 global catch at 22,756 t with the largest catches coming from Canada (5,536 t) and Norway (1,461 t) (FAO 2000) (note that some statistics will include the North Pacific Spiny Dogfish *Squalus suckleyi*).

Locally high biomass initially supports large catches, but most large-scale spiny dogfish fisheries have depleted populations and collapsed (Ocean Wildlife Campaign 1996). An aggregating habit makes it possible for fishers to continue to target highest value mature females even after stocks have been depleted to a few percent of baseline. The species is also taken as a bycatch in mixed species fisheries, meaning that fishing pressure can continue even after stocks have been so seriously depleted that they can no longer support viable fisheries.

There are potential impacts on spiny dogfish associated with habitat loss and degradation. Coastal development, pollution, dredging and bottom trawling affect coastal or benthic habitat on which spiny dogfish or their prey rely (ASMFC 2002).

Where spiny dogfish are taken as an unwanted bycatch in fisheries and discarded, their high survival rates and competitive release from retained demersal fish species may well lead to increased stocks of dogfish. This may have occurred in the Northwest Atlantic before declining fish stocks and high demand from European markets caused the species to be targeted there.

We must take into account that official fisheries statistics in most regions only consider landed biomass, and not actual captures. If we consider the possibility that a decade ago discards of these non targeted species were higher than discards nowadays (and this fact can easily be explained due to the collapse in most traditional fishing stocks, that lead to an increase in the commercialisation of these by-catch species), then the real decrease in the population biomass can be much higher than many of the estimates presented here.

Note that some of the following catch statistics will include the North Pacific Spiny Dogfish (*Squalus suckleyi*).

Northeast Atlantic:
Rey (1928) refers that in the 1920s this was a very abundant species in the Iberia Peninsula (Portugal and Spain) both for the Atlantic and the Mediterranean coasts. He added that this species probably aggregated during some periods because sometimes huge amounts were captured with longlines and nets. Heessen *et al*. (2003) identified a single Northeast Atlantic stock of spurdog, distributed from the north of the Bay of Biscay to the Norwegian Sea. This has been fished off Europe (mainly in the North and Irish Seas) since the early 1900s, primarily by British and Norwegian fishermen, later by the French and Irish as well (Bonfil 1994). Today, the UK fishery lands around 80% of the European Union catch.

Annual catches were well below 10,000 t throughout the ICES area before the 1930s, had more than doubled by 1937, then reached a peak of over 58,000 t in 1963 (Heessen *et al*. 2003 and see Figure). Holden (1968) considered the female portion of the Scottish-Norwegian stock to be overfished in the late 1960s. In the late 1970s, landings continued to decline and by 1978, the Norwegian fishery north of Scotland had collapsed (Hjertenes 1980). The important North Sea fishery declined steeply from around 37,000 t in the early 1970s, to 3,000-4,000 in recent years, while the more recent Celtic Seas fishery peaked at about 22,000 t in 1987, since declining to under 5,000 t. Total landings from the entire ICES area are now under 10,000 t, around 17% of peak landings.

Portuguese official fisheries statistics for landings of *Squalus acanthias* for fishes captured in Portuguese waters, have shown a decrease of 51% between 1987 and 2000. Since then, landings increased again until 2002, so the overall decrease from 1987 to 2002 has been 11.3% (DGPA, 1988-2004). When a linear regression was fitted to the log transformed data of these annual landings, projections were made for a three-generation period in the past, with a reduction of landed biomass of 43%. Taking into account that this species continues to be fished nowadays and there are no perspectives of reducing exploitation levels for the future, future projections were also made, and another 43% reduction of landed biomass in the next three generations estimated.

We must take into account that official fisheries statistics only consider landed biomass, and not actual captures. If we consider the possibility that 15 years ago discards of these non targeted species were higher than discards nowadays (and this fact can easily be explained due to the collapse in most traditional fishing stocks, that lead to an increase in the commercialisation of these by-catch species), then the real decrease in the population biomass can be much higher than one estimated here.

