SHARKS IN THE BALTIC

Distribution, use and conservation of cartilaginous fishes in the Baltic Sea

SHARK ALLIANCE

Contents and authors

THORNY SKATE, AN EGG-CASE OF THE STARRY SKATE, SPURDOG AT FISH MARKET © HEIKE ZIDOWITZ

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Thanks go to the following: Marc Dando, Heino Fock, Boris Frentzel-Beyme, Claudine Gibson, Eugenijus Leonavicius, Andy Murch, Christian Pusch, Matthias Stehmann, Charlott Stenberg, Susanne Stolpe and Dietmar Weber.

Introduction

A matter of survival

Whereas the brackish waters of the Baltic Sea are known to be limiting in terms of the distribution and diversity of all marine life, the region is home to sharks, rays (including skates) and chimaeras, collectively known as cartilaginous fishes. More than 30 such species have been recorded in the Baltic, although many are considered rare or vagrants.

This report reviews and analyses the available information on the presence, use and conservation of Baltic cartilaginous fishes. The aim is to fill existing knowledge gaps and inform management so as to ensure the survival of these especially vulnerable species.

WESLEY FERNANDES

Geographic and hydrographic description

The region

The Baltic Sea is the largest semi-enclosed brackish body of water in the world [48]. Surrounded almost entirely by land, it is connected to the North Sea (and hence the North Atlantic) by narrow straits: the Kattegat and Skagerrak, which are located between Denmark and the southern part of the Scandinavian peninsula. It is bordered by Denmark, Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland and Germany, while Norway is situated on the transitional waters of the Skagerrak, at the mouth of the North Sea.

The area under review can be sub-divided into the following geographic areas: Skagerrak, Kattegat, the Sound, the Belts, Western Baltic, Baltic Proper, Gulf of Riga, Gulf of Finland, Archipelago Sea, Bothnian Sea, and Bothnian Bay (see Table 1).

There is some controversy with regard to the borders of the Baltic Sea. Some authors include the Kattegat as part of the Baltic Sea, while others exclude it and set the border at the Belts and Sound areas (Danish Straits). The International Council for the Exploration of the Sea (ICES) refers to the Kattegat and Skagerrak together as a "transitional area". The Helsinki Commission (HELCOM) includes the Kattegat as part of the Baltic Sea, but excludes the Skagerrak. For the purposes of this report, so as to better reflect the bio-geographic background of species distribution, the Kattegat is considered part of the Baltic Sea and the Skagerrak with its deep-water trench (the Norwegian Deep) is a transitional area to the region under review.

The Baltic Sea has a water volume of 21,600km^3 [50] and covers an area of 413,000km^2 [50], with an average depth of 52 metres (m) [50]. Its deepest part (459m) lies at Landssort, between the Swedish islands of Gotland and Gotska Sandön, in the Baltic Proper [74]. The Sea spans from Germany's Flensburg Fjord eastward through the Gulf of Finland to St Petersburg, Russia. Its southernmost extension is the Pomeranian in the Polish town of Swinoujscie, while the northernmost point is found in the Bothnian Bay on the Swedish-Finnish border [75]. During normal winters, ice covers about 45% of the Baltic's surface area (approximately 200,000km^2) [34], including Bothnian Bay, the Gulf of Finland, the Bothnian Sea, the Archipelgo Sea, and the Gulf of Riga.

The Skagerrak is roughly triangular in shape, measuring 240km long and between 80 and 140km wide [76]. It deepens towards the Norwegian coast to more than 700m at the Norwegian Deep.

Hydrography and topography of the Baltic Sea

It takes 25 to 35 years to fully exchange the waters of the Baltic Sea [50]. Exchange from the North Sea through the Skagerrak, Kattegat and Danish Straits (the Sound

Figure 1: Map of the Baltic Sea and adjacent waters, showing the ICES Area names and sub-divisions (IIIb is also called sub-division 23).

Data source: Map ICES 2004 Advisory Committee on Ecosystems [36].

TABLE 1: Geographic sub-divisions of the Baltic Sea with their ICES Area names and salinity value of near-surface waters in practical salinity units (PSU).

Geographic name	ICES Area	Salinity (PSU)
Skagerrak	IIIan	30–28
Kattegat	IIIas	28–18
The Sound	IIIb (sub-area 23)	18–9
The Belts	IIIc 22	18–9
Western Baltic	Partly IIIc 22, IIIc and IIId24	18–7
Baltic Proper	IIId 25, 26, 27, 28, partly 29	9–6
Gulf of Riga	Partly IIId 28	6–4
Gulf of Finland	IIId 32	6–3
Archipelago Sea	Partly IIId 29	6–5
Bothnian Sea	IIId 30	6–4
Bothnian Bay	IIId 31	4–1

Data source: Salinity taken from Schramm 1996 [65]

and Belts area between the Danish islands) and into the central Baltic Sea, and vice versa, is slowed by a narrow mixing zone. The high-density seawater of the North Sea flows in towards the bottom layers of the Baltic Sea, while lower density, low-salinity water leaves the Baltic Sea near the surface [50].

Inflow from rivers and precipitation creates a freshwater surplus in the Baltic, leading to greater freshwater exit (950km^3 per year) than seawater entry (470km^3 per year) [50]. As a result, the Baltic Sea is brackish with a horizontal gradient of salinity, declining from western to eastern parts and southern to northern parts. The vertical circulation, however, is restricted by layering caused by the density differences in sea and freshwater that create a distinct border between waters of different salinity and density [50]. Deep water can only be exchanged by horizontal water influx, which is impeded by topographic barriers. For example, the Darss Sill (with a water depth of only 18m) inhibits rapid eastward transport of highly saline and oxygenated water. During periods of stagnation, decomposition of organic material trapped in deep water can cause local oxygen depletion, resulting in mass mortality of aquatic life. As a result, most Baltic fishes live near the surface or in shallower, coastal waters. Human-induced eutrophication (nutrient enrichment resulting in the proliferation of oxygen-depleting plant life) can further stress the fishes in this challenging environment. Eutrophication has been blamed for cases of decline in bony fish populations and biodiversity [41] and very likely affects cartilaginous fishes as well.

