The Conservation Status of Northeast Atlantic Chondrichthyans

Report of the IUCN Shark Specialist Group
Northeast Atlantic Regional Red List Workshop
Peterborough, UK, 13–15 February 2006

Compiled and edited by
Claudine Gibson, Sarah V. Valenti,
Sarah L. Fowler and Sonja V. Fordham

IUCN
SSC Species Survival Commission
Shark Specialist Group
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SHARK ALLIANCE

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Contents

List of Tables

List of Figures

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Participants of the IUCN Shark Specialist Group Northeast Atlantic Red List Workshop, February 2006, Peterborough, UK.

Glossary and Acronyms

Mainly modified from Compagno (2001); Kelleher (1999); Last and Stevens (1994); Pogonoski *et al.* (2002); and, http://www.fao.org/fi/glossary/ with IUCN Red List Category and criteria definitions from IUCN (2001). Refer to http://www.iucnredlist.org and the IUCN Red List Categories and Criteria for definitions specific to the Red List which may be more detailed than the general definitions included here.

Abyssal plain – the extensive, flat, gently sloping or nearly level region of the ocean floor from about 2,000m to 6,000m depth.

Adelphophagy – a mode of **aplacental viviparity** employing **uterine cannibalism**, whereby early foetuses deplete their yolksacs early, then subsist by first feeding on their smaller siblings and then on eggs produced by the mother (see **oophagy**).

Aplacental viviparity – a reproductive mode where the maternal adult gives birth to live young which do not have a yolksac placenta.

Aplacental yolksac viviparity – a reproductive mode where the maternal adult gives birth to live young which are primarily nourished by the yolk in their yolksac. The yolk is gradually depleted and the yolksac reabsorbed until the young are ready to be born. Often referred to as **ovoviviparity**.

Area of occupancy – the area within its **extent of occurrence** which is occupied by a taxon, excluding cases of vagrancy. This reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases the area of occupancy is the smallest area essential at any stage of the life cycle to the survival of existing populations of a taxon.

Artisanal fishery – small-scale traditional fisheries involving fishing households (as opposed to commercial companies) which input a relatively small amount of capital and energy, and catch fish mainly for local consumption, however the catch may be exported. Artisanal fisheries can be **subsistence fisheries** or **commercial fisheries**.

Bathyal – **benthic** habitats from 200m to 4,000m depth.

Bathymetric distribution – the vertical distribution of a marine organism, referring to its depth of occurrence.

Batoid – a **ray** or flat shark, a species of the order Rajiformes: the sawfish, sharkray, wedgefish, guitarfish, thornrays, panrays, electric rays, skates, stingrays, stingarees, butterfly rays, eagle rays, cownose rays and devilrays.

Beach meshing – an active fishing method utilising nets or baited drumlines designed to remove sharks from the local area for the purpose of bather protection. Employed only in Queensland and New South Wales in Australia and KwaZulu-Natal in South Africa.

Benthic – living on the bottom of the ocean; bottom-dwelling.

Biological extinction – the complete disappearance of a species from the Earth.

Biomass – the total weight, volume or quantity of organisms in a given area.

Bycatch – the part of a catch taken incidentally in addition to the target species towards which **fishing effort** is directed. In a broad context, this includes all non-targeted catch including **byproduct**, **discards** and other interactions with gear.

Byproduct – the part of the catch which is retained due to their commercial value, but which is not the primary target species (see **target catch**).

Cartilaginous fishes – species of the **class Chondrichthyes**.

Chimaera – a species of the order Chimaeriformes within the subclass **Holocephali**.

Chondrichthyan – referring to the **class Chondrichthyes**.

Chondrichthyes – the **class** Chondrichthyes; the cartilaginous fishes which include the **elasmobranchs** and the **holocephalans**.

Circumglobal – distributed worldwide.

Circumtropical – distributed throughout the tropical regions worldwide.

CITES – Convention on International Trade in Endangered Species of Fauna and Flora. An international agreement which aims to ensure that international trade in specimens of wild fauna and flora does not threaten the survival of species. Appendix II of CITES includes "species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation incompatible with their survival" (http://www.cites.org).

Class – one of the taxonomic groups of organisms, containing related **orders**; related classes are grouped into phlya.

CMS – The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention). An international agreement that recognises the need for countries to cooperate in the conservation of animals that migrate across national boundaries, if an effective response to threats operating throughout a species' range is to be made.

Codend – the end of a fishing net in which the catch collects.

Commercial fishery – a fishery targeting species which are retained and sold for their commercial value.

CFP – Common Fisheries Policy. Principal instrument for management of European Union (EU) marine fisheries.

Common name – the informal vernacular name for an organism, which may vary from location to location.

Continental shelf – the gently sloping, shelf-like part of the seabed adjacent to the coast extending to a depth of about 200m.

Continental slope – the often steep, slope-like part of the seabed extending from the edge of the **continental shelf** to a depth of about 2,000m.

CPUE – Catch-per-unit-effort: a measure of the catch rate of a fish species (or other marine or aquatic species) standardised for the amount of **fishing effort** put into catching that species.

Cryptic – fish species (or other organisms) that live amongst concealing or sheltering cover, or that possess protective colouration.

DELASS – 'Development of Elasmobranch Assessments'. A project funded by the EU to develop elasmobranch assessments to improve the scientific basis for the regulation of fisheries.

Demersal – occurring or living near or on the bottom of the ocean (cf. **pelagic**).

Discards – the component of a catch returned to the sea, either dead or alive. Primarily made up of the **bycatch** but can include juveniles and damaged or unsuitable individuals of the target species.

Discard/release mortality – the proportion of fish that die as a result of being discarded once captured. Discard mortality is often hard to assess as individuals returned to the sea alive may later die due to the effects of being caught.

Dropline fishing – a method of deepwater fishing using a vertical line bearing rows of baited hooks.

DW – disc width: a standard morphometric measurement for **batoids**, across the pectoral fins or 'disc'.

Dynamite fishing – a destructive fishing method using explosives to kill and collect fish. Often used around coral reefs, causing habitat destruction.

Ecosystem – the living community of different species, inter-dependent on each other, together with their non-living environment.

EEZ – Exclusive Economic Zone: A zone under national jurisdiction (up to 200-nautical miles wide) declared in line with the provisions of 1982 United Nations Convention of the Law of the Sea, within which the coastal State has the right to explore and exploit, and the responsibility to conserve and manage, the living and non-living resources.

Elasmobranch – referring to the subclass **Elasmobranchii**.

Elasmobranchii – the subclass Elasmobranchii, a major subdivision of the **class Chondrichthyes**, containing the living nonbatoid **sharks**, **batoids** and their fossil relatives.

Endemic – native and restricted to a defined region or area.

Epipelagic – the upper part of the **oceanic** zone from the surface to depths of about 200m.

Extent of occurrence – the area contained within the shortest continuous boundary which encompasses all known, inferred and projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g., large areas of obviously unsuitable habitat).

Family – one of the taxonomic groups of organisms, containing related **genera**; related families are grouped into **orders**.

FAO – United Nations Fish and Agricultural Organization.

Fauna – the community of animals peculiar to a region, area, specified environment or period.

Fecundity – a measure of the capacity of the maternal adult to produce young.

Filter-feeding – a form of feeding whereby suspended food particles are extracted from the water using the gill rakers.

Finning – the practice of slicing off a shark's valuable fins and discarding the body at sea.

Fishery independent survey – an experimental or scientific survey of the **fauna** or catch within a fishery or area, conducted independently of the fishing industry.

Fishing effort – the amount of fishing taking place; usually described in terms of the gear type and the frequency or period which it is in use.

Fishing mortality – the proportion of fish that die due to fishing; often expressed as a percentage of the total **population** caught each year.

FL – fork length: a standard morphometric measurement used for sharks, from the tip of the snout to the fork of the caudal fin.

Generation – measured as the average age of parents of newborn individuals within the **population**. Where generation length varies under threat, the more natural, i.e. pre-disturbance, generation length should be used.

Genus (plural: genera) – one of the taxonomic groups of organisms, containing related **species**; related genera are grouped into **families**.

Gestation period – the period between conception and birth in live-bearing animals.

Gillnet – a type of fishing net designed to entangle or ensnare fish.

Habitat – the locality or environment in which an animal lives.

Holocephalan – referring to the subclass **Holocephali**.

Holocephali – the subclass Holocephali, a major subdivision of the **class Chondrichthyes**, containing the living **chimaeras** (elephant fishes, chimaeras, ghost sharks, silver sharks, ratfishes, spookfishes) and their fossil relatives.

Holotype – a single specimen cited in the original description of a species which becomes the 'name-bearer' of the species. The Holotype is used to validate the species and its accompanying **scientific name** by anchoring it to a single specimen.

ICCAT – International Commission for the Conservation of Atlantic Tunas.

ICES – International Council for the Exploration of the Seas.

Incidental catch – see **bycatch**.

Intrinsic rate of increase – a value that quantifies how much a **population** can increase between successive time periods; plays an important role in evaluating the sustainability of different harvest levels and the capacity to recover after depletion.

IPOA-Sharks – International Plan of Action for the Conservation and Management of Sharks.

IUCN – International Union for Conservation of Nature-The World Conservation Union. A union of sovereign states, government agencies and non-governmental organisations.

K-selected species – species selected for its superiority in a stable environment; a species typified by slow growth, relatively large size, low natural mortality and low fecundity (cf. **r-selected species**).

Limited entry fishery – a management arrangement to control the amount of **fishing effort** in a fishery where the number of operators (and size of vessels) is restricted through license limitation or quota systems.

Local extinction – when there is no doubt that the last individual of a particular species has died from a particular region or area.

Longevity – the maximum expected age, on average, for a species or **population** in the absence of human-induced or **fishing mortality**.

Longline fishing – a fishing method using short lines bearing hooks attached at regular intervals to a longer main line. Longlines can be laid on the bottom (**demersal**) or suspended (**pelagic**) horizontally at a predetermined depth with the assistance of surface floats. May be as long as 150km with several thousand hooks.

Mesh-size – the size of openings in a fishing net. Limits are often set on mesh size to protect the young of target species, allowing them to reach maturity or optimal size for capture (minimum mesh size); or to protect larger breeding individuals (maximum mesh size).

Mesopelagic – the intermediate part of the **oceanic** zone from 200m to 1,000m depth.

Migratory – the systematic (as opposed to random) movement of individuals from one place to another, often related to season and breeding or feeding. Knowledge of migratory patterns helps to manage shared **stocks** and to target aggregations of fish.

MPA – Marine Protected Area: Any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.

MSY – maximum sustainable yield: the largest theoretical average catch or yield that can continuously be taken from a stock under existing environmental conditions without significantly affecting the reproductive process.

Natural mortality – the proportion of fish that die other than due to fishing, i.e. that proportion due to ageing, predation, cannibalism and disease; often expressed as a percentage of the total population dying each year.

NEAFC – Northeast Atlantic Fisheries Commission.

nm – Nautical Miles.

Non-target species – species which are not the subject of directed fishing effort (cf. **target catch**), including the **bycatch** and **byproduct**.

Oceanic – living in the open ocean, mainly beyond the edge of the **continental shelf**.

Oceanic seamount – a large isolated elevation in the open ocean, characteristically of conical form; often a productive area for deepwater fisheries.

Oophagy – a mode of **aplacental viviparity** employing uterine cannibalism, whereby early foetuses deplete their yolksacs early, then subsist by feeding on eggs produced by the mother.

OSPAR – The Convention for the Protection of the Marine Environment of the Northeast Atlantic

Order – one of the taxonomic groups of organisms, containing related **families**; related orders are grouped into **classes**.

Oviparity – a reproductive mode where the maternal adult deposits eggs enclosed in egg-cases on the seafloor which later hatch to produce young.

Ovoviviparity – see **aplacental yolksac viviparity**.

Pelagic – occurring or living in open waters or near the surface with little contact with or dependency on the bottom (cf. **demersal**).

Placental viviparity – a reproductive mode where the maternal adult gives birth to live young which had developed a yolksac placenta.

Population – a group of individuals of a species living in a particular area. (This is defined by IUCN (2001) as the total number of mature individuals of the taxon, with subpopulations defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange

(typically one successful migrant individual or gamete per year or less).)

Precautionary principle – a principle which states that lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental damage to habitats or species when there is a threat of serious or irreversible environmental degradation.

Productivity – relates to the birth, growth and mortality rates of a fish **stock**. Highly productive **stocks** are characterised by high birth, growth and mortality rates and can usually sustain higher exploitation rates and, if depleted, could recover more rapidly than comparatively less productive **stocks**.

r-selected species – a species selected for its superiority in variable or unpredictable environments; a species typified by rapid growth rates, small size, high natural mortality and high fecundity (cf. **K-selected biology**).

Ray – see **batoid**.

Red List of Threatened Species – listing of the conservation status of the world's flora and fauna administered by **IUCN**.

Rebound potential – a measure of the ability of a **species** or **population** to recover from exploitation.

Recruitment – the number of fish added to an exploitable **stock** in a fishing area each year, through the processes of growth (a fish grows to a size where it becomes catchable) or migration (a fish moves into the fishing area).

RFMO – Regional Fisheries Management Organisation. Organisation responsible for developing and implementing fishing regulations for international waters.

Scientific name – the formal binomial name of a particular organism, consisting of the **genus** and specific names; a **species** only has one valid scientific name.

Seine netting – a fishing method using nets to surround an area of water where the ends of the nets are drawn together to encircle the fish (includes purse seine and Danish seine netting).

Shark – a term generally used for the **cartilaginous fishes** other than the **batoids** and the **chimaeras**. However, the term can be used more broadly to include these groups as suggested by Compagno (2001).

Species – a group of interbreeding individuals with common characteristics that produce fertile (capable of reproducing) offspring and which are not able to interbreed with other such groups, that is, a **population** that is reproductively isolated from others; related species are grouped into **genera**.

Squalene – a long-chain hydrocarbon found in the liver oil of some **cartilaginous fishes**, and harvested from some deepwater species for medicinal, industrial and cosmetic uses.

SSC – Species Survival Commission. One of six volunteer commissions of **IUCN**.

SSG – Shark Specialist Group (part of the **IUCN** Species Survival Commission network).

Statutary Fishing Rights – a fishing permit or licence giving an operator the right to operate in a fishery according to the terms established by the authority regulating the fishery.

STECF – Scientific, Technical and Economic Committee for Fisheries – Standing committee, established in 2005 to provide input from scientific experts to inform the Commission's implementation of the CFP.

Stock – a group of individuals in a **species**, which are under consideration from the point of view of actual or potential utilisation, and which occupy a well defined geographical range independent of other stocks of the same species. A stock is often regarded as an entity for management and assessment purposes.

Subpopulation – geographically or otherwise distinct groups in a **population** between which there is little exchange.

Subsistence fishery – a fishery where the fish landed are shared and consumed by the families and kin of the fishers instead of being sold on to the next larger market.

Sympatric – different **species** which inhabit the same or overlapping geographic areas.

TAC – Total Allowable Catch: the total catch allowed to be taken from a resource within a specified time period (usually a year) by all operators; designated by the regulatory authority. Usually allocated in the form of quotas.

Target catch – the catch which is the subject of directed **fishing effort** within a fishery; the catch consisting of the **species** primarily sought by fishers.

Taxon (plural: taxa) – a formal taxonomic unit or category at any level in a classification (**family**, **genus**, **species**, etc.).

Taxonomy – the science of classification of flora and **fauna**.

TL – total length: a standard morphometric measurement for **sharks** and some **batoids**, from the tip of snout or rostrum to the end of the upper lobe of the caudal fin.

Trawling (trawl netting) – a fishing method utilising a towed net consisting of a cone or funnel shaped net body, closed by a **codend** and extended at the openings by wings. Can be used on the bottom (**demersal** trawl) or in midwater (**pelagic** trawl).

UNCLOS – United Nations Convention on the Law of the Sea.

Undescribed species – an organism not yet formally described by science and so does not yet a have a formal binomial **scientific name**. Usually assigned a letter or number designation after the generic name, for example, *Squatina* sp. A is an undescribed species of angel shark belonging to the **genus** *Squatina*.

UNSFA – United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.

Uterine cannibalism – see **adelphophagy** and **oophagy**.

Viviparity – a reproductive mode where the maternal adult gives birth to live young. Encompasses **aplacental viviparity** and **placental viviparity**.

World Conservation Union – see **IUCN**.

FAO Fisheries Areas

(Refer to ftp://ftp.fao.org/fi/maps/Default.htm#CURRENT
accompanying map – ftp://ftp.fao.org/fi/maps/world_2003.gif)

01 Africa – Inland Waters
02 North America – Inland Waters
03 South America – Inland Waters
04 Asia – Inland Waters
05 Europe – Inland Waters
06 Oceania – Inland Waters
08 Antarctica – Inland Waters
18 Arctic Seas
21 Northwest Atlantic
27 Northeast Atlantic
34 Eastern Central Atlantic
37 Mediterranean and Black Seas
41 Southwest Atlantic
47 Southeast Atlantic
48 Antarctic Atlantic
51 Western Indian
57 Eastern Indian
58 Antarctic Indian
61 Northwest Pacific
67 Northeast Pacific
71 Western Central Pacific
77 Eastern Central Pacific
81 Southwest Pacific
87 Southeast Pacific
88 Antarctic Pacific

1 Introduction

Sharks and their relatives, including skates, rays and chimaeras, are collectively termed chondrichthyan fishes[1]. This is a relatively small (approximately 1,115 described species) evolutionarily-conservative group that have functioned successfully in diverse ecosystems for over 400 million years. Despite their evolutionary success, many species are increasingly threatened with extinction as a result of human activities and the conservative life history traits of this group of fishes. Generally, chondrichthyans are slow growing and late to mature with low fecundity. These characteristics result in very low rates of potential population increase with little capacity to recover from overfishing (direct or indirect) and other threats such as pollution and habitat destruction (Compagno 2005; Musick 2005).

1.1 The IUCN Species Survival Commission's Shark Specialist Group

IUCN, the International Union for the Conservation of Nature, is the world's largest global environmental network. It is a membership union with more than 1,000 government and non-governmental member organisations and almost 11,000 volunteer scientists in more than 160 countries. This unique assemblage aims to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The Species Survival Commission (SSC) is comprised of 7,500 scientists, field researchers, government officials and conservation leaders from almost every country in the world. It provides an unmatched source of knowledge and information on biological diversity and its conservation. Working in close association with IUCN's Species Programme, SSC's major role is to provide information to IUCN on biodiversity conservation, the inherent value of species, their role in ecosystem health and functioning, the provision of ecosystem services and their support to human livelihoods. SSC members also provide scientific advice to conservation organisations, government agencies and other IUCN members, and support the implementation of multilateral environmental agreements. Most SSC members are mobilised through Specialist Groups, some of which address conservation issues related to particular groups of plants or animals, while others focus on topical issues such as reintroduction of species into former habitats, or wildlife health (IUCN 2008a; IUCN 2008b).

The SSC established the Shark Specialist Group (SSG) in 1991, in response to growing awareness and concern of the severe impact of fisheries on chondrichthyan populations around the world. The SSG aims to promote the conservation of the world's chondrichthyan fishes, effective management of their fisheries and habitats and, where necessary, the recovery of their populations. It is now one of the largest and most active of the IUCN SSC Specialist Groups, with 180 members from 90 countries distributed among 12 ocean-region sub-groups, all of whom are involved in chondrichthyan research, fisheries management, marine conservation, or policy development and implementation.

1.2 The SSG's Red List programme

One of the SSG's central roles is the preparation of species assessments for the *IUCN Red List of Threatened Species*™. The IUCN Red List is the world's most comprehensive inventory of the global status of plant and animal species. It uses a single standardised set of Red List Criteria to evaluate the extinction risk of thousands of species and subspecies worldwide. Each assessment is supported by detailed documentation, including information on ecology, life history, distribution, habitat, threats, population trends and conservation measures (IUCN 2008c). The IUCN Red List Categories and Criteria are widely recognised as the most objective system available for assessing the global risk of extinction for species (Vié *et al.* 2008). With its strong scientific base, the IUCN Red List is accepted as the most authoritative guide to the status of biological diversity. The overall aim of the Red List is to convey the urgency and scale of conservation problems to the public and policy makers, and to motivate the global community to try to reduce species extinctions. It is among the most widely used tool for focusing attention on species of conservation concern and identifying, documenting and monitoring trends. Additional uses include supporting the development and implementation of policy and legislation, and guiding development and conservation planning, conservation actions for individual species and scientific research. The IUCN Red List also provides information on the status of biodiversity and changes over time, identifying the main drivers of declines and biodiversity loss and monitoring the long-term effectiveness of management and conservation actions (Fowler *et al.* 2005; Vié *et al.* 2008). The SSG will use the IUCN Red List to measure and monitor changes in the status of shark biodiversity and our knowledge of the taxa.

The SSG's 10-year programme to assess all of the chondrichthyan fishes for the IUCN Red List has now been completed for every species described in scientific literature before the end of 2007. It provides the first fully comprehensive assessment of all members of a major marine taxonomic group and represents an important baseline for monitoring the global health of marine species and ecosystems.

This '*Global Shark Red List Assessment*' has primarily been undertaken through a series of regional workshops, in order to facilitate detailed discussions and pooling of resources and regional expertise. In 2006, as part of this programme, the SSG brought together a group of experts with the aim of using the IUCN Red List Categories and Criteria to assess the conservation status of every chondrichthyan species that occurs in the Northeast Atlantic region.

This report provides a detailed summary of the IUCN Red List assessment for each Northeast Atlantic species, highlighting those of conservation concern as well as identifying species assessed as Least Concern and Data Deficient. An overview of regional issues is also presented. This report is intended to support the development of research, conservation and management priorities for the region.

1 Chondrichthyan fishes include all species of sharks and batoids (skates, rays, guitarfishes and sawfishes) – collectively known as elasmobranchs, and the chimaeras or **holocephalans**. The term 'shark' is often used by the UN Food and Agriculture Organisation, IUCN and other bodies to include all chondrichthyan fishes.

2 Chondrichthyan fishes in the Northeast Atlantic

The Northeast Atlantic region (FAO Major Fishing Area 27) includes all Northeast Atlantic and Arctic Ocean waters from the North Pole to latitude 36°N in the central Atlantic, bordered in the west by the coast of eastern Greenland and longitude 40°W in the central North Atlantic (Figure 1).

A huge range of chondrichthyan habitat occurs in the Northeast Atlantic region, including areas permanently covered by sea ice, deep sea, cold water coral reefs, open ocean, coastal waters from the Arctic to the Mediterranean, kelp forests, seagrass beds and enclosed fully saline and brackish seas (Walker *et al.* 2008; UNEP 2008).

The region has a moderately diverse chondrichthyan fauna with an estimated 118 species (approximately 11% of total living chondrichthyans), comprised of 65 species of sharks from 21 families, 45 batoid species from 10 families and eight chimaera species from two families (Compagno 2005; Heessen 2003). This includes two as yet undescribed species and some species whose occurrence in the Northeast Atlantic is rare and/or infrequent or unconfirmed,

Figure 2.1 Map of the Northeast Atlantic region. Courtesy of FAO Fishery Department.

or at the edge of their range. All 118 species known to occur in the Northeast Atlantic region are listed in Appendix I.

The majority of Northeast Atlantic species are widespread throughout the region, with 92% also occurring elsewhere and 35 species distributed globally. There are, however, some species that have limited distributions within the Northeast Atlantic and nine species are endemic to the region. The latter include the white ghost catshark *Apristurus aphyodes*, Norwegian skate *Dipturus nidarosiensis*, the chimaera *Hydrolagus lusitanicus* and Krefft's skate *Malacoraja kreffti*.

Throughout the region, there is a general trend towards a decline in the abundance and distribution of chondrichthyan fishes, particularly the larger coastal species that are most biologically vulnerable to exploitation and occur in areas that have been heavily fished for a long time. These declines correspond with an increase in the intensity and technological advancement of commercial fisheries. They have caused some former commercially exploited species to become so rare that they are now protected or are being considered for listing under wildlife conservation legislation (Walker *et al*. 2005; OSPAR Commission 2008).

The common sawfish *Pristis pristis* and smalltooth sawfish *Pristis pectinata* were once common in the south of the region but are now thought to have been extirpated from Europe and the Mediterranean Sea. The angel shark *Squatina squatina* was common in coastal waters in the nineteenth and early to mid-twentieth century but is now rare in many areas. Many of the larger batoid species, such as white skate *Rostroraja alba*, common skate *Dipturus batis*, sharpnose skate *Dipturus oxyrhinchus*, blonde ray *Raja brachyura*, Norwegian skate *Dipturus nidarosiensis,* sandy ray *Leucoraja circularis* and undulate ray *Raja undulata*, are among those currently of high conservation concern (Walker *et al*. 2005).

3 Methodology

3.1 Workshop procedure

In February 2006, the SSG held a regional IUCN Red List workshop, attended by 25 scientists from eleven countries. Participants were drawn from government agencies, universities and private institutions. They included authors of published papers on shark and skate population status and experts who develop advice on shark quotas for European and international fisheries of the Northeast Atlantic. The aim of the workshop was to evaluate the conservation status of the chondrichthyan fish fauna of the Northeast Atlantic and to formulate priorities for species conservation and management in the region.

Workshop experts compiled documentation, added regional information, and drafted Red List assessments for each species they had elected to assess, either working alone or in small groups. Draft assessments were debated in plenary and agreed by the consensus of workshop participants.

During the workshop, experts collated information and prepared 74 global and 17 regional Red List assessments for species known to occur in the Northeast Atlantic region. The global Red List status of 41 of the 118 species of Northeast Atlantic chondrichthyans had been assessed between 2000 and 2006 and did not require re-assessment, but regional or subpopulation assessments were produced for 11 of these species. A new Northeast Atlantic endemic ray *Neoraja iberica* described in 2008 has now also been assessed. Two more new batoid species (*Dipturus* sp. and *Breviraja sp.*) are yet to be formally described and have not, therefore, been assessed.

All species were assessed using the IUCN Red List Categories and Criteria Version 3.1 (IUCN 2001). The nine Red List Categories are: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient and Not Evaluated. Classification of species into the threatened categories (Critically Endangered, Endangered and Vulnerable) applies a set of five quantitative criteria based on biological factors related to extinction risk, including rate of population decline, population size, area of geographic distribution and degree of population and distribution fragmentation. These IUCN Red List Categories and Criteria are summarised in Appendix II.

3.2 Assessing marine fishes – application of the Red List Categories and Criteria

Assessments were undertaken with reference to the *Guidelines for Using the IUCN Red List Categories and Criteria*, which are reviewed annually and updated on the Red List website (http://www.iucnredlist.org/static/categories_criteria).

The SSG recognises that some chondrichthyan species are the target of fisheries and therefore may show a decline in population size under a sustainable management regime

Expert preparation and evaluation of chondrichthyan species IUCN Red List assessments. IUCN SSG Northeast Atlantic Workshop, Peterborough, UK.

(although there is very little management in place for chondrichthyans in the Northeast Atlantic). Under the Red List Criteria, such taxa could be assigned a threatened status under Criterion A (declining population). Concern has been expressed that such a listing might not reflect extinction risk, especially if the decline is a consequence of a management plan designed to achieve a goal such as maximising the sustainable yield from a fishery. The IUCN Red List Guidelines (2008) state that such listings should not be problematic in the medium to long term. This is because, although the population may currently exhibit characteristics consistent with assignment of a threatened category, effective management will result in the population stabilising at a target level, when the decline will end. The taxon would then no longer qualify for a threatened listing and the assessment could be reviewed. If, however, population declines continued, the reason for concern and therefore the threatened listing would still apply (IUCN 2008d).

Where possible, the SSG uses the results of fishery-independent surveys to indicate species abundance. However, this type of information is rarely available for sharks. Catch per unit effort (CPUE) may therefore need to be used as an index of abundance to estimate percentage reductions in the number of mature individuals of exploited species (IUCN 2008d). It should be noted, however, that this measure is used with caution because changes in CPUE may underestimate population declines. For example, if the population aggregates even at small sizes, (e.g. spiny dogfish *Squalus acanthias*) catches may remain high with the same level of effort while the population is declining. Changes in fishing methods and efficiency also need to be considered (IUCN 2008d).

Additionally, some long-lived chondrichthyans show large long term declines even though their population may have recently increased and be above the thresholds used by the criteria for critical population size and distribution. Long term trends may indicate an underlying cause, whereas recent trends may be temporary. Species are therefore assessed against all the criteria (IUCN 2008d).

3.3 The precautionary approach

The IUCN guidelines recommend assessors should adopt a precautionary, but realistic approach when applying criteria, and that all reasoning should be explicitly documented (IUCN 2005; 2008d). For example, where a population decline is known to have taken place (e.g. as a result of fisheries) but no management has been applied to change the pressures on the population, it can be assumed the decline is likely to continue in the future. If fisheries are known to be underway, but no information is available on changes in CPUE, data from similar fisheries elsewhere may be used by informed specialists to extrapolate likely population trends. Additionally, where no life history data are available, the demographics of a very closely related species may be applied (Fowler and Cavanagh 2005).

3.4 Global assessments

Ninety-two percent of chondrichthyan species that occur within the Northeast Atlantic region also occur within other ocean regions. The assessment of the global status of many of these widely distributed species had begun at earlier SSG regional and thematic workshops, but lacked information from the Northeast Atlantic and/or other regions. One thematic and two regional workshops held since the Northeast Atlantic workshop have provided most of the remaining information required to complete these global assessments. The documentation for a small number of 'update' assessments (referred to as 'in preparation' in this report) is still being finalised. All other assessments have been submitted to the IUCN Red List Unit using the Species Information Service Data Entry Module (SIS-DEM).

3.5 Regional assessments

Some species have been assigned a regional Red List category, indicating that their status in the Northeast Atlantic region differs considerably from the global evaluation for these species. Regional assessments are not displayed separately on the IUCN Red List website, but are detailed within the documentation for the global Red List assessment, which is published on the IUCN Red List website.

3.6 Geographically distinct populations

The IUCN Red List recognises the separate assessment of geographically distinct populations. These subpopulations are defined as 'geographically or otherwise distinct groups in the [global] population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less)' (IUCN 2001). Subpopulation assessments are displayed separately on the IUCN Red List website.

3.7 Review and consensus process

The SSG has been appointed by the IUCN Species Survival Commission as the Red List Authority for chondrichthyan assessments. It considers full and open consultation with its membership, through workshops and correspondence, to be essential for the preparation of accurate and robust Red List assessments (Fowler 1996). Some species assessments developed at the Northeast Atlantic workshop in 2006 have been reviewed and updated at subsequent SSG regional or thematic workshops (including a pelagic shark workshop and an Expert Panel Review meeting), or *via* email correspondence. Prior to their submission to the IUCN Red List, however, all species assessments are circulated to the entire SSG global network, to ensure thorough and transparent review. The resulting assessments are, therefore, a product of scientific consensus on each species' status, supported by relevant literature and other data sources.

Once assessments have been submitted and accepted on to the IUCN Red List, they are periodically revisited and can be updated as new information becomes available. The IUCN Red List is updated annually. Unfortunately, due to the particularly large number of assessments prepared the preceding year, new chondrichthyan fish assessments were not released on the 2008 Red List. The global shark assessment should now be released in 2009, with updates in subsequent years. Readers are therefore urged to consult the current IUCN Red List (www.iucnredlist.org) in order to view the most up-to-date assessments.

4 Results and discussion

Species-specific information has now been documented and global IUCN Red List Categories assigned to each of the 116 described species of sharks, batoids and chimaeras known from the Northeast Atlantic region. Regional information was also compiled and used to develop separate Northeast Atlantic Red List assessments for many widely distributed species. The regional Red List status of 17 species was found to differ from their global status. Species accounts summarising the global and regional documentation supporting these Red List assessments are presented in Section 8 of this report. All Northeast Atlantic species, their Red List assessments and assessment dates are listed in Appendix I. Assessments submitted for listing in 2008 were not published on the IUCN Red List that year due to the very large volume of assessments received, but should be released in 2009. These assessments, and those listed as 'In preparation,' are subject to final consistency check by the IUCN Red List Unit and therefore should be considered provisional until they are released on the IUCN Red List website in 2009.

4.1 Summary of threatened status

Table 4.1 summarises the numbers of Northeast Atlantic species assigned to each Red List Category within the region and globally. The sub-totals in each row differ because the global and regional assessments for some species are not the same. Several species are assessed as having a higher threat status of risk regionally than globally, while a few species have a lower risk of extinction in the region.

Figure 4.1 compares the overall global (a) and regional (b) status of the 116 Northeast Atlantic chondrichthyan species. Globally, 25% of these species are threatened (3% Critically Endangered, 5% Endangered or 17% Vulnerable), 18% are Near Threatened, 30% are Least Concern and 27% are Data Deficient. Regionally, however, a slightly higher proportion, 26% (30 species), are considered to be threatened. Of these, 7% (eight species) are Critically Endangered, 7% (eight species) are Endangered and 12% (14 species) are Vulnerable. A further 20% (23 species) are assessed as Near Threatened and 27% (32 species) are Least Concern. Little is known about 27% (31 species), which have therefore been assessed as Data Deficient. The 'regional' assessments for Northeast Atlantic endemics are, of course, also global assessments.

Table 4.1 Number of Northeast Atlantic chondrichthyan fish species assigned to each Red List Category, regionally and globally.

	Threatened status of chondrichthyan fishes	
IUCN Red List Categories	**Northeast Atlantic***	**Global**
Critically Endangered (CR)	8	4
Endangered (EN)	8	6
Vulnerable (VU)	14	20
Near Threatened (NT)	23	21
Least Concern (LC)	32	34
Data Deficient (DD)	31	31
Total number of species	**116**	**116**

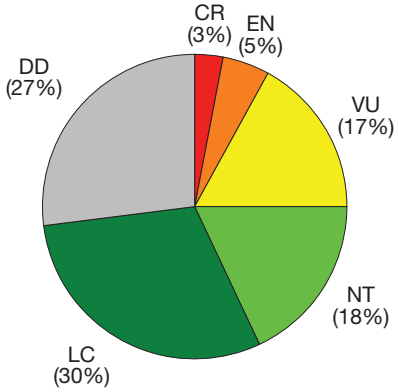
* If there is no separate regional assessment, the global status is used.

The 12 species assessed as having a higher threat category in the Northeast Atlantic region than they do globally are listed in Table 4.2. It is notable that only three species have a more favourable conservation status within the Northeast Atlantic than they do globally, including two species assessed as Least Concern regionally, although they are considered to be Vulnerable and Near Threatened globally.

Not only are a greater number of Northeast Atlantic species threatened within the region than they are globally, but the overall conservation status of Northeast Atlantic chondrichthyans is worse than for the entire taxonomic group. Globally, of the 1,038 chondrichthyan species assessed, 18% are threatened, 13% are Near Threatened, 23% are Least Concern and 46% are Data Deficient (Figure 4.2).