The species is still the region's most commercially important elasmobranch, with most of the catch being incidental although there are still local, directed fisheries in the north (Pawson and Vince 1998). Heessen *et al*. (2003) describe the stock as severely depleted, with an estimated decline in biomass from 1977 of over 5,000,000 (at which time landings had already fallen to 60% of peak catches) to well under 100,000 in 2001; a decline in biomass of well over 98%. Estimates of total numbers of mature adults in 2000 range from 100,000 to 600,000 individuals. Hammond and Ellis (2004) estimate depletion of this stock to about 5% of virgin biomass. The decline in biomass over the 75 year three generation period for this stock is also greater than 90% and the stock therefore assessed as Critically Endangered. There is currently no indication that effective management will be introduced to regulate the fishery and allow the stock to rebuild; quotas apply to only part of the stock (North Sea) and significantly exceed recent landings for this area, while ICES advice for a zero quota in 2006 was not adopted by the EU.

Mediterranean:
Depth distribution is from 20-30 m down to 800 m, with peaks of abundance in shallow water (to 50 m) and from 200-500 m. The species is most abundant in the Eastern Central area (southern Adriatic, Ionian and Albanian Sea), less so in the Eastern Aegean, and fairly scarce elsewhere. Spiny dogfish occurred in 5% of MEDITS trawls (1994-98). These data were used to calculate a total standing stock biomass in the entire MEDITS area of 6,682 tonnes (Serena in lit.). There are very few trend data. Jukic-Peladic *et al*. (2001) do not report any significant change in occurrence of *S. acanthias*. Aldebert (1997) reports a decline in observations of *S. acanthias* landings beginning in the 1980s. Anecdotal evidence from fishermen interviews in the Balearics indicates a significant decline in abundance in captures with bottom longlines and gillnets over the 17 years from 1985/6 (Gabriel Morey, personal communication).

Directed fisheries undertaken for this species during the 1970s ceased as a result of these stock declines. This stock is therefore assessed as Endangered.

Black Sea:
Although trend data are scarce for the Black Seas, some declines have been observed. A stock assessment for the Black Sea stock (Prodanov *et al*. 1997) identified a decline in abundance of *Squalus acanthias* of 60% between 1981 and 1992. Overall, the stock seems likely to be in a better state than in the Northeast Atlantic, which has been fished more intensively and for much longer. Fishing pressure is, however, likely to continue to remain high and the declines seem likely to continue and therefore the stock is assessed as Vulnerable.

Northwest Atlantic:
Spiny dogfish were fished intensively for liver oil off the eastern US during World War II until the synthesis of vitamin A (Castro 1983). Landings increased from 500 t in the early 1960s to 9,689 t in 1966 and peaked in 1974 at 25,620 t. Foreign fleets (from the former USSR and East German Republic, Poland, Japan and Canada) accounted for virtually all the reported catch from 1966 to 1977 (NOAA 1995). Annual US commercial dogfish landings from the Atlantic increased from only a few hundred tonnes in the late 1970s to around 4,500 t during 1979-1989. Increasing European demand led to a sevenfold increase in landings, to a peak of 27,200 t in 1996. Estimates of dogfish discards have ranged from 3,700 mt to 47,000mt for the years 1990-2002 (NEFSC 2003). Landings fell to 14,906 t in 1999, prior to the introduction of management (Rago and Sosebee 2002), but federal mortality targets have yet to be achieved. US recreational catches increased from about 350 t annually in 1979-1980 to about 1,700 t in 1989, averaged about 1,300 t from 1990-1994, then declined in 1996 to 386 t (NOAA 1998). Recreational landings remained stable through 2000 and then rose to roughly 2,000 mt in 2001 and 2002, a level that for the first time is considered significant (NEFSC 2003). Stock assessments indicate that total biomass was stable at a high level into the late 1990s, but, based on declines in targeted mature females, the stock was declared overfished in 1997. In the first stages of management, actual fishing mortality (F=0.27) greatly exceeded the target level (F=0.03) (MAFMC 2001). By 2002, fishing mortality had dropped to F=0.09, but still exceeded the rebuilding target by a factor of 3. Reproductive biomass peaked in 1989 and then declined by more than 75% by 2002 (NEFSC 2003). Average weight of landed females declined from 4 kg in 1987 to 2 kg in 2000 (Rago and Sosebee 2002). Recruitment estimates from 1997-2003 are the seven lowest in the 35-year time series. Average size of pups taken in surveys has also declined, consistent with new data regarding reduced average size of pups produced by smaller females. Reproductive potential is expected to continue to decline as these weak year classes mature. (NEFSC 2003). Overall, US federal efforts to manage the Northwest Atlantic stock for recovery have been hampered by delays, non-compliance and continued exploitation in state waters to supply European market demand. Whereas significant rebuilding (90% of SSB target) was anticipated by 2003, the population in 2005 had yet to show signs of recovery in mature females or significant improvement in recruitment. (ASMFC and MAFMC 2005). The U.S. Atlantic federal plan's fishing mortality target was scheduled to increase from 0.03 to 0.08 in 2004 based on this stock rebuilding that was anticipated but not realized (MAFMC 2001). Increases in fishing mortality are now possible under the FMP, but scientists recommended maintaining a target fishing mortality rate of 0.03 because of lack of rebuilding. Under the most optimistic scenario, rebuilding will take at least 15 years. Recovery under the target fishing mortality rate (yet to be realized) could take three decades. Long term projections, which account for lower survivorship of pups, predict stock collapse under current fishing mortality (NEFSC 2003).