The mixing of Baltic water layers is mainly forced by meteorological influences such as wind and heat exchange. Baltic currents are highly variable and primarily driven by wind, horizontal density gradients, and differences in sea level [20]. Tidal forces in the Baltic Sea are minimal.

In addition to regular water exchanges, strong influx events occasionally occur in the Baltic. These irregular phenomena usually take place in the late autumn and winter and depend on atmospheric circulation and a particular sequence of wind and resulting sea level changes. Until the 1980s, these events occurred on average every four to five years [51], but have since happened only once every 10 years (1983, 1993, 2003) [61]. These special hydrographical conditions limit the distribution of Baltic flora and fauna, particularly around the Danish Straits. Only euryhaline organisms (those capable of tolerating a wide range of salinity) and other well-adapted species survive under such highly variable environmental conditions.

The range of species favouring high-salinity water, including most cartilaginous fishes, depends both on the intensity of eastward currents and the strength of the last inflow event.

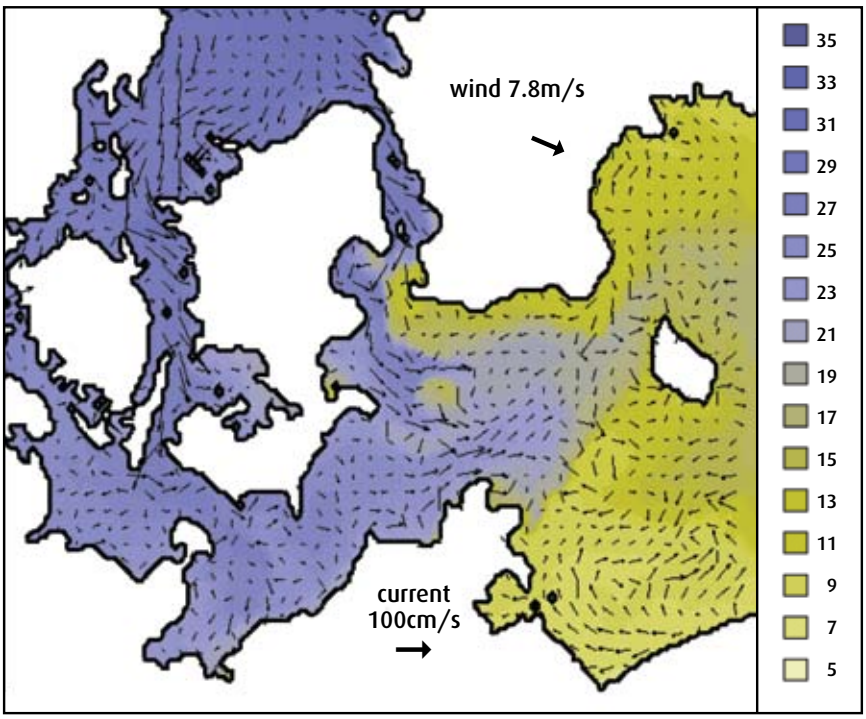


Figure 2: Salinity and current direction of the bottom layers of water in the western Baltic Sea area on 10 November 1996.

Data source: SALPRO research project.
See: www.io-warnemuende.de

Species descriptions

Common species of the Skagerrak, Kattegat and Western Baltic

For further information on species' Red List and/or HELCOM status, see Appendix 1.

Starry or thorny skate *Amblyraja radiata* (Donovan, 1808)

DESCRIPTION: Short snout; upper surface very rough; solid thornlets scattered all over disc and tail, thorns typically ribbed and with stellate margin [67]. Length up to 90cm, although not more than 60cm in the Baltic area [67].

BALTIC DISTRIBUTION: Skagerrak; Kattegat; Danish Straits.

HABITAT: Benthic, mainly on sandy and muddy bottoms; down to 1,000m, but mainly at 50-100m [71].

PREY: Crabs, prawns, sand eels and other small fishes [59], also cephalopods, worms and amphipods; diet changes with size [60].

REPRODUCTION: Maturity at about 40cm in the North Sea and between 60–75cm in higher latitudes [53]. Egg-laying with egg cases found throughout the year [69]; juveniles caught all year round [60]. Young hatch at about 10cm long [72] after four months' development [53], although this period may be much longer in colder regions [60].

FISHERIES AND USES: Forms a considerable proportion of rays and skates landed by trawlers for human consumption, including European markets [71].

TABLE 2: Alphabetical list of all 31 recorded cartilaginous fish species found in the Baltic Sea (including the Skagerrak) with distribution within the area.