Figure 4.1 The percentage of Northeast Atlantic chondrichthyan species within each IUCN Red List category (n= 116).

a) Global status



b) Regional status

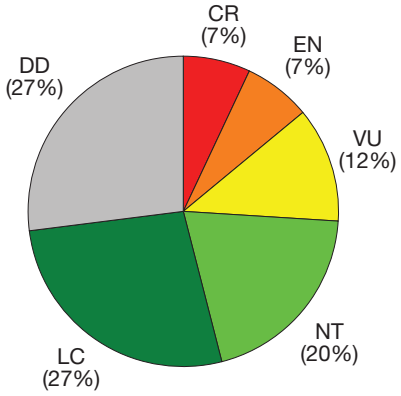
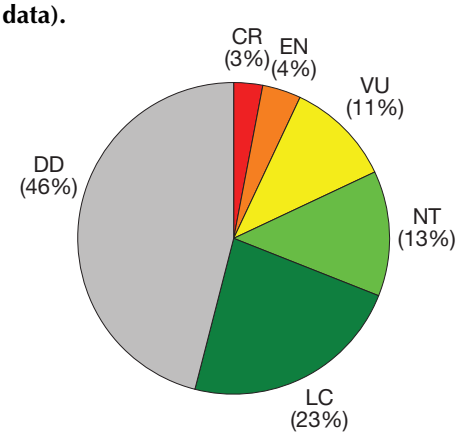


Figure 4.2 Percentage of globally assessed chondrichthyan fishes (n=1,038) within each IUCN Red List Category (2008 data).



4.2 Threatened species

Twenty-six percent of chondrichthyans known to occur in the Northeast Atlantic are threatened (Critically Endangered, Endangered or Vulnerable) (Table 4.2). This includes several species that are either wholly endemic to this region, or whose global distribution is confined to the Northeast Atlantic, adjacent European seas, and adjoining areas of the Mediterranean and Northwest African shelf. The status of these 30 species must be monitored particularly closely and, crucially, management measures and recovery plans should be implemented without delay. Further research and monitoring may be required to better understand these species' biology, threats and conservation needs, and to identify their critical habitats or other important locations for protection.

Taxa at highest risk of extinction in the Northeast Atlantic include some commercially important species, such as porbeagle *Lamna nasus* and spiny dogfish *Squalus acanthias*, which are Critically Endangered. Both species are highly susceptible to overexploitation by fisheries because of their low reproductive capacity and both have suffered severe population declines (Stevens *et al.* 2006; Fordham *et al.* 2006). Intense fishing pressure on these two species continues and is poorly restricted in the region.

A number of demersal species highly susceptible to trawling activities and with vulnerable life histories are threatened in the Northeast Atlantic. These include white skate *Rostroraja alba* and common skate *Dipturus batis*, both of which are Critically Endangered in the region. The large size at birth, slow growth, late maturity and low fecundity of these animals mean that there is a high probability of capture before breeding, while their intrinsic rate of population increase is low and likely to be exceeded by fisheries mortality (e.g. Dulvy *et al.* 2000; Dulvy and Reynolds 2002; Walker and Hislop 1998). Both species have experienced severe population depletions in the Northeast Atlantic and *D. batis* has been locally extirpated from parts of its former range (Dulvy *et al.* 2006a; Dulvy *et al.* 2006b). The large-bodied Critically Endangered angel shark *Squatina squatina* has been similarly affected. It has been declared extinct in the North Sea and has been extirpated from large areas of its range (ICES WGEF 2007; Morey *et al.* 2006). This is also the case for the two species of sawfish previously known from the region. Sawfishes are extremely vulnerable to bycatch. Both the common sawfish *Pristis pristis* and smalltooth sawfish *Pristis pectinata* are assessed as Critically Endangered globally, but are probably extinct in the region.

Other seriously threatened species include some of the deepsea sharks such as gulper shark *Centrophorus granulosus* (Critically Endangered in the Northeast Atlantic), Portuguese dogfish *Centroscymnus coelolepis* (regionally Endangered) and the Vulnerable lowfin gulper shark *Centrophorus lusitanicus.* Deepsea species have particularly low reproductive potential, making them intrinsically vulnerable to overexploitation and population depletion (Kyne and Simpfendorfer 2007). Fishing pressure on these species has increased significantly in recent years, with some species being targeted for their meat and to a lesser extent their liver oil (the meat of 'siki' sharks is of high value in some European countries) (Hareide *et al.* 2004).

Table 4.2 Threatened and Near Threatened Northeast Atlantic chondrichthyans.

Note: Species assessed regionally are listed under their regional category, with their global status indicated in parentheses.

Critically Endangered	
White skate **(EN)**	*Rostroraja alba*
Spiny dogfish **(VU)**	*Squalus acanthias*
Gulper shark **(VU)**	*Centrophorus granulosus*
Porbeagle **(VU)**	*Lamna nasus*
Angel shark **	*Squatina squatina*
Smalltooth sawfish	*Pristis pectinata*
Common sawfish	*Pristis pristis*
Common skate **	*Dipturus batis*
Endangered	
Basking shark **(VU)**	*Cetorhinus maximus*
Leafscale gulper shark **(VU)**	*Centrophorus squamosus*
Portuguese dogfish **(NT)**	*Centroscymnus coelolepis*
Blackchin guitarfish	*Rhinobatos cemiculus*
Common guitarfish	*Rhinobatos rhinobatos*
Undulate ray	*Raja undulata*
Giant devilray**	*Mobula mobular*
Scalloped hammerhead	*Sphyrna lewini*
Vulnerable	
Birdbeak dogfish **(LC)**	*Deania calceus*
Kitefin shark **(DD)**	*Dalatias licha*
Lowfin gulper shark	*Centrophorus lusitanicus*
Angular rough shark	*Oxynotus centrina*
Sandy ray**	*Leucoraja circularis*
Spiny butterfly ray	*Gymnura altavela*
Smalltooth sandtiger	*Odontaspis ferox*
Bigeye thresher	*Alopias superciliosus*
White shark	*Carcharodon carcharias*
Shortfin mako	*Isurus oxyrinchus*
Longfin mako	*Isurus paucus*
Oceanic whitetip shark	*Carcharhinus longimanus*
Dusky shark	*Carcharhinus obscurus*
Sandbar shark	*Carcharhinus plumbeus*
Near Threatened	
Rabbitfish**	*Chimaera monstrosa*
Large-eyed rabbitfish	*Hydrolagus mirabilis*
Frilled shark	*Chlamydoselachus anguineus*
Sharpnose sevengill shark	*Heptranchias perlo*
Bluntnose sixgill shark	*Hexanchus griseus*
Black dogfish **(LC)**	*Centroscyllium fabricii*
Velvet belly **(LC)**	*Etmopterus spinax*
Greenland shark	*Somniosus microcephalus*
Norwegian skate *	*Dipturus nidarosiensis*
Longnose skate	*Dipturus oxyrinchus*
Shagreen ray**	*Leucoraja fullonica*
Blonde ray**	*Raja brachyura*
Thornback ray	*Raja clavata*
Smalleyed ray**	*Raja microocellata*
Common stingray **(DD)**	*Dasyatis pastinaca*
Lusitanian cownose ray **	*Rhinoptera marginata*
Thresher shark **(VU)**	*Alopias vulpinus*
Atlantic catshark**	*Galeus atlanticus*
Nursehound	*Scyliorhinus stellaris*
Silky shark	*Carcharhinus falciformis*
Tiger shark	*Galeocerdo cuvier*
Blue shark	*Prionace glauca*
Smooth hammerhead	*Sphyrna zygaena*

* Northeast Atlantic endemics

** Global distribution restricted to the Northeast Atlantic and adjacent areas (Mediterranean and Northwest African shelf)

4.3 Near Threatened species

Twenty-three species (20%) are assessed as Near Threatened. These include several demersal species taken as bycatch and often utilised in multi-species fisheries, such as the endemic Norwegian skate *Dipturus nidarosiensis*, longnose skate *Dipturus oxyrinchus*, shagreen ray *Leucoraja fullonica* and blonde ray *Raja brachyura*. These species may be unable to withstand prolonged exploitation, particularly if fishing pressure increases. It is essential that their status is monitored closely. Where possible, precautionary management measures should be taken to prevent them from becoming threatened in the future.

4.4 Least Concern species

Just over a quarter (27%, 32 species) of chondrichthyans in the Northeast Atlantic are not considered to be under any threat of extinction now or in the foreseeable future. These species include four of the eight chimaeras known from the region, some of the small-bodied catsharks (e.g. smalleye catshark *Apristurus microps*, blackmouth catshark *Galeus melastomus*, mouse catshark *Galeus murinus* and smallspotted catshark *Scyliorhinus canicula*) and some of the smaller deepwater batoids (e.g. pallid skate *Bathyraja pallida*, Richardson's skate *Bathyraja richardsoni*, deepwater ray *Rajella bathyphila* and Bigelow's ray *Rajella bigelowi*). Many of the species assessed as Least Concern are generally abundant and/or widespread with limited fishing pressure, are not particularly susceptible to fisheries because of their deepwater distribution, or are relatively productive. Although currently listed as Least Concern, these species may still benefit from conservation and management action.

4.5 Data Deficient species

Thirty-one species (27%) were assigned the Data Deficient category, indicating that there is inadequate information to assess accurately their extinction risk within the Northeast Atlantic. In most cases, this is due to the absence of information on population trends. The lack of accurate species-specific landings data in many fisheries and a paucity of biological data have restricted stock assessment efforts (Ellis *et al.* 2005). Other reasons for the lack of species-specific information include limited research efforts, or the rarity and limited geographic distribution of some species. Several of these species may be especially vulnerable to anthropogenic threats, particularly overexploitation. A Data Deficient listing certainly does not mean that these 31 species are not of concern. In fact, as knowledge improves, such species may prove to be amongst the most threatened. For example, the tope shark *Galeorhinus galeus* is presently assessed as Data Deficient in the Northeast Atlantic, but is Vulnerable globally and Critically Endangered regionally elsewhere. As more information becomes available, it may be that this species could be placed in a higher threat category within the region. Other species assessed as Data Deficient include the smooth hound *Mustelus mustelus* and a number of deepsea sharks (Appendix I). Directing research and funding efforts towards these species as well as those in threatened categories is essential. This is particularly important when there are apparent threats, yet virtually no available data on population size or biological parameters (Cavanagh *et al.* 2003; Cavanagh and Gibson 2007). The Development of Elasmobranch Assessments (DELASS) project initiated by the ICES Working Group on Elasmobranch Fishes (WGEF) and funded by the European Union ran for three years, 2000–2002. Projects such as these are important for providing information on the status of species and improving the scientific basis for the management of their fisheries (Heesen 2003). They should be encouraged and expanded.

4.6 Endemic species

Nine species (8%) are endemic to the Northeast Atlantic only and a further 13 species have a global distribution confined to the Northeast Atlantic, adjacent European seas, and adjoining areas of the Mediterranean and Northwest African shelf (Table 4.3). These include two Critically Endangered (9%), one Endangered (5%), one Vulnerable (5%), seven Near Threatened (32%), five Least Concern (23%) and six Data Deficient (27%) species. In total 18% of these species are threatened and 50% are in both threatened and Near Threatened categories. It is interesting to note that most of the species endemic only to the Northeast Atlantic are assessed as Data Deficient and Least Concern and occur in deepwater, whilst the majority of the species endemic to both the Northeast Atlantic and Mediterranean Sea are in higher threat categories and primarily occur on the shelf (with the exception of *D. batis*, *C. monstrosa*, *G. atlanticus* and *L. fullonica*). The three Least Concern Northeast Atlantic endemics all occur in very deepwater, placing the majority of their populations outside the range of current fishing pressure. It is concerning though that very little is known about several of the Data Deficient Northeast Atlantic endemics that occur within the range of expanding deepwater fisheries in the region and may have very limited geographic and bathymetric distributions, such as the two *Neoraja* spp.

Table 4.3 Regionally endemic species and species with restricted global distribution.

Regional endemics	
Norwegian skate	*Dipturus nidarosiensis* (NT)
Pallid skate	*Bathyraja pallida* (LC)
Krefft's skate	*Malacoraja kreffti* (LC)
(Portuguese: Coelho)	*Hydrolagus lusitanicus* (LC)
Azores dogfish	*Scymnodalatias garricki* (DD)
Blue ray	*Neoraja caerulea* (DD)
Blue pygmy skate	*Neoraja iberica* (DD)
Mid-Atlantic skate	*Rajella kukujevi* (DD)
White ghost catshark	*Apristurus aphyodes* (DD)
Species with restricted global distribution (Northeast Atlantic and adjacent areas)	
Angel shark	*Squatina squatina* (CR)
Common skate	*Dipturus batis* (CR)
Giant devilray	*Mobula mobular* (EN)
Sandy ray	*Leucoraja circularis* (VU)
Rabbitfish	*Chimaera monstrosa* (NT)
Shagreen ray	*Leucoraja fullonica* (NT)
Blonde ray	*Raja brachyura* (NT)
Smalleyed ray	*Raja microocellata* (NT)
Lusitanian cownose ray	*Rhinoptera marginata* (NT)
Atlantic catshark	*Galeus atlanticus* (NT)
Spotted ray	*Raja montagui* (LC)
Starry smoothhound	*Mustelus asterias* (LC)
Blackspotted smoothhound	*Mustelus punctulatus* (DD)

5 Northeast Atlantic Regional Overview

The following sections provide an overview of the status of fisheries, trade, management and conservation in the Northeast Atlantic region, updated from Walker *et al.* (2005).

5.1 Fisheries

Generally, most chondrichthyans landed in the Northeast Atlantic region are not landed in target fisheries but in multi-species fisheries or as utilised bycatch. The few traditional fisheries targeting commercially valuable chondrichthyan species are now all in decline. Many vessels formerly engaged in these fisheries have been re-directed to other target species or have stopped fishing altogether. It is apparent that reduced availability of stocks, rather than falling market values, has been the main reason that these fisheries have become unprofitable (Walker *et al.* 2005).

Three major types of fisheries take chondrichthyan species in the Northeast Atlantic. These include traditional fisheries for demersal species on the continental shelf, high seas pelagic fisheries and, more recently, deepwater fisheries (Hareide *et al.* 2007). These fisheries and the primary species taken are described in more detail in Section 5.3 of this report.

FAO capture production data from 1985–2006 indicate that the major fishing nations landing chondrichthyans in the Northeast Atlantic region are Spain, France, the UK and Portugal (Table 5.1). These countries are also amongst the largest chondrichthyan fishing nations reporting highest global capture production of these species (FAO 2008). In 1997, Spain reported the highest landings in the world at almost 100,000t; in 2006 it was ranked fifth in the world with ~40,000t, but most of these catches are made outside the Northeast Atlantic (Clarke *et al.* 2005; FAO 2008). Records indicate that Belgium, Ireland and Norway are also key contributors to elasmobranch landings in the region (Table 5.1).

Total chondrichthyan landings for all countries within the Northeast Atlantic region are shown in Figure 5.1 and landings for the top five countries from the region shown in Figure 5.2 (over).

Total landings of chondrichthyans in the Northeast Atlantic region have, until recently, remained relatively stable; fluctuating around ~100,000t for just over 50 years. Reported regional landings were around 80,000t in 1950, peaking in the early 1960s and again in the late 1960s at 125,700t and 127,700t respectively. They have been declining significantly since 2000, to ~51,000t in 2006 (Table 5.1, Figure 5.1).

The UK and France dominated landings in the Northeast Atlantic from the 1950s until the late 1990s (when Spain surpassed them by a large margin). The UK had the highest landings in Europe during the 1950s, at ~30,000–35,000t/year. Over the next few years, France's reported landings gradually became higher than the UK's, peaking at ~42,000t in 1981. In 1999–2000, France reported ~23,000t/year and the UK ~17,500t (Figure 5.2).

The total regional peak of ~111,000t in 1997 (Figure 5.1) clearly reflects the dramatic eight to nine-fold increase in

Table 5.1 Chondrichthyan landings in the Northeast Atlantic region, 1985–2006. (Metric tonnes (t) by country reported to FAO (FAO 2008))

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	3,117	2,841	2,795	2,229	2,250	1,899	1,729	1,855	1,787	1,726	1,686	1,813	1,722	1,625	1,720	1,647	1,954	2,217	2,317	2,505	2,554	2,393
Channel Islands	97	84	76	118	162	166	155	200	202	191	177	230	66	250	284	217	294	290	314	249	292	245
Denmark	1,856	1,277	1,577	1,611	1,188	1,478	1,387	933	617	372	293	294	317	242	300	362	360	375	335	402	264	189
Estonia																	56	62	4	3	23	9
Faroe Islands	314	280	212	123	158	176	222	385	447	450	705	569	702	731	723	480	727	417	462	687	672	668
France	32,343	35,701	36,448	34,266	26,907	26,070	25,655	24,473	22,908	22,022	21,593	22,328	23,556	21,420	22,755	24,708	25,528	22,381	21,743	21,148	20,815	18,617
Germany	205	174	155	113	62	83	14	61	161	519	327	393	225	207	382	606	764	667	787	859	346	32
Greenland	7	3		24	39		1	5	3		20	2	6									
Iceland	183	180	291	214	300	452	1,198	1,038	728	1,720	2,341	1,941	1,762	1,575	1,218	1,360	1,530	2,206	1,932	1,400	995	763
Ireland	11,817	7,345	11,432	8,860	6,191	4,154	3,281	3,653	5,196	5,164	6,249	5,500	5,071	4,694	4,093	3,166	4,871	5,240	6,188	5,043	3,610	2,885
Isle of Man	127	106	145	117	102	129	145	81	67	60	33	35	31	18	22	16	4	1	2			
Latvia						3																
Lithuania								1,289									14	40	33	101	85	76
Netherlands														550	480	659	790	833	733	631	659	684
Norway	7,821	6,451	5,067	5,199	7,981	11,117	12,287	11,802	10,991	7,393	5,025	5,551	3,335	2,210	2,375	2,857	2,921	1,901	2,107	1,819	1,698	1,324
Poland																	11	8	8	1		
Portugal	4,872	5,243	6,077	6,063	5,916	12,735	11,881	11,482	10,761	9,283	10,945	9,530	10,148	9,411	7,183	7,983	7,807	8,596	8,004	6,997	7,265	7,628
Russian Federation				3,735	2,117	454		580	502	626			476	929	815	907	339	211	44	250	157	197
Spain	3,872	4,830	4,888	5,297	4,941	5,431	6,346	8,435	8,573	14,823	19,414	8,179	41,753	33,695	40,648	44,926	41,748	22,981	14,688	12,723	9,868	8,807
Sweden	375	484	720	749	630	404	342	264	222	132	123	164	206	143	118	128	251	278	288	285	186	178
Un. Sov. Soc. Rep.	880	3,770	4,465																			
United Kingdom	22,816	21,340	25,652	24,343	22,114	21,776	20,688	23,408	19,663	18,355	22,143	21,327	21,406	20,028	17,509	17,372	19,304	16,782	19,570	16,024	9,593	6,366
TOTAL	90,702	90,109	100,000	93,061	81,058	86,527	85,331	89,944	82,828	82,836	91,074	77,856	110,782	97,728	100,625	107,394	109,273	85,486	79,559	71,127	59,082	51,061

reported landings by Spain (Figure 5.2, Table 5.1). This may have been due to improved reporting, increased retention of bycatch, or a shift towards target chondrichthyan fisheries as teleost stocks decline (few data are identified to species level, making interpretation difficult). These volumes, combined with high landings from pelagic fleets operating outside the Northeast Atlantic, may also explain Spain's recent dominance in the Hong Kong shark fin market (Walker *et al.* 2005). From 1998 to 2000, Spain was the top importer of shark fins to Hong Kong. However, in recent years (2001–2005), Spain dropped to the third largest importer, due to increased imports from mainland China (owing to cross-boundary trading with Hong Kong, not increased catches) and Taiwan (Hareide *et al.* 2007). With the decline of swordfish stocks in many areas, the Spanish pelagic fleet is now also targeting sharks (Hareide *et al.* 2007; Mejuto *et al.* 2005). Portugal's reported chondrichthyan landings increased significantly in the early 1990s (Figure 5.2; Table 5.1).

Recent declines in total regional landings over the past few years are mainly due to large reductions in reported landings from the UK and Spain, to ~18,600t and 6,300t, respectively, in 2006 (Figure 5.2; Table 5.1).

5.2 Commercially important elasmobranchs

5.2.1 Spiny dogfish *Squalus acanthias*

The spiny dogfish *Squalus acanthias* is the Northeast Atlantic region's most important commercial elasmobranch species based on relatively high catches and prices. *Squalus acanthias* from the UK can sell in Italy for US$8.13–9.91 per kg, making it among Europe's most valuable sharks for meat (Vannuccini 1999). As is the case in other parts of the world, fisheries usually target aggregations of adult female spiny dogfish because they grow larger than males and fetch a higher price. Because this species exhibits a lengthy gestation (nearly two years) and no resting stage, large females are usually pregnant. Targeting of this key segment of the stock is often especially problematic for overall population health.

The main fishing nations taking spiny dogfish from the Northeast Atlantic are France, Ireland, Norway and the UK. In the north of the region, fisheries target *S. acanthias* using trawl, seine nets and deep longlines. Outside of these areas, most the catch is incidental and landings are generally low. Other countries, for example Germany, Denmark, Poland and Belgium, tend to have much lower landings (Pawson and Vince 1998; ICES WGEF 2007).

Overall annual spiny dogfish landings averaged 3,000t prior to the 1930s, increased to more than 12,000t by 1937 and then varied between 20,000–42,000t from 1951–1970 (Holden 1977). 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).

ICES and FAO statistics show spiny dogfish landings from the Northeast Atlantic dropped more than 50% from 43,000t in 1987 to under 20,000t in 1994 and under 12,500t/year by 2000. Total annual landings for the Northeast Atlantic population stock of *S. acanthias* were just over 3,000t in 2006 compared to over 6,000t in 2004 (ICES 2008; FAO 2008).

ICES WGEF advises that the Northeast Atlantic population of spiny dogfish has declined steadily to its lowest ever level (estimated at less than 10% of virgin biomass) and is now in danger of collapse (ICES WGEF 2008). This decline is driven by high exploitation in the past, coupled with biological characteristics that make this species particularly vulnerable to such intense fishing (ICES WGEF 2006). Furthermore, spiny dogfish are less frequently caught in groundfish surveys than they were 20 years ago, and a preliminary analysis of Scottish survey data indicates significant declines in catch rate (>75% decline in catch per unit effort (CPUE) since 1985) (ICES WGEF 2008).

In 2007, Norway introduced a general ban on fishing and landing of spiny dogfish in the Norwegian EEZ and in international waters in ICES areas I–XIV. However, boats less than 28m in length are allowed to fish for spiny dogfish with traditional gear inshore and in territorial waters. Spiny dogfish caught as bycatch in other fisheries have to be

Figure 5.1 Total chondrichthyan fishery landings in the Northeast Atlantic region, 1950–2006. (Metric tonnes (t), compiled from FAO landings statistics for all countries in the region (FAO 2008)).

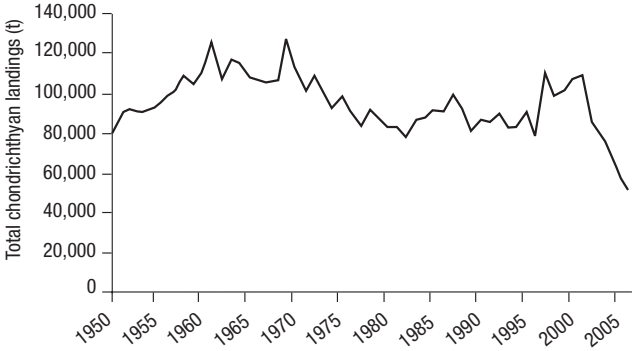
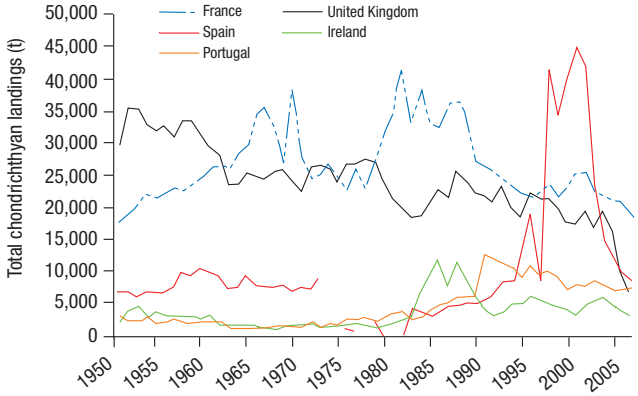


Figure 5.2 Total chondrichthyan fishery landings, 1950–2006, for the five countries with highest landings in the Northeast Atlantic region in the year 2006. (Metric tonnes (t), compiled from FAO landings statistics (FAO 2008)).



landed and Fiskeridirektoratet is allowed to stop the fishery when catches reach last year's level. Norway also has a 70cm minimum landing size (ICES WGEF 2007). In 2008, Sweden prohibited fishing for spiny dogfish with nets and longlines in its waters and trawl fisheries are only permitted to take this species as a bycatch. Swedish commercial fishermen can apply for a permit to fish for spiny dogfish (ICES WGEF 2008).

Spiny dogfish have been under EU quota management in the North Sea (ICES areas IIa (EC) and IV) since 1988, but for several years the Total Allowable Catch (TAC) was based on high historic catches, with uptake only reaching 25–35%. The TAC for 2005 was reduced by 75% from the previous year to 1,136t and may have been restrictive in this area since then. ICES advice has remained consistent since 2005: target fisheries should no longer be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level. In 2005, ICES advised that a TAC for 2006 should cover all areas where spiny dogfish are caught in the Northeast Atlantic and this should be set at zero (ICES WGEF 2007). In 2007, the EU established a spiny dogfish bycatch rule for the North Sea TAC, for which *S. acanthias* "shall not comprise more than 5% by live weight of the catch retained on board". This limit is designed to prevent fisheries from targeting aggregations. Also new for 2007 was a TAC covering EU and international areas outside the North Sea (in ICES sub-areas IIIa, I, V, VI, VII, VIII, XII and XIV). This TAC was set to 2,828t for 2007 (total landings for all areas except IIa and IV were 2,087t in 2006) and 2,004t in 2008. The TAC for *S. acanthias* in the North Sea and the Norwegian Sea (IIa (EC) and IV) continues to be reduced annually, with the TACs in 2007 (841t) and 2008 (631t) based on a reduction of 20% and 25% on the previous year (ICES WGEF 2008). In 2008, while reiterating the advice for one TAC of zero, ICES recommended the introduction of a maximum landing size to deter fisheries targeting mature females.

5.2.2 Lesser spotted dogfish *Scyliorhinus canicula*

The lesser spotted dogfish *Scyliorhinus canicula* is captured primarily as bycatch in fisheries in northern Europe, but is more abundant in the south of the region, where it apparently replaces *S. acanthias*. Off the east coast of Scotland, the relative abundance is 6.5:93% respectively, whereas off the Breton coast *S. canicula* represents 67% of landings and *S. acanthias* 16% (Walker *et al.* 2005).

Oliver (1996) describes a fishery on the continental slope off Cantabria (northern Spain) which occurs when traditional target species are lacking. In 1992, 17 vessels participated in the fishery and landed 340t and in 1993 10 vessels landed 452t. Species caught included *S. canicula*, but it is difficult to determine accurate landings or catches per species because the fish are skinned and/or just the liver is retained (Walker *et al.* 2005).

Scyliorhinus canicula is the most important shark species in the bycatch of the demersal fishery that operates along the north and north-west coast of Spain. However, most of the catch is discarded, with only 10% landed (around 200t) as observed in the Spanish fishing fleets operating in the Cantabrian Sea (ICES 2002). Fishery CPUE series from Spanish trawlers in one area shows an increasing trend from 1991–2001 with a pronounced peak in the latter two years.

ICES and FAO statistics show landings from the Northeast Atlantic have remained relatively stable or slightly increasing over the past 20 years, fluctuating around ~6,000t–7,000t/year (ICES 2008; FAO 2008).

In 2008, ICES warned that limited information on population status coupled with generally low reproductive potential warrant a cautious management approach. ICES advised that 2009 landings of *S. canicula* from the Bay of Biscay and Iberian Waters 'be held at or reduced from average landings in 2002–2006'.

5.2.3 Porbeagle *Lamna nasus*

The porbeagle *Lamna nasus* is one of the highest value fish food species in Europe, but also one of the region's most biologically vulnerable to overfishing. Historically, *L. nasus* has been the subject of intense, targeted longline fisheries that were not regulated until 2008 with a TAC that was still too high to be restrictive.

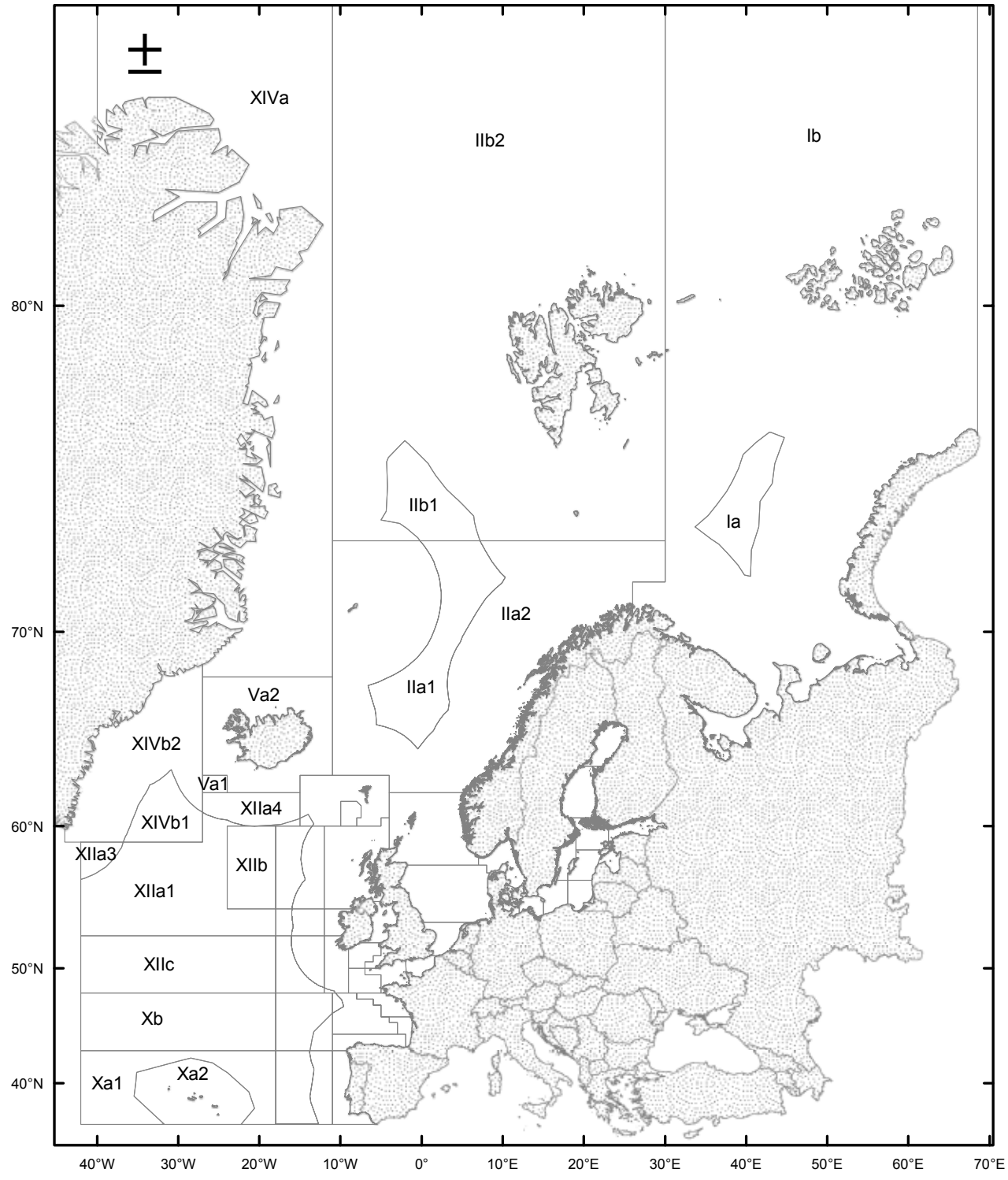
Total landings for the Northeast Atlantic region declined from 1,990t in 2000 to 243t in 2006, although the data are considered incomplete (ICES WGEF 2007). In the north of the region, directed fisheries for *L. nasus* have been carried out in the North Sea and off the Scottish coast by Norwegian and, to a lesser extent, Danish vessels, and in the south and west of England by French vessels. The Norwegian fishery was active in the 1930s–1940s and was the principal fishery for this species in the Northeast Atlantic after World War II (Gauld 1989), but it has been of little importance since the 1960s (ICES 1995). A progressive drop in landings occurred in the Norwegian fishery from around 6,000t/year to 160–300t/year in the early 1970s to around 10–40t/year in the late 1980s/early 1990s (ICES 1995). Danish landings in the North Sea declined from around 500–600t/year in the 1950s to a minimum of 32t in 1988, then increased again to 94t in 1994, while those in the Kattegat and Skaggerak decreased (40–50t to 2–4t) in the same period (ICES 1995). The quotas formerly granted to Norway and the Faeroe Islands to take this species in European waters were far too high to be caught and these fisheries subsequently ceased in the ICES area. Sport fishermen regularly catch *L. nasus* in the English Channel and occasionally off the Irish coast. *Lamna nasus* tagged off southern England have been recaptured over a wide area between northern Norway, Denmark, and northern Spain (Pawson and Vince 1998; Stevens *et al.* 2006).

Porbeagles are taken by a longline fishery targeting swordfish that operates from Europe's most important market for pelagic sharks in Algeciras, southern Spain. Other pelagic sharks taken include *P. glauca*, *Isurus* spp., *Sphyrna* spp., and *A. superciliosus*, but reliable data on catches and/or landings is scant. The only remaining reportedly directed fishery for *L. nasus* is carried out by French vessels in the Bay of Biscay.

Also, *Lamna nasus* and *I. oxyrinchus* make up less than 0.5% of total landings of a small Spanish longline fishery targeting *P. glauca* in the Bay of Biscay (SGRST 2002). Large pelagic sharks, including *L. nasus*, are caught as bycatch in the longline fishery for swordfish in the Azores (Walker *et al.* 2005).

Sweden prohibited catch of porbeagle in 2004 and yet obtained one ton of the 2008 EU porbeagle quota. In 2006, ICES stated that available information from Norwegian and Faroese fisheries showed landings had declined sharply and these fisheries had ceased in the ICES area. These fisheries had not resumed, implying that the stock has not recovered

Figure 5.3 Map of ICES Fishing Areas.



here. ICES further stated that the available information from the French fishery suggested that CPUE reached a peak in 1994. It then declined until 1999 and has been stable at a much lower level, despite a relatively constant number of vessels involved.

Also in 2006, ICES advised that "no targeted fishing for porbeagle should be permitted on the basis of its life history and vulnerability to fishing. In addition, measures should be taken to prevent bycatch of porbeagle in fisheries targeting other species, particularly in the depleted northern areas". This advice was further considered by STECF in 2006, who reiterated that no directed fishing for porbeagle in the Northeast Atlantic should be permitted and that additional measures be taken to prevent bycatch of porbeagles in fisheries targeting other species (ICES WGEF 2007). In 2008, ICES added a recommendation that landings of porbeagle sharks should be prohibited.

Figure 5.4 Map of ICES Fishing Areas – Western Europe.

In 2006, the European Commission proposed establishing a TAC of 240t for EC waters, but no TAC was adopted by the Council of Fisheries Ministers. In 2007, Norway implemented ICES advice by banning all directed fisheries for porbeagle (ICES WGEF 2007). EC Regulation 40/2008 allotted quota shares of a new, 2008 EC porbeagle TAC (581t in EC and international waters of the Northeast Atlantic) to France, Spain, Denmark, Portugal, Ireland, Germany, UK and Sweden. In addition a few States adopted domestic fisheries management measures (CMS 2007); however, these have not been effective for beginning recovery of Northeast Atlantic *L. nasus*.