US commercial landings of spiny dogfish amounted to 1,170 mt (approximately 2.5 million lbs) in 2003 and 980 mt (roughly 2 million lbs) in 2004; total landings are approximately 99% was female (ASMFC and MAFMC 2005). NMFS reported Massachusetts landings for the fishing year spanning May 1, 2004 to April 30, 2005 at less than 1 million pounds; however, Massachusetts officials claim two processors in New Bedford processed about 2 million pounds, collectively during that time period (Pierce 2006). The average size of females landed is increasing over time, primarily due to a shift in fisheries (more landings from gill net and hook fishing, fewer from trawls). The ratio of total landings to numbers removed reveal that the number of females landed increased roughly 16-fold, indicating that the average size has greatly decreased. Dead discards from US commercial fisheries were estimated to be between 6,400 to 13,285 mt (14.1 and 29.3 million pounds) depending on the assumed discard mortality by gear type. Recreational landings of spiny dogfish increased from a very low number in 2000 to a high value of 81,972 animals in 2002. In 2005, the relevant scientific committee recommended the continuation of very low possession limits and a quota ("bycatch cap") reduction of 50% (down to 2 million lbs annually). In recent years, the fraction of the dogfish population found in nearshore waters has increased markedly for unknown reasons (ASMFC and MAFMC 2005).

Resulting increased interactions with fishermen have sparked widespread demands for loosening dogfish restrictions.

The Dogfish Technical Committee in 2005 expressed concern about constraining effects that dogfish discards in commercial fisheries and the directed Canadian dogfish fishery are having on progress toward spiny dogfish population recovery. They recommended a 50% reduction in the quota ("bycatch cap"), continuation of low trip limits and measures to reduce discarding (ASMFC and MAFMC 2005). A full "benchmark" population assessment for this stock is scheduled for July 2006.

In the Canadian Atlantic, dogfish are targeted in the Bay of Fundy, Scotian Shelf and Gulf of St. Lawrence. Foreign landings on the Scotian Shelf peaked at 24,000 t in 1972-1975, but were then replaced by national fisheries (ICES 1997). Atlantic Canadian landings prior to 1979 were insignificant (OWC 1996). A directed fishery then developed off the Maritimes and took off as the US fishery came under regulation. Canadian Atlantic landings increased from an average of 500 t from 1979-1988 to 1,800 t in 1994. After a subsequent decline to roughly 400 t in 1996 and 1997, catches (primarily from Nova Scotia) rose nearly six times from 1997 to 2001 (as U.S. regulations went into effect) and soon represented the largest proportion of the landings from the stock (NEFSC 2003). Canadian landings dropped slightly in 2002 and 2003, but were back up again in 2004 at 2336 mt (approximately 5 million lbs) allocated for the fishery as well as a 700-ton research fishery (ASMFC and MAMFC 2005). The driving force behind these fisheries continues to be international trade to satisfy the European market demand.

In 2003, Canada announced its intention to develop their own dogfish population assessment after a five year data collection program and their anticipation to maintain Canadian fishing effort, deemed unsustainable in U.S. assessments, in the meantime (Bundy 2003). Canadian Maritime officials note increased interest in the species from U.S. buyers and their industry's reports of good markets for dogfish. According to Department of Fisheries and Oceans statistics, in just two years (1999 to 2001), the volume of dogfish exports doubled while its value nearly tripled.