Scientific name	Common name	Distribution/area
Alopias vulpinus	Common thresher shark	Found occasionally in Skagerrak and Kattegat
Amblyraja radiata	Starry or thorny skate	Skagerrak; Kattegat; Danish Straits
Carcharhinus longimanus	Oceanic whitetip shark	Single record in Swedish Gullmarsfjord (2004) [68]
Cetorhinus maximus	Basking shark	Skagerrak; Kattegat [15]
Chimaera monstrosa	Ratfish, rabbit fish, ghost shark	Skagerrak (especially Norwegian Deep)
Dasyatis pastinaca	Common stingray	Skagerrak; Kattegat; found occasionally in Danish Straits
Dipturus batis	Common skate, blue ray	Skagerrak; Kattegat; found occasionally in Western Baltic
Dipturus linteus	Sailray	Skagerrak
Dipturus oxyrinchus	Longnose skate	Skagerrak
Echinorhinus brucus	Bramble shark	Skagerrak (Norwegian Deep)[18]
Etmopterus spinax	Velvet belly shark	Skagerrak (Norwegian Deep)
Galeorhinus galeus	Tope, school shark	Skagerrak; Kattegat
Galeus melastomus	Blackmouth dogfish Blackmouth catshark	Skagerrak; vagrant into Kattegat
Hexanchus griseus	Bluntnose sixgill shark	Skagerrak, vagrant into Kattegat
Lamna nasus	Porbeagle	Skagerrak; Kattegat; Danish Straits; vagrant into Western Baltic, up to Åland Islands [49]
Leucoraja circularis	Sandy ray	Skagerrak
Leucoraja fullonica	Shagreen ray	Skagerrak; single record in the Belts (1890) [16]
Mustelus asterias	Starry smoothhound	Skagerrak
Oxynotus centrina	Angular roughshark	Rare in Skagerrak (Norwegian Deep); single record in Danish shallow coastal water (1972) [44]
Prionace glauca	Blue shark	Skagerrak; rarely up to Kattegat; vagrant into Western Baltic
Raja clavata	Thornback ray	Skagerrak; Kattegat; Danish Straits, found occasionally in Western Baltic
Raja montagui	Spotted ray	Rare in Skagerrak [33]; rare in Kattegat [33]
Rajella fyllae	Round ray	Skagerrak (Norwegian Deep)
Scyliorhinus canicula	Small-spotted catshark, Lesser spotted dogfish	Skagerrak; Kattegat; Danish Straits
Scyliorhinus stellaris	Nursehound, greater spotted dogfish	Rare in Skagerrak, two records on Swedish coast (Bohuslän) in 1875 and 1944 [44]; single record in Kattegat [15]
Somniosus microcephalus	Greenland shark	Rare in Skagerrak; rare in Kattegat [12]
Sphyrna zygaena	Smooth hammerhead shark	Single record in Kattegat (1937) [71]
Squalus acanthias	Spurdog, spiny dogfish, piked dogfish	Skagerrak; Kattegat; Danish Straits; Western Baltic, recorded up to German island of Rügen [15] and eastern Swedish coast of Skåne [14]. Reported in Archipelago Sea (1961) [44].
Squatina squatina	Common angel shark	Skagerrak; Kattegat; found occasionally in Western Baltic
Torpedo marmorata	Marbled electric ray	Rare in Skagerrak; rare in Kattegat [71]
Torpedo nobiliana	Electric ray	Rare in Skagerrak

Data source: George 2003 [29] and Møller & Nielsen 2000 [52], except where indicated.

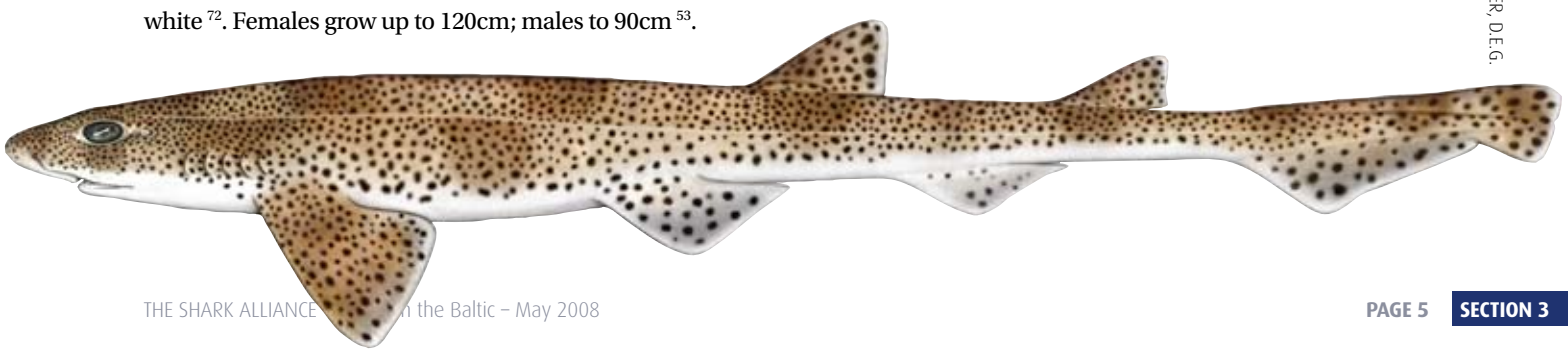
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Vulnerable Globally (in prep. 2008).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no limits for the Baltic. The EU has largest share of an international thorny skate catch limit adopted in 2004 by the Northwest Atlantic Fisheries Organization (NAFO). The NAFO limit is currently the only international catch restriction for a cartilaginous fish.

Small-spotted catshark, lesser spotted dogfish *Scyliorhinus canicula* (Linnaeus, 1758)

DESCRIPTION: Slender body covered with numerous small dark spots on light background; up to nine dusky saddles [10]. Greatly expanded nasal flaps reach mouth [10]. Can grow up to 100cm in length in the North Sea, but only 60cm in the Mediterranean [10].
BALTIC DISTRIBUTION: Skagerrak; Kattegat; Danish Straits.
HABITAT: Benthic, over gravelly, sandy or muddy bottom; from shallow water up to 550m, but mainly from 50 to 250m on the continental shelf [66].
PREY: Feeds on small bottom invertebrates (crustaceans, gastropods, cephalopods, worms) and fishes [10].
REPRODUCTION: Maturity at 39cm in males and 44cm in females [10]. Egg-laying; 90 to 115 egg cases per year [66], deposited in pairs all year round on seaweed; hatch in 5–11 months.
FISHERIES AND USES: Taken in bottom fisheries; accounts for substantial part of shark landings in Europe [66].
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Least Concern Globally (in prep. 2008).
EU CONSERVATION MEASURES: For this species in Swedish waters, Sweden has prohibited fishing and landing [21].