5.2.4 Basking shark *Cetorhinus maximus*

In the past few decades, landings of basking shark *Cetorhinus maximus* varied considerably, partly due to fluctuating availability and market prices. Historic data

series from Norwegian, Scottish and Irish fisheries show classic 'boom and bust' patterns, with extremely slow recovery following fishery collapses. Landings from target fisheries appeared to have ceased completely in 2002 (Walker *et al.* 2005).

Historically, *C. maximus* was an important commercially fished species in Northern Europe. Liver oil was traditionally the main product, supplying domestic oil markets, but today the liver oil market is dominated by deepsea sharks (ICES 1995). More recently, it was the high value of *C. maximus* fins (worth up to US$1,000–2,400 per shark at first sale [Walker *et al.* 2005]) that was thought to encourage the landing of this species.

Fishermen targeted *C. maximus* for centuries, but these fisheries had rarely lasted longer than 20 years (taking an average of 200 fish per year) before populations collapsed, taking up to 100 years to rebuild. A seasonal fishery started in 1947 at Achill Island, off the west coast of Ireland. Landings declined by over 90% in 20–25 years and it closed in 1975, despite high oil prices. Parker and Stott (1965) and Horsman (1987) attributed the decline and collapse of this fishery to the overfishing of a local stock. Berrow and Heardman (1994) note that there were still very few observations of *C. maximus* along the whole west and north-west coast of Ireland in 1993 and Achill Island fishermen reported fewer than 10 sharks sighted annually (Earll pers. comm.). Recently, the last directed fishery in operation appears to have been the declining Norwegian fishery, which took only an estimated 36 sharks in 2001, compared with >600 a year in the early 1990s (Walker *et al.* 2005) and between 1,266 and 4,266 sharks per year during 1959–1980 (ICES WGEF 2007). This target fishery has now closed but some bycatch is still landed.

5.2.5 Tope *Galeorhinus galeus*

There is currently no directed commercial fishery for tope *Galeorhinus galeus* in the region, although some recreational anglers specialise in fishing for this species. Tope are caught mainly as bycatch in bottom, trawl, net and line fisheries, especially by French vessels. Landings of this species in France decreased from ~1,400t in 1983 to ~200t in 1992 (Walker *et al.* 2005). French landings gradually increased to 454t in 1997 and then have slowly been declining to 276t in 2007 (with the exception of two peak years, 450t in 2000 and 465t in 2001) (ICES 2008). Species-specific landings records commenced in 1978 for French fisheries and landings of this species have been relatively stable in recent years, at about 500t/year (ICES WGEF 2007). Stevens (2005) reports that declining landings of *G. galeus* in this region and the Southwest Atlantic are cause for concern. Stevens (in Pawson and Vince 1998) reports that *G. galeus* tagged off England were recaptured throughout the eastern Atlantic from southern Spain to the north-west of Iceland. *Galeorhinus galeus* tagged off the Irish coast have also been re-captured in the Mediterranean Sea, off the coasts of Algeria and Spain. In the Azores, this species is caught in demersal fisheries, from which it is discarded in large quantities. It is also among the species caught as bycatch in longline fisheries targeting swordfish (Walker *et al.* 2005).

It has been suggested that there may be a greater retention of tope in some UK inshore fisheries operating in ICES Division IVc, as a result of bycatch limits on skates and rays, although no data are currently available. Sea Fisheries Committees considered local bylaws to deter targeted fisheries establishing in UK coastal waters (ICES WGEF 2007). In 2008, it became illegal for commercial vessels to target tope and a bycatch allowance of 45kg was set. Furthermore, recreational anglers are restricted from landing tope. This species is now afforded the same level of protection in Welsh and English waters (Shark Alliance, 2008).

5.2.6 Blue shark *Prionace glauca*

Prionace glauca are widely considered to be a major bycatch of pelagic longline (and former driftnet fisheries) targeting tuna and billfishes (ICCAT 2005), but are increasingly targeted, particularly by Spanish vessels, as new markets develop. Blue shark catch is particularly significant for nations with high seas fleets such as Japan, Taiwan, Korea and Russia. The entire catch is not retained on all fishing trips so landings data is not indicative of stock trends (ICES 2002). The situation is different in the Spanish pelagic longline fleet, which now targets both sharks and swordfish, with sharks (90% blue shark, 10% mako *Isurus oxyrinchus*) comprising over 70% of the Atlantic catch of the swordfish fleet (Mejuto *et al.* 2005). This swordfish fishery is, in fact, also a major target fishery for blue shark (Hareide *et al.* 2007).

Recent observer data has also indicated that substantially more sharks are caught than reported in catch statistics. For the entire North Atlantic, catch is estimated to exceed 100,000t with mortality estimates between 26,000 to 37,000t (ICES WGEF 2007). ICCAT collects and collates catch landings statistics from commercial fisheries, but these data are incomplete. Joint efforts have been made by ICCAT and ICES to undertake stock assessments in 2004 and 2008, but this process has been hampered by poor data reporting and the results are highly conditional upon assumptions made about catch levels (ICES WGEF 2007).

Since 1998 there has been a small Spanish longline fishery targeting *P. glauca* off the Basque coast in the Bay of Biscay. The rest of the catch consists of other pelagic sharks such as *L. nasus* and *I. oxyrinchus* (less than 0.5% of total landings (SGRST 2002; ICES WGEF 2007). Other small commercial target fisheries arise from time to time. Blue shark is also an important target for recreational anglers in southwest England and Ireland (ICES WGEF 2007), although catches have fallen in recent decades and most is now tag and release.

Portugal has surface longline fisheries targeting large pelagic sharks and they are also taken as bycatch from Portuguese gillnet, purse-seine and surface longline fisheries targeting teleost fishes. The Portuguese longline fisheries for swordfish in the Northeast Atlantic, operating off the mainland coast and around the Azores, like the Spanish fleet lands a larger 'bycatch' of *P. glauca* and *I. oxyrinchus* than the registered landings of swordfish (SGRST 2002). Other species caught include porbeagle *L. nasus*, thresher shark *Alopias vulpinus*, hammerheads *Sphyrna* spp., and tope *G. galeus* (Hareide *et al.* 2007).

5.2.7 Deepwater sharks

Deepwater sharks have only relatively recently become the subject of regular monitoring and sampling as new fisheries exploit the remaining resources of the Northeast Atlantic. Scientists do know, however, that these species have exceptionally low productivity and therefore warrant an especially precautionary approach to management. Both

the targeting and bycatch of deepwater sharks is a cause for concern (Walker *et al.* 2005). Commercial fisheries have relatively recently expanded into deepwater along the continental shelf, from Portugal to the Rockall and Hatton Banks in the North, and around the Azores. These operations are still largely unregulated. Deepwater sharks are taken in some target gillnet and longline fisheries and are also an important component of mixed deepwater trawl fisheries (Hareide *et al.* 2004). ICES (2007) summarises the distribution and range of the 12 most frequently caught deepwater sharks, the most important of which are marketed as 'siki' sharks: leafscale gulper shark *Centrophorus squamosus* and Portuguese dogfish *Centroscymnus coelolepis*. Fisheries taking these and other species were described extensively in ICES (2006) and STECF (2006) presented a review of available information on deepwater shark gillnet fisheries (ICES WGEF 2007).

Countries landing the majority of deepwater sharks are France, the UK, Germany, Faeroe Islands, Norway, Spain and Portugal. Landings of 'siki' sharks began in 1988 and increased rapidly to 1997, then fluctuated with an upward trend to 2003, when over 10,000t were landed. Reported landings have declined since then, possibly as a result of effort and quota reductions in mixed trawl fisheries and the introduction of quotas for deepwater sharks, although there had also been substantial declines in several CPUE series for siki sharks over the previous decade (ICES WGEF 2006). The kitefin shark *Dalatias licha* targeted off the Azores has also shown a decline in landings in the past two decades. Although population depletion as a result of exploitation is thought to play a role; the falling market value of the liver oil has probably also contributed to the pattern seen and the target fishery closed in 1990 because it was no longer profitable (ICES WGEF 2006). This species is still a used as a bycatch of deepwater fisheries.

A wide range of other deepwater shark species are also taken in mixed fisheries, but are of lesser value and importance than the three species described above. These fisheries were described by ICES WGEF (2005 and 2006). Species involved are not generally reported by species, but include gulper shark *Centrophorus granulosus*, birdbeak dogfish *Deania calceus*, longnose velvet dogfish *Centroscymnus crepidater*, black dogfish *Centroscyllium fabricii*, velvet belly *Etmopterus spinax*, blackmouth catshark *Galeus melastomus*, Greenland shark *Somniosus microcephalus* and a number of lantern sharks *Etmopterus* spp. Some of these species are also landed, or in some cases, livers and fins are retained and the carcasses discarded.

In 2006, ICES noted substantial (90%) declines in CPUE series for both *C. coelolepis* and *C. squamosus* in Sub-areas VI, VII and XII, suggesting that the stocks of both species are depleted. CPUE for both species in the northern area have displayed strong downward trends leading to the conclusion that the stocks were being exploited at unsustainable levels (ICES WGEF 2007). Landings of *C. coelolepis* and *C. squamosus* declined from ~10,000t in 2001 to 2004, to ~2,000t in 2006 (ICES WGEF 2007). This is partly due to quota restrictions and gillnet bans. Recent landings are the lowest since the fishery reached full development in the early 1990s and much lower than TACs available (7,100t) (ICES WGEF 2007).

ICES advice in 2006 was that no target fisheries should be permitted for *C. coelolepis*, *C. squamosus* or *D. licha* unless there are reliable estimates of current exploitation rates and stock productivity". ICES also advised that the "TAC should be set at zero for the entire distribution area of *C. coelolepis* and *C. squamosus* stocks and additional measures should be taken to prevent bycatch of these sharks in fisheries targeting other species" (ICES WGEF 2007). ICES recommends that exploitation of *D. licha* should "only be allowed when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and implemented" (ICES WGEF 2007).

In 2006, the use of gillnets that had been causing unsustainable levels of deepwater shark mortality was banned in water deeper than 200m. Also in 2006, STECF reviewed deepwater gillnet fisheries, including those targeting deepwater sharks, and recommended the maintenance of the closure of shark gillnetting, and to permit hake and monk netting in waters shallower than 600m. The 600m depth limit was considered best to avoid the main deepwater shark species being caught, and was introduced in 2007 (ICES WGEF 2007). A maximum bycatch of deepwater shark of 5% is allowed in hake and monkfish gillnet catches. This ban does not cover Sub-areas VIII or IX. A gillnet ban in waters deeper than 200m is also in operation in the NEAFC regulatory Area (all international waters of the ICES Area). NEAFC also ordered the removal of all such nets from these waters by 1 February 2006.

In 2007, the TAC for deepwater sharks in Sub-areas V, VI, VII, VIII and IX was 2,472t. This was reduced to 1,646t in 2008. In 2007 and 2008, the TAC for deepwater sharks was set at 20t annually in Sub-area X, and 99t in Sub-area XII. These TACs apply to the following list of species: *C. coelolepis*, *C. squamosus*, *D. calceus*, *D. licha*, *Etmopterus princeps*, *E. spinax*, *C. fabricii*, *C. granulosus*, *G. melastomus*, *Galeus murinus*, and *Apristurus* species combined. In Sub-area X, *Deania hystricosum* and *Deania profundorum* are also on this list (ICES WGEF 2007). A number of effort regulations apply to these deepwater shark species. Council of the EU Regulation (EC) No 2347/2002 sets maximum capacity and power (kW) ceilings on individual member states' fleets fishing for deepwater species. Council Regulation (EC) No 27/2005 set a limit of effort (kilowatt*days) at 90% of the 2003 level for 2005, and at 80% for 2006. Council Regulation 1568/2005 bans the use of trawls and gillnets in waters deeper than 200m in the Azores, Madeira and Canary Island areas. Council Regulation (EC) No 41/2007 banned the use of gillnets by Community vessels at depths greater than 600m in ICES Divisions VIa, b, VII b, c, j, k and Sub-area XII. In October 2008, the European Council of Fisheries Ministers announced that in 2009, TAC's for deepsea sharks will be 859t. France and the United Kingdom were awarded the largest national deepsea shark quotas for 2009 (345t and 188t, respectively), followed by Portugal (137t), Spain (110t), Ireland (56t), and Germany (20t). Furthermore, EC Fisheries Ministers decided that in 2010, 10% of the 2009 TAC should account for sharks taken incidentally as bycatch (Shark Alliance 2008).

5.2.8 Skates and rays

Skates and rays are under heavy fishing pressure in Northern Europe. ICES compiled annual landings for skates and rays combined. Total international landings of all skate and ray species combined from the North Sea have declined steeply since World War II (SGRST 2002). In the past, directed fisheries for all skates and rays occurred off the European continental coast (Walker 1996), and in the 1940s skates and rays made up almost 30% of all landings in the Bristol

Channel (southern Irish Sea), which provided 27% of the entire UK skate and ray catch. From 1964–1974, skate and ray populations were declining even more rapidly than in the 1960s.

In recent years, skates and rays have contributed more than 40% by weight to the reported landings of elasmobranchs in the northern part of the region (SGRST 2002). Nowadays they are mainly caught as bycatch, although most of the species have a commercial value. Although landings data are confounded by a lack of information on effort, species composition of catches and market mechanisms, a number of trends can be seen. The most obvious is a decrease in landings of large batoids. In the past, common skate *Dipturus batis* was considered to be widely distributed throughout the central and northern North Sea and was an abundant constituent of the demersal fish community of north-west Europe. Its range in the North Sea is now restricted to northern areas and it is reported as extirpated from the Irish Sea. Very low numbers are still caught, but only sporadically; these may mainly be from very deepwater populations only recently targeted by fisheries. The thornback ray *Raja clavata* has also decreased in its area of distribution in the North Sea, and in its contribution to landings in many areas, for example North Wales, UK. ICES (1995) reported that none were caught along the Dutch coast from 1958–1994 in an area which *R. clavata* had previously been common (Walker *et al.* 2005). Other large-bodied species have been similarly affected. Du Buit (pers. comm.) noted the sharp decrease in Brittany of the catches of large species such as white skate *Rostroraja alba*, longnose skate *Dipturus oxyrinchus* (which has become very rare) and *D. batis*, landings of which declined from 1,165t in 1964 to 200t in 1992. *Rostroraja alba* has not been recorded in French landings since 1980. These species are relatively sedentary and local stock depletions are, therefore, unlikely to be replenished quickly by immigration from elsewhere (Walker *et al.* 2005).

A small-scale fishery off south-east Ireland targets rays, especially *R. clavata* (in the 1950s and 1960s this was a much bigger fishery operating from Wales). During the last decade, small-scale fixed net fisheries targeting *R. clavata* and other species have dropped off the west and north coasts of Wales and similar fisheries using lines, fixed nets and trawls have taken place in localised coastal regions in the North Sea. *Raja clavata* is often the target of directed seasonal fisheries by France, mainly in the Celtic and Irish Sea (SGRST 2002).

Quero and Monnet (1993) studied statistics from the port of Arcachon (west France), and state that the fall in the landings of skates and rays is dramatic, from 1,000t/year in the early 1920s (23.8% of the total catch), to 3–15t in recent years (0.3% of total catch). Three series of transects perpendicular to the Dutch coast (Sole Transect Data, Netherlands Institute for Fisheries Research) have been sampled since 1951, with >90% of catches being the thornback ray *R. clavata* (Walker and Heesen 1996). Since the mid-1950s, no skates or rays of any species have been caught in these transects, with the exception of a few individuals. Annual landings of skates and rays in England and Wales have fallen from ~18,000t to 3,000t over the last 40 years (Jones *et al.* 2002). It is apparent that larger species are more seriously affected by this overexploitation. Although only the larger individuals (>~70cm) are landed regularly, most length and age classes are caught in trawls and individuals as small as 30cm are sometimes landed (Walker pers. obs.). Since only mature individuals can contribute to the next generation, survival during the juvenile period is a key factor in batoid population dynamics. It is to be expected, therefore, that those species with the lowest length and/or age at maturity have the highest chance of survival at increasing levels of exploitation.

The Bristol Channel area of the UK is an important area for skates and rays and used to account for 25–30% of UK landings. *Dipturus batis* was once frequent but is now commercially extinct there and blonde ray *Raja brachyura* and *R. clavata* have also declined in abundance and size, to be partly replaced by smaller species; the spotted ray *Raja montagui* and the cuckoo ray *Leucoraja naevus* (Jones *et al.* 2002).

In the first half of the last century, the distribution of *R. clavata* and *D. batis* was considered to be extensive throughout central/southern and central/northern North Sea, respectively (Walker 1996). The limited evidence available suggests that in the past few decades *D. batis* has retreated to the very northern North Sea, *R. clavata* in no longer caught in the south-eastern bight and the starry ray *R. radiata* has replaced other species in the central North Sea (Rijnsdorp *et al.* 1996; Walker 1996; Walker and Heesen 1996; Walker and Hislop 1998). Even the populations of the other species that are still present in the North Sea are unlikely to be able to withstand the current level of total mortality for long, despite changes in maturation which, at a population level appears to enable spotted ray *Raja montagui* and starry ray *Amblyraja radiata* to survive a slightly higher level of mortality now than in the past.

Species considered to have disappeared from the southern Bay of Biscay are *R. alb*a, *D. batis* and *R. brachyura*. The recovery of the populations after the World Wars in the first half of the twentieth century shows that overexploitation is the reason for the decline. Another indicator is the abundance of rays in areas where fishing is restricted. Scientific trawl surveys with R.V. 'Thalassa' yielded 46 specimens/hour in the Douarnenez Bay (Bay of Biscay) and 300–600 specimens/hour in the north of Cardigan Bay (Wales), both areas closed for commercial fishing (Quero and Gueguen 1981; Quero 1998).

Certain stability in landings is reported from other areas. Landings from the Irish Sea and Bristol Channel were about 6,000t/year between 1960 and 1964, declined to 4,200t/year in 1975, but increased up to 6,350t/year in 1988. Catches from the English Channel and Celtic Sea show similar stability (Walker *et al.* 2005).

A study of Portuguese commercial fisheries landing elasmobranchs (1986–1999), showed *Raja* spp. to be the main group landed accounting for ~30% of total landings, followed by a number of deepsea sharks. A significant decrease in yearly landings of *Raja* spp. was observed (1996 landings were just 57.6% of landings in 1995), although market prices per kilogram increased (Correia and Smith 2003). Another study has shown that landings of rays in Portugal (particularly in the Algarve) decreased more than 42% in 10 years, while their commercial value increased by more than 71% (DGPA 2000). In the Azores, *R. clavata* is caught in demersal fisheries and is discarded in large quantities (Walker *et al.* 2005).

In 1999 the EC first introduced a common TAC for "skates and rays", but only for the North Sea. In 2005 ICES advised "target fisheries for common skate *D. batis* and thornback

ray *R. clavata* should not be permitted from the North Sea stock, and bycatch in mixed fisheries should be reduced to the lowest possible level". Moreover, ICES advised that if the fisheries for rays continue to be managed with a common TAC for all ray species, this TAC should be set at zero for 2006 (ICES 2007).

In 2006 the EC TAC for skates and rays for areas IIa (EC waters) and IV (EC waters) was set at 2,737t, which was 15% less than the TAC for 2005. The TAC for 2007 was 20% less than that for 2006 (on no particular scientific ground). This TAC was indicated to comprise of "bycatch quota" and it is specifically mentioned that "these species shall not comprise more than 25% by live weight of the catch retained on board". The TAC for 2008 was set at 1,643t, which is 25% less than the TAC for 2007. From 2008 onwards the EC has obliged member states to provide species specific landings data for the major North Sea species: *R. clavata, R. montagui, R. brachyura, L. naevus, A. radiata* and *D. batis*. ICES WGEF is of the opinion that this measure is ultimately expected to improve our understanding of the skate fisheries in the area (ICES 2008). There is, however, still no quota management for skates and rays outside the North Sea. Minimum landings sizes (40cm disk width) have been set for skates and rays by several Sea Fisheries Committees on the coast of England and Wales (ICES WGEF 2007). These protect smaller, more fecund and abundant species more effectively than they do the depleted large-bodied species. ICES (2008) noted that a Maximum Landing Length (MLL) of 100cm for all skates and rays would be beneficial for common skate, while not influencing most other species.

ICES (2008) also advised prohibiting targeted fishing and minimising bycatch for *D. batis* and *R. undulata* throughout the Celtic and North Seas. Furthermore, ICES advised that *R. alba* is afforded the highset possible protection in the Celtic Seas, including zero TAC and a prohibition on landing. ICES also suggest "maintaining the status quo and closing monitoring fisheries" for a variety of rays and that landing of skates and rays (collectively) in 2009 are held to or reduced from recent landings (ICES 2008).

5.3 Utilisation and trade

Elasmobranchs are versatile fishery resources providing meat and fins for human consumption, liver oil for lubricants, cosmetics and vitamin A, skins for leather; cartilage for medicinal use, and jaws and teeth as curios. Despite the lucrative market for their fins, sharks have generally not been the subject of high value fisheries. As a result, sharks have not been high priorities for fishery managers and populations have been left to follow boom-and-bust cycles. The versatility and development of new elasmobranch products and the ease with which the species can be targeted when other species are depleted or otherwise unavailable have led to increased elasmobranch fishing over the past few decades (Hareide *et al.* 2007). Global statistics on the production of particular shark products, such as meat, fins and liver oil, are available from the FAO Fishstat database, but are hampered by sparse and incomplete data. Produced quantities of less valuable elasmobranch products, such as skins and leather, cartilage, fish meal and fertiliser, are rarely tabulated by trade authorities and are thus even more difficult to assess. Although there is significant under-reporting of trade in shark products, available evidence indicates that the European Union dominates world shark trade activity (although this may be due to better trade records in Europe) (Hareide *et al.* 2007).

The product with the longest history of trade in the Northeast Atlantic region is shark liver oil, which stimulated Irish fisheries for basking sharks *Cetorhinus maximus* as early as the eighteenth and nineteenth centuries to produce lighting fuel (Walker *et al.* 2005). In the 1930s and 1940s, the use of shark liver oil also prompted a boom in fisheries for Greenland shark *Somniosus microcephalus*, tope *Galeorhinus galeus*, spiny dogfish *Squalus acanthias*, and the deepwater sharks *Centrophorus squamosus* and *Centroscyllium coelolepis*. In later years, the development of synthetic substitutes for fuel soon caused the shark liver-oil market to collapse. Although the oil is still used in the manufacture of cosmetics and pharmaceutical products, reported production has decreased markedly since the mid-1970s (Hareide *et al.* 2007).

Historically, shark meat has been considered a low-value product outside of speciality markets. Europe has been a hotspot for demand, dating back to the introduction of commercial refrigeration in the 1950s (Hareide *et al.* 2007; Clarke *et al.* 2005). Since 1985, reported world landings of sharks have tripled as the popularity of shark meat has increased. EU countries (particularly Spain and Italy) were responsible for 56% of reported global shark meat imports in 2005. Fisheries that previously focused on the squalene-rich livers of deepsea sharks are now also landing meat, since markets have developed (Hareide *et al.* 2005). Market demand is also the main reason for retaining elasmobranchs such as dogfishes, skates and rays taken as bycatch in other fisheries. Dogfish species such as spiny dogfish *Squalus acanthias* are favoured as food in Northern European countries, particularly the UK, France, Germany and Belgium, whereas houndsharks, *Mustelus* spp. and makos *Isurus* spp. are preferred in southern European countries such as Spain (Vannuccini 1999).

Shark fins are still usually the most valuable parts of sharks and some of the most expensive seafood products in the world (selling for up to 500€/kg) (Hareide *et al.* 2007). Fins from short-fin makos *Isurus oxyrinchus*, hammerheads *Sphyrna* spp. and guitarfish *Rhinobatos* spp. are among the most valuable. The dominant species in the global shark fin trade is the blue shark, whose fins comprise at least 17% of the Hong Kong shark fin auction market (Clarke *et al.* 2006).

Some Northeast Atlantic countries are among the biggest exporters of shark fins to Asia. Spain leads this category, contributing 14% of all shark fin imports to Hong Kong (by adjusted weight) for 1998–2000, nearly double the contribution of the world's second ranked exporter: Indonesia (Clarke *et al.* 2005). In addition, Spain was the second greatest exporter of all shark products in 2003 and 2005 and the UK was ranked as the fifth and seventh greatest exporter of all shark products in 2003 and 2005, respectively, by tonnage (Lack and Sant 2005).

5.4 Fisheries governance in the Northeast Atlantic

Fisheries in the Northeast Atlantic region are influenced by a number of regional and international policies, management and advisory bodies, all of which play an important role by providing technical advice or developing management measures.

5.4.1 Regional Fisheries Management Organisations

Regional Fisheries Management Organisations (RFMOs) are responsible for developing and implementing fishing regulations for international waters. RFMOs have a duty to consider all species associated with or affected by fisheries they govern and are increasing their attention to sharks and rays. Such species have been generally considered bycatch but in many cases are also targeted. RFMOs have a key role to play in conservation, particularly for wide-ranging species whose effective management depends upon collaboration between States. The RFMOs most relevant for elasmobranchs of the Northeast Atlantic Ocean are the Northeast Atlantic Fisheries Commission (NEAFC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT).

The Northeast Atlantic Fisheries Commission (NEAFC) was formed to commission and disseminate scientific advice on the state of fish stocks in the Northeast Atlantic and to recommend measures to maintain their rational exploitation. The Advisory Committee on Fisheries Management of the International Council for the Exploration of the Sea (see below), supplies NEAFC with scientific advice. The present NEAFC Convention entered into force in 1982 and there are currently six contracting parties: The European Community, Denmark (on behalf of the Faroe Islands and Greenland), Iceland, Norway, Poland and the Russian Federation. Most of the NEAFC Convention Area is under the fisheries jurisdiction of NEAFC's Contracting Parties; the three remaining areas of international waters constitute the NEAFC Regulatory Area. Deepsea sharks such as Portuguese dogfish and leafscale gulper shark are taken in NEAFC regulated fisheries and NEAFC has closed some deepsea areas to bottom fishing. In 2005, NEAFC recommended a ban on fishing for basking sharks (NEAFC 2008, http://www.neafc.org).

The International Commission for the Conservation of Atlantic Tunas (ICCAT) is an inter-governmental fishery organisation responsible for the conservation of tunas and tuna-like species throughout the entire Atlantic Ocean. ICCAT currently has 46 Contracting Parties which annually consider and often agree (usually by consensus) management measures for a variety of tunas, swordfish, billfish and, to a lesser extent, sharks. Scientists associated with ICCAT's Standing Committee on Research and Statistics (SCRS) compile relevant fishery statistics from all entities fishing in the Atlantic Ocean, convene and conduct stock assessments, develop management advice, and produce related publications. Sharks have been characterised as 'bycatch' in ICCAT fisheries, but species such as shortfin makos and blue sharks are increasingly targeted in international waters. The SCRS has conducted population assessments for blue and mako sharks since 2004 and, in 2008, facilitated ecological risk assessments for these and nine other pelagic elasmobranchs. As a result, the SCRS has issued advice on shark data collection, fin to carcass ratios, and pelagic shark fishing limits. In 2004, ICCAT became the world's first RFMO to adopt a ban on shark finning. Since then, ICCAT Parties have adopted binding recommendations to reduce fishing mortality of North Atlantic shortfin mako and porbeagle sharks, but without setting any specific shark fishing limits. More information can be found at http://www.iccat.int/en/.

5.4.2 Common Fisheries Policy (CFP)

Established in 1983, the Common Fisheries Policy (CFP) is the principal instrument for management of European Union (EU) marine fisheries. The primary objective of the CFP is to: "Ensure sustainable exploitation of living aquatic resources, integrating economics, conservation and environmental considerations." The European Commission states that the European Community "shall apply the precautionary approach to protect and conserve living aquatic resources, to ensure sustainable use of, and to minimise the impact of fishing activities on marine ecosystems". There is concern however that this pledge has not been adhered to, even for the most biologically vulnerable fish species, such as sharks and rays (EC 2008; http://ec.europa.eu/fisheries/cfp_en.htm).

The European Commission's Directorate-General (DG) for Fisheries is responsible for initiating European fisheries legislation. Such proposals are influenced by expert advice (see below) and considered by Working Groups of Member State officials and the European Parliament before being offered for adoption by the Fisheries Council (consisting of Agriculture and Fisheries Ministers). In principle, the Fisheries Council takes decisions by qualified majority vote with Member States' votes weighted, roughly, according to population size. In practice, however, fisheries decisions are often made by consensus. Most fishing restrictions, including Total Allowable Catches (TACs) and national quotas, are decided at Council meetings in November and December. Norway is included in negotiations related to shared North Sea fish populations. Enforcement of EU fishing regulations is the responsibility of Member State authorities and the EU Inspectorate (Shark Alliance 2008).

To date, under the CFP, the Commission has proposed and EU Member States have adopted catch limits for spiny dogfish *Squalus acanthias*, deepwater sharks, porbeagle shark *Lamna nasus*, and a suite of skate and ray species. Additional limits (for 2009) are anticipated for more species of demersal elasmobranchs, based on new ICES advice.

5.4.3 Scientific, Technical and Economic Committee for Fisheries (STECF)

The STECF is a standing committee, established in 2005 to provide input from scientific experts to inform the Commission's implementation of the CFP. The STECF is composed of scientific experts in the fields of marine biology and ecology, fisheries science and the economic, statistical and research issues associated with fisheries. The STECF produces annual reports on the state of fish stocks and trends in the fisheries industry and is consulted on matters relating to EU fishing activities. STECF's findings are key to the annual process for setting EU total allowable catches and national quotas (Europa 2008). With the Commission's agreement, the Committee can create working parties for specific issues. The Subgroup on Resource Status (SGRST) of the STECF provides information on the status of fisheries resources; including chondrichthyan fisheries (e.g. SGRST 2002). More information on the STECF can be found at http://fishnet.jrc.it/web/stecf and http://europa.eu/scadplus/leg/en/cha/c11127.htm.

5.4.4 International Council for the Exploration of the Sea (ICES)

ICES is the scientific and research organisation that coordinates and promotes marine research in the North

Atlantic and adjacent seas. A map of ICES Fishing Areas is shown in Figure 5.3 (over) and details of ICES Fishing Areas for Western Europe are shown in Figure 5.4 (over). ICES is the primary source of advice on matters relating to marine ecosystems for member governments, the European Commission and NEAFC. ICES is comprised of more than 1,600 marine scientists from its 20 North Atlantic member countries who compile and analyse information about the marine ecosystem and fisheries. ICES fills gaps in existing knowledge, responds to member inquiries and provides regular advice for limits associated with sustainable fishing. ICES is structured into a system of committees and more than 100 working/study groups, including the ICES Working Group on Elasmobranch Fishes (WGEF) (ICES 2008). More information can be found at: http://www.ices.dk/indexfla.asp.

5.4.5 Finning Regulations

The discrepancy between high value shark fins and low value meat provides a strong economic incentive for 'finning' (cutting off the shark's fins and discarding the carcass into the sea). This practice results in the waste of 95–98% of the animal. Finning is considered to be a problem because it is associated with excessive and unreported shark mortality and a lack of accurate data on catches on which to make science-based catch limits. It thereby threatens food security and the stability of marine ecosystems and the future of sustainable commercial and recreation fisheries (IUCN 2003).

Two finning prohibitions apply within Northeast Atlantic waters. The European Union adopted a finning ban in 2003 (Regulation 1185/3003) to prevent the practice within European waters and by the European fleet wherever they fish. The Regulation allows the removal of shark fins at sea only by vessels with special permits, but the majority of shark fishing vessels have since obtained such permits. These vessels are bound instead by a fin to carcass ratio limit of 5% of the live or 'theoretical' weight of the shark, the world's highest and therefore most lenient such ratio. In 2004, the International Commission for the Conservation of Atlantic Tunas adopted a similar ban for Atlantic large pelagic fisheries which employs a 5% fin to carcass ratio but does not specify whether it applies to live or dressed weight (this accommodates both EU practise and the tighter 5% dressed weight standards in other ICCAT countries such as the USA and Canada). The effectiveness of these finning bans in the Northeast Atlantic remains largely unknown due to a lack of at-sea monitoring and enforcement difficulties related to the ability to remove shark fins at sea. In addition, the EU finning ban allows shark fins and carcasses to be landed separately in different ports, further complicating enforcement.

The European Commission reviewed its finning Regulation in December 2005, stimulating significant further debate on its efficacy and whether the measures in force were fit for the purpose (Hareide *et al.* 2007). Most scientists and conservationists agree that the most reliable means for ensuring an end to finning is to prohibit the removal of shark fins at sea. This greatly eases enforcement and also facilitates the collection of better, species-specific catch data, as sharks are more easily identifiable with their fins attached (Hareide *et al.* 2007). Support for the 'fins-attached' strategy is reflected in a 2008 IUCN Resolution, the 2007 United Nations General Assembly Fisheries Resolution and regulations in the US Atlantic, parts of Australia and much of Central America. The European Commission is nearing completion of a long-awaited Community Plan of Action for Sharks, pursuant to the 1999 International Plan of Action for Sharks, which *inter alia* proposes to require simultaneous landings of shark fins and carcasses and to reduce the EU fin to carcass ratio to 5% dressed weight, although exceptions may still be allowed.

5.5 International and regional instruments relevant to the conservation of chondrichthyans in the Northeast Atlantic

5.5.1 The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention)

CMS recognises the need for countries to cooperate in the conservation of animals that migrate across national boundaries, if an effective response to threats operating throughout a species' range is to be made. The Convention actively promotes concerted action by the Range States of species listed on its Appendices. CMS Parties should strive towards strictly protecting the endangered species on Appendix I, conserving or restoring their habitat, mitigating obstacles to migration and controlling other factors that might endanger them (CMS 2008). The Range States of Appendix II species (migratory species with an unfavourable conservation status that need or would significantly benefit from international cooperation) are encouraged to conclude global or regional Agreements for their conservation and management (CMS 2008). Currently, the white shark and basking shark are listed on Appendices I and II of the CMS (the whale shark is also listed on Appendix II, but does not occur in the Northeast Atlantic region). The EU subsequently adopted a zero TAC for basking sharks and Norway closed the basing shark fishery. In 2005, the 8th Conference of Parties adopted a Resolution on migratory sharks. In early 2007 the IUCN SSG was commissioned by DEFRA and the CMS Secretariat to prepare a database of all migratory sharks and rays and a background paper on the conservation status of these species and possible options for international cooperation under the Convention. Subsequent to a number of specific meetings, the Scientific Council determined that an additional 35 shark and ray species meet the criteria for listing under the CMS Appendices (Zidowitz *et al.* 2008). After further review, proposals to list four species of shark; spiny dogfish, porbeagle, shortfin and longfin mako on Appendix II of CMS have been submitted for consideration by the 9th CMS Conference of Parties in December 2008. See: http://www.cms.int/ for more information.

5.5.2 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES was established in recognition that international cooperation is essential for the protection of certain species from over-exploitation through international trade. It creates the international legal framework for the prevention of trade in endangered species of wild fauna and flora and for the effective regulation of international trade in other species which may become threatened in the absence of such regulation.

Two shark species (whale shark *Rhincodon typus* and basking shark *Cetorhinus maximus*) have been listed on CITES Appendix II since 2002. White sharks were added to

Appendix II in 2004. At the 14th Conference of Parties in 2007, all but one species of sawfish (Family Pristidae) were listed on CITES Appendix I. The freshwater sawfish *Pristis microdon* was listed on Appendix II, which allows limited trade in live specimens for conservation purposes. Following a lack of support in previous years, Germany's Appendix II listing proposals for spiny dogfish *Squalus acanthias* and porbeagle *Lamna nasus* were presented by the EU to the 14th CoP14 in June 2007. Both proposals received a majority of votes, but fell short of the two-thirds majority required for adoption. Germany has pledged to propose the listing of both these species again at the CITES CoP15 in 2010 which, if successful, would mean trade in their meat and fins would be regulated to sustainable levels (Shark Alliance 2008).