At its annual meeting in 2005, Parties to the Northwest Atlantic Fisheries Organization (NAFO), in

accordance with the recommendations from the 2002 NAFO Symposium on Elasmobranch Fisheries that "the NAFO Scientific Council [be directed] to investigate the status and management needs of elasmobranchs in NAFO waters," requested the NAFO Scientific Council (SC) to review all available information from both research vessel surveys and commercial catches on the stock structure, relative biomass, geographic distribution, life history, and size/age/sex composition of spiny dogfish (*Squalus acanthias*) occurring within the NAFO Regulatory Area. The SC was also requested to provide historical and recent information on catches and by-catches, and to identify those fisheries in which spiny dogfish is taken as bycatch.

This stock is currently assessed as Endangered (A2+4bd) on the basis of past and continuing declines, persistent market demand and targeted fishing, increasing discarding, and growing pressure to reopen fisheries. The population would be assessed as Vulnerable (A1) if science-based management measures were introduced and adhered to over the long term across the whole stock.

Australasia:
Considered coarse, dogfish meat is of little value to Australians (Last and Stevens 1994). Tasmanian recreational gillnet fisheries do, however, take substantial amounts (Simpfendorfer, pers. comm. in Fordham 2005).

Reported New Zealand landings increased from 3,000-4,000 t during the 1980s to 7,000-11,000 t from the mid 1990s to the mid 2000s (Manning *et al*. 2004, Sullivan et al. 2005). However some, if not most, of the apparent increase was probably a result of better reporting. It is not known if this level of fishing is sustainable, but catch rate analyses and trawl survey biomass indices show no sign of significant declines; indeed one of the main stocks on the Chatham Rise has shown a 5-fold biomass increase since 1991 (Manning et al. 2004, Sullivan *et al*. 2005). Population assessments for spiny dogfish off New Zealand are not yet available. Spiny dogfish were introduced to the New Zealand Quota Management System in October 2004 with a TAC of 12,660 t (M. Francis, pers. comm.). As such, this stock can be assessed as Least Concern.

South America:
Squalus acanthias is, together with the similar shortspine spurdog *S. mitsukurii* and shortnose spurdog *S. megalops*, one of the more important coastal commercial species in Brazil, where landings of the genus have declined considerably. It is also taken as bycatch in mixed demersal fisheries and the target fishery for *Lophius gastrophysus*. Unregulated and expanding target and bycatch fisheries take spiny dogfish in Uruguay and Argentina, where declines of ~50% have been reported (Massa *et al*. 2002). Patagonian trawlers fishing for hake and shrimp take a bycatch of spiny dogfish. Rising effort in these fisheries and a lack of bycatch control is considered to be a threat to this and other elasmobranch populations in the region (Van Der Molen *et al*. 1998). As in so many other regions, pregnant females are commonly targeted. The South American stocks are assessed as Vulnerable, but may prove to be Endangered when a more detailed regional review can be undertaken.

Southern Africa:
Spiny dogfish are considered a nuisance off South Africa and are not currently targeted. Demersal trawl dogfish catch for the South Coast was recently estimated at 4.7 t, 99% of which is discarded. Off the West coast, an estimated 3.4 t is taken annually (100% discarded). The lack of data on historical dogfish catch will make it difficult to monitor future trends.

Conservation Actions (see Appendix for additional information)

Despite several decades of warnings of unsustainable fishing pressure and reported steep stock declines, very few conservation or management measures are in place for spiny dogfish; measures in place have not been effective in terms of rebuilding populations. A notable exception may be New Zealand, where quotas have been introduced to limit catches to sustainable levels in response to the first signs of fishery development to meet European demand for meat. Spiny dogfish were brought under the New Zealand Quota Management System in October 2004 (M. Francis, pers. comm).

Holden (1968) first warned that part of the Northeast Atlantic stock was over-exploited, but there is still no effective management in this region despite wide-spread recognition that fishing levels are unsustainable and several parts of the stock have collapsed. A minimum landing size established in Norway in order to protect mature females is of limited value for a migratory species that is intensively fished in other parts of its range. Total Allowable Catches in EU waters, first established in 1998, have consistently exceeded recent landings and do not appear, therefore, to have had any constraint upon current unsustainable levels of fishing pressure. This fishery needs to be closed if the stock is to recover, ICES recommended a zero quota in 2006, but this advice was not heeded by the EU.

In the Northwest Atlantic, the 1999/2000 US federal dogfish rebuilding plan has yet to reverse population decline and fishing mortality targets continue to be grossly exceeded.