Spurdog, spiny or piked dogfish *Squalus acanthias* (Linnaeus, 1758)

DESCRIPTION: Spine in front of dorsal fins; second is larger and stands clear of the fin; no anal fin. White spots scattered on the dark grey back and sides; ventral side is lighter or white [72]. Females grow up to 120cm; males to 90cm [53].
BALTIC DISTRIBUTION: Skagerrak; Kattegat; Danish Straits; Western Baltic – recorded up to German island of Rügen [14] and eastern Swedish coast of Skåne [15]; two specimens taken near Åland Islands in 1961 in the Archipelago Sea [44].
HABITAT: Prefers soft bottoms and a water temperature of 6–15°C [53]; depth range usually 10–200m, although exceptionally to 950m [72].
PREY: Schooling fishes, herring, sprat, pilchard, sand eels, whiting, garfish; also bottom-dwelling species, cod, dragonet and flatfishes, squids and crabs [72].
REPRODUCTION: In Northeast Atlantic, males mature at 60–70 cm (10 years old); females at 75–90 cm (12 years old) [53]. Live bearer; pups nourished by yolk; record long gestation period of 18–24 months; 1–32 pups [10], usually 3 to 11 per litter [72]. Born at 20–33 cm [72]; maximum age may exceed 60 years, depending on population [53].
FISHERIES AND USES: One of the most heavily fished and traded sharks in the world. Meat sought for human consumption, primarily in Europe; used in fish and chips in UK; smoked belly flaps popular in Germany. Fins not prized but used for shark fin soup. Targeted and taken as bycatch in trawl, gillnet and longline fisheries [38]. In the Kattegat, recreational angling for spurdog is popular during summer [23], but limited since 2008 to one fish per person per 24-hour period [22].
BALTIC STATUS: HELCOM high priority, significant decline, critically endangered [33].
IUCN RED LIST STATUS: Vulnerable Globally (2006). Critically Endangered in Northeast Atlantic (2006).
EU CONSERVATION MEASURES: The first EU total allowable catch (TAC) limit for the North and Norwegian Sea (ICES Areas IV and IIa) was imposed in 1999 and has been lowered substantially since, yet not enough to restrict fishing and promote recovery. In 2007, a TAC for surrounding EU and international waters including the Skagerrak and Kattegat (Area IIIa) was added, but Area IIIa was removed from the applicable areas in 2008. ICES has recommended one TAC of zero for all these areas. In Swedish waters, catches with nets and longline are prohibited, while retention of bycatch from trawls is allowed only through special permits. The EU proposed spurdog for CITES listing in 2007 but was defeated.



SMALL-SPOTTED CATSHARK © DIETMAR WEBER, D.E.G.

Species of the Skagerrak and Kattegat and vagrants into the Western Baltic

Common stingray *Dasyastis pastinaca* (Linnaeus, 1758)

DESCRIPTION: Diamond shaped; large pectoral fins; no dorsal fins, but one (sometimes two) serrated spine in the tail, which is very long and whip-like [72]. Reach up to 200cm, with tail more than 50% of length [53].
BALTIC DISTRIBUTION: Rare summer guest in Skagerrak and Kattegat; found occasionally in the Danish Straits.
HABITAT: Benthic, shallow waters to 200m deep on soft bottoms [73].
PREY: Bottom-living organisms, molluscs and crabs; also fishes [72].
REPRODUCTION: Live bearer; pups nourished by yolk; four to nine pups per litter; four-month gestation period [53].
FISHERIES AND USES: Low commercial value; taken by anglers [71].
BALTIC STATUS: HELCOM medium priority, probable decline, threatened migrant [33].
IUCN RED LIST STATUS: Near Threatened Globally (in prep. 2008).
EU CONSERVATION MEASURES: No specific restrictions. May benefit from catch and mesh size limits outside Baltic.

Common skate, blue ray *Dipturus batis* (Linnaeus, 1758)

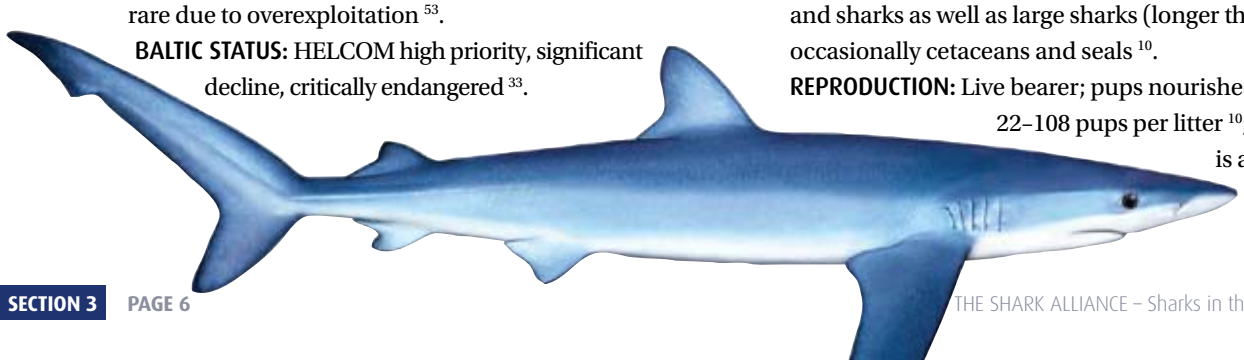
DESCRIPTION: Large; long snout. Front edge of disc is strongly concave; upper surface smooth in young, partly prickly in larger specimens or adult females. Females reach up to 285cm; males reach 200cm [72].
BALTIC DISTRIBUTION: Skagerrak; Kattegat; found occasionally in Western Baltic.
HABITAT: Benthic; has depth range of 30–600m [72].
PREY: Feeds primarily on fish, but also crustaceans and other cartilaginous fishes [72].
REPRODUCTION: Maturity at about 150cm or 11 years of age [53]; egg-laying.
FISHERIES AND USES: Once the most commercially important species of skate/ray in north-western Europe; used for meat (smoked), fishmeal and oil. Now extremely rare due to overexploitation [53].
BALTIC STATUS: HELCOM high priority, significant decline, critically endangered [33].
IUCN RED LIST STATUS: Critically Endangered Globally (2006).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. Sweden has prohibited fishing and landing from Swedish waters [21].

Blackmouth dogfish, blackmouth catshark *Galeus melastomus* Rafinesque, 1810

DESCRIPTION: Pattern of dark saddles, blotches and circular spots on back and tail; distinct crest of enlarged dermal denticles along upper margin of elongated tail; mouth cavity black. Maximum length 90cm [10].
BALTIC DISTRIBUTION: Skagerrak (Norwegian Deep); vagrant into Kattegat.
HABITAT: Deep-water; bottom-living on upper edge of continental slopes; mostly in depths of 200–500m; rarely in shallower water up to 55m [72].
PREY: Shrimps and prawns; also small fish species such as lantern fishes [72].
REPRODUCTION: Egg-laying; up to 13 eggs per female. Males mature at 34–42cm, females at 39–45cm [10].
FISHERIES AND USES: Taken as bycatch in bottom trawls [8]; low commercial value [10].
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Least Concern Globally (in prep. 2008).
EU CONSERVATION MEASURES: Outside the Baltic, covered by gear restrictions and bycatch quotas for deep-water shark measures in Areas V–X.