CITES' other major role in promoting the sustainable management of wild species (arguably as important, if not more important than species listings on its Appendices), is through the adoption of Resolutions and Decisions. Resolution Conf. 12.6 encourages Parties, *inter alia*, to identify endangered shark species that require consideration for inclusion in the Appendices, if their management and conservation status does not improve. Decision 13.42 encourages Parties to improve their data collection and reporting of catches, landings and trade in sharks (at species level where possible), to build capacity to manage their shark fisheries, and to take action on several species-specific recommendations from the Animals Committee, some of which refer to Northeast Atlantic species (CITES 2006; Fowler and Cavanagh 2005). See http://www.cites.org for more information.

5.5.3 United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS provides a framework for the conservation and management of fisheries and other uses of the sea by giving Coastal States the right and responsibility for the management and use of fishery resources within their national jurisdiction (the territorial sea, which can extend up to 12 nautical miles). UNCLOS also recognises Coastal States' right to claim an exclusive economic zone (EEZ) of up to 200 nautical miles. The management goal adopted by UNCLOS (Article 61(3)) is that of maximum sustainable yield, qualified by environmental and economic factors. The provisions of UNCLOS directly related to the conservation and management of sharks include the duty placed on Coastal States to ensure that stocks occurring within their jurisdictional waters are not endangered by overexploitation. See http://www.un.org/Depts/los/index.htm for more information.

5.5.4 United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA)

UNFSA was established to implement the provisions of UNCLOS pertaining to the conservation and management of straddling and highly migratory fish stocks. UNSFA (adopted in 1995, ratified in 2001) calls for Parties to protect marine biodiversity, minimise pollution, monitor fishing levels and stocks, provide accurate reporting of and minimise bycatch and discards, and gather reliable, comprehensive scientific data as the basis for management decisions. In the absence of scientific certainty, it mandates a precautionary approach to the management of straddling and highly migratory stocks and species. Cooperation for such species is achieved though regional fisheries arrangements or organisations. According to Annex I of UNCLOS, Coastal States and other States who fish in areas where highly migratory species occur are required to ensure the conservation and promote optimum utilisation of listed species. The following chondrichthyans are listed on UNCLOS Annex I, Highly Migratory Species: sixgill shark *Hexanchus griseus*, basking shark *Cetorhinus maximus*, thresher sharks family Alopiidae, whale shark *Rhincodon typus,* requiem sharks family Carcharhinidae (including blue shark), hammerhead sharks family Sphyrnidae, and mackerel sharks family Isuridae (including shortfin mako and porbeagle). Other chondrichthyan species may be classified as 'straddling stocks' (Article 63 (2)) under the Convention. States are required to agree upon measures to ensure the conservation of qualifying chondrichthyan species or stocks which straddle coastal waters and high seas. The final mandate is for chondrichthyans that only occur on the high seas: fishing States must individually, or in cooperation with other fishing States, take measures to ensure these stocks are conserved (Fowler and Cavanagh 2005). See http://www.oceanlaw.net/texts/unfsa.htm or more information.

5.5.5 FAO International Plan of Action for the Conservation and Management of Sharks (IPOA–Sharks)

In 1999, the United Nations Food and Agriculture Organization (FAO) adopted the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) within the framework of their 'Code of Conduct for Responsible Fisheries' (Fowler and Cavanagh 2005b).

The objective of IPOA-Sharks is to ensure the conservation and management of sharks (and their relatives) and their long-term sustainable use. FAO have developed Technical Guidelines (FAO 2000) to support the IPOA-Sharks, which say 'States contributing to fishing mortality on a species or stock should participate in its management'. The IPOA-Sharks calls upon all States to produce a Shark Assessment Report (SAR) and to determine whether or not they need to develop and implement a National Plan of Action for Sharks (NPOA-Sharks) (FAO 2000). An NPOA should identify research, monitoring and management needs for all chondrichthyan fishes that occur in the waters of a particular State (Fowler and Cavanagh 2005b).

The implementation of the IPOA-Sharks is, however, wholly voluntary and progress toward its implementation has been slow. It was intended that NPOAs should have been completed by the FAO's Committee on Fisheries (COFI) session of early 2001, however the EU only recently started to develop a Community Plan of Action (CPOA) for sharks. Following a long consultation period, the European Commission will present its CPOA in December 2008 and the formal response from the Council of Ministers is expected early in 2009. As of yet, there are no regional plans of action for sharks.

5.5.6 The Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR)

The OSPAR Convention brings together 15 governments with the European Community to help protect and conserve the Northeast Atlantic and its resources. OSPAR uses an ecosystem approach to establish programmes, measures and policies across nations to protect the marine environment

from the adverse effects of human activities and to encourage the sustainable use of the seas. OSPAR's work is structured into six thematic strategies. The OSPAR List of threatened and/or declining species and habitats was adopted in 2003 under the OSPAR Strategy on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area. It provides guidance on the future conservation priorities and research needs of marine biodiversity at risk in this region. Inclusion onto the list will highlight priority species/habitats for further research and draw the attention of other management bodies to the need for their protection. OSPAR will further develop education and awareness materials on the need for protection of these features and Contracting Parties will be urged to take this into account when developing Marine Protected Areas (MPAs). Nominations for additions to the list are submitted to the OSPAR Commission by Contracting Parties and observers who provide evidence in support of the listing to justify the need for further protection and conservation action. To date, 11 elasmobranch species have been listed on OSPAR to receive greater protection either across the entire OSPAR region or in specified areas. These are: Portuguese dogfish *Centroscymnus coelolepis,* gulper shark *Centrophorus granulosus*, leafscale gulper shark *Centrophorus squamosus*, basking shark *Cetorhinus maximus*, common skate *Dipturus batis*, spotted ray *Raja montagui*, thornback ray *Raja clavata*, white skate *Rostroraja alba*, spiny dogfish *Squalus acanthias*, angel shark *Squatina squatina* and porbeagle shark *Lamna nasus*. For more information see: http://www.ospar.org.

6 Conclusions

This report presents the first comprehensive IUCN Red List assessment of chondrichthyans in the Northeast Atlantic region. With 26% (30 species) assessed as Critically Endangered, Endangered, or Vulnerable, chondrichthyans are more threatened in the region compared to global Red List results for the whole taxonomic group, of which 18% are threatened globally.

A number of commercially important species occur within the Northeast Atlantic and the region is bordered by some of the largest and most important chondrichthyan fishing nations in the world, including Spain, France, the UK and Portugal.

Only the basking shark *Cetorhinus maximus* and white shark *Carcharodon carcharias*, common sawfish *Pristis pristis* and smalltooth sawfish *Pristis pectinata* are afforded any kind of protected status internationally, through their listing on the CITES and/or CMS Appendices. Basking shark fisheries have, as a result, been closed in the EU and Norway. However it is assumed that both sawfish species are already extinct in European waters, based on a lack of records over many decades. The UK and Sweden are the only Northeast Atlantic countries to provide full, national protection for certain shark and ray species and the Critically Endangered angel shark *Squatina squatina* is only protected in English waters.

There are no international catch limits for Northeast Atlantic chondrichthyans. The European Union (EU) has set fishing quotas for a few species, including spiny dogfish *Squalus acanthias* and porbeagle *Lamna nasus*. However total allowable catches (TACs) for these two species are set higher than the zero catch advised by the International Council for Exploration of the Sea (ICES). The EU has also set broad limits on multiple species of skates and rays as well as deepwater sharks, but these limits are also not yet in line with scientists' recommendations. Norway is the only country to have adopted ICES advice for porbeagle. It is clear that additional management and conservation measures are urgently needed and that the exploitation of depleted populations needs to be regulated.

Due to insufficient knowledge and information, 31 species have been assessed as Data Deficient. Despite the current lack of data, this group may prove to include some of the most threatened chondrichthyans. Although limited data availability is often cited as a problem for the development of management measures, it must not be used to justify lack of management. Enough is known about shark biology and the dynamics of shark fisheries to begin implementing basic management measures wherever fisheries exist (Camhi *et al.* 1998). Increased funding and research attention should also be directed towards these species.

7 Recommendations

The following recommendations have been formulated based on the information collated within this report. They are intended to complement and enhance existing scientific advice regarding the conservation and management of Northeast Atlantic chondrichthyans.

All entities with fishing fleets operating in the Northeast Atlantic Ocean should:

1. complete, implement and regularly revise Plans of Action, pursuant to the United Nations (UN) Food and Agricultural Organization (FAO) International Plan of Action for the Conservation of Sharks (IPOA-Sharks), which include specific strategies for conservation action;
2. ratify and comply with the UN Agreement for Highly Migratory Fish Stocks and Straddling Fish Stocks;
3. promptly provide accurate, species-specific elasmobranch catch data to national, regional and international authorities;
4. actively engage in elasmobranch conservation initiatives associated with OSPAR, CITES, CMS, ICCAT and NEAFC;
5. encourage their fishery scientists to collaborate in the ongoing assessment of the population status and conservation requirements of Northeast Atlantic chondrichthyans;
6. promote and enforce fishing limits for chondrichthyans in line with scientific advice from the International Council for Exploration of the Sea, including:
   - total allowable catches (TACs) of zero for spiny dogfish and deepwater sharks;
   - a reduced skate and ray TAC and expansion of the area subject to this TAC;
   - an end to fishing for common skates and undulate rays;
   - a prohibition on landings of porbeagle, white skates, and angel sharks;
   - caps on catches for other demersal sharks and rays;
7. apply the precautionary approach with respect to chondrichthyan fishing limits;
8. publicise and enforce elasmobranch conservation measures, including prohibitions on shark finning and take of basking sharks as well as TACs;
9. strengthen shark finning bans by requiring that sharks be landed with their fins attached in order to ease enforcement and facilitate the collection of species-specific shark catch information;
10. establish programmes to research and protect habitats essential to chondrichthyans (such as pupping and nursery areas);
11. reduce fishing capacity and effort;
12. facilitate experts' participation in efforts to increase the selectivity of fishing gears used in the Northeast Atlantic and thereby minimise regional chondrichthyan bycatch.

Regional Fishery Management Organisations, particularly the Northeast Atlantic Fisheries Commission (NEAFC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT), should:

13. develop regional plans of action under the FAO IPOA-Sharks;
14. continue to encourage and create incentives for prompt and accurate reporting of species-specific elasmobranch catch data associated with their respective Convention Areas;
15. work to improve elasmobranch population assessments;
16. implement available scientific advice for elasmobranch fishing limits in order to ensure international catches are sustainable;
17. fully protect (through zero catch limits and/or prohibitions on retention) particularly vulnerable and/or depleted elasmobranch species taken in international fisheries of the Northeast Atlantic, such as porbeagles, bigeye threshers and deepwater sharks;
18. strengthen shark finning bans by requiring that sharks be landed with their fins attached in order to ease enforcement and facilitate the collection of species-specific shark catch information;
19. apply the precautionary approach with respect to chondrichthyan fishing limits;
20. investigate and promote measures to minimise chondrichthyan bycatch; and reduce fishing capacity and effort.

8 Species accounts

8.1 Sharks

ORDER **HEXANCHIFORMES**

FAMILY **CHLAMYDOSELACHIDAE**

Frilled Shark

Chlamydoselachus anguineus (Garman, 1884)

Red List assessment **Global: Near Threatened** (Paul, L. and Fowler, S. 2003)

Rationale A generally rare to uncommon deepwater species, with a few localities where it is taken more commonly as bycatch in several fisheries. Not an important target species, but a regular, though small, bycatch in many bottom trawl, midwater trawl, deep-set longline, and deep-set gillnet fisheries. As bycatch, this species is variously either used for meat, fishmeal, or discarded. Occasionally kept in aquaria (Japan). There is some concern that expansion of deepwater fisheries effort (geographically and in depth range) will increase the levels of bycatch. Although little is known of its life history, this deepwater species is likely to have very little resilience to depletion as a result of even non-targeted exploitation. It is classified as Near Threatened due to concern that it may meet the Vulnerable A2d+A3d+4d criteria.

Sharpnose Sevengill Shark

Heptranchias perlo (Bonnaterre, 1788)

Red List assessment **Global: Near Threatened** (Paul, L. and Fowler, S. 2003)

Rationale A wide ranging, but relatively uncommon species where it occurs. Its centres of abundance may be at outer shelf, slope, and oceanic seamounts where commercial fisheries for other target species are likely to develop. It is likely to have a low intrinsic rate of increase, and poor resilience to depletion. This species is of minor commercial importance, but bycatch in bottom trawl and longline fisheries may have caused population declines where deepwater fisheries have been underway for several decades. Increased deepwater fishing effort in many regions is likely to affect populations in the future. The species is assessed as Near Threatened due to concern that it may meet the Vulnerable A2d+A3d+4d criteria.

Bluntnose Sixgill Shark

Hexanchus griseus (Bonnaterre, 1788)

Red List assessment **Global: Near Threatened** (Cook, S.F. and Compagno, L.J.V. 2000)

Rationale A valuable food and sports fish, the species seems unable to sustain target fisheries and is taken as bycatch (e.g., in *Centrophorus* liver oil fisheries now underway over large areas of the Indo-Pacific). Fisheries activity in parts of its range, including the Northeast Pacific, have led to the depletion of regional populations, some of which may be Vulnerable (A1bd+2bd). However, because population and fisheries data are lacking from many regions, a worldwide population depletion of over 20% is not proven for this wide-spread species.

Bigeye Sixgill Shark

Hexanchus nakamurai (Teng, 1962)

Red List assessment **Global: Data Deficient** (Ebert, D.A., Serena, F. and Mancusi, C. 2008)

Rationale A little-known, moderately large (to 180cm TL), primarily deepwater cow shark, with a patchy distribution in tropical and warm temperate waters in the Northeast and Central Atlantic, the Mediterranean Sea, Northwest, Western Central and Southwest

Pacific and the Indian Ocean. Probably mesopelagic to benthic in shelf and slope waters from 90–621m with possible excursions to the surface. The species has often been misidentified as the larger *H. griseus,* leading to confusion and poor knowledge of its distribution and no knowledge of population trends. It is uncommonly taken by bottom trawl and longline gear and is of relatively small importance to fisheries. Due to insufficient information this species cannot be assessed beyond Data Deficient at present. Species-specific catch data are required to better define the distribution, population trends, if any, and threats to the species.

ORDER **SQUALIFORMES**

FAMILY **ECHINORHINIDAE**

Bramble Shark

Echinorhinus brucus (Bonnaterre, 1788)

Red List assessment **Global: Data Deficient** (Paul, L. 2003)

Rationale An apparently rare deepwater shark, recorded sporadically and usually singly at widely dispersed localities. It may be present at greater depths than are commercially fished, but this is only speculative. It reaches a large size and, although very little is known of its life history, it is likely to be a slow-growing, late-maturing species of low overall productivity. In the Northeast Atlantic there is published qualitative information on a decline in this species over recent decades. At present there is inadequate information to assess the conservation status of this species, however, since it is a known (albeit infrequent) component of fisheries bycatch with probable limiting life-history characteristics and likely rare status, the species may well meet the criteria for a threatened category as more information becomes available.

FAMILY **SQUALIDAE**

Spurdog or Spiny Dogfish

Squalus acanthias (Linnaeus, 1758)

Red List assessment **Global: Vulnerable A2bd+3bd+4bd** (Fordham, S., Fowler, S.L., Coelho, R., Goldman, K.J. and Francis, M. 2006)
Northeast Atlantic: Critically Endangered A2bd+3bd+4bd (Fordham, S., Fowler, S.L., Coelho, R. 2006)

Rationale *Squalus acanthias* is a small demersal shark of temperate continental shelf seas worldwide. 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 *S. 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. This species was listed on the OSPAR List of threatened and/or declining species and habitats in 2008. 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. Fisheries and population trend data indicate that the southern part of the Northeast Pacific stock has also declined through overfishing, but stocks appear stable off Alaska. The only data identified from the Northwest Pacific are from Japan, where

landings of *S. acanthias* declined ~80% between 1952 and 1965, and inshore *S. acanthias* CPUE declined 80 to 90% from the mid 1970s to late 1990s. 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.

Longnose Spurdog

Squalus blainvillei (Risso, 1826)

Red List assessment **Global: Data Deficient** (Ebert, D.A., Serena, F. and Mancusi, C. 2008)

Rationale This benthic spurdog may form a species complex. There are no type specimens and the species was inadequately described. It has been widely reported (with perhaps two or three different species involved in the eastern Atlantic), but the complex is in need of critical revision to define the species' true distribution. Like other Squaloid sharks, this species is apparently ovoviviparous and may have life-history characteristics that make it more vulnerable to heavy fishing pressure. It is fished in the tropical eastern Atlantic and Mediterranean with bottom trawls, gillnets and line gear, where it is caught with a complex of other *Squalus* species, but due to problems with identification the level of catch is uncertain. The species is used fresh, salted, dried and smoked for human consumption. It is not possible to assess *Squalus blainvillei* beyond Data Deficient until the species has been critically revised and the taxonomic issues resolved. Resolution of these issues and the quantification of catch levels should be a priority.

Shortnose Spurdog

Squalus megalops (Macleay, 1881)

Red List assessment **Global: Data Deficient** (Cavanagh, R.D. and Lisney, T.J. 2003)

Rationale A common to abundant dogfish of temperate and tropical seas, this species is of considerable interest to fisheries. It is taken in significant quantities in bottom trawls and also caught with lines and mesh nets. It should be noted that although currently considered a wide-ranging single species, *Squalus megalops* may in fact be an Australian endemic pending further taxonomic studies. Due to taxonomic uncertainty, the global assessment is Data Deficient, pending further study.

FAMILY CENTROPHORIDAE

Gulper Shark

Centrophorus granulosus (Bloch and Schneider, 1801)

Red List assessment **Global: Vulnerable A2abd+3d+4d** (Guallart, J., Serena, F., Mancusi, C., Casper, B.M., Burgess, G.H., Ebert, D.A., Clarke, M. and Stenberg, C. 2006)
Northeast Atlantic: Critically Endangered A2abd+3d+4d (Clarke, M. and Stenberg, C. 2006)

Rationale A rare deepwater dogfish with a widespread global distribution, inhabiting the upper continental slopes and outer continental shelf area. Believed to have the lowest reproductive potential of all elasmobranch species, its reproductive biology is characterised by a late onset of maturity (12 to 16 years in females), only one pup per litter and a two-year gestation period with occasional resting periods. This makes it extremely vulnerable to overexploitation and population depletion. Despite a lack of data for certain regions within its geographic range, this species is globally assessed as Vulnerable on the basis of its limiting life-history traits and the global increase in unmanaged fishing effort to exploit deeper waters.

This species is extremely rare in the Mediterranean, which, in combination with the documented localised depletion subsequent to brief targeted fishing efforts and the species' inherent vulnerability to exploitation even in moderate numbers through bycatch, leads to an assessment of Vulnerable in this region. A decline of 80 to 95% from baseline has been estimated for the Northeast Atlantic population. Due to the

low level of recruitment (resulting from a low fecundity and low reproductive output), this species is assessed as Critically Endangered within the Northeast Atlantic. It was recently (2008) listed on the OSPAR List of threatened and/or declining species and habitats where it occurs in the Northeast Atlantic.

Lowfin Gulper Shark

Centrophorus lusitanicus (Bocage and Capello, 1864)

Red List assessment

Global: Vulnerable A2bd+4bd (Clarke, M., White, W. and Compagno, L.J.V. 2008)

Rationale

A deepwater shark distributed from Portugal, along the western African coasts, possibly to Cameroon in the Eastern Atlantic. Occurs at 300–1,400m depth, mostly between 300–600m. Records of *Centrophorus lusitanicus* from elsewhere may be misidentifications. This species has been confused with *C. niaukang* in South African waters and specimens collected in the Eastern Indian Ocean and Western Central Pacific are a much smaller and slender species. The 'real' *C. lusitanicus* from various areas may be a species complex. Therefore this species, pending further investigation, should be considered only from the eastern Atlantic from where it was originally described. This species is of concern because of its limited range, extremely low fecundity, and subjection to deepwater fisheries in the Northeast and Eastern Central Atlantic. It is commonly confused with its congener *C. granulosus*. *Centrophorus granulosus* is estimated to have undergone declines of 80–95% where it is fished in the Northeast Atlantic, and these declines may actually apply to both species. *Centrophorus lusitanicus* and *C. granulosus* are taken in deepwater fisheries operating off Portugal and in areas of their range in the Eastern Central Atlantic. Deepwater fisheries are expanding to greater depths off the western coast of Africa and declines in catches of deepwater sharks 'combined' have already been observed. This is a large, heavy-built species (possibly reaches greater than 1m length) and may therefore be even more biologically vulnerable to depletion than other *Centrophorus* spp (longevity >30 years and one pup produced every two years) and there is no reason to suspect that this species will not also suffer declines where it is fished. *Centrophorus lusitanicus* is assessed as Vulnerable on the basis of inferred declines in areas where it is fished, balanced with areas of refuge from fishing pressure. Bycatch levels and fisheries should be monitored throughout this species' range, and it may prove to warrant a higher category in the future, particularly as fisheries expand further across of its distribution. Species-specific monitoring of catch and population trends is urgently required for this biologically vulnerable shark.

Leafscale Gulper Shark

Centrophorus squamosus (Bonnaterre, 1788)

Red List assessment

Global: Vulnerable A2bd+3bd+4bd (White, W., Blasdale, T., Hareide, N.R., Crozier, P., and Ebert, D. 2003)
Northeast Atlantic: Endangered A2bd+3bd+4bd (Blasdale, T., Hareide, N.R., Crozier, P. In preparation)

Rationale

A deepwater shark of the continental slopes, found on or near the seabed at depths of 230–2,400m and also in the upper 1,250m of oceanic water, well above the seabed. The very unproductive life-history characteristics of this species, including very late maturity (35 years), long lifespan (70 years) and a long estimated generation period (>50 years), make it highly vulnerable to depletion and slow to recover from over-fishing. This shark has been exploited commercially for many years and is (or has been) an important component of fisheries in certain areas of its range. The species has been heavily exploited in the Northeast Atlantic, where available catch per unit effort data show consistently declining trends. French commercial trawl data which provides an estimate of *Centrophorus squamosus* stock abundance in the areas exploited by these fleets to the west of the UK, show an overall decline in CPUE in all areas fished of ~90% or >90% since 1995. From 2001–2005 the decline in CPUE was consistent across all areas fished and also supported by CPUE data from Irish trawlers. Catch rates of *C. squamosus* in Scottish surveys have also declined. In contrast, short time series of CPUE available for the western coast of Portugal, at the southern extent of this species' range in the Northeast Atlantic area seem stable. Given this species' very high intrinsic vulnerability to depletion, evidence for steep declines in several areas of its range in this region and continued fishing pressure, it is assessed as Endangered in the Northeast Atlantic region. It was recently (2008) listed on the OSPAR

List of threatened and/or declining species and habitats. The catches of this species in Australia and Oceania are relatively low and do not represent a significant component of the squaloid catches in either southeastern Australia and New Zealand, but at present there is not enough information to assess it beyond Data Deficient in this region. In Japan exploitation of *C. squamosus* peaked during World War II, but quickly declined due to decreasing numbers caught. Globally the species is assessed as Vulnerable on the basis of steep declines in several areas of its range, its very low productivity and continued fishing pressure from expanding deepwater fisheries.

Little Gulper Shark

Centrophorus uyato (Rafinesque, 1810)

Red List assessment **Global: Data Deficient** (Pogonoski, J. and Pollard, D. 2003)

Rationale Declines of over 99% between the years 1976 to 1977 and 1996 to 1997 between the Sydney area (central New South Wales) and the Eden-Gabo Island area (southern New South Wales/northern Victoria) have been documented by a fishery independent trawl survey. The relatively narrow continental slope habitat of this species (which is fished throughout its entire depth range) suggests that it may now only be present in any numbers in areas that are non-trawlable. However, as dropline fishers also harvest this species off New South Wales (under NSW jurisdiction), further pressure may be placed on it in such areas. There was a small, short-lived fishery out of Esperance, Western Australia for *Centrophorus uyato* in the mid-1990s, which ceased due to rapid catch declines and there may be some bycatch in the Western Australia Commonwealth-managed trawl fishery. As with other deepwater sharks, particularly this genus, the low fecundity, high longevity and probable late age at first maturity of this species not only result in extremely rapid population depletion in fisheries, but also prevent it from quick recovery after such depletion. This species is currently Data Deficient globally due to the taxonomic problems. However, deepwater demersal trawl fisheries are expanding in other parts of its potential range, and with the observed declines described above, together with the knowledge that its biology is similar to other deepwater shark species, this, and related species warrants urgent conservation attention globally.

Birdbeak Dogfish

Deania calceus (Lowe, 1839)

Red List assessment **Global: Least Concern** (Stevens, J.D. 2003)
Northeast Atlantic: Vulnerable A2bd+A4bd (Blasdale, T. In preparation)

Rationale **Global:** Mainly a bycatch species taken by trawl and hook, although with some limited targeting for its flesh and oil. While there are currently no quantitative data on population trends in Australasia, the species has low productivity and increased targeting should be viewed with concern. However, the species is currently still abundant and a Near Threatened assessment cannot be justified. The situation should be monitored carefully.
Northeast Atlantic: *Deania calceus* is one of the most common commercially-encountered deepwater sharks in this region. It is taken as bycatch by deep-water trawl, longline and gillnet fisheries and is usually discarded due to high levels of skin damage. The species has very low productivity and a long generation period (possibly ~30 years). Catch rates in Scottish surveys increased between 1998 and 2004 but overall catch rates in these surveys were 11% of those in MAFF surveys in the 1970s. These surveys cannot be directly compared as they used different gear and vessels and fished different depth ranges; while they do appear to indicate that population levels have declined from pre-fishery levels, the magnitude of this decline is uncertain. Fisheries in the Northeast Atlantic do not currently exploit the entire distribution range of this species and trends outside the exploited area are unknown. Given the species' very low productivity and evidence for population decline in the Northeast Atlantic, *D. calceus* is given a precautionary assessment of Vulnerable in this region.

Rough Longnose Dogfish

Deania hystricosa (Garman, 1906)

Red List assessment **Global: Data Deficient** (Ebert, D., McCormack, C., Freitas, M., Biscoito, M., Francis, M., Tanaka, S., Ishihara, H., Holtzhausen, H. and Stewart, A. 2008)

Rationale A little-known medium-sized (to at least 111cm TL) benthic and probably epibenthic deepwater shark known from depths of 471–1,900m on the upper and middle continental and insular slopes off South Africa, Namibia, Madeira and possibly the Azores in the Atlantic Ocean, and off New Zealand and Japan in the Pacific Ocean. Taken by deepwater longline fisheries off Madeira and the Canary Islands, where it is utilised for its meat and liver oil. The species also occurs within the depth range of bottom trawl, longline, gillnet and tanglenet fisheries elsewhere in its range (i.e. Namibia, Japan) and may be taken as bycatch in these fisheries; however species-specific data are lacking. The lower portions of the species' deep depth distribution may offer it refuge from fishing pressure. At present there are no data with which to determine or infer population trends for this species and it cannot be assessed beyond Data Deficient. Furthermore, the characters that distinguish *Deania hystricosa* from *D. calcea* need to be examined in more detail. Like other deepwater sharks, this species may be biologically vulnerable to population depletion. Bycatch levels in fisheries should be determined and monitored, especially as fisheries expand into deeper depths across the species range.

Arrowhead Dogfish

Deania profundora (Smith and Radcliffe, 1912)

Red List assessment **Global: Least Concern** (Ebert, D.A., McCormack, C. and Samiengo, B. 2008)

Rationale A moderate-sized (to 104cm but mostly around 80cm) dogfish found on or near the bottom at depths of 275–1,785m on the upper continental and insular slopes. It is often found in huge aggregations, possibly increasing the threat of overfishing where fisheries occur. There is little information on the catch of this species but deepwater fisheries operate over much of its range (e.g. Canary Islands, the Azores, off Namibia and in the Gulf of Mexico). This species is taken on longlines off the Canary Islands and utilised for liver oil and meat. It may also be taken by an experimental deepsea tanglenet fishery off Namibia, where identification of the *Deania* species being caught is uncertain. Observations suggest they may be more common in the deeper end of their bathymetric range. There are no known deepwater fisheries currently operating off South Africa and the Philippines and these areas may provide a refuge from fishing pressure. Given this species' relatively wide geographic and bathymetric range and the absence of data to suggest significant declines, this species is assessed as Least Concern. Expanding fisheries should be monitored as they move into deeper water.

FAMILY **ETMOPTERIDAE**

Black Dogfish

Centroscyllium fabricii (Reinhardt, 1825)

Red List assessment **Global: Least Concern** (Ebert, D.A., Crozier, P., Blasdale, T. and McCormack, C. 2008)
Northeast Atlantic: Near Threatened (Ebert, D.A., Crozier, P., Blasdale, T. and McCormack, C. 2008)

Rationale A relatively small (to at least 90cm TL) deepwater, schooling shark of the outer continental shelf and slope found at depths from 180–2,250m (mostly below 275m). The species has a widespread but discontinuous distribution in the temperate Atlantic Ocean (tropical records are uncertain). The species' wide depth distribution affords it refuge from fishing pressure in many parts of its range, where deepwater fisheries are less developed. Recent population trends in parts of the Northwest Atlantic appear stable. Given stable population trends in the Northwest Atlantic and the species' relatively wide depth and geographic range, there is no reason to suspect that the global population has declined by approaching 30% and the species is assessed as Least Concern. However, deepwater fisheries are more developed and have a long history of operation across this species' range in the Northeast Atlantic, where it is

taken as bycatch. Significant fishing pressure throughout much of the species' geographic and depth range in the Northeast Atlantic warrant a regional assessment of Near Threatened in this region, on the basis of suspected continuing declines approaching 30% (close to meeting VU A4bd).

Great Lantern Shark

Etmopterus princeps (Collett, 1904)

Red List assessment **Global: Data Deficient** (Herndon, A.P. and Burgess, G.H. 2006)

Rationale *Etmopterus princeps* is a relatively small (to 75cm TL), deepwater (350 to 4,500m) lantern shark occurring in the North and Eastern Central Atlantic. Biology is essentially unknown. This species is subject to bycatch fishing mortality by deepwater trawlers over much of its range and may be under considerable fishing pressure but specific information is not available. It could prove to be Near Threatened on the basis of reductions in population size, however, given that so little is known about the species and the overall lack of fisheries information, it cannot be assessed beyond Data Deficient at this time. Like many deepwater chondrichthyan species, more information on biology, ecology and importance in fisheries are required. Deepwater fisheries in the region need to be carefully monitored and managed.

Smooth Lantern Shark

Etmopterus pusillus (Lowe, 1839)

Red List assessment **Global: Least Concern** (Coelho, R., Tanaka, S. and Compagno, L.J.V. 2008)

Rationale *Etmopterus pusillus* is a deepwater lantern shark that occurs in the Atlantic, Pacific and Indian Oceans, found on or near the bottom of continental and insular slopes at depths of 150–1,000m, and possibly down to almost 2,000m. The species is also oceanic in the central south Atlantic, and is found from the surface to 708m depth over deepwater. Although *E. pusillus* is of little interest to global fisheries, it is a bycatch of bottom trawls operating in the eastern Atlantic and off Japan, fixed bottom nets, and line gear. It is discarded by fisheries off southern Portugal, but is probably a utilised elsewhere in the eastern Atlantic. In the Northeast Atlantic, although captures are still high and stable, very little is known about the biology and distribution of this deepwater species. More studies on this species' biology are needed; particularly considering that many deepwater squaloids have life-history characteristics that can make them especially vulnerable to depletion in fisheries. However, there is no evidence to suggest that this species has declined or faces significant threats. Furthermore it has a widespread geographic and bathymetric distribution and is therefore considered Least Concern at present. Expanding deepwater fisheries should be monitored and bycatch levels should be quantified to ensure that this species is not significantly impacted.

Velvet Belly

Etmopterus spinax (Linnaeus, 1758)

Red List assessment **Global: Least Concern** (Coelho, R., Blasdale, T., Mancusi, C., Serena, F., Guallart, J., Ungaro, N., Litvinov, F., Crozier, P. and Stenberg, C. 2008)
Northeast Atlantic: Near Threatened (Coelho, R., Blasdale, T., Crozier, P. and Stenberg, C. 2008)

Rationale A common lantern shark occurring in the Eastern Atlantic and Mediterranean Sea on outer continental shelves and upper slopes at depths of 70–2,000m, and most abundant at 200–500m. A non-commercial species, all specimens captured as bycatch by commercial fishing vessels are discarded, thus limiting the data available. Data from the Mediterranean Sea, Eastern Central and South Atlantic indicate that the species is still relatively commonly caught in scientific trawl surveys and there is no evidence that the population has declined there. A recently introduced ban on bottom trawling below 1,000m depth in the Mediterranean Sea will afford it protection there. Deepwater fisheries also operate off the coast of western Africa, but these are relatively limited at this time. However, deepwater fisheries are intense in the Northeast Atlantic and scientific trawl surveys indicate that catch rates of this species declined by approaching 20% between the 1970s and 1998–2004. This species shows size structure segregation with depth. The deeper-occurring larger mature female sharks are probably more affected by the commercial deepwater fisheries operating in the Northeast Atlantic than the immature

stages that are found in shallower waters. An assessment of Near Threatened is warranted in the Northeast Atlantic, given the apparent decline and continued, intense deepwater fishing pressure. Elsewhere and globally, the species is assessed as Least Concern because there is no evidence for population decline throughout the rest of its range and there are areas of refuge from fishing pressure. Continued monitoring is required to ensure that this species is not detrimentally affected by expanding deepwater fisheries in the future, particularly in the Eastern Central and Southeast Atlantic.

FAMILY **SOMNIOSIDAE**

Portuguese Dogfish

Centroscymnus coelolepis Bocage and Capello, 1864

Red List assessment

Global: Near Threatened (Stevens, J. and Correia, J.P.S. 2003)
Northeast Atlantic: Endangered A2bd+4bd (Blasdale, T. In preparation)

Rationale

Global: Mainly a bycatch species taken by trawl and hook, although with some limited targeting for its flesh and oil. However, appropriate data on biomass or trends in abundance are lacking. The productivity of this species is likely to be low (although age estimates and annual fecundity are currently unknown) and further increases in catches should be viewed with concern. This species is of much lower abundance than *D. calcea* or *C. crepidater* and, although the quantitative data on populations are lacking, its lower abundance, demersal habits (not appearing to range into midwater) and suspected low productivity warrant a Near Threatened assessment.
Northeast Atlantic: In the Northeast Atlantic, this species forms an important catch of mixed trawl fisheries, and mixed and directed longline and gillnet shark fisheries operating west of Ireland, Spain, Portugal and France. *Centroscymnus coelolepis* likely has limiting life-history characteristics similar to related species, with very slow growth and low fecundity, resulting in very low intrinsic rate of increase. Where catch per unit effort are available, these are initially high and then tend to decline rapidly. There has been a consistent overall decline in CPUE in all ICES subareas exploited by French commercial trawlers since 1995, to 10% or less of the 1995 level by 2005. This is supported by CPUE data from Irish trawlers, and by fishery-independent data from Scottish surveys. The species is of particular concern in this region because the mature part of the population is vulnerable to fisheries and it has a low reproductive output. Evidence for steep declines in several areas of its range in the Northeast Atlantic and continued fishing pressure lead to an assessment of Endangered on the basis of estimated declines of 50–>80%. This species was listed on the OSPAR List of threatened and/or declining species and habitats in 2008.