Federal Fishery Management Councils in the eastern US developed a spiny dogfish rebuilding plan in the late 1990s coincident with the stock being officially declared overfished. Low priority and controversy over cuts led to serious delays. Implemented in mid 2000, the plan aimed to rebuild the population through a low fishing mortality target (F=0.03) and corresponding quota (four million lbs) and trip limits (300 to 600 lbs for two periods) that would discourage targeted fishing and yet allow some landing of incidental catch. Once that the ten-year legal limit to recover the population became impossible, federal law allowed the rebuilding period to be extended, opening the plan up for relaxation of measures.

As Federal measures developed, the dogfish fishery shifted into state waters (within three miles from shore). Continued state fisheries have undermined the federal plan ever since. Most notably, Massachusetts, the Atlantic state with the largest directed dogfish fishery, adopted a 2000 state quota at nearly twice the Federal allotment for the entire Atlantic and excessive possession limits that allowed for continued directed dogfish fishing. Under the federal plan, overages are not deducted from the subsequent year?s quota.

In late 2002, the Atlantic States Marine Fisheries Commission (ASMFC) adopted a federally compatible dogfish rebuilding plan for state waters. In early 2003, however, the ASMFC rejected scientific advice and accepted a Massachusetts proposal to more than double the quota (to 8.8 million lbs) and increase trip limits by an order of magnitude (to 7,000 lbs) to allow directed dogfish fishing. The ASMFC did impose scientifically defensible limits for the 2004 fishing year (beginning in May), but rejected the 2005 advice for a 50% quota cut for 2006 in favour of the status quo (4 million lbs). This advice, from a joint state and federal technical committee, was also rejected by the New England Fishery Management Council, but adopted by the Mid-Atlantic Fishery Management Council (MAFMC). The decision on catch limits for the 2006 fishing season now lies with the NMFS, but pressure to relax recovery efforts is increasing due to the movement of a larger percentage of the population to nearshore waters and

therefore fishing gear. The ability to set catch limits for a multi-year period (3 to 5 years) is currently being considered by both state and federal authorities and may be realized as soon as this year.

Canada began restricting Atlantic dogfish catch in May of 2002, following a significant increase in landings in years just prior. The government capped 2002 commercial landings at 2,500 metric tons for the fixed gear groundfish sector off Nova Scotia and in the Bay of Fundy, based on landings history at the time. In addition, bycatch caps for other fisheries consistent with historical landings and an additional 700 mt for a cooperative industry sampling program were granted. The Canadian government has stated that the caps are aimed to limit harvest while future sustainable catch levels are investigated. The Canadian government intends to maintain dogfish catches at roughly 3,200 mt for directed fishing and research while they collect data and develop their own population assessment, expected by 2007 (Campana 2002, pers comm).

There are no management programs for spiny dogfish in Australia (Simpfendorfer, pers. comm).

In southern Africa, South African fisheries for teleosts (mainly hake), which take dogfish as bycatch, appear to be managed sustainably although efforts to improve observer data for these fisheries have not yet been implemented.

Credits

Assessor(s): Fordham, S., Fowler, S.L., Coelho, R.P., Goldman, K. & Francis, M.P.

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External Resources

For Images and External Links to Additional Information, please see the Red List website.

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.1. Marine Neritic - Pelagic	Resident	Suitable	-
9. Marine Neritic -> 9.3. Marine Neritic - Subtidal Loose Rock/pebble/gravel	Resident	Suitable	-
9. Marine Neritic -> 9.4. Marine Neritic - Subtidal Sandy	Resident	Suitable	-
9. Marine Neritic -> 9.10. Marine Neritic - Estuaries	Resident	Suitable	-
11. Marine Deep Benthic -> 11.1. Marine Deep Benthic - Continental Slope/Bathyl Zone (200-4,000m) -> 11.1.1. Hard Substrate	Resident	Suitable	-
11. Marine Deep Benthic -> 11.1. Marine Deep Benthic - Continental Slope/Bathyl Zone (200-4,000m) -> 11.1.2. Soft Substrate	Resident	Suitable	-

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Education

http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T91209505A2898271.en

Conservation Actions in Place
Subject to recent education and awareness programmes: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.1. International level
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.1. International level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
0. Root -> 100.1. OLD 1.1.1-Policy-base actions->Management plans->Development
1. Research -> 1.6. Actions
3. Monitoring -> 3.1. Population trends

Additional Data Fields

Distribution
Lower depth limit (m): 900
Upper depth limit (m): 30
Habitats and Ecology
Generation Length (years): 25

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