Bluntnose sixgill shark *Hexanchus griseus* (Bonnaterre, 1788)

DESCRIPTION: Large (up to 500cm) [72]; six long gill slits; only one dorsal fin placed far back near tail; broad head and blunt snout [72]; comb-shaped lower teeth.
BALTIC DISTRIBUTION: Skagerrak; vagrant into Kattegat.
HABITAT: Continental shelves and slopes; islands and seamounts, usually at depths of 500–1,100m [10].
PREY: Squids, benthic and pelagic bony fishes, small rays and sharks as well as large sharks (longer than 200cm); occasionally cetaceans and seals [10].
REPRODUCTION: Live bearer; pups nourished by yolk; 22–108 pups per litter [10]; length at birth is about 60cm [72].
FISHERIES AND USES: Taken as



BLUE SHARK © DIETMAR WEBER, D.E.G.

PORBEAGLE © ANDY MURCH/ELASMODIVER.COM

bycatch in line gear, gillnet, traps and bottom-trawl fisheries [7]; used for food, fishmeal and oil (for pharmaceuticals, lubricants, and cosmetics) [10].
BALTIC STATUS: HELCOM high priority, significant decline, critically endangered [33].
IUCN RED LIST STATUS: Near Threatened Globally (2000).
EU CONSERVATION MEASURES: No specific protections.

Porbeagle *Lamna nasus* (Bonnaterre, 1788)

DESCRIPTION: Heavy bodied; conical snout; long gill slits. Strong keels on caudal peduncle (near tail fin); short secondary keels on caudal base; distinctive white spot on rear tip of first dorsal fin. Length up to 300–370cm [9].
BALTIC DISTRIBUTION: Skagerrak; Kattegat; Danish Straits; vagrant into Western Baltic; historical records from southern and central Baltic to Åland Islands [15]. Penetrates estuaries in North Sea [49].
HABITAT: Pelagic; inshore and offshore; from surface down to 700m.
PREY: Small schooling fishes, mainly herring and mackerel; dogfish, tope and squids [10].
REPRODUCTION: Maturity for males at 150–200cm, females mature at 200–250 cm [9] (five years old) [53]. Live bearer; pups nourished by yolk; usually four pups per litter; feed on unfertilized eggs in utero [40]. Size at birth is 60–75 cm; gestation period is eight to nine months [9]. Maximum age is 30 years; although may reach 46 years of age in unexploited areas [55].
FISHERIES AND USES: Targeted and taken as bycatch for valuable meat and fins.
BALTIC STATUS: HELCOM high priority, significant decline, critically endangered [33].
IUCN RED LIST STATUS: Vulnerable Globally (2006). Critically Endangered in Northeast Atlantic (2006) [27].
EU CONSERVATION MEASURES: In 2004, Sweden prohibited porbeagle fishing in Swedish waters [21]. First EU catch limit of 581tonnes (t) imposed in 2008 for Areas I–XIV included 1t allocation to Sweden, 6t to Germany and 30t to Denmark. The EU proposed CITES listing in 2007 but was defeated.

Blue shark *Prionace glauca* (Linnaeus, 1758)

DESCRIPTION: Slim, torpedo shape; long, conical snout. Dark blue on back; bright blue flanks [10]. Reaches up to 380cm [10].
BALTIC DISTRIBUTION: Skagerrak; rarely up to Kattegat; vagrant into Western Baltic.
HABITAT: Primarily offshore, pelagic [10]; also occurring in coastal waters, often swimming near the surface, down to 150m [66]. Considered the most wide-ranging of all sharks [10].
PREY: Relatively small species such as squid and pelagic fish; also invertebrates, turtles, bottomfish and other sharks [10].
REPRODUCTION: Males mature at 180–280cm (six years old); females at about 220cm (five to seven years old) [10]. Live bearer; pups nourished by placenta; 4–135 pups per litter (usually 15–30); 9–12 month gestation period. Females breed annually or in alternate years [10].
FISHERIES AND USES: One of the most heavily fished and traded sharks; several millions taken annually. Meat of traditionally low value, but new markets developing; fins used for shark fin soup [10].
BALTIC STATUS: HELCOM medium priority, probable decline, threatened migrant [33].
IUCN RED LIST STATUS: Near Threatened Globally (2000).
EU CONSERVATION MEASURES: No specific safeguards. May benefit from EU and international finning bans.

Thornback ray *Raja clavata* Linnaeus, 1758

DESCRIPTION: Dense prickles over entire back; large thorns along mid-line from mid-disc to dorsal fins; highly variable colour on back; cream colour ventral side with grey margins [72]. Reaches up to 90cm [67].
BALTIC DISTRIBUTION: Skagerrak; Kattegat; Danish Straits; found occasionally in Western Baltic.
HABITAT: Benthic, on muddy, sandy or gravelly bottoms, rarely on rough grounds; from shallow waters to depths of 280m [72].
PREY: A variety of bottom-dwelling organisms, preference for crustaceans; also fishes [72].
REPRODUCTION: Egg-laying; about 150 egg cases laid per year (in shallow water); embryo development takes about five months [67].
FISHERIES AND USES: One of the most frequently landed skates/rays. Taken as bycatch in otter and beam-trawl fisheries; targeted in gillnet and longline fisheries [38]. Meat ('wings') used for human consumption, including European markets.
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Near Threatened Globally (2000).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. Sweden prohibits fishing and landing thornback ray from Swedish waters [21].