Roughskin Dogfish

Centroscymnus owstoni (Garman, 1906)

Red List assessment

Global: Least Concern (Paul, L. 2003)

Rationale

A moderately common deepwater shark within its known geographic range, and which may extend deeper than is currently recognised. Although captured in some quantity in some deepwater trawl fisheries, it is taken mainly as bycatch, and presumably from only part of its known range. However, if the population is mobile and migrates into exploited fishing grounds from other parts of its range, if (as with other deepwater sharks) it becomes more frequently targeted, and if it proves to have the life-history characteristics (low fecundity, slow growth and high longevity) typical of better known squaloids, the assessment may have to move into a higher category. However, the species is currently still moderately common over its wide southern Australian and New Zealand range and a Near Threatened assessment is not justified at this time.

Longnose Velvet Dogfish

Centroselachus crepidater (Bocage and Capello, 1864)

Red List assessment

Global: Least Concern (Stevens, J., Irvine, S., Blasdale, T. and Acuña, E. 2003)

Rationale

Centroselachus crepidater is a deepwater shark with a wide but patchy distribution, occurring from 270–2,080m depth. Mainly a bycatch species taken by trawl and hook in several areas of its range, although with some limited targeting for its flesh and oil.

Catches in Australia have been increasing in the last few years with relaxation of mercury laws and fishers looking for non-quota species in the South East Trawl Fishery. Surveys extending over 10 years in New Zealand show a trend for increasing biomass, but may be confounded by the use of different vessels. In the Northeast Atlantic, catch rates in Scottish surveys declined between 1998–2004, but this was heavily skewed by one very large catch in 1998, and these recent catches are much higher than those in surveys in the 1970s. The productivity of this species appears to be low, with age at maturity in Australia of nine years (males) and 20 years (females), and longevity of around 54 years, thus further increases in catches should be viewed with concern. However, the species is currently still abundant and a Near Threatened assessment cannot be justified at this time, thus it is assessed as Least Concern. The situation should be monitored carefully, particularly as fisheries expand into deeper water.

Azores Dogfish

Scymnodalatias garricki (Kukuev and Konovalenko, 1988)

Red List assessment **Global: Data Deficient** (Séret, B., McCormack, C. and Pinho, M.R.R. 2008)

Rationale A rare deepsea dogfish known only from the holotype (37.7cm TL) found at 300m over a seamount north of the Azores in the Northeast Atlantic, and a second specimen captured south of the Azores in 2001. The biology of the species is virtually unknown. At present there is insufficient information to assess the species beyond Data Deficient, however it occurs in an area where deepsea longline fisheries are developing and could potentially be taken as bycatch in these fisheries in the future. The species may have limiting life-history characteristics, similar to other deepwater shark species, thus will not be sufficiently fecund to withstand high levels of exploitation. Catches need to be carefully monitored and reassessment should be undertaken as further biological and fisheries data become available.

Knifetooth Dogfish

Scymnodon ringens (Bocage and Capello, 1864)

Red List assessment **Global: Data Deficient** (Blasdale, T. and Valenti, S.V. 2008)

Rationale A little-known deepwater shark, found at depths of 200–1,600m in the eastern Atlantic from Scotland to Portugal and off Mauritania and Senegal. Very little is known of its biology. Reported as relatively common in the eastern Atlantic, but has only been captured in very small numbers in commercial trawls and deepwater surveys west of Scotland. The species is taken in bottom trawls, with line gear, and with fixed bottom nets. It is among a wide group of demersal squaloids taken as bycatch in the Spanish deepwater trawl fishery for black hake off Mauritania. Landings of this group declined between 1992 and 2001, which may be attributable to a shift in the depths fished, economic reasons and probable over-exploitation of both target and bycatch species. The proportion of this species in the landings is unknown and may be low. There is no specific information available on the population of this species. The species' deep bathymetric distribution, probably largely outside the range of current fisheries, probably affords it some protection from exploitation. However, the trend for fisheries to target resources in deeper and deeper waters in the eastern Atlantic is of concern and the species may be at risk if exploitation expands throughout its depth and geographic range. *Scymnodon ringens* is not included in the list of species covered by the European Union Total Allowable Catch for deepwater sharks, thus it is not covered by fisheries measures. At present there is insufficient information to assess this species beyond Data Deficient and this needs to be rectified. Given the uncertainties of the effects of fisheries in a part of its range, bycatch levels need to be quantified and monitored and effect on the population determined.

Greenland Shark

Somniosus microcephalus (Bloch and Schneider, 1801)

Red List assessment **Global: Near Threatened** (Kyne, P.M., Sherrill-Mix, S.A., Burgess, G.H., Stenberg, C. and Ellis, J. 2006)

Rationale A large shark of the Arctic and North Atlantic, inhabiting inshore zones to continental shelves and slopes usually in depths of 0–1,200m (one individual recorded at 2,200m). Maximum size is uncertain but reaches at least 640cm TL, possibly to 730cm TL, with

most adults between 244–427cm TL. This appears to be an extremely long-lived and slow-growing elasmobranch with limited reproductive capacity. Historically targeted for its liver oil in Norway, Iceland and Greenland, with catches reaching 32,000 sharks/year in the 1910s in Greenland alone. These fisheries may have had a significant impact on this species, but the rate of historical decline (if any) is unknown. Presently taken as bycatch in trawl, gillnet and trap fisheries, as well as in Arctic artisanal fisheries. Its population dynamics and biology are not well understood but its large size and slow growth rate suggest it is vulnerable to fishing pressure. This shark is listed as Near Threatened on the basis of possible population declines and limiting life-history characteristics. There is a need to examine historical data and monitor current bycatch levels.

Little Sleeper Shark

Somniosus rostratus (Risso, 1826)

Red List assessment

Global: Data Deficient (Séret, B., Guallart, J., Vacchi, M., Mancusi, C. and McCormack, C. 2008)

Rationale

A rare, moderate-sized (to 143cm TL) deepwater shark known from a few records on the outer continental shelf and upper slope in the Northeast Atlantic and western Mediterranean Sea, at depths of 180–2,220m. Also recorded from Israel in the eastern Mediterranean and Cuba in the Northwest Atlantic. Occasionally taken as bycatch in deep bottom trawl and bottom longlines fisheries and sometimes landed under the same commercial category as the other sleeper sharks, although usually discarded. Very little is known of the population of this species. The scarcity of captures could be related to a natural low density of the population. It is also possible that the species' bathymetric distribution extends deeper than the depths currently surveyed. The species may occur throughout the deeper reaches of the water column, beyond the depth of many demersal fisheries. The ban on bottom trawling below depths of 1,000m in the Mediterranean Sea probably affords the species some protection in this region, although it is still vulnerable to capture in the upper half of its depth range there, and by intense deepsea fisheries operating in areas of the Northeast Atlantic. The relatively small range of this species, compared to most other sleeper sharks, and rarity in an area which has been subject to very heavy fishing pressure for a long period are cause for concern. Furthermore the species may have limiting life-history characteristics, like other deepwater squaloids, and therefore may not be sufficiently fecund to withstand heavy fishing pressure. Given these concerns and in the absence of any information on trends, this species is assessed as Data Deficient at present. Bycatch levels should be quantified and monitored to provide information to make a full evaluation of this species status.

Velvet Dogfish

Zameus squamulosus (Günther, 1877)

Red List Assessment

Global: Data Deficient (Burgess, G.H. and Chin, A. 2006)

Rationale

A widespread but sporadically distributed deepwater dogfish recorded from most regions, with the present exception of the Eastern Pacific. Benthic on the continental and insular slopes at depths of 550 to 1,450 m; also epipelagic and oceanic off Brazil. The presently known disjunct range in many ocean regions suggests that it is more widely distributed than currently recorded. Reaches a maximum size of 69cm TL, but little is known of its biology. Taken as bycatch in various deepwater fisheries including by trawl, longline and set net, but species-specific information is not available. However, it should be recognised that deepwater squaloids are vulnerable to population collapse from overfishing (directed or bycatch) due to their limited life-history characteristics and as such catches of this and other species require monitoring, particularly as deepwater fisheries expand worldwide. Due to lack of information this species cannot be assessed beyond Data Deficient at the present time.

FAMILY **OXYNOTIDAE**

Angular Roughshark

Oxynotus centrina (Linnaeus, 1758)

Red List assessment **Global: Vulnerable A2bcd+4bd** (Bradaï, M.N., Serena, F., Bianchi, I. and Ebert, D.A. 2007)

Rationale A medium-sized (to 150cm but mostly <100cm) deepwater, bottom dwelling shark distributed throughout the Eastern Atlantic and Mediterranean and possibly off Mozambique at known depths of 60 to 660m. Taken primarily as bycatch by offshore bottom and pelagic trawlers in the Mediterranean Sea and the Northeast Atlantic. Survey data for the Mediterranean indicate that the species is now rare in the western (Morocco, Spain and France) and eastern (Aegean) areas and absent from the eastern central area (Adriatic, Ionian and Albania). However, records in the Adriatic and Ionian, suggest that the species still exists there in unknown numbers. In another survey, the species was also absent in the Gulf of Lions where it once occurred, indicating that it may be locally extinct in that region. The large spiny dorsal fins and relatively large body size make this species particularly vulnerable to capture in nets and its depth distribution lies entirely within the depth of fisheries throughout much of its range. The mortality of discards is likely to be high given the depths of capture. The current extremely low level of abundance throughout much of this species former range, and evidence for local scale declines, suggests an assessment of Critically Endangered in the Mediterranean. Off southern Africa, *Oxynotus centrina* is only known from a few specimens. It may occasionally be caught as bycatch in trawl fisheries there, but at present it is not possible to assess this species beyond Data Deficient in this region. Data are lacking on population trends in the Northeast Atlantic, however, given the high fishing pressure throughout much of its range in the Northeast Atlantic, the growing trend in deepsea fishing, the vulnerable life-history characteristics, and susceptibility to capture, there is no reason to suspect that it has not also declined in this region. Based on the species unproductive life-history characteristics and documented declines in the Mediterranean as well as inferred declines in the Northeast Atlantic, and continuing fishing pressure through much of its range, the species is assessed as Vulnerable globally, on the basis of suspected and documented past and future declines.

Sailfin Roughshark

Oxynotus paradoxus (Frade, 1929)

Red List assessment **Global: Data Deficient** (Soldo, A. and Freitas, M. 2008)

Rationale An uncommon deepwater bottom shark found at depths from 265–720m. The species reaches a maximum reported size of up to 118cm TL. Moderately abundant in deeper offshore waters off the British Isles. The species is probably taken as bycatch of offshore trawling fleets but no information is available on frequency. The species' known depth range is entirely within the range of deepwater fisheries operating in the Northeast Atlantic, although the Mid-Atlantic ridge and southern part of its range probably offer some refuge from fishing pressure. Furthermore, it is possible that *Oxynotus paradoxus* is continuously distributed along the Northeast and Eastern Central Atlantic floor, deeper than presently known. Alternatively, separate slope and ridge populations may exist. Given the paucity of information available on this species it is assessed as Data Deficient. Research is needed to better define the distribution, population structure and the impact of fisheries on the species.

FAMILY **DALATIIDAE**

Kitefin Shark

Dalatias licha (Bonaterre, 1788)

Red List assessment **Global: Data Deficient** (Compagno, L.J.V. and Cook, S.F. 2000)
Northeast Atlantic: Vulnerable A2bd+4bd (Blasdale, T. In preparation)

Rationale **Global:** Records of yields from the Portuguese/Azores *Dalatias licha* fishery suggest that targeted fisheries are capable of reducing populations quite rapidly. The life

history of this species is expected to result in a slow recovery after depletion. An increasing trend for fisheries to move into deeper water on continental shelves and slopes suggests that fishing pressure on this species will likely increase over the next decade or more. However, because *D. licha* is widely distributed and data on fisheries and populations are lacking from most of its range, it is not possible to reach a global assessment.

Northeast Atlantic: This species is taken in deepwater longline and gillnet fisheries in the Northeast Atlantic. A comparison between recent Scottish trawl surveys and MAFF surveys in the 1970s shows a 94% decline in catch rate to the west of the British Isles, however, this value must be treated with caution as it is likely that other species may have been misidentified as *D. licha* in the 1970s and this species is at the edge of its range in this area. Directed hand line and gillnet fisheries for *D. licha* began off the Azores in the 1970s. Portuguese landings in this fishery increased rapidly to 896t in 1991 and then decreased steadily to <46t from 1998 onwards. The DELASS project considered this stock depleted. Given the evidence for declines in this region and the species' limiting life-history characteristics, it is assessed as Vulnerable in the Northeast Atlantic.

Spined Pygmy Shark

Squaliolus laticaudus (Smith and Radcliffe, 1912)

Red List assessment **Global: Least Concern** (Kyne, P.M. and Burgess, G.H. 2006)

Rationale *Squaliolus laticaudus* is one of the world's smallest sharks, reaching a maximum size of 27.5cm TL. Oceanic, with a widespread warm-temperate and tropical distribution, occurring near land masses generally over continental slopes and avoiding central ocean basins. Little is known of its biology but it is known to undertake diel vertical migrations from depth (~500 m) to ~200m probably related to prey movements. An absence of identifiable threats (irregularly taken by fisheries due to its small size) and its widespread distribution justifies an assessment of Least Concern.

ORDER **SQUATINIFORMES**

FAMILY **SQUATINIDAE**

Angel Shark

Squatina squatina (Linnaeus, 1758)

Red List assessment **Global: Critically Endangered A2bcd+3d+4bcd** (Morey, G., Serena, F., Mancusi, C., Fowler, S.L., Dipper, F. and Ellis, J. 2006)

Rationale This large stocky angel shark was formerly a common and important demersal predator over large areas of its coastal and outer continental shelf sediment habitat in the Northeast Atlantic, Mediterranean and Black Seas. Most of this region is now subject to intense demersal fisheries, and the species is highly vulnerable from birth onwards to bycatch in the benthic trawls, set nets and bottom longlines operating through most of its range and habitat. As a result of its limiting life-history characteristics and bycatch in fisheries with steadily increasing effort and capacity, its abundance has declined dramatically during the past 50 years to the point where it has been declared extinct in the North Sea and has apparently been extirpated from large areas of the northern Mediterranean. It is now extremely uncommon throughout most of the remainder of its range, with the possible exception of some areas of the southern Mediterranean and Canary Islands where its status should be confirmed and conservation measures introduced as a matter of urgency. This species was recently (2008) listed on the OSPAR List of threatened and/or declining species and habitats where it occurs in the Northeast Atlantic.

FAMILY **GINGLYMOSTOMATIDAE**

Nurse Shark

Ginglymostoma cirratum (Bonnaterre, 1788)

Red List assessment **Global: Data Deficient** (Rosa, R.S., Castro, A.L.F., Furtado, M., Monzini, J. and Grubbs, R.D. 2006)

Rationale Despite its wide distribution in the tropical Atlantic and Eastern Pacific oceans, virtually nothing is known about the migratory behaviour and connectivity (gene flow) between populations of *Ginglymostoma cirratum*. Preliminary studies on its biology indicate a strong site fidelity, which renders this shark vulnerable to local extirpation from overexploitation. There is recent qualitative evidence of population declines in several areas as well as decline and fragmentation of geographic range size. The species is extremely vulnerable to coastal fisheries, being incidentally and deliberately captured both in gillnets and longlines. It is an easy target of spear fishing due to its sedentary and docile behaviour, being prized in competitions for its large body size. *G. cirratum* is also vulnerable to indirect coastal impacts, particularly in reef areas, which constitute its main habitat. Due to the lack of data from its range in the Eastern Pacific and Eastern Atlantic, and a need for further investigation on this species in these areas, the species is currently assessed as Data Deficient globally.

ORDER **LAMNIFORMES**

FAMILY **ODONTASPIDIDAE**

Smalltooth Sand Tiger

Odontaspis ferox (Risso, 1810)

Red List assessment **Vulnerable A2abd+3ad+4abd** (Pollard, D., Gordon, I., Williams, S., Flaherty, A. and Fergusson, I.K. In preparation (update of 2003 assessment))

Rationale Despite its worldwide distribution, *Odontaspis ferox* populations and occurrences are fragmented and the species may be naturally rare. This species is morphologically very similar to *Carcharias taurus*, but is larger and bulkier and generally found in deeper water (13–420m depth). It is presumed to have a very low reproductive capacity and slow growth, similar to that of *Carcharias taurus*. Recent evidence of shallow water aggregations in a number of areas (including the Mediterranean Sea and eastern Pacific Ocean) suggests that the species may be more vulnerable to fishing pressure than previously assumed, and potentially susceptible to coastal habitat impacts as well as highly vulnerable to over-exploitation. Increased demersal trawl fisheries in Australia and New Zealand are now operating in areas of possible and known occurrence. Fishery independent surveys indicate an observed decline of over 50% in catches off the east coast of Australia (hence the Vulnerable assessment in these waters), probably the result of commercial fishing operations off New South Wales. Similar declines are presumed to have occurred in many other parts of its range impacted by fisheries. The species is fished in the Mediterranean Sea and off Japan with bottom trawls and nets and line gear. Given the species' likely very low reproductive capacity and intensive fishing pressure throughout its bathymetric range in the Mediterranean Sea and adjacent Northeast Atlantic, the decline of *O. ferox* in this region is suspected to match or even exceed that in Australia. Given the species' biological vulnerability, documented and suspected declines, and continued fishing pressure throughout its range, this species is now assessed as Vulnerable globally.

FAMILY **MITSUKURINIDAE**

Goblin Shark

Mitsukurina owstoni (Jordan, 1898)

Red List assessment **Global: Least Concern** (Duffy, C.A.J., Ebert, D.A. and Stenberg, C. 2004)

Rationale This species is assessed as Least Concern because, although apparently rare, it is widespread in the Atlantic, Indian and Pacific Oceans and is only infrequently taken in deepwater fisheries. It has a sporadic distribution with most records from the Northwest Pacific (Japan, Taiwan) on the upper continental slope. May also be mesopelagic. It is likely to be found in more locations than previously known as deepwater surveys are undertaken in other regions or as deepwater fisheries expand globally. Taken in deep bottom-set gillnet, bottom longline and trawl fisheries; rarely surface drift nets. Also entangled in deepwater fishing gear. Recorded from depths of =30m (occasional) to >1,000 m, with reported landings of adults rare suggesting most of the adult population is unavailable to existing deepwater fisheries.

FAMILY **ALOPIIDAE**

Bigeye Thresher

Alopias superciliosus (Lowe, 1839)

Red List assessment **Global: Vulnerable A2bd** (Amorim, A., Baum, J., Cailliet, G.M., Clò, S., Clarke, S.C., Fergusson, I., Gonzalez, M., Macias, D., Mancini, P., Mancusi, P., Myers, R., Reardon, M., Trejo, T., Vacchi, M. and Valenti, S.V. 2008)

Rationale All members of genus *Alopias*, thresher sharks, are listed as Vulnerable globally because of their declining populations. These downward trends are the result of a combination of slow life-history characteristics, hence low capacity to recover from moderate levels of exploitation, and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries. *Alopias superciliosus* is an apparently highly migratory, oceanic and coastal species found virtually circumglobally in tropical and temperate seas. It has low fecundity (2–4 pups/litter) and an exceptionally low (0.002) potential annual rate of population increase, compared with other thresher sharks. This species is especially vulnerable to fisheries exploitation (target and bycatch) as its epipelagic habitat occurs within the range of many largely unregulated gillnet and longline fisheries in which it is readily caught, and it has been fished throughout its range. Significant reductions in thresher CPUE have been reported in pelagic longline fisheries in the Northwest Atlantic and Eastern tropical Pacific, and declines are suspected to have occurred in other areas also. Although data are lacking for many parts of its range, it is evident that this vulnerable species with such low productivity faces major threats throughout most of its range, where fishing pressure is unlikely to cease or decrease anytime in the immediate future. However, this may underestimate the extent of global decline and there is an urgent need for global review of all available data throughout its range.

Thresher Shark

Alopias vulpinus (Bonnaterre, 1788)

Red List assessment **Global: Vulnerable A2bd+3bd+4bd** (Goldman, K.J., Baum, J., Cailliet, G.M., Cortés, E., Kohin, S., Macías, D., Megalofonou, P., Perez, M., Soldo, A. and Trejo, T. 2008)
Northeast Atlantic: Near Threatened (Soldo, A. In preparation)

Rationale Global: All members of genus *Alopias*, thresher sharks, are listed as Vulnerable globally because of their declining populations. These downward trends are the result of a combination of slow life-history characteristics, hence low capacity to recover from moderate levels of exploitation, and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries. *Alopias vulpinus* is virtually circumglobal, with a noted tolerance for cold waters. This species is especially vulnerable to fisheries exploitation (target and by-catch) because its epipelagic habitat occurs within the range of many largely unregulated and under-reported gillnet and longline fisheries, in which it is readily caught. It is an important economic species in many areas and is

valued highly for its meat and large fins. Its life-history characteristics (2–4 pups per litter; 8–14 year generation period) and high value in both target and bycatch fisheries make it vulnerable to rapid depletion. Serious declines have occurred where this species has been heavily fished, for example in the 1980s Eastern Central Pacific drift gillnet fishery, where reported landings collapsed to 27% of peak levels between 1982 and the late 1980s. Analyses of pelagic longline CPUE data from logbook reports covering the species' entire range in the Northwest and Western Central Atlantic vary according to the time period, but suggest thresher shark stocks declined by between 63–80% during 1986–2000. There is evidence that thresher sharks are being increasingly targeted by pelagic fisheries for swordfish and tuna (e.g. in the Mediterranean Sea), in attempts to sustain catches, and exploitation is increasing in these areas. The high value of the species and its exploitation by unmanaged fisheries combined with its biological vulnerability, indicate that at least some, if not most, subpopulations in other parts of the world are likely to be equally, or more seriously at risk than those for which data are available and, unlike the Californian stock, are not the subject of management, enabling stocks to rebuild.

Northeast Atlantic: The species is taken primarily as bycatch of longline fisheries for tuna and swordfish in the Northeast Atlantic, and also in driftnets and gillnets. It is very likely that this catch is retained. Limited information is available on thresher shark catch in this region and estimated landings are still considered incomplete. Prior to 2000, estimated landings fluctuated at 17–13t, in 2000–2001 they exceeded 100t, after which they dropped to 4t in 2002 and have not exceeded 7t since. Increased targeting of pelagic sharks by Moroccan drift-netters in the Alboran Sea and Strait of Gibraltar mentioned above, has also likely impacted *A. vulpinus* in the Northeast and Eastern Central Atlantic. The species is currently assessed as Near Threatened in this region and there is a need to collect further data on the status the species in this area.

FAMILY **CETORHINIDAE**

Basking Shark

Cetorhinus maximus (Gunnerus, 1765)

Red List assessment

Global: Vulnerable A1ad+2d (Fowler, S.L. 2000)
Northeast Atlantic: Endangered A1ad (Fowler, S.L. 2000)

Rationale

A very large filter-feeding cold-water pelagic species, widely distributed but only regularly seen in a few favoured coastal locations and probably never very abundant. Documented fisheries in several regions have usually been characterised by rapidly declining local populations as a result of short-term fisheries exploitation, followed by very slow or no recorded population recovery. There is likely potential for similar population declines to occur in the future from directed and bycatch fisheries, driven at least in part by the demand for fins in international trade. *Cetorhinus maximus* is now legally protected in some territorial waters. Compagno (1984) considers *C. maximus* "to be extremely vulnerable to overfishing, perhaps more so than most sharks ... ascribed to its slow growth rate, lengthy maturation time, long gestation period, probably low fecundity and probable small size of existing populations (belied by the immense size of individuals in their small schools)." In the Northeast Atlantic, >80,000 sharks were landed from the northern part of region, with a greater than 90% decline in annual catches before target fisheries were closed. There is still some bycatch. Only rarely reported from much of Mediterranean and southern Europe. On the OSPAR list of Threatened and Declining species.

FAMILY **LAMNIDAE**

White Shark

Carcharodon carcharias (Linnaeus, 1758)

Red List assessment

Global: Vulnerable A1cd+2cd (Fergusson, I., Compagno, L.J.V. and Marks, M. 2000)

Rationale

Carcharodon carcharias is a widely but sparsely distributed top predator with a very low reproductive potential (late maturity and small litter size) and high vulnerability to target and bycatch fisheries (commercial and recreational), some of which supply high-value products (fins, jaws and teeth) for international trade. Notoriety of this

shark as an ultimate Hollywood monster encourages inflated values for *C. carcharias* products, and encourages illicit trade in white shark parts that is difficult to assess and control. Where detailed population data are available, these indicate that the abundance and average size of *C. carcharias* have declined. The species is now protected in some parts of its range, where it may be Lower Risk/conservation dependent, but the effectiveness of such protection is questionable where enforcement is weak. A global status of Endangered (A1cd+2cd) may be proven accurate for this shark as further data is collated.

Shortfin Mako

Isurus oxyrinchus (Rafinesque, 1810)

Red List assessment

Global: Vulnerable A2abd+3bd+4abd (Cailliet, G.M., Cavanagh, R.D., Kulka, D.W., Stevens, J.D., Soldo, A., Clo, S., Macias, D., Baum, J., Kohin, S., Duarte, A., Holtzhausen, J.A., Acuña, E., Amorim, A., and Domingo, A. 2008)
Atlantic: Vulnerable A2bd+A3bd+A4bd (Cailliet, G.M., Cavanagh, R.D., Kulka, D.W., Stevens, J.D., Soldo, A., Clo, S., Macias, D., Baum, J., Kohin, S., Duarte, A., Holtzhausen, J.A., Acuña, E., Amorim, A., and Domingo, A. 2008)

Rationale

Global: *Isurus oxyrinchus* is an important target species, a bycatch in tuna and billfish longline and driftnet fisheries, particularly in high-seas fisheries, and is an important coastal recreational species. Most catches are inadequately recorded and underestimated and landings data do not reflect numbers finned and discarded at sea. Various analyses suggest that this species may have undergone significant declines in abundance over various parts of its range. A global assessment of Vulnerable is considered appropriate for this species on the basis of estimated and inferred declines, inadequate management resulting in continuing (if not increasing) fishing pressure, the high value of its meat and fins, and vulnerable life-history characteristics. Although it is difficult to accurately assess the conservation status of this shark because it is migratory and caught in numerous poorly monitored fisheries worldwide, it is reasonable to assume that decreases may be occurring in those areas for which there are limited or no data.
Atlantic: In the North Atlantic, *I. oxyrinchus* has likely undergone a decline in abundance (estimates based on logbook records ranging between 33 and 50%, demographic modeling suggesting a decline between 20 and 80%). In the Northeast Atlantic landings data are not available for some countries, but the species is taken as a bycatch of the pelagic fishery. The area around the Strait of Gibraltar is thought to be a nursery area; most specimens caught there are juveniles. This area is heavily fished by the swordfish longline fleet. EU vessels fishing for small pelagic species off the west coast of Africa are also known to take unquantified elasmobranch bycatch, including *I. oxyrinchus*. There is no evidence of overfishing in the South Atlantic although data there are sparse and pelagic fishing pressure high. In the Southwest Atlantic, *I. oxyrinchus* is caught as bycatch in the pelagic longline fishery targeting mainly swordfish and tuna. Logbooks and landing data presented by Brazil and Uruguay at ICCAT's Sharks Subcommittee meeting in July 2007 show a decreasing trend in the CPUE values since 2003. Given the apparent decline in abundance in the North Atlantic, the trends of the CPUE values in the Southwest Atlantic and high fishing pressure from pelagic fleets throughout the Atlantic, this species is assessed as Vulnerable in the Atlantic.

Longfin Mako

Isurus paucus (Guitart Manday, 1966)

Red List assessment

Global: Vulnerable A2bd+3d+4bd (Reardon, M.B., Gerber, L. and Cavanagh, R.D. 2006)

Rationale

Isurus paucus is a widely distributed but rarely encountered oceanic tropical shark. This species is known to be caught as bycatch in tropical pelagic longline fisheries for tuna, swordfish and sharks and in other oceanic fisheries which operate throughout its range, but at much lower ratios than the smaller, more fecund *Isurus oxyrinchus*. Catches are inadequately monitored and underestimated due to common misidentification with *I. oxyrinchus* and because landings do not reflect numbers of individuals finned and discarded at sea. *Isurus oxyrinchus* may have undergone significant documented declines in the North (50% or more) and South Atlantic and faces high fishing pressures throughout its epipelagic habitat from commercial longline fleets. Since *I. paucus* is often caught in the same fishing gear, populations are considered also likely to have declined. In addition to the inferred declines, this is a

species of conservation concern due to its apparent rarity, large maximum size (>4m), low fecundity (2–8 pups/litter) and continued bycatch in intensive oceanic fisheries. A global assessment of Vulnerable is considered appropriate for this species as a precautionary measure. A vast improvement in the collection of data is required and effective conservation of this species will require international agreements.

Porbeagle

Lamna nasus (Bonnaterre, 1788)

Red List assessment **Global: Vulnerable A2bd+3d+4bd** (Stevens, J., Fowler, S.L., Soldo, A., McCord, M., Baum, J., Acuña, E., Domingo, A. and Francis, M. 2006)
Northeast Atlantic: Critically Endangered A2bcd+3d+4bd (Stevens, J., Fowler, S.L., Soldo, A., McCord, M., Baum, J., Acuña, E., Domingo, A. and Francis, M. 2006)

Rationale *Lamna nasus* is a wide-ranging, coastal and oceanic shark, but with apparently little exchange between adjacent populations. Low reproductive capacity and high commercial value (in target and incidental fisheries) of mature and immature age classes makes this species highly vulnerable to over-exploitation and population depletion. This depletion, despite variations in availability of data and degree of depletion between the northern and southern hemispheres, is considered to meet Vulnerable criteria globally. The eastern and western North Atlantic populations have both been seriously over-exploited by directed longline fisheries. Collapse of the Northeast Atlantic population led to intensive target fishing in the well-documented Northwest Atlantic fishery in the 1960s, with most of the virgin biomass removed in just six years. Renewed target fishing in the 1990s led to a further population decline to ~11 to 17% of virgin biomass within the three-generation period for this species. Recently improved management in the Northwest Atlantic should now help stocks to recover, however the Northeast Atlantic population has been subject to unrestricted fishing pressure ever since its earlier crash. Data are lacking, but stock depletion is considered to be much greater than in the Northwest Atlantic. Longline tuna and swordfish fleets in the southern hemisphere take a significant partially-utilised bycatch. Only limited trend data are available, including over 90% declines in landings by the Uruguayan longline fleet in the southwest Atlantic. Recently (2008) listed on the OSPAR List of threatened and/or declining species and habitats.

ORDER CARCHARHINIFORMES

FAMILY SCYLIORHINIDAE

White Ghost Catshark

Apristurus aphyodes (Nakaya and Stehmann, 1998)

Red List assessment **Global: Data Deficient** (Duffy, C. and Huveneers, C. 2004)

Rationale A deepwater catshark known from the Eastern North Atlantic from depths of 1,014 to 1,800m. Known from only a limited number of specimens. Reaches a maximum of 54cm TL but little known of its biology. Insufficient information is available to assess the species beyond Data Deficient.

Iceland Catshark

Apristurus laurussonii (Saemundsson, 1922)

Red List assessment **Global: Data Deficient** (Duffy, C. and Huveneers, C. 2007)

Rationale An apparently common deepwater catshark on the continental slope in parts of the North Atlantic at depths of 560 to 2,060m. *Apristurus laurussonii* together with *A. parvipinnis* are reported to be the commonest *Apristurus* species in the Gulf of Mexico. Maximum size recorded is around 72cm TL. Although reported to be a relatively common bycatch in several deepwater trawl fisheries, insufficient catch and biological information is available to assess this species beyond Data Deficient at present.

Ghost Catshark

Apristurus manis (Springer, 1979)

Red List assessment **Global: Least Concern** (Ebert, D.A. 2004)

Rationale This little-known deepwater catshark is occasionally taken by research vessels surveying the North Atlantic continental slope region at depths of 1,000 to 2,000m. In the south Atlantic it is known from only a few specimens caught in very deepwater off Cape Town, South Africa. Future expansion of deepwater fisheries could pose a threat to this poorly known species, however, at present much of its range is below the depth of fishing activities (>1,500m) and it is considered to be Least Concern.

Black Roughscale Catshark

Apristurus melanoasper (Iglésias, Nakaya and Stehmann, 2004)

Red List assessment **Global: Data Deficient** (McCormack C. and Iglésias, S. 2008)

Rationale A recently described deepwater catshark, found on the slope of the North Atlantic Ocean at 512–1,520m but generally deeper than 1,000m. It is reported from off France, Ireland, British Isles and the northern USA. Maximum recorded size is 76.1cm TL but virtually nothing is known of its biology. This species is an uncommon bycatch of commercial deepwater trawlers. Although its relatively wide depth range may afford the species some refuge from fishing pressure, there is a continuing trend for deepwater fishing activities in the Northeast Atlantic. This is a poorly known species and it cannot be assessed beyond Data Deficient without further information on catch levels and population trends.

Smalleye Catshark

Apristurus microps (Gilchrist, 1922)

Red List assessment **Global: Least Concern** (Ebert, D.A. 2004)

Rationale This catshark is known from occasional captures in deepsea exploratory trawls (in 700 to 1,200m), becoming most abundant >800m. It is known to occur to 2,000m or more. In southern Africa there are currently no deepsea trawl fisheries. In the North Atlantic, this species is possibly caught as a bycatch in deepwater trawl fisheries, but these could be other *Apristurus* species. A careful examination of North Atlantic *A. cf. microps* should be compared to southern African forms. Future expansion of deepwater fisheries could pose a threat to this poorly known species, however, at present much of its range is below the depth of fishing activities and it is considered to be Least Concern.

Atlantic Catshark

Galeus atlanticus (Vaillant, 1888)

Red List assessment **Global: Near Threatened** (Coelho, R., Rey, J., Serena, F. and Mancusi, C. 2007)

Rationale A little known demersal catshark reported at depths of 330 to 710m. This shark has a narrow extent of occurrence (approximately 50,000km^2), being recorded only in the Mediterranean, from the Strait of Gibraltar to Cape Gata, in Northeast Atlantic from Cape S. Vicente to the Strait of Gibraltar. Off West Africa this species is only confirmed from the type specimen captured off Cape Spartel (northwest coast of Morocco), and from one specimen caught off Mauritania (Castilho *et al.* submitted). Other reports from this region require confirmation. Previously synonymised with *Galeus melastomus*, this is now a valid species based on morphometrics, external field marks and genetic evidence. Nonetheless, given the very close resemblance with other species, this species is probably still being confused with *G. melastomus* and *G. polli*. The entire narrow depth and geographic range of this species is currently being exploited by deepwater fisheries that take it as bycatch. Although the species is usually discarded, nothing is known of the mortality of these discards. Larger individuals are marketed with *G. melastomus*. Given that the entire narrow range of this species is heavily fished, and that fishing pressure is unlikely to decrease in the future, the species is given a precautionary assessment of Near Threatened, with concern that it may meet Vulnerable A3d. If the range of this species proves to extend further along

the African coasts, then it may be afforded more protection, especially if part of the population occurs in areas outside the range of fisheries and the assessment would then need to be revisited.