Common angel shark *Squatina squatina* (Linnaeus, 1758)

DESCRIPTION: Broad, flattened body similar to rays, but with gill openings at the sides of the head, not beneath. Eyes on top of head; large spiracles and large mouth at front. Grey to reddish or greenish-brown back with scattered small white spots and blackish dots. Reaches up to 250cm [66].
BALTIC DISTRIBUTION: Skagerrak; Kattegat; found occasionally in Western Baltic.
HABITAT: Bottom dweller on sand or mud; moderate depth (5–100m) [66]; also inshore on coast and estuaries [10].
PREY: Mainly flatfishes, skates, crustaceans and molluscs [10].
REPRODUCTION: Maturity at 126–167 cm. Live bearer; pups nourished by yolk; 7–25 pups per litter, number increases with female size. Gestation of 8–10 months; length at birth is 24–30cm [10].
FISHERIES AND USES: Formerly targeted for human consumption, now taken primarily as bycatch in trawl, gillnet and longline fisheries [66].
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Critically Endangered Globally (2006).
EU CONSERVATION MEASURES: No specific safeguards.

Species distributed into the Skagerrak, up to/into the Kattegat

Basking shark *Cetorhinus maximus* (Gunnerus, 1765)

DESCRIPTION: Very large: up to 1,000cm in length [10]; average size in northern European waters around 760cm [72]. Slow-moving. Large gill slits extend almost completely from top to bottom of head.
BALTIC DISTRIBUTION: Skagerrak; Kattegat.
HABITAT: Pelagic, mainly near surface; highly migratory species.
PREY: Plankton, ingested by filtering through large mouth and gills.
REPRODUCTION: Maturity at around 700cm [54], males at 12–16 years; females at up to 20 years [9]. Live bearer, pups nourished by yolk; gestation period suspected to last three and a half years [70]; one to two young; 150–170cm at birth [10].
FISHERIES AND USES: Fished in the past with harpoons and nets, taken now as bycatch in trawls; valuable oil from massive livers used in pharmaceuticals, lubricants and cosmetics; fins used for soup but also (due to large size) prized as signboards in Asian restaurants [54].
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Vulnerable Globally (2000); Endangered in the Northeast Atlantic (2000).
EU CONSERVATION MEASURES: International trade regulated through 2002 listing on CITES Appendix II. Sweden prohibited fishing and landing from Swedish waters in 2004 [21]. Listed under CMS Appendix I and II in 2005. The EU prohibited fishing, retention, transhipment and landing by Community vessels in 2006 [11].

Ratfish, rabbit fish, ghost shark *Chimaera monstrosa* Linnaeus, 1758

DESCRIPTION: Short snout; very long, rat-like tail; large eyes. High first dorsal fin; strong spine; large pectoral fins; long but low second dorsal fin and similar anal fin [53].
BALTIC DISTRIBUTION: Skagerrak (Norwegian Deep and shallow areas).
HABITAT: Deep water, found close to bottom at depths of 300–500m [72].
PREY: Brittlestars, crabs, shrimps, molluscs, small fishes [72].
REPRODUCTION: Egg-laying; egg cases about 17cm long. Males have a clasper on forehead, which is used to hold on to the female during copulation [53].
FISHERIES AND USES: Taken as bycatch, including in Skaggerak shrimp trawl fisheries; previously discarded but now often landed [72].
BALTIC STATUS: HELCOM medium priority, decline not known, vulnerable [33].
IUCN RED LIST STATUS: Near Threatened Globally (2007).
EU CONSERVATION MEASURES: No specific protections. May benefit from restrictions on deep-sea fishing.

Sailray *Dipturus linteus* (Fries, 1839)

DESCRIPTION: Uniform light grey or brown colour above, underside of disc is white with dark margin; grey line on tail; large dark blotch on each side of the vent; 42–51 spines from nape to first dorsal fin [67]. Reaches up to 110cm in length [67].
BALTIC DISTRIBUTION: Skagerrak (Swedish Bohuslän coast) [15].
HABITAT: Benthic, soft bottoms at depths of 150–650m [67].
PREY: A variety of benthic organisms [72].
REPRODUCTION: Egg-laying.
FISHERIES AND USES: Currently of no commercial importance.
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Least Concern Globally (in prep. 2008).
EU CONSERVATION MEASURES: The EU loosely limits catches

of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no limits for the Baltic.

Longnose skate *Dipturus oxyrinchus* (Linnaeus, 1758)

DESCRIPTION: Snout extremely long and pointed; disc broadly rhombic with acute outer corners; anterior margins very deeply concave. Maximum size about 150cm long [67].
BALTIC DISTRIBUTION: Skagerrak.
HABITAT: Bottom-dwelling skate, at depth of about 90–950m, mainly on soft bottom [72].
PREY: Crustaceans such as shrimps and crabs; fishes of different species [72].
REPRODUCTION: Egg-laying; reaches maturity at about 120cm [54].
FISHERIES AND USES: Taken as bycatch in deep-water trawls and longlines [72].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Near Threatened Globally (2007).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no such limits for the Baltic.

Bramble shark *Echinorhinus brucus* (Bonnaterre, 1788)

DESCRIPTION: No anal fin; dorsal fins spineless and set far back, starting behind pelvic origins; large scattered thorn-like denticles on body and fins. Maximum length about 310cm [10].
BALTIC DISTRIBUTION: Skagerrak (Norwegian Deep).
HABITAT: Near bottom, primarily a deep-water species; occurring on continental shelves and upper slopes at depths of 18–900m [10].
PREY: Eats smaller sharks (spurdog), bony fishes (including ling, catfish and lizardfish) and crabs [9].
REPRODUCTION: Mature females reported at 213–230cm; males at 150–174cm [9]. Live bearer; pups nourished by yolk; 15 to 24 young per litter; length at birth between 29–90cm [9].
FISHERIES AND USES: In Northeast Atlantic, especially from the North Sea to Portugal, caught in bottom trawls and on longline gear; used for fish meal and liver oil, but currently of little commercial importance [9].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Data Deficient Globally (2003).
EU CONSERVATION MEASURES: No specific protections; may benefit from deep-sea fishing restrictions.

Life history characteristics of cartilaginous fishes

An animal's resilience to exploitation is determined by the biological parameters of its lifecycle (e.g. growth rate, brood size, natural mortality) and the strategies that influence its survival and reproduction [5]. Cartilaginous fishes generally grow slowly, mature late, have only a few, well-developed young after a lengthy gestation period and live a long time, subject to a low natural mortality. These are all characteristics of species with few natural predators, which are highly successful under natural conditions [28]. They only need to produce very few young capable of reaching maturity in order to maintain population levels at the carrying capacity of the ecosystem [5]. Compared to the typically more productive bony fishes (cod, tuna, flounder), their slow reproduction rate makes them particularly vulnerable to overexploitation and slow to recover from depletion.

Velvet belly shark *Etmopterus spinax* (Linnaeus, 1758)

DESCRIPTION: Small and dark. Abruptly black belly with very fine dermal denticles, giving the skin a velvety feel. Sharp spines at front of dorsal fins, second one much larger; pectoral fins small and rounded; no anal fin; small gill openings. Reaches up to 60cm in length [72].
BALTIC DISTRIBUTION: Skagerrak (Norwegian Deep).
HABITAT: Deep water, near bottom; depth range from 70–2,000m, although mostly 200–500m [10].
PREY: Small fishes, squids and crustaceans [72].
REPRODUCTION: Live bearer; pups nourished by yolk; 6–20 pups per litter; size at birth about 12–14cm [10].
FISHERIES AND USES: Caught offshore in bottom and pelagic trawls; used for fishmeal and meat [10].
BALTIC STATUS: HELCOM medium priority, decline not known, vulnerable [33].
IUCN RED LIST: Least Concern Globally (in prep. 2008). Near Threatened in the Northeast Atlantic (in prep. 2008).
EU CONSERVATION MEASURES: Covered by gear and bycatch restrictions for deep-water sharks in Areas V–X.

Tope, school shark *Galeorhinus galeus* (Linnaeus, 1758)

DESCRIPTION: Slender bodied and long nosed. Moderate first dorsal fin; small second dorsal fin, similar to opposite anal fin which can reach 200cm [10].
BALTIC DISTRIBUTION: Skagerrak; Kattegat.
HABITAT: Pelagic, but often near bottom; 2–470m depth range [10].
PREY: Feeds opportunistically on small schooling fishes, bottom fishes, squids, crustaceans and echinoderms [72].
REPRODUCTION: Female maturity at over 10 years of age. Live bearer; pups nourished by yolk; 10-month gestation;

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20–40 pups per litter, depending on size of female. Length at birth 35–40cm; maximum age about 60 years [10].
FISHERIES AND USES: Fished around the world for meat, liver oil (for pharmaceuticals, lubricants and cosmetics) and fins; also popular with anglers.
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Vulnerable Globally (2006).
EU CONSERVATION MEASURES: None yet; protection proposed in UK [13] and Germany [62].

Sandy ray *Leucoraja circularis* (Couch, 1838)

DESCRIPTION: Short snout; strong spiny tail; disc has rounded tips; four to six creamy spots with dark margins on wings and pelvic fins. Length up to 120cm, but usually about 70cm [67].
BALTIC DISTRIBUTION: Skagerrak.
HABITAT: Benthic, on sandy bottoms; usually at depths of 50–100 m [72].
PREY: Variety of benthic animals [53].
REPRODUCTION: Egg-laying, year round [53].
FISHERIES AND USES: Caught primarily in bottom-trawls; of local commercial importance in southern regions of its range [67].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Endangered Globally (in prep. 2008).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no limits for the Baltic.

Shagreen ray *Leucoraja fullonica* (Linnaeus, 1758)

DESCRIPTION: Rhomboid shape with pronounced, pointed snout. About eight thorns in a row around inner margin of eyes; a row of about 50 thorns on each side of midline from shoulders to first dorsal fin [67]. Upper surface colour is plain ash grey, underside white [72]. Reaches 120cm in length, but usually between 30 and 70cm [14].
BALTIC DISTRIBUTION: Skagerrak; a single record in the Belts in 1890 [14].
HABITAT: Benthic, in relatively cold coastal waters; upper parts of continental slopes from 30–550m [72].
PREY: Feeds on a variety of bottom-dwelling animals, but probably prefers fishes.
REPRODUCTION: Egg-laying.
FISHERIES AND USES: Caught in bottom-trawl fisheries; regularly landed in northern parts of range by longliners [72].
BALTIC STATUS: HELCOM medium priority, probable decline, threatened migrant [33].
IUCN RED LIST STATUS: Near Threatened Globally (in prep. 2008).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no limits for the Baltic.

Starry smoothhound *Mustelus asterias* Cloquet, 1821

DESCRIPTION: Two nearly equal-sized dorsal fins; body grey above and sprinkled with white (star-like) spots, ventral is creamy-white; pavement of flat teeth. Up to 180cm long, with average around 120cm [72].
BALTIC DISTRIBUTION: Skagerrak.
HABITAT: Inshore species, close to bottom, from shore down to 70m depth; mostly on sandy and gravel grounds [72].
PREY: Primarily a crustacean feeder [9].
REPRODUCTION: Maturity at 70–80 cm [54]; live bearer; pups nourished by yolk; 12-month gestation; 10–20 pups per litter; 30cm at birth [54].
FISHERIES AND USES: Taken as bycatch in bottom trawls, line gear, and probably gillnet fisheries [9]; low market value; taken by anglers [10].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Least Concern Globally (2000).
EU CONSERVATION MEASURES: None.

Round ray *Rajella fyllae* (Lütken, 1887)

DESCRIPTION: Rhomboid disc with greatly rounded outer corners; tail conspicuously longer than body [72]. Upper surface entirely rough; concentrations of thorns on hind parts of disc and head; several irregular, parallel rows of prominent thorns from shoulder to dorsal fin [72]. Upper surface is ash grey to dark brown, clouded darker or paler; underside predominantly white [72]. Up to 55cm in length [72].
BALTIC DISTRIBUTION: Skagerrak (Norwegian Deep).
HABITAT: Benthic, 170–2,000m. Restricted to waters of 1–7°C. Common between 300 and 800m [72].
PREY: A variety of bottom-dwelling animals, with a preference for invertebrates [72].
REPRODUCTION: Egg-laying.
FISHERIES AND USES: Unknown.
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Least Concern Globally (in prep. 2008).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no limits for the Baltic.