Blackmouth Catshark

Galeus melastomus (Rafinesque, 1810)

Red List assessment **Global: Least Concern** (Serena, F., Mancusi, C., Ungaro, N., Hareide, N.R., Guallart, J., Coelho, R. and Crozier, P. 2008)

Rationale This small, common to abundant catshark is widely distributed in the Northeast Atlantic and Mediterranean Seas. *Galeus melastomus* occurs on continental shelves and upper slopes, mainly at depths of 200–500m, although it has been recorded between 55–2,000m. It is taken as bycatch in demersal trawl and longline fisheries and is generally discarded, although it is retained and utilised in some areas. Research surveys indicate that this species is very abundant in some areas, notably the area southwest of Iceland, on the Hatton Bank, northwest of Ireland and in the Alboran Sea in the western Mediterranean. Various research survey and landings data show no evidence of any significant decline, and overall populations appear stable. The recently introduced ban on bottom trawling below 1,000m depth in the Mediterranean Sea should also offer this species some refuge from fishing pressure at greater depths. At present this species is assessed as Least Concern, but population trends should continue to be monitored.

Mouse Catshark

Galeus murinus (Collett, 1904)

Red List assessment **Global: Least Concern** (Iglésias, S. 2008)

Rationale A relatively small (reaches ~50cm length) deepwater catshark known from the west coast of Iceland to the Faeroes Channel, and more recently off Scotland and the Hebrides Islands, Ireland, France and Western Sahara, Northwest Africa. Reported on the continental slope at depths of 380–1,250m. This species may have been confused with one other, and possibly two other species, causing uncertainty in some of the literature and further investigation is required into this species' taxonomy. It is taken as bycatch by commercial deepwater trawlers operating on the Northeast Atlantic slope and by Spanish and Moroccan experimental fisheries off western Africa. However, this species is small and may be able to escape through the mesh of trawl nets used in the Northeast Atlantic. *Galeus murinus* may be relatively fecund, like some other small catsharks, and therefore resilient to depletion in fisheries. Furthermore, its relatively wide depth and geographic range probably afford it refuge from fishing pressure in parts of its distribution. Given these factors there is no reason to suspect that this species has declined and it is assessed as Least Concern.

Smallspotted Catshark

Scyliorhinus canicula (Linnaeus, 1758)

Red List assessment **Global: Least Concern** (Ellis, J., Mancusi, C., Serena, F., Haka, F., Guallart, J., Ungaro, N., Coelho, R., Schembri, T. and MacKenzie, K. 2008)

Rationale A small, common catshark, widespread in the Northeast and Eastern Central Atlantic, from Norway and the Shetland Islands to Senegal (possibly along the Ivory Coast), and found throughout the Mediterranean Sea. This is one of the most abundant elasmobranchs in the Northeast Atlantic and Mediterranean Sea. Although localised depletions appear to have occurred in some areas (e.g. in the Wadden Sea and off Malta), scientific surveys throughout the majority of its range suggest that populations are stable or even increasing in some areas. Reproduction is oviparous and the species appears to be relatively productive biologically, thus may be able to withstand higher levels of exploitation. Though commercial landings are made and large individuals are retained for human consumption, the species is often discarded and studies show that post-discard survival rates are high. The species is assessed as Least Concern because overall population trends appear to be stable and there is no evidence to indicate that the global population has declined significantly. Catches and population trends should be monitored.

Nursehound

Scyliorhinus stellaris (Linnaeus, 1758)

Red List assessment **Global: Near Threatened** (Ellis, J., Serena, F., Mancusi, C., Haka, F., Morey, G., Guallart, J. and Schembri, T. 2008)

Rationale A large-bodied catshark that occurs inshore and offshore in the Northeast and Eastern Central Atlantic, over the continental shelf between southern Scandinavia and Senegal, and is also present throughout the Mediterranean. It is found at depths of 1–2m to at least 125m, but is most common in depths of 20–63m, and in relatively shallow waters in northern areas of the Northeast Atlantic. Around the British Isles, it is locally abundant in certain areas (e.g. the coasts of Pembrokeshire, Anglesey, Lleyn Peninsula and Cardigan Bay), but may be at risk from localised depletion. This species is fished by bottom trawls, gill nets, bottom set long lines, handlines and fixed bottom nets, and occasionally pelagic trawls. Although limited data are available on the exploitation and trends in abundance, declines have been indicated in the Mediterranean Sea, particularly around the Balearic Islands and in the northwest Mediterranean. The capacity for recovery of this species is affected by a low level of interconnectivity between isolated populations around islands far from the continental coast. Little information is available on its biology, however, it is a large-bodied species and is likely more vulnerable to population depletion than *S. canicula*, which also occurs in the region. Given its large size, patchy distribution and evidence for declines in areas of the Mediterranean Sea, an assessment of at least Near Threatened is warranted. There is concern that it may qualify for VU A4bd in the future.

FAMILY **PSEUDOTRIAKIDAE**

False Catshark

Pseudotriakis microdon (Capello, 1868)

Red List assessment **Global: Data Deficient** (Kyne, P.M., Yano, K. and White, W.T. 2004)

Rationale A wide-ranging but sporadically captured, large, deepwater shark with most records from the Northern Hemisphere (it appears rarer in the Southern Hemisphere). May be cosmopolitan, but as yet has not been recorded from the South Atlantic or Eastern Pacific. Primarily inhabits the continental and insular slopes at depths of 200 to 1,890m, but also occasionally occurs on the continental shelf. *Pseudotriakis microdon* reaches a maximum size of 296cm TL. This species displays a modified form of oophagy, the first confirmed oophagous species outside the Lamniformes. Fecundity is low (typically two embryos per litter) and this, combined with an estimated long gestation period and presumed slow growth rate, may place populations at risk of localised depletion if the species becomes more regularly caught. At present the species is of no interest to fisheries but is taken sporadically as bycatch in deepwater longline and trawl fisheries. Deepwater fisheries are generally expanding globally and, given the biology of this species, bycatch of this rare fish may be of concern for any localised populations in areas where fishing may be concentrated, such as deepwater reefs or seamounts. However, since there is no available information on population trends and because of the overall lack on information concerning biology (particularly age, growth rates and gestation), the species is assessed as Data Deficient.

FAMILY **TRIAKIDAE**

Tope Shark

Galeorhinus galeus (Linnaeus, 1758)

Red List assessment **Global: Vulnerable A2bd+3d+4bd** (Walker, T.I., Cavanagh, R.D., Stevens, J.D., Carlisle, A.B., Chiaramonte, G., Domingo, A., Ebert, D.A., Mancusi, C., Massa, A., McCord, M., Morey, G., Paul, L., Serena, F. and Vooren, C.M. 2006)
Northeast Atlantic: Data Deficient (Cavanagh, R.D., Ellis, J. and Dulvy, N.K. 2006)

Rationale **Global:** A widespread mainly coastal and bottom associated shark of temperate areas, which has been fished in all parts of its distribution. In the 2000 IUCN Red List, *Galeorhinus galeus* was listed as Vulnerable globally and Conservation Dependent in

Australasia (Stevens 2000). This updated assessment retains the original Vulnerable global assessment (with updated criteria) and presents new regional assessments of this species as Critically Endangered in the Southwest Atlantic, Vulnerable in Australia and South Africa, Near Threatened in New Zealand and Least Concern in the Eastern North Pacific. Further research, monitoring and assessment of status is required for this species in the Northeast Atlantic and Mediterranean, Eastern Central Atlantic and Eastern South Pacific, where it is currently considered Data Deficient.

Northeast Atlantic: *Galeorhinus galeus* is of limited importance in commercial fisheries in the Northeast Atlantic where it is typically a bycatch of mixed demersal and pelagic fisheries, especially by French vessels fishing in the English Channel, Celtic Sea and northern Bay of Biscay. In Europe, this species is important in recreational fisheries, though is typically released after capture. Landings data are limited, as landings are often included within the generic "dogfishes and hounds" category. Nevertheless, England and France have had increased species-specific landings data since the 1980s, and there are also limited data from Denmark, Portugal and Ireland for recent years. Biological data for Northeast Atlantic tope are limited. Tagging studies have indicated widespread movements, which suggest there is one stock in this region, though more detailed studies on stock structure are required. Due to the lack of accurate landings data and survey data, no accurate assessment can be made and the species is considered Data Deficient in the Northeast Atlantic at this time. Given the threatened status of other *G. galeus* stocks, further investigations into its status in the Northeast Atlantic are required.

Starry Smoothhound

Mustelus asterias Cloquet, 1821

Red List assessment

Global: Least Concern (Ellis, J. 2000)
Northeast Atlantic: Least Concern (Ellis, J. In preparation)

Rationale

Global: This coastal species is widespread, although not abundant, from Northern Europe to Northwest Africa, including the Mediterranean. It is not considered to be in any immediate threat of over-exploitation. It is only occasionally caught in trawls, which may be a reflection of it favouring rocky areas, where it can be caught in gill nets. There is no evidence of a decline in the population, and it is not subject to a targeted commercial fishery.

Northeast Atlantic: *Mustelus asterias* is more common than *M. mustelus* in the Northeast Atlantic. In the northern parts of the Northeast Atlantic, *Mustelus* spp have little market value and are often discarded. No species-specific fisheries catch data are available for *M. asterias* because landings data often refer to all *Mustelus* spp combined, or even *Mustelus* spp and *Squalus* spp combined. Abundance trends in fishery independent surveys available from northwestern European seas in the Northeast Atlantic appear stable at the present time. The species is assessed as Least Concern in this region, but monitoring of trends is essential.

Smoothhound

Mustelus mustelus (Linnaeus, 1758)

Red List assessment

Global: Least Concern (Ellis, J. 2000)
Northeast Atlantic: Data Deficient (Ellis, J. In preparation)

Rationale

Global: This coastal species is widespread, although not abundant, from Northern Europe to South Africa, including the Mediterranean. Although this species is not abundant and taken in mixed-species fisheries, it is widespread and there is no evidence of a decline in the population.

Northeast Atlantic: *Mustelus mustelus* is less common than *M. asterias*, the other co-occurring smoothhound, in the Northeast Atlantic. Data for these two species may be confounded due to misidentification. They are occasionally taken by trawl and gillnet and are often discarded in this region, although they may be landed as bait in England and Ireland. They are a relatively important sport fish in some areas, such as the Bristol and English Channels. Species-specific landings data are not available and no other information is currently available to determine the status of this species in the region. As such the species is assessed as Data Deficient in the Northeast Atlantic.

Blackspotted Smoothhound

Mustelus punctulatus (Risso, 1826)

Red List assessment **Global: Data Deficient** (Serena, F., Mancusi, C., Haka, F., Morey, G. and Schembri, T. 2008)

Rationale *Mustelus punctulatus* is poorly known, partly as a result of confusion with the more common *M. mustelus*. This demersal shark is found on the continental shelf (to 200m depth) in the Mediterranean Sea and off Western Sahara in the Eastern Central Atlantic. Very little information is available on populations of this species, partly due to confusion with other *Mustelus* spp, but it seems to be very rare where surveys have been undertaken in the northern Mediterranean Sea. *Mustelus punctulatus* is more common, however, in the southern Mediterranean and it appears to be abundant on coasts of Tunisia and Libya. Like other *Mustelus* spp in this region, it is taken as bycatch in trawls and other demersal fisheries. Landings data are often grouped and therefore species-specific information is not currently available on landings, although *Mustelus* spp are retained and utilised for human consumption in many areas. As a result of confusion with its congeners and a lack of data on catches and abundance, this species is currently assessed as Data Deficient. However, given that it is apparently rare, may be fished throughout its range and evidence that other *Mustelus* spp have declined, further investigation is a priority.

FAMILY **CARCHARHINIDAE**

Silky Shark

Carcharhinus falciformis (Müller and Henle, 1839)

Red List assessment **Global: Near Threatened** (Bonfil, R., Amorim, A., Anderson, C., Arauz, R., Baum, J., Clarke, S.C., Graham, R.T., Gonzalez, M., Jolón, M., Kyne, P.M., Mancini, P., Márquez, F., Ruíz, C. and Smith, W. 2008)

Rationale This oceanic and coastal-pelagic shark is circumglobal in tropical waters, where it dominates as a target species or bycatch in certain pelagic fisheries. This species has a generation period of 11 years and is significantly less resilient to fisheries than blue shark. It is vulnerable to a wide variety of pelagic fisheries and is taken in large numbers, but there are no population estimates and most catches are unreported. It is highly associated with seamounts and is the dominant shark taken by tuna purse seine fisheries on drifting FADs (fish aggregating devices), where declining catch rates have been recorded in the Eastern Pacific. *Carcharhinus falciformis* ranks among the three most important sharks in the global shark fin trade, with between half a million and one and a half million traded annually. Estimates of trends in abundance from standardised catch rate indices for *Carcharhinus* species combined in the Northwest Atlantic range from non-significant trends, to a decline of 85% over 19 years. Species-specific trends for C. *falciformis* are difficult to estimate because of difficulties distinguishing it from other Carcharhinid sharks. Declines are also inferred in other areas, and C. *falciformis* are known to be particularly important in pelagic fisheries in the Indian Ocean. Globally this species is assessed as Near Threatened, and it may prove to meet the criteria for VU A2bd+A3bd+A4bd in the future.

Oceanic Whitetip Shark

Carcharhinus longimanus (Poey, 1861)

Red List assessment **Global: Vulnerable A2ad+3d+4ad** (Baum, J., Medina, E., Musick, J.A. and Smale, M. 2006)

Rationale This formerly widespread and abundant large oceanic shark is subject to fishing pressure virtually throughout its range. It is caught in large numbers as a bycatch in pelagic fisheries, with pelagic longlines, probably pelagic gillnets, handlines and occasionally pelagic and even bottom trawls. Catches, particularly in international waters, are inadequately monitored. Its large fins are highly prized in international trade although the carcass is often discarded. Fishery pressure is likely to persist, if not increase, in future. *Carcharhinus longimanus* is assessed as Critically Endangered in the Northwest and Western Central Atlantic because of the enormous declines that have been reported there. Two estimates of trends in abundance from standardised

catch rate indices were made from independent datasets. An analysis of the US pelagic longline logbook data between 1992 and 2000, which covers the Northwest and Western Central Atlantic regions, estimated declines of 70%. An analysis of the Gulf of Mexico, which used data from US pelagic longline surveys in the mid-1950s and US pelagic longline observer data in the late-1990s, estimated a decline of 99.3% over this 40-year time period or 98% over three generations (30 years). However, changes in fishing gear and practices over this time period were not fully taken into account in the latter analysis, and there is currently debate as to whether or not these changes may have resulted in an under- or overestimation of the magnitude of these declines. This species is under similar fishing pressure from multiple pelagic fisheries elsewhere. There are no data to suggest that declines would and have not have also occurred in these areas, given there are similar fisheries throughout the range. As such, a precautionary global assessment of Vulnerable is considered appropriate for the oceanic whitetip. Efforts are underway to improve the collection of data from some regions and effective conservation and management of this species will require international agreements.

Dusky Shark

Carcharhinus obscurus (Leseur, 1818)

Red List assessment

Global: Vulnerable A2bd (Musick, J.A., Grubbs, R.D., Baum, J. and Cortés, E. In preparation)

Rationale

Carcharhinus obscurus is a large wide-ranging coastal and pelagic warm water species, which is among the slowest-growing, latest-maturing of known sharks, bearing small litters after a long gestation. Its very low intrinsic rate of increase renders this species among the most vulnerable of vertebrates (including the great whales and sea turtles) to depletion by fisheries. Unfortunately *C. obscurus* is difficult to manage or protect because it is taken with other more productive sharks in mixed species fisheries, and has a high mortality rate when taken as bycatch. This species' fins are highly valued. Time series data are available from the Northwest and Western Central Atlantic, where catch rates have declined. Management requiring all individuals captured in the US longline fishery to be released was introduced in 2000, however, while this may have led to an increase in the numbers of juvenile sharks, adults still appear to be declining. A recent stock assessment of the fishery off southwestern Australia estimated that CPUE of this species declined by >75% from the early 1970s–2004 and this decline was still continuing. Given the very high intrinsic vulnerability of this species to depletion, significant declines observed in several areas of its range, and inferred declines in highly fished areas from which data are not available, *C. obscurus* is assessed as Vulnerable globally on the basis of an overall decline estimated at 30–50%.

Sandbar Shark

Carcharhinus plumbeus (Nardo, 1827)

Red List assessment

Global: Vulnerable A2bd+4bd (Musick, J.A., Stevens, J.D., Baum, J.K., Bradai, M., Clò, S., Fergusson, I., Grubbs, R.D., Soldo, A., Vacchi, M. and Vooren, C.M. In preparation)

Rationale

This large coastal species is widespread in subtropical and warm temperate waters around the world. Tagging, age and growth studies show that *Carcharhinus plumbeus* is a long-lived species with low fecundity and is very vulnerable to over-fishing. It is an important component of shark fisheries in most areas where it occurs and has been severely overfished in the western North Atlantic, Mediterranean and Southern Brazil, and declines are inferred in the Northeast Pacific. Biomass has also declined to ~35% of pre-fishery levels as a result of fishing off western Australia. The species is common but not fished in Hawaiian waters. Significant declines have occurred in the Northwest and Western Central Atlantic and, despite the introduction of a management plan in 2000, a recent assessment indicates that the stock is still only 26–43% of virgin mature abundance. Analysis of research survey data from different areas off the US Atlantic coast over different time periods (1972–2003, 1983–1995, 1964–2004) all estimate declines of 84–97%. The species now appears to be absent from beach seine catches in southern Brazil, in which it was previously common and where fishing pressure is intensive. Given the high intrinsic vulnerability of this species to depletion, significant declines observed in several areas of its range, and inferred declines in highly fished areas from which data are not available, *C. plumbeus* is assessed as Vulnerable globally on the basis of an overall decline estimated at 30–50%.

Tiger Shark

Galeocerdo cuvier (Peron and Leseur, 1822)

Red List assessment **Global: Near Threatened** (Simpfendorfer, C. 2000)

Rationale This large omnivorous shark is common worldwide in tropical and warm-temperate coastal waters. It is a relatively fast-growing and fecund species, and caught regularly in target and non-target fisheries. There is evidence of declines for several populations where they have been heavily fished. Continued demand, especially for the valuable fins, may result in further declines in the future, but this species can withstand a higher level of fishing activity than many other species of shark. Additionally, juvenile survivorship increases where adult tiger shark populations have been depleted by fisheries and predation of young is lessened.

Blue Shark

Prionace glauca (Linnaeus, 1758)

Red List assessment **Global: Near Threatened** (Stevens, J. 2000)
Northeast Atlantic: Near Threatened (Stevens, J.D., Soldo, A., Megalofonou, P., Bianchi, I., Macias, D., Baum, J., Ferretti, F., Holtzhausen, H., Kohin, S., Cailliet, G. M., and Clarke, S. In preparation)

Rationale **Global:** This abundant highly migratory pelagic and oceanic shark is widespread in temperate and tropical waters between 50°N and 50°S. It is relatively fast-growing and fecund for a large shark, maturing in 4–6 years and producing average litters of 35 pups, with an intrinsic rate of population increase at maximum sustainable yield of 6% *per annum*. It is also the most heavily fished shark in the world and estimated to be taken in large numbers, mainly as bycatch. The low value of *Prionace glauca* meat indicates that many carcasses were discarded prior to the recent introduction of finning bans in parts of its range. Recorded and estimated catch and population declines within the past three generation period (30–45 years) or less range from 80% to 60% to 40% in 10–20 years, with other trend data fairly stable. Global maximum sustainable yield (MSY: the highest possible theoretical sustainable catch) is estimated as 7.26–12.60 million sharks year. There are no population estimates and many (perhaps most) catches are unreported, but include large numbers of immatures in some regions. An estimated ~11 million (range 5–16 million) individuals enter the international fin trade annually. This exceeds the estimated range for exploitation at MSY, and this trade-based catch estimate is likely to under-represent the total number of sharks taken by fisheries each year; total mortality is therefore likely even higher. Any trade-based estimate that approaches or exceeds an MSY reference point is of concern because it indicates that catches are unsustainable. There is concern over the ecosystem effects of removing such large numbers of this likely keystone predator from the ocean. *Prionace glauca* catches are largely unregulated, other than through the finning bans recently adopted by some Regional Fisheries Bodies and some fishing States, fishing effort is not declining, and these trends are likely to continue.
North Atlantic: *Prionace glauca* undertakes extensive migrations across the entire North Atlantic Ocean. They are taken in significantly large numbers as bycatch in fisheries throughout the Atlantic, but a large proportion of this catch is unreported. Most *P. glauca* reported in Mediterranean large pelagic fisheries and all those reported in the Bay of Biscay, were immature. Marked declines in fisheries and research survey catch rates have been recorded in the Northwest Atlantic; a 60% decline in overall catch rates in the US pelagic shark fishery in the West Atlantic from the Equator to waters off Canada from 1986–2000 (with over one million blue sharks caught), a 53% decline in the same fishery from 1992–2005 and an 80% decline in male *P. glauca* catches in longline research surveys off the US Atlantic coast from mid-1980s to early 1990s. The first ICCAT shark stock assessment in 2004, however, which drew upon a wide range of fisheries and trend data, indicated that *P. glauca* populations in both hemispheres of the Atlantic are above the theoretical maximum sustainable yield (MSY) reference point (50% of unfished biomass) and in some model scenarios close to unfished biomass levels. However, these results were characterised as very preliminary in nature due to large uncertainties arising from the quality and quantity of available data (data from the largest Atlantic fishing fleet were not available). Similar, but equally uncertain, conclusions were drawn by ICCAT in 2008. Management has not been introduced, other than through the finning bans recently adopted by ICCAT and some fishing States.

FAMILY **SPHYRNIDAE**

Scalloped Hammerhead

Sphyrna lewini (Griffith and Smith, 1834)

Red List assessment **Global: Endangered A2bd+4bd** (Baum, J., Clarke, S., Domingo, A., Ducrocq, M., Lamónaca, A.F., Gaibor, N., Graham, R., Jorgensen, S., Kotas, J.E., Medina, E., Martinez-Ortiz, J., Monzini Taccone di Sitizano, J., Morales, M.R., Navarro, S.S., Pérez, J.C., Ruiz, C., Smith, W., Valenti, S.V. and Vooren, C.M. In preparation)

Rationale This coastal and semi-oceanic hammerhead shark is circumglobal in coastal warm temperate and tropical seas, from the surface and intertidal to at least 275m depth. Although it is wide ranging, there is genetic evidence for multiple subpopulations. All life-stages are vulnerable to capture as both target and bycatch in fisheries: large numbers of juveniles are captured in a variety of fishing gears in near shore coastal waters, and adults are taken in gillnets and longlines along the shelf and offshore in oceanic waters. Population segregation and the species' aggregating habit make large schools highly vulnerable to fisheries and means that high CPUEs can be recorded, even when stocks are severely depleted. Hammerhead shark fins are more highly valued than other species because of their high fin ray count, leading to increased targeting of this species in some areas. Where catch data are available, significant declines have been documented: both species-specific estimates for *S. lewini* and grouped estimates for *Sphyrna* spp combined suggest declines in abundance of 50–90% over periods of up to 25 years in several areas of its range, including South Africa, the Northwest and Western Central Atlantic and Brazil. Interviews with fishermen also report declining trends. Similar declines are also inferred in areas of the species' range from which specific data are not available, but fishing pressure is known to be high. Although *S. lewini* is relatively fecund compared to other large sharks (with litters of 12–38 pups) the generation period is greater than 15 years in the Gulf of Mexico and its life-history characteristics mean that its resilience to exploitation is low. Given the major declines reported in many areas of this species' range, increased targeting for its high value fins, low resilience to exploitation and continuing, largely unregulated, fishing pressure from both inshore and offshore fisheries, this species is assessed as Endangered globally.

Smooth Hammerhead

Sphyrna zygaena (Linnaeus, 1758)

Red List assessment **Global: Near Threatened** (Simpfendorfer, C. 2000)

Rationale A relatively common and widespread shark, captured in a number of fisheries throughout its range, mostly by gillnet and longline. There is likely to be significant mortality of this species in large-scale longline and driftnet fisheries, although the impact on populations is unknown at present. Fins from hammerhead sharks are prized in Asia and individuals caught as by-catch are unlikely to be released alive.

8.2 Batoids

ORDER RAJIFORMES

FAMILY PRISTIDAE

Smalltooth Sawfish

Pristis pectinata (Latham, 1794)

Red List assessment **Global: Critically Endangered A2bcd+3cd+4bcd** (Adams, W.F., Fowler, S.L., Charvet-Almeida, P., Faria, V., Soto, J. and Furtado, M. 2006)

Rationale This large, widely distributed sawfish has been wholly or nearly extirpated from large areas of its former range in the North Atlantic (Mediterranean, US Atlantic and Gulf of Mexico) and the Southwest Atlantic coast by fishing and habitat modification. Remaining populations are now small, fragmented and Critically Endangered globally.

It is apparently extinct in the Mediterranean and likely also the Northeast Atlantic. Reports of this species outside the Atlantic are now considered to have been misidentifications of other *Pristis* species.

Common Sawfish

Pristis pristis (Linnaeus, 1758)

Red List assessment **Global: Critically Endangered A1abc+2cd** (Cook, S.F. and Compagno, L.J.V. 2000)

Rationale A large species of inshore marine and freshwater sawfish that was once common in the Mediterranean and Eastern Atlantic, but has now, along with all other sawfishes, been extirpated from Europe and the Mediterranean. Its status in West Africa is unsurveyed, but it is extremely vulnerable to bycatch and is believed to be severely depleted in Africa, where elasmobranch fisheries effort has increased. Without timely intervention, there is a high probability that this sawfish will become extinct.

FAMILY **RHINOBATIDAE**

Blackchin Guitarfish

Rhinobatos cemiculus (E. Geoffroy St-Hilaire, 1817)

Red List assessment **Global: Endangered A4bd** (Notarbartolo di Sciara, G., Bradai, M.N., Morey, G., Brahim, K., Camara L., Litvinov, F., Dulvy, N., Doumbouya, F., Ducrocq, M., Heenan, A. and Sidi, N. 2007)

Rationale *Rhinobatos cemiculus* is targeted throughout its range in West Africa. The high price that fins can fetch (100 to 150 Euro/kg) presents a lucrative incentive for fishermen and as a result targeted artisanal fisheries have developed in the region to supply the Asian shark fin trade. Pregnant females and reproductively active males move inshore for parturition, as mating immediately follows birth. As demonstrated in Guinea-Bissau, gravid females are targeted specifically for their large fins, this alongside the aggregation of spawning individuals around the coast render this species susceptible to fishing exploitation. This species is large and has a low level of fecundity, it is likely to have a relatively unproductive and vulnerable life history. A decrease in overall landings and size reduction of specimens landed has been observed, landings in Senegal have decreased from 4,050t in 1998 to 821t in 2005. It is also taken as bycatch to international trawling fleets, in artisanal gillnet fisheries and in bottom trawl cephalopod fisheries which operate throughout its range. It is suspected that there will be a projected decline of >50% within three generations (15 to 30 years) on the basis of the severe declines in other guitarfishes and wedgefishes, the continuation of fishing pressure in shallow coastal habitats, the potential for fishing effort to shift towards the further targeting of guitarfish in light of their highly valued fins, particularly in the absence of other sharks. As a result this species is assessed as Endangered. Aside from the localised protection within the Banc d' Arguin, this species is not subject to any management of conservation measures. The status of this species should be monitored carefully and a finning ban including a ban on carcass dumping should be considered. Otherwise, the implementation of licenses for shark fishing and finning and a tax system on shark fins is recommended.

Common Guitarfish

Rhinobatos rhinobatos (Linnaeus, 1758)

Red List assessment **Global: Endangered A4cd** (Notarbartolo di Sciara, G., Bradai, M.N., Morey, G., Marshall, A.D., Compagno, L.J.V., Mouni, A., Hicham, M., Bucal, D., Dulvy, N., Heenan, A. and Coelho, R. 2007)

Rationale A guitarfish known from the southern Bay of Biscay, southwards to Angola, including the Mediterranean Sea. Although the distribution is fairly wide, it is subjected to fishing pressures throughout most of its range. Its existence along coastal inshore areas makes this species an easy target for subsistence fisheries. Limited data are available on biology, but it is large and is likely to have a relatively unproductive and vulnerable life history. Off the west African coasts, this species is taken as bycatch of international shrimp trawl fleets, bottom trawl cephalopod fisheries and in artisanal gill net fisheries. It is targeted for its meat, which is salted, dried and exported within the region and its fins

are used to supply the Asian fin trade market. Other guitarfishes and wedgefishes have undergone severe declines (*Rhynchobatus luebberti*, *Rhinobatos cemiculus*) and future fishing pressure in shallow coastal habitats is unlikely to decrease. *Rhinobatos rhinobatos* is believed to face similar threats as *Rhinobatos cemiculus*. In the northern Mediterranean, where both species used to be quite common (for example present daily in the Palermo fish market); both have disappeared from bottom trawl surveys, from Alboran to Aegean Sea within the MEDITS international programme, from the landings in Mazara del Vallo (Sicily), and appear to have been extirpated. In the Balearic Islands both species were considered as typical inhabitants of unvegetated sandy bottoms. Old fishermen reported their relative frequency during the first half of the 20th century, but nowadays they seem to be extinct in the area. In areas of the southern Mediterranean (e.g., Gulf of Gabés, but perhaps elsewhere along the still underfished Mediterranean African coast) both species are still present in the catch, but with a large fraction of immatures. Given evidence for regional extinctions in the northern Mediterranean Sea and intense and continuing fishing pressure throughout this species' habitat along the west African coasts, observed declines in its congener *R. cemiculus*, and its likely vulnerable life-history characteristics, there is no reason to suspect that this species will not suffer similar declines to those observed in the northern Mediterranean throughout the rest of its range. Therefore this species is assessed as Endangered on the basis of past and suspected future declines. The status of this species should be monitored carefully. At present, this species is not subject to any conservation or management measures. It recommended that species specific landings data, and fishing effort should be recorded and analysed.

FAMILY **TORPEDINIDAE**

Marbled Electric Ray

Torpedo marmorata (Risso, 1810)

Red List assessment

Global: Data Deficient (Notarbartolo di Sciara, G., Serena, F., Ungaro, N., Ferretti, F., Pheeha, S. and Human, B. 2008)

Rationale

Torpedo marmorata seems to have a wide distribution throughout the eastern Atlantic Ocean and the Mediterranean Sea. Its life-history traits are relatively well known, however its abundance and possible threats faced by this species are not well known throughout its range. Trawl survey data indicate that this species is more common that other *Torpedo* spp in the northern Mediterranean Sea and may be increasing in coastal waters of Italy. Little is known of population trends or the impact of fisheries off western Africa and throughout the rest of its range, where demersal trawl effort is high. Therefore it is assessed as Data Deficient globally at present, until information on its population status can be obtained from throughout its range.

Great Torpedo Ray

Torpedo nobiliana (Bonaparte, 1835)

Red List assessment

Global: Data Deficient (Notarbartolo di Sciara, G., Serena, F., Ungaro, N., Ferretti, F., Holtzhausen, H.A. and Smale, M.J. 2008)

Rationale

Torpedo nobiliana has a relatively wide range in the Atlantic Ocean, including the Mediterranean Sea. Adults are frequently pelagic or semi-pelagic, from near the surface to 800m depth, whereas juveniles are mainly benthic living on soft-substrate and coral reef habitat in shallower water. Very little data are available on population or catch trends, although surveys suggest that this species is rare in the Mediterranean Sea. When caught, torpedo rays are usually discarded at sea, resulting in very little data on catches of these species. *Torpedo nobiliana* is caught with bottom trawls and line gear and further research is required to determine the impact of fishing activities on the species. Destruction and degradation of the species' shallow water nursery grounds may threaten juveniles. At present this species is assessed as Data Deficient globally due to very little information on catches and population trends.

Common Torpedo Ray

Torpedo torpedo (Linnaeus, 1758)

Red List assessment **Global: Data Deficient** (Serena, F., Notarbartolo di Sciara, G. and Ungaro, N. 2008)

Rationale This electric ray occurs in the Eastern Atlantic, from the southern Bay of Biscay, south to Angola and in the Mediterranean Sea. It is primarily coastal, found in inshore waters, although occasionally found to depths of >300m. The species is apparently more common in southern Mediterranean waters than in the northern Mediterranean. Trawl survey data available from the northern Mediterranean indicate that *T. torpedo* is less common than other *Torpedo* spp in this area. Few data are currently available from throughout the rest of the species' range. This species is taken as bycatch in demersal fisheries, including coastal artisanal fisheries, trawls and trammel nets, although no specific data are available on its capture and it is most likely discarded at sea. Post discard survival may be relatively high because it is often caught in shallow waters. At present insufficient data are available to assess this species beyond Data Deficient globally. Demersal fishing pressure is relatively intensive in large areas of its range and there is a need to investigate further the impact of fisheries and habitat pressures on this species.

FAMILY **ARHYNCHOBATIDAE**

Pallid Skate

Bathyraja pallida (Forster, 1967)

Red List assessment **Global: Least Concern** (Orlov, A. 2007)

Rationale A very poorly known deepwater skate, recorded from depths of 1,879 to 2,952m. This species was described relatively recently and there are only few subsequent records. Deeply distributed, this species is outside the range of current deepwater fisheries. No data on its ecology and biology are available, although this may be a large skate with unproductive life-history characteristics that would make it vulnerable to over-fishing. Given that its deep distribution is beyond the range of fishing activities, it is assessed as Least Concern. Research on its life history is required and deep water fisheries worldwide should be monitored and managed.

Richardson's Skate

Bathyraja richardsoni (Garrick, 1961)

Red List assessment **Global: Least Concern** (Kulka, D.W., Orlov, A. and Barker, A. 2007)

Rationale *Bathyraja richardsoni* is likely to be cosmopolitan in deep water. Sporadic, deep records from various parts of its range indicate that this species is widespread and it is suspected that the distribution is much wider than records indicate. Their deep bathydemersal distribution (most records exceed 1,000m) places them outside of the range of most human threats, including deepwater fishing. Given the species' wide depth and geographic range, the majority of the population is thought to exist outside the range of deepwater fisheries and this species is considered Least Concern. Deepwater fisheries should be monitored and managed.

Spinytail Skate

Bathyraja spinicauda (Jensen, 1914)

Red List assessment **Global: Near Threatened** (Kulka, D.W., Orlov, A.M., Devine, J.A., Baker, K.D., and Haedrich, R.L. 2008)
Northeast Atlantic: Least Concern (Kulka, D.W. and Orlov, A.M. 2008)

Rationale *Bathyraja spinicauda* is a deepsea skate found along the North Atlantic continental slope from 140 to at least 1,650m. Its population density increases with depth, suggesting that it may extend into waters that exceed depths surveyed or commercially fished, although few data exist at these greater depths. Most life-history parameters are unknown, but this is one of the largest species of skates recorded

from the Atlantic and likely to have a low resilience to fisheries. Deepwater fishing effort and distribution in the Northwest Atlantic has been greatly reduced since its peak in the early 1970s. *Bathyraja spinicauda* still comprises the most common bycatch skate species in the slope fishery for Greenland halibut off the Grand Bank to Labrador Shelf and thus is vulnerable to fishing pressure, but effort and quotas have recently been reduced in this fishery. Survey data from Canadian Atlantic waters demonstrated a population decline exceeding 80% and a 25% reduction in body size during 1978–1994, but it has been queried whether this trend is representative of the entire population, including poorly-surveyed deepwater areas, or part of the population only. In the Northeast Atlantic, *B. spinicauda* records are relatively rare suggesting that fishing and survey/fishing effort rarely overlap the depth range of the species there, although there is concern that fisheries are moving into deeper water here. That a large proportion of the population occurs outside of the area fished and surveyed, particularly in the Northeast Atlantic, presently affords some protection against anthropogenic effects. The species is therefore assessed as Near Threatened globally, Vulnerable in the Northwest Atlantic and Least Concern in the Northeast Atlantic, with concern expressed that fisheries and population trends should be monitored extremely carefully and the assessment revised when more data become available from deepwater.

FAMILY **RAJIDAE**

Arctic Skate

Amblyraja hyperborea (Collette, 1879)

Red List assessment **Global: Least Concern** (Kulka, D.W., Barker, A.S., Pasolini, P. and Orlov, A. 2007)

Rationale A deepwater skate very widely distributed, found in the North Atlantic, Southwest and East Pacific, and off southern Australia in the East Indian Ocean. Occurs from 260 to 2,500m, primarily at depths greater than most fisheries along lower continental slopes, and therefore has apparently limited interaction with human threats. There is no current fishery interest. Reaches a maximum size of about 1m, and appears to live exclusively at temperatures below 4ºC. Very little is known of its life-history parameters, although this is a medium to large skate, which may exhibit similar characters to other unproductive deepwater skates. In the Northwest Atlantic, this species has been taken occasionally in research trawls and in deepwater commercial fisheries off Canada. Caught commonly during surveys on the slope of the eastern Norwegian Sea and more recently in bottom trawl surveys of the Svalbard archipelago. Given that this species is primarily distributed outside the range of current fishing activity and has a wide geographic range, it is assessed as Least Concern. Continued monitoring of catches and expanding deepwater fisheries, and the collection of life-history data should be a priority.

Jensen's Skate

Amblyraja jenseni (Bigelow and Schroeder, 1950)

Red List assessment **Global: Least Concern** (Kulka, D.W., Orlov, A. and Barker, A. 2008)

Rationale A little-known deepwater skate, occurring from southern New England, USA, Nova Scotia and Grand Banks to Labrador, Canada, in the Northwest Atlantic, to waters off Ireland in the Northeast Atlantic, including the Mid-Atlantic ridge. The species occurs at depths of 167–2,548m, with a shallower distribution in the Northwest Atlantic, and in deeper water in the Northeast Atlantic. Although part of the species' range is fished in the Northwest Atlantic, the species' wide depth range in this area (to 2,311m), its occurrence over the Mid-Atlantic ridge and at great depths in the Northeast Atlantic, offer refuges from fishing pressure. Increasing density with depth suggests that the majority of the population occurs well beyond areas surveyed and fished. In the absence of major potential threats and data to suggest declines, the species is assessed as Least Concern. If deepwater fisheries expand to greater depths within this species' range in future, this assessment should be re-visited.

Starry Ray

Amblyraja radiata (Donovan, 1808)

Red List assessment

Global: Vulnerable A2b (Kulka, D.W., Sulikowski, J., Gedamke, J., Pasolini, P. and Endicott, M. 2008)

Northeast Atlantic: Least Concern (Kulka, D.W., Sulikowski, J., Gedamke, J., Pasolini, P. and Endicott, M. 2008)

Rationale

Global: *Amblyraja radiata* is found in the Northeast and Northwest Atlantic at depths of 18–1,400m, but is most common in 27–439m. There is evidence which might support population segregation and subdivision into subpopulations, but at this time, it is unknown if genetic mixing of subpopulations takes place in either the Northeast or Northwest Atlantic stocks. Its geographic range includes contrasting population trends: relatively stable in recent years in Canada and the Northeast Atlantic, yet declining in the USA. Moreover, the potential occurrence of subpopulations with different age and growth rates and the potential lack of protection under a continuing USA skate wing fishery, warranted a precautionary approach to the evaluation. On the other hand, the overall abundance (whether divided among subpopulations or not) still constitutes several hundred millions of individuals. Skates are under fisheries management measures in both Canada and the USA, but the causes of observed declines are not well understood across its range. Overall, the extent of the decline is considered to warrant a global assessment of Vulnerable. Regional population trends are summarised below.

Northeast Atlantic: The species is common in the Northeast Atlantic. It is the most abundant skate in the North Sea, and has shown a marked increase between 1970 and 1983 in the Central North Sea and from 1982–1991 in English groundfish surveys. Although a survey of this species indicated a decline recently in the North Sea, this is believed to be a result of a change in survey gear. This species is occasionally landed as bycatch of demersal fisheries, but its distribution lies outside the main beam trawling areas in this region. It has a relatively low length at first maturity (44cm) and demographic modelling suggests this species is less susceptible to fishing mortality in this region than other larger-bodied skate species. For these reasons in the Northeast Atlantic region this species is assessed as Least Concern.

Common Skate

Dipturus batis (Linnaeus, 1758)

Red List assessment

Global: Critically Endangered A2bcd+4bcd (Dulvy, N.K., Notobartolo di Sciara, G., Serena, F., Tinti, F., Ungaro, N., Mancusi, C. and Ellis, J. 2006)

Rationale

This skate, the largest European rajid, was once an abundant constituent of the demersal fish community of north-western Europe. Formerly targeted, it is now a bycatch of multispecies trawl fisheries, which cover much of its shelf and slope habitat. This species is included on the OSPAR List of threatened and/or declining species and habitats. Fisheries data indicate that populations of *Dipturus batis* have undergone an extremely high level of depletion in the central part of its range around the British Isles since the early 20th century (the three-generation period). It has been extirpated from most inshore areas and from the south-central North Sea, but is still caught in Scottish waters, especially around the Shetlands and off north-western Scotland, and also along the shelf edge and in the Celtic Sea. Accurate international species-specific landings data are lacking, although Icelandic landings have declined. French landings appear stable, though this is likely to be attributed to a re-direction of fishing effort from shelf seas (where common skate are now very rare) into deeper water. This skate formerly occupied the shelf and slope areas of the Mediterranean excluding North Africa west of Morocco but now appears to be virtually absent from much of this range. Fishing capacity and effort in the Mediterranean have also increased substantially over the second half of the 20th century. The life history and demography of this species allow little capacity to withstand exploitation by fisheries, its large body size renders it catchable by fishing gears even from birth. As fishing pressure on this species is unlikely to be reduced in the future, it is assessed as Critically Endangered throughout its range.

Sail Ray

Dipturus lintea Fries, 1839

Red List assessment **Global: Least Concern** (Kulka, D.W., Orlov, A. and Stenberg, C. 2008)

Rationale Sporadic, deepwater records from various parts of the North Atlantic indicate that this little known species is widespread but distributed deeply: from 316–1,455m (deepest sets fished) in the Northwest Atlantic and from 196–635m in the Northeast Atlantic. Increasing density with depth in the Northwest Atlantic suggests that its centre of mass is well beyond areas surveyed and fished, placing this species outside of the range of most human threats there. In the Northeast Atlantic, potential overlaps with fishing effort are greater, but catches there are rare. This species is thus assessed as Least Concern, but monitoring of population trends and capture in fisheries in the Northeast Atlantic should be implemented.

Norwegian Skate

Dipturus nidarosiensis (Collett, 1880)

Red List assessment **Global: Near Threatened** (Stehmann, M.F.W. 2008)

Rationale This large (to 200cm TL), deepwater skate is endemic to the Northeast Atlantic, found off Norway, southern Iceland, and around Rockall Trough. This species is commercially exploited and is taken as target or utilised bycatch. Little information is generally available on the landings of deepwater skates, although FAO statistics report landings of 19–393t for *D. nidarosiensis* between 1982 and 1993. ICES reports that, although there are historical records from Rockall and the Norwegian Deep, where it was known to have occurred, there have been no recent records of the species in these areas. This is one of the largest skates and as such has low productivity and high catchability, similar to other large skates that have been heavily impacted by even moderate levels of bycatch. Given the species' high intrinsic vulnerability, an absence of management or conservation measures and its apparent disappearance from Rockall and the Norwegian Deep, an assessment of at least Near Threatened is considered appropriate. There is a continuing trend of increasing deepwater fishing activities in the Northeast Atlantic, with effort expanding into deeper waters and this species needs to be very carefully monitored. It may prove to qualify for a threat category under A2bd+4bd.

Longnose Skate

Dipturus oxyrinchus (Linnaeus, 1758)

Red List assessment **Global: Near Threatened** (Ungaro, N., Serena, F., Dulvy, N.K.D., Tinti, F., Bertozzi, M., Mancusi, C., Notarbartolo di Sciara, G. and Ellis, J.E. 2007)

Rationale *Dipturus oxyrinchus* is benthic and found on sandy or muddy bottoms from depths of 90m on the continental shelf, down the slope to 900m, mainly around 200m, and was most frequently captured at depths of 200 to 500m in the Mediterranean International Trawl Surveys (MEDITS). This species is now very rare on continental shelves. Nothing is known of current population trends in the northeast Atlantic region or of its status along the Norwegian coast, in Iceland and the Faroes, or in French and Iberian waters. There is some evidence to infer that this species was captured historically in the Irish Sea and may now be locally extinct from the Irish Sea. The large body size and inferred low intrinsic rate of population increase suggests this species will be highly vulnerable to bycatch mortality from demersal trawls and deepwater longline and gillnet fisheries, and consequently we have assigned this species as Near Threatened in the Northeast Atlantic. *Dipturus oxyrinchus* is moderately abundant in the Mediterranean with a standing stock biomass estimated at 1,899t in the western, northern and eastern Mediterranean. The overall biomass index assessed by the MEDITS surveys was 3.7kg/km^2 throughout this area. In Italian waters there has been no indication of a decline in abundance in the last 20 years. However, it does not appear to have been captured by research surveys from the Gulf of Lions since 1984 and it is now rarely captured in the Adriatic Sea shelf areas. However, *D. oxyrinchus* mostly inhabits deep areas where fishery exploitation is presently at low levels in the Mediterranean, thus it is assumed these areas are currently refuges for much of the population. There is a need for precaution given its relatively large body size indicating a low intrinsic rate of population increase and thus a low capacity to withstand even moderate fishing pressure. This, together with the evidence of dramatic declines and apparent disappearance in some

localised areas (likely due to fisheries pressure), leads to the assessment of this species as Near Threatened in the Mediterranean. The situation must be closely monitored to ensure that its conservation status is not raised into the Vulnerable category in the future, particularly if deepwater fisheries were to develop.

Sandy Ray

Leucoraja circularis (Couch, 1838)

Red List assessment

Global: Vulnerable A2bcd+A3bcd+A4bcd (Ungaro, N., Serena, F., Ellis, J., Dulvy, N., Tinti, F., Bertozzi, M., Mancusi, C. and Notarbartolo di Sciara, G. 2008)

Rationale

A relatively large skate, found in the Northeast Atlantic and Mediterranean Sea. Traditionally, it was thought to be found mainly around 100m depth on sandy and muddy bottoms, though it has been suggested that it is now favours slightly deeper waters. This species is taken as bycatch of multi-species trawl fisheries and offshore bottom longlines. The occurrence of *L. circularis* in the Mediterranean appears to have decreased significantly in the last 50 years. From 1957–1960 it was recorded in 10–17% of trawl samples in the Gulf of Lions and in 1948 it was recorded in 3.2% of trawl samples in the Adriatic Sea. The species appears to be no longer present in these areas. Northern Mediterranean-wide scientific trawl surveys from 1995–1999 recorded this species in only 12 of 6,336 trawls. Benthic trawl effort has increased significantly during the last 50 years and fishing pressure continues within this species' depth range. The current rarity of this species in the Mediterranean, evidence of local extirpation from the two locations covered by the historical comparative trawl surveys, and its likely low intrinsic rate of increase suggested by its large body size and large size at maturity suggest that it is Endangered in this region. In the Northeast Atlantic, this species is relatively rare, and it is also taken as a bycatch of multi-species trawl fisheries. French landings data for this species have declined from about 500 tonnes per year in the early 1990s to about 300 tonnes per year. Species-specific landings data prior to this are not available. English surveys in the North Sea and Celtic Sea have not recorded this species since 1996 and 1997 respectively, although it is still recorded in various Scottish surveys around north-western Scotland. Most of the recent captures of this species in Scottish surveys have been made in waters of 180–500m depth, suggesting that the main part of the distribution is now in deeper water, along the edge of the continental shelf and on offshore banks. Given the decline in French landings in recent years, and that the distribution has contracted (or shifted) to deeper waters, this species is assessed as Vulnerable in the Northeast Atlantic, on the basis of continuing population declines of at least 30%. Globally, this species is assessed as Vulnerable, although with further data from the Northeast Atlantic it may prove to meet the criteria for a higher category. Close monitoring is required and future analyses should examine the long-term distribution and relative abundance of this species.

Shagreen Ray

Leucoraja fullonica (Linnaeus, 1758)

Red List assessment

Global: Near Threatened (Ellis, J., Ungaro, N., Serena, F., Dulvy, N., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C. and Notarbartolo di Sciara, G. 2008)

Rationale

Leucoraja fullonica appears to be comparatively rare in the Northeast Atlantic and very rare in the Mediterranean Sea. It is an offshore species, usually occurring on the outer parts of the continental shelf at depths of 30–550m, although it has rarely been recorded deeper in the Mediterranean Sea. Very few data are available on this species in the Mediterranean Sea, where it was recorded in only seven out of 6,336 tows during MEDITS research surveys in the northern Mediterranean at depths ranging from 10–800m. The species is taken as bycatch in demersal trawl and longline fisheries throughout much of its range. Reported French landings for this species were more than 370 tonnes in 1983, but since 1984 annual landings have been more stable and averaged about 75 tonnes. Trends in surveys are difficult to determine accurately due in part to limited time-series data for this species, and given some uncertainty in the taxonomic identification in earlier surveys. English (Cefas) surveys in the North Sea have not recorded this species since 1998, though Scottish (FRS) surveys continue to record it in various surveys around Scotland. Given the low numbers caught in surveys in offshore shelf habitats, it is possible that the main part of the distribution is now in deeper water, such as along the edge of the continental shelf. Indeed, most of the recent captures of this species in Scottish surveys have been made in waters more than 200m deep. Nevertheless, due to temporal changes in surveys (areas/gears) over the

extensive period covered by Scottish surveys, accurate trends in abundance are hard to determine. Much like with *L. circularis*, the distribution may have contracted (or shifted) to deeper waters. However, there is uncertainty in the magnitude of any decline in abundance for the population as a whole and this species appears slightly more common than *L. circularis* and is slightly smaller in body-size. *Leucoraja fullonica* is currently assessed as Near Threatened on the basis of continuing population declines approaching 30% (close to meeting the criteria for Vulnerable A2bcd). Further analyses of survey data and close monitoring are required to elucidate the long-term distribution and relative abundance of this species.

Cuckoo Ray

Leucoraja naevus (Müller and Henle, 1841)

Red List assessment **Global: Least Concern** (Ellis, J., Ungaro, N., Serena, F., Dulvy, N.K., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C. and Notarbartolo di Sciara, G. 2008)

Rationale This small-bodied skate is relatively widespread in the Northeast Atlantic, from southern Norway to northern Morocco, including the Mediterranean Sea. It is also reported from Senegal. It occurs at depths of 20–500m, and is more common at ~200m in the Mediterranean Sea. This species is taken as bycatch in mixed demersal fisheries through much of its range and utilised in some areas. *Leucoraja naevus* is apparently rare in the Mediterranean Sea and was caught rarely but consistently (only 42 out of 6,336 survey tows) during Mediterranean-wide trawl surveys from 1994–1999. It is now not found in the Gulf of Lions in the north-western Mediterranean, the species was reported in comparable surveys from 1957–60 to 1980–84 but was not captured in later surveys from 1992–95. It is, however, still recorded in areas that have been less intensively trawled, such as the Balearic Islands. This relatively small skate may have some capacity to withstand moderate fishing pressure, compared to larger skates that are highly vulnerable to rapid depletion as a result of their limiting life-history characteristics. Given observed declines in heavily trawled areas of the Mediterranean, combined with areas of its range that are less heavily fished, it is currently assessed as Near Threatened in this region. Abundance trends, as indicated by surveys, are not consistent in the Northeast Atlantic. The Celtic Sea stock was assessed under the DELASS project, indicating a decrease with subsequent increase. Survey data for the North Sea have indicated a decline, following an earlier increase. In western areas, survey catch rates have increased in the Irish Sea and declined in the Celtic Sea. It should be noted that survey catch rates are based on all individuals, and no analyses of the relative abundance of mature fish have been made. Observed increases and declines tend to be of a low magnitude, and overall the population may be stable. At present this species is assessed as Least Concern, globally, as the total population is not considered to have declined significantly. However, more information on stock identity is required, and the status of stocks in those areas where it is exploited most in the Northeast Atlantic (e.g. Celtic Sea and Bay of Biscay) need to be better assessed.

Krefft's Skate

Malacoraja kreffti (Stehmann, 1978)

Red List assessment **Global: Least Concern** (Stehmann, S. and Orlov, A. 2007)

Rationale This species was described only relatively recently and only few subsequent records are known. The deep bathydemersal distribution (all records exceed 1,000m) places this species outside of the range of current fisheries, and it is therefore considered to be Least Concern at present. The situation requires careful monitoring and should fisheries expand into deeper waters throughout its range in the future this assessment may need to be re-visited in the near term. The collection of life-history data is also a priority.

Roughskin Skate

Malacoraja spinacidermis (Barnard, 1923)

Red List assessment **Global: Least Concern** (Smale, M.J. and Kulka, D.W. 2007)

Rationale Apparently uncommon or rarely caught, this large deepwater species is widely distributed and may be more common in deeper waters that are not presently exploited by commercial trawlers. There are 147 records of sets containing this skate off Canada from over 40,000 sets, nearly all at depths of over 800m. The species is taken

occasionally as bycatch in deep fisheries off Canada, but is currently regarded as Least Concern because it is distributed primarily out of the range of current fishing efforts. However, expansion of trawling operations to deeper waters may increase the threat to this species and the situation should be monitored closely. Catch data and information on the life-history characteristics of this little-known species should be collected as a priority.

Blue Pygmy Skate

Neoraja caerulea (Stehmann, 1976)

Red List assessment **Global: Data Deficient** (Séret, B. and Stehmann, M. 2008)

Rationale This poorly known, small (~32cm TL), deepwater skate is endemic to the Northeast Atlantic, at depths of 600–1,260m. It appears to be relatively rare and was known only from the type series until more recently, when further records have been obtained with the development of deep bottom fisheries on the continental slopes and scientific exploration cruises in the eastern North Atlantic. It is occasionally taken as bycatch in deepwater trawl fisheries, which are expanding in the Northeast Atlantic, but few data are available. The species' known geographic distribution appears to lie within the range of deepwater fisheries in this area. Insufficient information is currently available to assess this species beyond Data Deficient and further study is required on the species' full distribution and interactions with fisheries.

Iberian Pygmy Skate

Neoraja iberica (Stehmann, Séret, Costa and Baro, 2008)

Red List assessment **Global: Data Deficient** (Stehmann, M. and Valenti, S.V. 2008)

Rationale This recently described, moderately rare, pygmy skate is known only from a limited area off the southern coasts of Portugal and Spain. It is found on the upper slope at depths of 270–670m. All type specimens were taken as bycatch in demersal trawl fisheries, and would usually be discarded because the species is too small to be considered commercially valuable. Although not taken regularly, it occurs in an area that has been commercially fished for groundfish and crustaceans for a long period. No data are available to evaluate historical trends and no information is available on the extent of bycatch or post-discard mortality, therefore the species is assessed as Data Deficient at present. Given that this species has a limited range (known extent of occurrence is possibly <10,000km^2) in an area that is fished, and where there little possibility of a decrease in fishing effort in the near future, the impact of these fisheries on the species needs to be investigated. Population trends need to be monitored through surveys or collection of species-specific data on catches by onboard observers.

Blonde Ray

Raja brachyura (Lafont, 1873)

Red List assessment **Global: Near Threatened** (Ellis, J.,Ungaro, N., Serena, F., Dulvy, N., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C. and Noarbartolo di Sciara, G. 2008)

Rationale A relatively large-bodied skate, endemic to the Northeast Atlantic and western Mediterranean Sea. Occurs on soft substrates to depths of about 150m in the Northeast Atlantic and mainly from 10–300m depth in the Mediterranean Sea. Targeted in areas where it is locally abundant and taken as bycatch in mixed demersal fisheries using trawl, gill nets and longlines elsewhere in its range. It is apparently rare in the Mediterranean Sea, captured in only 21 of 6,336 tows in Mediterranean-wide trawl surveys conducted between 1994–1999 at depths of 10–800m. It is not certain whether this species has always been rare there; no data are currently available on historical abundance or trends for this region and there is no evidence to suggest it was ever common. The lack of data on this apparently rare species prevents an assessment beyond Data Deficient in the Mediterranean Sea at present, but given that demersal fishing pressure is relatively intense throughout large areas of its range there, an assessment of catches is a priority. This species is more common in the Northeast Atlantic where it is taken as bycatch and also targeted where sufficiently abundant. No formal stock assessments have been undertaken for this species. Although it is locally abundant in some areas, survey data indicate that declines have occurred. Medium-sized skates showed marked declines in relative abundance, especially

R. brachyura, in comparable research trawl surveys conducted in three locations around the British Isles in 1901–1907 and 1989–1997. Furthermore, the percentage composition of *R. brachyura* decreased by close to 30% between the two survey periods. Demersal fishing pressure is still high throughout large areas of the Northeast Atlantic and declines are inferred elsewhere, where specific data are not available. This species probably has limiting life-history characteristics, like other relatively large skates, making it vulnerable to depletion. Given observed and inferred declines, continued high levels of exploitation and this species' rarity in the Mediterranean Sea, it just fails to meet the criteria for Vulnerable A2bd globally and is assessed as Near Threatened globally and in the Northeast Atlantic. Improved monitoring of population trends and further assessment of the Atlantic and Mediterranean populations are a priority.

Thornback Ray

Raja clavata Linnaeus, 1758

Red List assessment

Global: Near Threatened (Ellis, J. and Walker, P. 2000)
Northeast Atlantic: Near Threatened (Ellis, J. In preparation)

Rationale

Global: *Raja clavata* is one of the most abundant rajids in the North-eastern Atlantic and Mediterranean, and is an important component of mixed demersal trawl fisheries. It is also taken in set nets and targeted by recreational anglers. There is some evidence of decline in catch rates in NW European waters. A minimum landing size exists in certain inshore areas of the UK.
Northeast Atlantic: *Raja clavata* is taken in targeted fisheries where it is locally abundant (southern North Sea, eastern English Channel, eastern Irish Sea, Bristol Channel) and as a bycatch elsewhere within its range in the Northeast Atlantic. Although this species is still locally abundant in some areas, it has undergone a contraction in range and decline in abundance in parts of its Northeast Atlantic range, most markedly in the central and eastern North Sea. Area of occupancy in the North Sea may now be only 44% of the extent of the species in the 1980s, although the accuracy of this estimate is dependent on the reliability of the data, and it is known that there has been some confusion between *R. clavata* and starry ray (or thorny skate) *Amblyraja radiata*. Although such confusion will affect the perception of the distribution in the central and northern North Sea, surveys indicate that it has declined off Northeast England, in the south-eastern North Sea (German Bight) and eastern Southern Bight. The North Sea population of this species was listed on the OSPAR List of Threatened and/or Declining species and habitats in 2008. This skate is sufficiently large to be vulnerable to depletion where fishing pressure is high and three year generation period for this species is estimated at about 30 years. Accurate species-specific landings data are not available, as "skates and rays" have not generally been reported by species in landings data, although overall catches of "skates and rays" have declined. Fishery independent surveys have indicated relatively stable catch rates of this species in recent years (since the mid-1990s), however longer-term abundance trends are unknown. Although this species has undergone range contraction in the North Sea that may warrant a threatened listing in this area, the level of range contraction for the overall Northeast Atlantic population is not thought to be as high, and the extent of any decline in abundance over the wider area is uncertain. It is currently assessed as Near Threatened in the Northeast Atlantic, and population trends and management measures should be monitored closely, because there is concern that this species may meet the criteria for Vulnerable A2bcd in the future.

Smalleyed Ray

Raja microocellata Montagu, 1818

Red List assessment

Global: Near Threatened (Ellis, J. 2000)

Rationale

Raja microocellata is restricted primarily to the Atlantic coasts of Northwest Europe, from Gibraltar to the British Isles, although it has also been recorded further south, to Western Sahara, north-western Africa. It is found on the continental shelf, mostly at <100m depth. The range of this skate is smaller than many of the more common European skates and rays. It favours sandy bays and is only recorded as abundant at a few sites (e.g. Bristol Channel, UK and Bertheaume Bay, France). *Raja microocellata* is taken as bycatch in trawl and set net fisheries, with most landings from the Bristol Channel, and is commercially important for ports in parts of southern England. Given its restricted and patchy, fragmented geographical distribution and localised abundance, local populations may potentially be vulnerable to declines caused by over-fishing,

habitat degradation and other anthropogenic disturbance. This species is assessed as Near Threatened on the basis of suspected declines approaching 30%, as a result of high levels of exploitation, close to meeting the criteria for Vulnerable A4d. Fishery independent data for mature *R. microocellata* are limited and careful monitoring of populations of this species is required to determine accurate population trends of mature individuals.

Brown Ray

Raja miraletus Linnaeus, 1758

Red List assessment **Global: Least Concern** (Smale, M.J., Ungaro, N., Serena, F., Dulvy, N., Tinti, F., Bertozzi, M., Mancusi, C. and Notarbartolo di Sciara, G. 2008)

Rationale A wide-ranging relatively small (to ~60cm TL), fairly fecund skate, found predominantly on the continental shelf, but occurring down to 530m. Apparently forms distant subpopulations in the Northeast Atlantic, Mediterranean, Angola to Namibia in the Southeast Atlantic, and from the Western Cape (South Africa) to Kenya in the Western Indian. Although this species is exploited throughout much of its depth range in the Mediterranean and Northeast Atlantic, there appears to be no significant threat from current levels of exploitation. This is one of the most abundant skates in the Mediterranean, and although surveys have shown temporal fluctuations of abundance, this species appears to be stable in most parts of the region, including over longer time scales from 1948–1999 in the Adriatic Sea. Little information is available from the Angola-Namibia subpopulation, and it may be taken as bycatch off Namibia in deepwater fisheries. The South Africa-Kenya population is thought to be under no threat, given refuges in untrawlable areas and the relative lack of deeper water fishing activities off Southeastern Africa at present. Its small body size and early maturation suggests its overall resilience to exploitation and a global assessment of Least Concern is justified.

Spotted Ray

Raja montagui (Fowler, 1910)

Red List assessment **Global: Least Concern** (Ellis, J., Ungaro, N., Serena, F., Dulvy, N., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C. and Noarbartolo di Sciara, G. 2007)

Rationale This small skate is widespread in the inshore waters and shallow shelf seas of the Northeast Atlantic and is common throughout the Mediterranean Sea, particularly in the east (Aegean Sea) and the western central area (coasts of Tyrrhenia, Corsica, Sardinia and Sicily). The bulk of the population appears to exist between 100 and 500m in the Mediterranean. Populations of *Raja montagui* appear to be stable throughout its range despite being commonly landed in fisheries. Their small body size is likely to mean this species has greater resilience to fishing impacts compared to larger-bodied skate species. *R. montagui* is common in landings from fisheries and trawl surveys throughout much of the Northeast Atlantic and, although accurate species-specific landings data are not available, catch rates in fishery-independent surveys indicate that catches are stable, possibly increasing in certain areas. It is also captured in trawl fisheries as bycatch in the Mediterranean and although temporal fluctuations of the abundance have occurred, populations appear to be stable in most parts of the Mediterranean. Therefore this species is assessed as Least Concern. It is listed on the OSPAR List of threatened and/or declining species and habitats. Given intense trawling pressure within its range, future trends and bycatch levels should be closely monitored.

Undulate Ray

Raja undulata (Lacepede, 1802)

Red List assessment **Global: Endangered A2bd+3d+4bd** (Coelho, R., Bertozzi, M., Ungaro. N. and Ellis, J. 2008)

Rationale This medium-sized, inshore skate has a patchy distribution in the Northeast and Eastern Central Atlantic, with discrete areas where it may be locally common (south-western Ireland, eastern English Channel, southern Portugal). It also occurs in the Mediterranean Sea, where it appears to be uncommon. *Raja undulata* occurs in shelf waters down to about 200m depth, although it is more common in shallow waters. This species is taken as utilised bycatch by trawl, trammel net and other demersal fisheries. Its patchy

distribution means that populations are widely separated, possibly with little exchange. In the areas where it is known to be locally common, available data suggest declines have occurred. Time series catch data from Tralee Bay, southwestern Ireland (where this species forms a discreet population) show that catches of this species have declined by 60–80% since 1981, although they fluctuate each year. The species has also traditionally been observed in English beam trawl surveys in the eastern English Channel, but has been absent in recent years. French landings of this species from the Celtic Seas have declined steeply during the past decade. Another major area of occurrence is southern Portugal, where it is the most common skate captured by the mixed species trammel net fisheries. Species-specific landings data are not collected, but overall landings of *Raja* species have decreased by 29% between 1988 and 2004 in this area. This medium-bodied skate has limiting life-history characteristics that make it more vulnerable to exploitation than smaller skate species (it has a three-year generation period of ~45 years). Given the species' life-history characteristics, documented species-specific declines in some areas and the declines in aggregate catch data, significant declines are also inferred to have occurred off southern Portugal. Although no specific data are available from western Africa, intensive artisanal and demersal trawl fisheries operate throughout its inshore range there. Due to the patchy distribution of this inshore species, and that it is thought to have declined in major areas of its range, it is assessed as Endangered.

Deepwater Ray

Rajella bathyphila (Holt and Byrne, 1908)

Red List assessment **Global: Least Concern** (Stehmann, M.F.W. 2008)

Rationale A deepwater skate occurring in the Northeast and Northwest Atlantic on deeper continental slopes and probably abyssal plains, mainly at depths greater than 1,400m. *Rajella bathyphila* is occasionally landed as bycatch of deepwater fisheries, but its deepwater range places the majority of the population outside the range of current fishing pressure. In the absence of potential threats and data to suggest declines, the species is assessed as Least Concern. If deepwater fisheries expand to greater depths within this species range' in future, this assessment should be re-visited. Monitoring of catches is important given that deepwater skates generally have limiting life-history characteristics that can make them vulnerable to rapid depletion when heavily fished.

Bigelow's Ray

Rajella bigelowi (Stehmann, 1978)

Red List assessment **Global: Least Concern** (Orlov, A., Kulka, D., Barker, A.S. and Stehmann, M. 2008)

Rationale A little-known small (to 53cm TL) deepwater skate recorded from depths of 367–4,156m. Sporadic, deepwater records from various parts of the North and Central Atlantic indicate that this species is widespread but distributed at great depths (the mean depth of existing records is 1,669m). It is suspected that the distribution is much wider than records indicate, in very deep water. Their bathydemersal distribution (most records exceed 1,000m) and relatively wide geographic distribution probably places the majority of the population outside the range of current deepwater fisheries. In the absence of potential threats and data to suggest declines in abundance, this species is assessed as Least Concern. If deepwater fisheries expand to greater depths within this species' range in future, this assessment should be re-visited.

Round Ray

Rajella fyllae (Lütken, 1888)

Red List assessment **Global: Least Concern** (Kulka, D.W., Barker, A.S., Orlov, A. and Pasolini, P. 2008)

Rationale This small species is widely distributed in the deeper shelf and upper slope waters of the North Atlantic Ocean, at depths of 170–2,050m. This is a small-bodied species which may have moderate to high population growth rates and thus be fairly resilient to low levels of exploitation. It is taken as bycatch by trawl and longline fisheries operating in the North Atlantic and is discarded. The species' wide depth distribution offers refuge beyond the deepest depths reached by trawl fisheries, at present. Available data on trends in abundance suggest that the population is relatively stable at present,

and possibly increasing in some areas, and the species is assessed as Least Concern. Given that fisheries are known to operate at depths at which the species is most abundant, bycatch levels should be monitored. If fisheries expand further throughout its depth range, this assessment should be re-visited in the near term.

Mid-Atlantic Skate

Rajella kukujevi (Dolganov, 1985)

Red List assessment **Global: Data Deficient** (Orlov, A. 2008)

Rationale This poorly known, deepwater skate is endemic to the Northeast Atlantic, occurring from the Mid-Atlantic ridge to Iceland, Ireland and the Faroes. It is found at depths of 775–1,500m, and is most common below 1,000m. Relatively few individuals have been captured since the species was originally described and very little data are available. Virtually nothing is known of the biology of this species, though it is likely to have the limiting life-history characteristics similar to other deepwater skates, making it potentially vulnerable to depletion. It is taken as bycatch by deepwater trawl fisheries targeting deepwater teleost fishes to the west of the British Isles, and in other areas of its range. Although this species' deep depth range may afford it refuge from fishing pressure in some areas, fisheries operate throughout much of its bathymetric distribution in others. At present insufficient information is available to assess this species beyond Data Deficient, however, its relatively limited range in deepwaters that are heavily fished is of concern. Efforts should be made to assess catches and population trends and this assessment should be re-visited as soon as data are available.

White Skate

Rostroraja alba (Lacepède, 1803)

Red List assessment **Global: Endangered A2cd+4cd** (Dulvy, N.K., Pasolini, P., Notarbartolo di Sciara, G., Serena, F., Tinti, F., Ungaro, N., Mancusi, C. and Ellis, J.E. 2006)
Northeast Atlantic: Critically Endangered A2cd+4cd (Ellis, J.E. 2006)

Rationale The size of this large benthic skate renders it particularly susceptible to capture by fishing gears which, in combination with its life-history parameters and population demography, allow little capacity for it to withstand exploitation by fisheries. This species is likely to be caught as bycatch to multispecies trawl fisheries which operate on much of the continental shelf and slope, coinciding with this species habitat. Based on anecdotal and trawl survey data, this species has undergone dramatic declines in abundance and substantial reductions in geographic range within the Mediterranean and the Northeast Atlantic. It is listed on Appendices of the Barcelona and Bern Conventions and on the OSPAR List of threatened and/or declining species and habitats.

The data available indicate that *Rostroraja alba* was formerly captured frequently in the north-western Mediterranean during the 1960s and off Tunisia and Morocco in the early to mid-1970s. It is now considered rare and is believed to have undergone a significant but currently unquantifiable decline in abundance and extent. This, in combination with the continued and potentially increasing threat from fisheries, call for this species to be assessed as Endangered in the Mediterranean. Similar declines in geographical range have occurred in the Northeast Atlantic and anecdotal evidence suggests this species, including localised populations, has declined severely e.g., in the Irish Sea. There is a high potential for population decline in the Bay of Biscay, on the Iberian coast, and in the Celtic Sea. The collapse of a directed long-line targeted fishery in Brittany highlights the incapacity for this species to withstand fisheries exploitation. The data presented here for the Northeast Atlantic indicate that this species is assessed as Critically Endangered.

On this basis, this species is globally assessed as Endangered, however this will need to be revisited once information from West and SubEquatorial African range of its distribution is available (specifically with data from South African trawl fisheries).

Roughtail Stingray

Dasyatis centroura (Mitchill, 1815)

Red List assessment **Global: Least Concern** (Rosa, R.S., Furtado, M., Snelson, F., Piercy, A., Grubbs, D., Serena, F. and Mancusi, C. 2007)

Rationale One of the largest marine and brackish water stingrays, distributed widely throughout the Atlantic. Populations in the Northwest Atlantic, Southwest Atlantic and Eastern Atlantic are considered separate. Although limited data are available on the biology of this species, its huge size (maximum size 260cm disc width) and low fecundity (2–6 pups per litter) make it intrinsically vulnerable to depletion. In US waters of the Northwest Atlantic this species is not targeted and the available data on population trends suggests that populations off the east coast of the USA are stable. In the Southwest Atlantic and Mediterranean, it is taken in trawl and artisanal fisheries operating throughout much of its depth range. Skate and ray landings in the artisanal fishery in the Rio Grande do Sul, southern Brazil have declined significantly since the early 1950s and there is some anecdotal evidence that the abundance of this species in catches has declined off Rio Grande do Norte State, northeastern Brazil. It has only been rarely reported from the Mediterranean, where intense trawl fisheries operate at depths of 50 to 800m. Given that its very large size makes it intrinsically vulnerable to population depletion, intense trawl fisheries in its range in the Mediterranean and the Southwest Atlantic and the declines observed in other vulnerable batoid species in these regions, the species is given a precautionary assessment of Near Threatened in the Mediterranean and Southwest Atlantic. As populations in the US Northwest Atlantic appear stable it is assessed as Least Concern in this region and Least Concern globally.

Common Stingray

Dasyatis pastinaca (Linnaeus, 1758)

Red List assessment **Global: Data Deficient** (Serena, F., Mancusi, C., Morey, G. and Ellis, J.R. 2008)
Northeast Atlantic: Near Threatened (Morey, G. and Ellis, J.R. 2008)

Rationale This stingray occurs in the Eastern Atlantic and Mediterranean Sea. It occurs from the shore to about 200m depth, but is more commonly found in shallow waters (<50m). This depth distribution makes it more vulnerable to small-scale inshore fisheries than to offshore trawling. For example, *Dasyatis pastinaca* made up more than 40% of the elasmobranch biomass captured in the trammel net fishery off the Balearic Islands. In the Northeast Atlantic, it is a less common species, generally showing a low abundance index in comparison to the Mediterranean Sea and may have disappeared from the south of the Bay of Biscay. Data from comparative trawl surveys (1948 and 1998) conducted in the Adriatic Sea suggest that this species may have decreased in abundance. Although few data are available, this species appears to be less common than it once was in the Mediterranean and Northeast Atlantic. It is currently assessed as Near Threatened there and further investigation is required into catches and the taxonomic status of population throughout this species' global distribution before it can be assessed beyond Data Deficient globally.

Pelagic Stingray

Pteroplatytrygon violacea (Bonaparte, 1832)

Red List assessment **Global: Least Concern** (Baum, J., Bianchi, I., Domingo, A., Ebert, D.A., Grubbs, R.D., Mancusi, C., Piercy, A., Serena, F. and Snelson, F.F. 2008)

Rationale The pelagic stingray is widespread, with an almost circumglobal distribution, throughout tropical and subtropical areas of the Pacific, Atlantic and Indian Oceans. It is perhaps the only species of stingray that occurs in pelagic, oceanic waters. The species is taken as bycatch in pelagic longline fisheries around the world. It is caught frequently by tuna and swordfish longliners and mostly discarded, but is retained and utilised in some areas (for example Indonesia). Post-discard survival rates are thought to be low in some areas because the fish are often discarded with serious mouth and jaw damage. Analyses of research surveys conducted with pelagic longlines in the 1950s and recent

(1990s) observer data from commercial pelagic longline fisheries suggest increases in CPUE in the tropical Pacific Ocean and Northwest Atlantic. Although there is some debate as to consistency of reporting of pelagic stingrays in fisheries statistics and data are lacking from several areas of the species' range, there are no data to suggest that significant declines have occurred in this species. Increasing fishing effort in pelagic fisheries, owing to decreasing abundance of target species (swordfish and tunas) will result in an increase in catches of this species and associated high discard mortality in some areas. Careful monitoring is therefore required, however, given increasing trends observed in some regions, this species' widespread distribution, and in the absence of evidence to suggest significant declines it is currently assessed as Least Concern globally.

FAMILY **GYMNURIDAE**

Spiny Butterfly Ray

Gymnura altavela (Linnaeus, 1758)

Red List assessment **Global: Vulnerable A2bd+4bd** (Vooren, C.M., Piercy, A.N., Snelson Jr., F.S., Grubbs, R.D., Notarbartolo di Sciara, G. and Serena, S. 2008)

Rationale A wide-ranging butterfly ray from tropical and warm temperate continental shelf waters on the eastern (Portugal to Angola) and western (Massachusetts State, USA to Buenos Aires Province, Argentina) sides of the Atlantic Ocean, including the Mediterranean Sea, the Black Sea and the Madeira and Canary Islands. A large (to 220cm disc width) ray with a small litter size (producing 1–8 pups depending on geographic location), making it intrinsically vulnerable to population depletion. It has a patchy and discontinuous distribution and appears to be habitat-dependent. Noted for the quality of its meat and is landed for human consumption. Globally, the extent of demonstrated declines in the Southwest Atlantic, Mediterranean and West Africa is considered to meet the criteria for Vulnerable, based on an overall past and suspected continuing decline of >30%. Species specific monitoring, and urgent protection in areas where it is threatened are needed.

FAMILY **MYLIOBATIDAE**

Common Eagle Ray

Myliobatis aquila (Linnaeus, 1758)

Red List assessment **Global: Data Deficient** (Holtzhausen, J.A., Ebert, D.A., Serena, F. and Mancusi, C. 2008)

Rationale This semi-pelagic ray occurs from the North Sea to South Africa in the Eastern Atlantic, including the Mediterranean Sea, and also off Kenya and South Africa in the Western Indian Ocean. It appears to prefer inshore waters (<50m), although it has been reported from depths of up to 537m off southern Africa. This species often swims in groups close to the bottom. Populations in Europe may differ from populations elsewhere and a systematic review of the species in these areas is required. *Myliobatis aquila* appears to be less common in the Mediterranean Sea and possibly the eastern Atlantic. Time series data from demersal fishery landings and demersal trawl surveys show that this species declined in the Gulf of Lions, north-western Mediterranean Sea, in the late 1970s. It was recorded in low numbers during northern Mediterranean-wide trawl surveys from 1994–1999, and is still sometimes observed in fish markets. Few data are currently available to assess trends in other areas of the Mediterranean Sea but, given that fishing pressure is high throughout this species' bathymetric range there, declines are also likely to have occurred elsewhere. This species is assessed as Near Threatened in the Mediterranean Sea. Further investigation of catch trends in the southern Mediterranean is required and with further information this species may prove to meet the criteria for Vulnerable A2bd+A3bd. No data are currently available from the Eastern Central Atlantic, but this species is presumably taken in coastal artisanal fisheries along the coast of western Africa and investigation of the species' status in this area is a priority. Off southern Africa, it is only rarely taken as bycatch and is not subjected to great fishing mortality. Available time series data on catches of this species from 1981–2001 showed no trend, and the species is assessed as Least Concern in southern Africa. The lack of data on catches and population trends throughout the species' range and uncertain taxonomic status of populations in Europe and southern Africa precludes a

global assessment beyond Data Deficient at present. This assessment should be revisited when these issues are better resolved.

Bull Ray

Pteromylaeus bovinus (Geoffroy St-Hilaire, 1817)

Red List assessment **Global: Data Deficient** (Wintner, S.P. and Morey, G. 2006)

Rationale A widespread species in the eastern Atlantic, including the Mediterranean (excluding the Black Sea), and the southwestern Indian Ocean, although the distribution is not completely and accurately defined. Little is known of the species' biology and ecology outside of South Africa, where most of the information is historical (1940–60s). In South Africa the species is taken as minor trawl bycatch and a minor bycatch of the KwaZulu-Natal shark protection nets (no significant trend in the catch rate of Natal Sharks Board (NSB) nets between 1977 and 2000). It is also caught by recreational fishers, but less frequently than other inshore elasmobranchs (e.g. *Gymnura natalensis*) and is generally released alive after capture. These low exploitation levels in South Africa as well as management considerations (reductions in NSB nets, reducing prawn trawl effort on the Tugela Bank, and recreational fishing restrictions) justify a Least Concern assessment for that country. However, given the historical nature of most ecological information, an update on the biology (maturity, litter size, nursery grounds etc.) and basic age and growth information is needed to reassess the regional status of this species in the near future. Elsewhere across its range, *P. bovinus* is documented to be caught occasionally off Kenya and commonly off Senegal. Given the species' inshore occurrence, however, it is likely taken in coastal artisanal fisheries across much of its African range. Myliobatids are generally susceptible to a variety of inshore fishing gear and as such an assessment of catch levels across its range is a priority, particularly given the species' low fecundity (3–4 pups/litter) and the presence of generally unregulated and often intense fishing pressure on the inshore environment in some areas. At present, given the dearth of information on the species outside of South Africa, it is assessed globally as Data Deficient.

FAMILY **RHINOPTERIDAE**

Lusitanian Cownose Ray

Rhinoptera marginata (E. Geoffroy St-Hilaire, 1817)

Red List assessment **Global: Near Threatened** (Notarbartolo di Sciara, G., Serena, F., Ducrocq, M. and Séret, B. 2008)

Rationale *Rhinoptera marginata* is a large benthic ray, known from the western coast of Africa and Mediterranean Sea. It is apparently very rare in the Mediterranean Sea, but is common in shallow waters off western Africa. This species is commonly caught with multiple gear types, and is particularly vulnerable to coastal fisheries using purse seine, gillnet and trammel nets. Coastal fishing pressure is generally intensive along the western African coast, and it is known to be an important component of catches in areas for which data are available. This species forms large schools, meaning that large numbers can be fished in a single haul. Although no age data are available specific to this species, generation period may be estimated at about 11 years, based on data for other Rhinopterids. *Rhinoptera marginata* also has very low fecundity (possibly only one pup per litter). Heavy fishing pressure has caused declines in other Rhinopterids (for example, *R. brasiliensis* is thought to have been extirpated from southern Brazil as a result of intensive inshore fisheries). Although this species is still caught off western Africa, given its low fecundity, schooling behaviour and continuing high levels of exploitation it is inferred that this species is also being negatively impacted. It is currently assessed as Near Threatened (close to meeting the criteria for VU A2d+A3d), and assessment and monitoring of catch levels and population trends will be required.

FAMILY **MOBULIDAE**

Giant Devilray

Mobula mobular (Bonnaterre, 1788)

Red List assessment **Global: Endangered A4d** (Notarbartolo di Sciara, G., Serena, F. and Mancusi, C. 2006)

Rationale This huge plankton-feeding ray is the largest of the genus *Mobula*. It has a very low reproductive capacity (giving birth to a single huge pup at unknown intervals) and its geographic range is probably limited to offshore deepwaters of the Mediterranean (and possibly adjoining North Atlantic waters). It is taken as bycatch on longlines, in swordfish pelagic driftnets, purse seines, trawls and in fixed tuna traps, to unsustainable levels. Given high bycatch mortality, its limited reproductive capacity and range, *Mobula mobular* is listed as Endangered A4d. More research is needed on its exploitation, distribution, biology and ecology. In particular, catch data are required, and stock assessments should be undertaken where the species is fished.

8.3 Chimaeras

ORDER **CHIMAERIFORMES**

FAMILY **RHINOCHIMAERIDAE**

Smallspine Spookfish

Harriotta haeckeli (Karrer, 1972)

Red List assessment **Global: Least Concern** (Dagit, D.D. 2006)

Rationale At present, *Harriotta haeckeli* is known from only a few specimens from the Northwest Atlantic off southern Greenland, the Eastern Central Atlantic off the Canary Islands and the Southwest Pacific off New Zealand. A benthic species occurring on deepwater slopes and troughs at depths of 1,114 to 2,002m around New Zealand and 1,970 to 2,603m in the Atlantic. Recent deep water trawling around New Zealand has revealed a number of specimens from that region, whereas capture records from the Atlantic are rare. The species may be more abundant and widespread in deeper water, particularly in regions where surveys and deepwater fishing efforts are limited at present. Nothing is known of biology, ecology, reproduction or population structure and size. Not known to be commercially fished but may be caught as bycatch in deepwater bottom trawls. Current evidence suggests this is a rare species and populations may be threatened in the future by deepwater fishing operations, particularly if they continue to expand globally.

Narrownosed Chimaera

Harriotta raleighana (Goode and Bean, 1895)

Red List assessment **Global: Data Deficient** (Dagit, D.D. 2006)

Rationale This species appears to be the only chimaeroid with a widespread, global distribution. Occurs in deep waters of the continental slopes in depths of 380 to 2,600m in both the Atlantic and Pacific Oceans. Also occurs in the Indian Ocean (off southern Australia). They seem to be somewhat common in the Northern Atlantic, Northwest Pacific and Southwest Pacific, however, very little is known about the biology of this species. They are oviparous but nothing is known of spawning and reproduction and very few juveniles have been collected. As with many other chimaeroids, adults and juveniles may occupy different habitats. Known to be captured in deepwater research trawls and as bycatch in deepwater commercial trawls. Data from the South Tasman Rise Trawl Fishery (south of Tasmania, Australia) indicates that this species is a negligible component of bycatch. Increased deepwater trawl fisheries could pose a potential threat to habitats and populations in the future. At present this species appears to be widespread geographically and bathymetrically and relatively abundant, with no

immediate threats to the population, and is thus classified as Least Concern. However, bycatch data from other fisheries and the monitoring of expanding deepwater fisheries are required.

Straightnose Rabbitfish

Rhinochimaera atlantica (Holt and Byrne, 1909)

Red List assessment **Global: Least Concern** (Dagit, D.D. and Compagno, L.J.V. 2006)

Rationale This deepwater species appears to be widespread throughout the Atlantic at depths of ~500 to 1,500m and may be more widespread in deeper waters than is presently known. Nothing is known with regard to behaviour, feeding and reproduction, and no information is available on population structure. Not known to be commercially exploited, and although it is not currently reported as bycatch, this species is known to occasionally occur in deepwater research trawls and almost certainly occurs as bycatch in some deepwater fishing activities. At present it is likely the species is most abundant beyond the range of most deepwater commercial fisheries. Given its wide distribution and depth range, the species is assessed as Least Concern, although it could be potentially threatened in the future by expanding deepwater demersal fisheries. Collection of data on size, sex and depth is recommended to improve understanding of population size and structure and life history. Furthermore, the monitoring of bycatch should be undertaken.

FAMILY **CHIMAERIDAE**

Rabbitfish

Chimaera monstrosa Linnaeus, 1758

Red List assessment **Global: Near Threatened** (Dagit,D.D., Hareide, N. and Clò, S. 2007)

Rationale This species is widespread throughout the Northeast Atlantic and capture records seem to indicate *Chimaera monstrosa* is fairly abundant throughout its range. Among chimaeroid fishes this is one of the better known and most studied species, however, data on population structure, biology and ecology is still limited. Appears to prefer upper continental slope habitats at depths of 300 to 500m with a reported maximum depth of 1,663m and summer inshore migrations to 40 to 100m have been observed in some areas. Oviparous with apparent spawning season in spring and summer. This species' unproductive life-history characteristics (reaches maturity at 11.2 to 13.4 years; longevity is 26 to 30 years) likely render it vulnerable to exploitation and population depletion, like many deepwater chondrichthyans. *Chimaera monstrosa* is taken in deepwater trawl fisheries in the Northeast Atlantic and is either landed as byproduct or is a component of discarded bycatch. There is a continuing trend of increasing deepwater fishing activities in the North Atlantic, while regulation is often lagging. *Chimaera monstrosa* had the largest discard biomass of all chondrichthyans in a study of the discards of the French bottom trawl fleet from the South Rockall Bank to the northerly slopes of the Wyville-Thomson Ridge and constitutes 13 to 15% of the discards in deepwater trawlers operating off the West Coast of Ireland. Survival rates of discards are likely low given the depths of capture and the fact that many discards are undersized individuals or are unmarketable individuals (suggesting damage). Increasing interest in the production of dietary supplements for human consumption derived from the liver oil of this species suggests that exploitation is likely to increase. Given that this species' preferred depth range is entirely within the range of current fishing activity, its unproductive life-history characteristics, and the suspected high rate of mortality to discards, it is assessed as Near Threatened on the basis of a future suspected decline of >20% in three generations, leading to concern that it may soon qualify for Vulnerable A3bd. Further information is required on deepwater fishing activities (including catch and bycatch levels, effort and trend monitoring). The ban on deepwater trawling below 1,000m in the Mediterranean may afford this species some protection, but given that its preferred depth range is entirely within the range of fisheries in this region, both present and future fishing pressure is likely unsustainable for *C. monstrosa*.

Atlantic Chimaera

Hydrolagus affinis (Brito Capello, 1868)

Red List assessment **Global: Least Concern** (Dagit, D.D. and Clarke, M.W. 2007)

Rationale A deepwater slope, seamount and seaplain-dwelling fish reported at depths of 300 to 2,410 m, most commonly found below 1,000m. This species appears to be widespread in the northern Atlantic. Almost nothing is known of population size, biology and reproduction in this species and most captures are large adults near or >100cm TL. Likely a slow-growing species with low fecundity. Not commonly captured except in deepwater research trawls and occasionally as bycatch in deepwater commercial trawls. Potentially threatened by emerging deepwater commercial trawl fisheries in the North Atlantic. However, this species is present deeper than the main fisheries operating within its range and it is therefore considered Least Concern. Furthermore, it may be distributed at greater depths than currently reported offering a deep refuge from fishing pressure. Although it is considered unlikely that fisheries will ever target this species due to its low abundance, study of population size, and age and growth is highly recommended as this may be a slow-growing species that could be affected by bycatch.

Coelho

Hydrolagus lusitanicus (Moura, Figueiredo, Bordalo-Machado, Almeida and Gordo, 2005)

Red List assessment **Global: Data Deficient** (Valenti, S.V. and Couzens, G. 2008)

Rationale A recently described species of deepwater chimaera, from the continental slope of Portugal. This species is known only from 22 specimens collected by commercial longline vessels at depths of ~1,600m on the Portuguese continental slope. It is an infrequent bycatch of the directed Portuguese longline fishery for black scabbard fish (*Aphanopus carbo*) with a bycatch of deepwater sharks. This fishery generally operates at depths of 800–1,200m and is thought to only occasionally fish within this species' range (>1,500m). This species is discarded at sea if captured and therefore no information is available on the numbers caught. This species is most closely related to *H. affinis*, which occurs to depths of 2,410m in the North Atlantic (most commonly below 1,000m) and *Hydrolagus lusitanicus* may also be deeply distributed, with refuge below the range of current fishing pressure. At present, insufficient information is available to assess this recently described species beyond Data Deficient. However, further information on this species' full range and abundance is needed to determine the threat posed by deepwater fisheries. Given that discard survivorship is most likely very low for such a deep-living species and it may share the limiting life-history characteristics of other deepwater elasmobranchs, population trends should be monitored, particularly as deepwater fisheries expand to exploit greater depths in the Northeast Atlantic. This assessment should be re-visited as soon as further data become available.

Large-eyed Rabbitfish

Hydrolagus mirabilis (Collett, 1904)

Red List assessment **Global: Near Threatened** (Dagit, D.D., Compagno, L.J.V. and Clarke, M.W. 2007)

Rationale A poorly known deepwater slope species occurring at depths of 450 to 1,933m. Known most commonly from the Northeast Atlantic on deep slopes off Iceland, Ireland, Hebrides and Scotland but also reported from the Eastern Central Atlantic off north-western Africa and recently from Namibia. The species may be more widespread in the Atlantic than previously reported. Also known from the Gulf of Mexico and Suriname. It is likely that this species is widespread throughout the northern Atlantic and may be most abundant at deeper depths. Not presently commercially fished and no data exist on bycatch but potentially threatened by increased deepwater fishing efforts. Nothing is known of population structure, ecology and reproduction although it is likely this species shares similar life-history traits with other *Hydrolagus* species (e.g., *H. colliei*). It is recommended that data be collected from all incidental captures to improve understanding of this species. It has a shallower depth range than its congeners and is therefore more vulnerable to deepwater fisheries operating within its range in the Northeast Atlantic. Heavy fishing pressure within its sampled depth range

in the Eastern Atlantic gives cause for suspected past and future declines. A precautionary assessment of Near Threatened is assigned on this basis, due to concern that it may qualify for Vulnerable A4d.

Pale Chimaera

Hydrolagus pallidus Hardy and Stehmann, 1990

Red List assessment **Global: Least Concern** (Dagit, D.D. and Clarke, M.W. 2007)

Rationale A large species recognised as distinct from *Hydrolagus affinis* only within the last 15 years. Reported on deepwater slopes and troughs at depths of 1,200 to 2,075m in the Northern Atlantic, and may occur at greater depths. Most common in the Northeast Atlantic, it is also known from the Canary Islands, the Mid-Atlantic Ridge and is probably widespread throughout the north Atlantic, including the Northwest Atlantic, and may be more abundant at depths below 2,000 m, offering it refuge from current fishing activity. Its range overlaps that of *H. affinis* and, although nothing is known of reproductive biology or population structure, life-history characteristics are likewise probably very similar (probably a slow-growing species with low fecundity) to *H. affinis*. *Hydrolagus pallidus* is not known to be commercially targeted or utilised. This species faces a potential threat as bycatch in deepwater trawl and longline fisheries, particularly as deepwater fisheries expand to greater depths and alternative species are targeted throughout the northern Atlantic. However it is considered that this species occurs deeper than current fisheries, and that it will never be targeted because its abundance is too low. Furthermore, it may be distributed at greater depths than currently reported, offering a deep refuge from fishing pressure. Further research, particularly the collection of life-history data is required. Careful monitoring of catches is recommended, considering its likely vulnerable life-history characteristics.

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Appendix I: Threatened status of chondrichthyan fishes in the Northeast Atlantic region

Scientific name	Common name	IUCN Red List assessment (year submitted)		Species account page number
		Global assessment	Regional assessment	
Squatina squatina	Angel shark	**CR** (2006)		35
Pristis pectinata	Smalltooth sawfish	**CR** (2006)		48
Pristis pristis	Common sawfish	**CR** (2000)		49
Dipturus batis	Common skate	**CR** (2006)		53
Rhinobatos cemiculus	Blackchin guitarfish	**EN** (2007)		49
Rhinobatos rhinobatos	Common guitarfish	**EN** (2007)		49
Raja undulata	Undulate ray	**EN** (2008)		59
Rostroraja alba	White skate	**EN** (2006)	**CR** (2006)	61
Mobula mobular	Giant devilray	**EN** (2006)		65
Sphyrna lewini	Scalloped hammerhead	**EN** (in prep)		48
Squalus acanthias	Spurdog or spiny dogfish	**VU** (2006)	**CR** (2006)	25
Centrophorus granulosus	Gulper shark	**VU** (2006)	**CR** (2006)	26
Centrophorus lusitanicus	Lowfin gulper shark	**VU** (2008)		27
Centrophorus squamosus	Leafscale gulper shark	**VU** (2003)	**EN** (in prep)	27
Oxynotus centrina	Angular rough shark	**VU** (2007)		34
Amblyraja radiata	Starry ray	**VU** (2008)	**LC** (2008)	53
Leucoraja circularis	Sandy ray	**VU** (2008)		55
Gymnura altavela	Spiny butterfly ray	**VU** (2008)		63
Odontaspis ferox	Smalltooth sand tiger	**VU** (in prep)		36
Alopias superciliosus	Bigeye thresher	**VU** (2008)		37
Alopias vulpinus	Thresher shark	**VU** (2008)	**NT** (2008)	37
Cetorhinus maximus	Basking shark	**VU** (2000)	**EN** (2000)	38
Carcharodon carcharias	White shark	**VU** (2000)		38
Isurus oxyrinchus	Shortfin mako	**VU** (2008)		39
Isurus paucus	Longfin mako	**VU** (2006)		39
Lamna nasus	Porbeagle	**VU** (2006)	**CR** (2006)	40
Galeorhinus galeus	Tope shark	**VU** (2006)	**DD** (2006)	43
Carcharhinus longimanus	Oceanic whitetip shark	**VU** (2006)		45
Carcharhinus obscurus	Dusky shark	**VU** (in prep)		46
Carcharhinus plumbeus	Sandbar shark	**VU** (in prep)		46
Chimaera monstrosa	Rabbitfish	**NT** (2007)		66
Hydrolagus mirabilis	Large-eyed rabbitfish	**NT** (2007)		67
Chlamydoselachus anguineus	Frilled shark	**NT** (2003)		24
Heptranchias perlo	Sharpnose sevengill shark	**NT** (2003)		24
Hexanchus griseus	Bluntnose sixgill shark	**NT** (2003)		24
Centroscymnus coelolepis	Portuguese dogfish	**NT** (2003)	**EN** (in prep)	31
Somniosus microcephalus	Greenland shark	**NT** (2006)		32
Bathyraja spinicauda	Spinytail skate	**NT** (2008)	**LC** (2008)	51
Dipturus nidarosiensis	Norwegian skate	**NT** (2008)		54
Dipturus oxyrinchus	Longnose skate	**NT** (2007)		54
Leucoraja fullonica	Shagreen ray	**NT** (2008)		55
Raja brachyura	Blonde ray	**NT** (2008)		57
Raja clavata	Thornback ray	**NT** (2000)		58
Raja microocellata	Smalleyed ray	**NT** (2000)		58
Rhinoptera marginata	Lusitanian cownose ray	**NT** (2008)		64
Galeus atlanticus	Atlantic catshark	**NT** (2007)		41
Scyliorhinus stellaris	Nursehound	**NT** (2008)		43
Carcharhinus falciformis	Silky shark	**NT** (2008)		45
Galeocerdo cuvier	Tiger shark	**NT** (2000)		47
Prionace glauca	Blue shark	**NT** (2000)		47
Sphyrna zygaena	Smooth hammerhead	**NT** (2000)		48
Harriotta haeckeli	Smallspine spookfish	**LC** (2006)		65
Rhinochimaera atlantica	Straightnose rabbitfish	**LC** (2006)		66
Hydrolagus affinis	Atlantic chimaera	**LC** (2007)		67
Hydrolagus pallidus	Pale chimaera	**LC** (2007)		68
Deania calceus	Birdbeak dogfish	**LC** (2003)	**VU** (in prep)	28
Deania profundora	Arrowhead dogfish	**LC** (2008)		29
Centroscyllium fabricii	Black dogfish	**LC** (2008)	**NT** (2008)	29
Etmopterus pusillus	Smooth lantern shark	**LC** (2008)		30

Appendix I: Threatened status of chondrichthyan fishes in the Northeast Atlantic region, cont'd.

Scientific name	Common name	IUCN Red List assessment (year submitted)		Species account page number
		Global assessment	Regional assessment	
Etmopterus spinax	Velvet belly	**LC** (2008)	**NT** (2008)	30
Centroscymnus owstoni	Roughskin dogfish	**LC** (2003)		31
Centroselachus crepidater	Longnose velvet dogfish	**LC** (2003)		31
Squaliolus laticaudus	Spined pygmy shark	**LC** (2006)		35
Bathyraja pallida	Pallid skate	**LC** (2007)		51
Bathyraja richardsoni	Richardson's skate	**LC** (2007)		51
Amblyraja hyperborea	Arctic skate	**LC** (2007)		52
Amblyraja jenseni	Jensen's skate	**LC** (2008)		52
Dipturus lintea	Sail ray	**LC** (2008)		54
Leucoraja naevus	Cuckoo ray	**LC** (2008)		56
Malacoraja kreffti	Krefft's skate	**LC** (2007)		56
Malacoraja spinacidermis	Roughskin skate	**LC** (2007)		56
Raja miraletus	Brown ray	**LC** (2008)		59
Raja montagui	Spotted ray	**LC** (2007)		59
Rajella bathyphila	Deepwater ray	**LC** (2008)		60
Rajella bigelowi	Bigelow's ray	**LC** (2008)		60
Rajella fyllae	Round ray	**LC** (2008)		60
Dasyatis centroura	Roughtail stingray	**LC** (2007)		62
Pteroplatytrygon violacea	Pelagic stingray	**LC** (2008)		62
Mitsukurina owstoni	Goblin shark	**LC** (2004)		37
Apristurus microps	Smalleye catshark	**LC** (2004)		41
Galeus melastomus	Blackmouth catshark	**LC** (2008)		42
Galeus murinus	Mouse catshark	**LC** (2008)		42
Scyliorhinus canicula	Smallspotted catshark	**LC** (2008)		42
Mustelus asterias	Starry smoothhound	**LC** (2000)		44
Mustelus mustelus	Smoothhound	**LC** (2000)	**DD** (in prep)	44
Harriotta raleighana	Narrow-nosed chimaera	**DD** (2006)		65
Hydrolagus lusitanicus	(Portuguese: Coelho)	**DD** (2008)		67
Hexanchus nakamurai	Bigeyed sixgill shark	**DD** (2008)		24
Echinorhinus brucus	Bramble shark	**DD** (2003)		25
Squalus blainvillei	Longnose spurdog	**DD** (2008)		26
Squalus megalops	Shortnose spurdog	**DD** (2003)		26
Centrophorus uyato	Little gulper shark	**DD** (2003)		28
Deania hystricosa	Rough longnose dogfish	**DD** (2008)		29
Etmopterus princeps	Great lantern shark	**DD** (2006)		30
Scymnodalatias garricki	Azores dogfish	**DD** (2008)		32
Scymnodon ringens	Knifetooth dogfish	**DD** (2008)		32
Somniosus rostratus	Little sleeper shark	**DD** (2008)		33
Zameus squamulosus	Velvet dogfish	**DD** (2006)		33
Oxynotus paradoxus	Sailfin roughshark	**DD** (2008)		34
Dalatias licha	Kitefin shark	**DD** (2000)	**VU** (in prep)	34
Torpedo marmorata	Marbled electric ray	**DD** (2008)		50
Torpedo nobiliana	Great torpedo ray	**DD** (2008)		50
Torpedo torpedo	Common torpedo ray	**DD** (2008)		51
Neoraja caerulea	Blue pygmy skate	**DD** (2008)		57
Neoraja iberica	Iberian pygmy skate	**DD** (2008)		57
Rajella kukujevi	Mid-Atlantic skate	**DD** (2008)		61
Dasyatis pastinaca	Common stingray	**DD** (2008)	**NT** (2008)	62
Myliobatis aquila	Common eagle ray	**DD** (2008)		63
Pteromylaeus bovinus	Bull ray	**DD** (2006)		64
Ginglymostoma cirratum	Nurse shark	**DD** (2006)		36
Apristurus aphyodes	White ghost catshark	**DD** (2004)		40
Apristurus laurussonii	Iceland catshark	**DD** (2007)		40
Apristurus manis	Ghost catshark	**DD** (2004)		41
Apristurus melanoasper	Black roughscale catshark	**DD** (2008)		41
Pseudotriakis microdon	False catshark	**DD** (2004)		43
Mustelus punctulatus	Blackspotted smoothhound	**DD** (2008)		45
Breviraja sp.		**NE**		-
Dipturus sp.		**NE**		-

Footnotes:
Red List assessments submitted in 2008 are pending final consistency check by the IUCN Red List Unit and should therefore be considered provisional until they are published online in 2009.
Taxonomy follows Compagno (2005).

Appendix II: Summary of the IUCN's Red List Categories and Criteria Version 3.1

Summary of the five criteria (A–E) used to evaluate if a species belongs in a category of threat (Critically Endangered, Endangered or Vulnerable)

Use any of the criteria A–E	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following: **(a)** direct observation **(b)** an index of abundance appropriate to the taxon **(c)** a decline in AOO, EOO and/or habitat quality **(d)** actual or potential levels of exploitation. **(e)** effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.			
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under A1.			
A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on (a) to (e) under A1.			
B. Geographic range in the form of either B1 (extent or occurrence) AND/OR B2 (area or occupancy)			
B1. Extent of occurrence	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following:			
(a) Severely fragmented, **OR** number of locations.	= 1	≤ 5	≤ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future)	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a) (i) # mature individuals in each subpopulation.	< 50	< 250	< 1,000
(a) (ii) or % individuals in one sub-population at least.	90%	95%	100%
(b) extreme fluctuations in the number of mature individuals.			
D. Very small or restricted population			
Either:			
Number of mature individuals	≤ 50	≤ 250	**D1.** ≤ 1,000
			AND/OR
	Restricted area of occupancy	**D2.**	AOO < 20 km² or # locations ≤ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (100 years max)	≥ 20% in 20 years or 5 generations (100 years max)	≥ 10% in 100 years

Source: Standards and Petitions Working Group of the IUCN SSC Biodiversity Assessments Sub-Committee 2008; http://www.iucnredlist.org/documents/redlist_guidelines_v1223290226.pdf

Appendix III: Workshop Participants

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Key
NEA = Northeast Atlantic Region
NWA = Northwest Atlantic Region
MED = Mediterranean Region

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The Conservation Status of Northeast Atlantic Chondrichthyans

Report of the IUCN Shark Specialist Group Northeast Atlantic Regional Red List Workshop Peterborough, UK, 13–15 February 2006

Compiled and edited by
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Executive Summary

This report describes the results of a regional Red List Workshop held at the Joint Nature Conservation Committee (JNCC), Peterborough, UK, in 2006, as a contribution towards the IUCN Species Survival Commission's Shark Specialist Group's 'Global Shark Red List Assessment'. The purpose of the workshop was to assess the conservation status of the chondrichthyan fishes (sharks, rays and chimaeras) of the Northeast Atlantic region (FAO Major Fishery Area 27). This region is bordered by some of the largest and most important chondrichthyan fishing nations in the world, including Spain, France, the UK and Portugal. A regional overview of fisheries, utilisation, trade, management and conservation is also presented.

The Northeast Atlantic chondrichthyan fauna is moderately diverse, with an estimated 118 species (approximately 11% of total living chondrichthyans). These occur within a huge range of habitats, including the deep-sea, open oceans, and coastal waters from the Arctic to the Mediterranean.

During the workshop, experts collated information and prepared 74 global and 17 regional species assessments, thereby completing the Red Listing process for the described chondrichthyan fauna of the Northeast Atlantic (two undescribed species were not assessed). These assessments were agreed by consensus throughout the SSG network prior to their submission to IUCN Red List of Threatened Species™.

Results show that 26% of Northeast Atlantic chondrichthyans are threatened within the region (7% Critically Endangered, 7% Endangered, 12% Vulnerable). A further 20% are Near Threatened, 27% Least Concern and 27% are Data Deficient. This is a significantly higher level of threat than that for the whole taxonomic group, worldwide. Globally, of the 1, 038 species of chondrichthyans assessed, 18% are threatened (3% CR, 4% EN, 11% VU), 13% are Near Threatened, 23% Least Concern and 46% Data Deficient.

Species accounts are presented for all known sharks, batoids and chimaeras of the Northeast Atlantic region. Each account provides the global and/or regional IUCN Red List Category and summarises the documentation supporting the Red List assessment.

The report's recommendations are intended to complement and enhance existing scientific advice regarding the conservation and management of Northeast Atlantic chondrichthyans. It is envisaged that the information contained within this report will facilitate the further development of research, conservation and management priorities for the region.

The IUCN Species Survival Commission Shark Specialist Group (SSG) was established in 1991 to promote the sustainable use, wise management and conservation of the world's chondrichthyan fishes. There are 180 SSG members from 90 countries distributed among 12 ocean-region subgroups, all of whom are actively involved in chondrichthyan research and fisheries management, marine conservation or policy development and implementation. The SSG has recently concluded its ten year Global Shark Red List Assessment programme by completing Red List assessments for every chondrichthyan species described in scientific literature before the end of 2007. This is the first complete assessment of all members of a major marine taxonomic group, and will provide an important baseline for monitoring the global health of marine species and ecosystems.