Species found occasionally in the Skagerrak, Kattegat and Western Baltic

Common thresher shark *Alopias vulpinus* (Bonnaterre, 1788)

DESCRIPTION: Caudal fin very long; upper lobe equals the length of the body. Length possibly up to 600cm in females [66].
BALTIC DISTRIBUTION: Found occasionally in the Skagerrak and Kattegat.
HABITAT: Pelagic, from surface to at least 366m deep [10].
PREY: Marine fish including herring, mackerel and garfish[72]. Herds and stuns small fishes with its tail, sometimes cooperatively [10].
REPRODUCTION: Live bearer; pups nourished by yolk; gestation period of nine months [9]; two to four pups per litter, 114–160cm long at birth. Males mature at about 300cm; females at 370–400cm [8]; maximum age estimated to be 45–50 years [7].
FISHERIES AND USES: Targeted and taken incidentally in longline and driftnet fisheries and by offshore anglers. Meat and fins are valuable.
BALTIC STATUS: HELCOM high priority, significant decline, critically endangered [33].
IUCN RED LIST STATUS: Vulnerable Globally (in prep. 2008).
EU CONSERVATION MEASURES: None.

Osmoregulation: How sharks and rays survive in both salt and freshwater

Marine cartilaginous fishes maintain concentrations of urea and other substances which affect osmosis in their tissues and body fluids at slightly higher levels than those in the surrounding seawater, resulting in a net influx of water [46]. As such, they do not need to drink seawater continuously, as bony fishes do. Juvenile sharks, especially, benefit from the increased prey abundance and reduced rates of predation associated with low-salinity waters [59], e.g. shallow bays and rivers in the sub-tropics and tropics. Some shark and ray species are euryhaline, which means that they are able to tolerate and even thrive in both fresh and salt water [46].

Large parts of the Baltic Sea have ever-changing salinity levels, which require inhabitants to osmoregulate. The gills, kidneys, liver, rectal gland and drinking processes all play a significant role in helping sharks and rays adjust to different environmental salinities [32]. Hyperosmotic sharks and rays experience a massive influx of water when they enter brackish areas and the processing of this water by the kidneys and subsequent excretion requires a great deal of energy. It appears impossible for such species to live for extensive periods in the nearly freshwater of the far northern and eastern parts of the Baltic Sea. Shark and ray species that do adapt well to salinity differences in this region, such as spurdog (*Squalus acanthias*) and thornback ray (*Raja clavata*), are considered marginally freshwater species. In the strong, seasonally influenced environment of the Baltic Sea, however, no true euryhaline species exist.

Although research on the physiology of Baltic sharks and rays is limited, scientists speculate that the cold temperatures and scarcity of available prey during the winter months limit the metabolic capability needed to maintain the energetic activity of osmoregulation. Another process that is likely to be limited by low salinity is reproduction. Indeed, it appears sharks and rays do not reproduce in the Baltic Sea. Egg-bearing species may suffer disruption or slowing of embryo development in egg cases, while live-bearing species may not be able to gain the surplus energy required for their lengthy embryonic development. As such, they are thought to migrate back into high-salinity areas to lay eggs or give birth.

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Angular roughshark *Oxynotus centrina* (Linnaeus, 1758)

DESCRIPTION: High, triangular body; sail-like dorsal fins with spines. First dorsal spine inclined forward; no anal fin. Large, rough denticles over eyes; grey or grey-brown above and below with a colour pattern of darker marks on a light background [8]. Size up to 150cm, usually from 50–70 cm [9].
BALTIC DISTRIBUTION: Found occasionally in the Skagerrak (Norwegian Deep) [53]; single record in Danish shallow coastal water (1972) [44].
HABITAT: Benthic, on continental shelf and upper slope; depths of 60–660m [66], although usually below 100m [10].
PREY: Worms, crustaceans and molluscs [10].
REPRODUCTION: Maturity at about 50cm [8]. Live bearer; pups nourished by yolk; probably seven or eight young [66]; born 25cm in length [10].
FISHERIES AND USES: Caught primarily as bycatch in deep-water, bottom and pelagic trawls; used for fishmeal and liver oil (for pharmaceuticals, lubricants and cosmetics); smoked, dried and salted for human consumption [8].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Vulnerable Globally (2007).
EU CONSERVATION MEASURES: None.

Spotted ray *Raja montagui* Fowler, 1910

DESCRIPTION: Rhomboid shape with short rostrum; bright background with many small black spots on whole upper side. Two equal-sized dorsal fins at end of tail; long regular row of 20–50 thorns from mid-disc to first dorsal. Reaches up to 80cm in length [66].
BALTIC DISTRIBUTION: Found occasionally in the Skagerrak and Kattegat [33].
HABITAT: Benthic, from shallow waters to 650m; more common at about 100m on sandy and muddy bottoms [66].
PREY: Wide variety of invertebrates, such as crustaceans and molluscs; also bottom fishes [72].
REPRODUCTION: Maturity at about 60cm [66]; egg-laying; 24–60 egg cases per year, laid in summer [66].
FISHERIES AND USES: Taken as bycatch in bottom-trawl fisheries [66].
BALTIC STATUS: HELCOM high priority, significant decline, endangered [33].
IUCN RED LIST STATUS: Least Concern Globally (2007).
EU CONSERVATION MEASURES: The EU loosely limits catches of skates and rays (particularly Family Rajidae) from the North and Norwegian Seas (Areas IV and IIa), west of the Skagerrak. There are no limits for the Baltic.

Nursehound, greater spotted dogfish *Scyliorhinus stellaris* (Linnaeus, 1758)

DESCRIPTION: Very similar to small-spotted catshark (*S. canicula*), but with large, rounded dark-brown blotches. First dorsal fin set vertically above base of pelvic fins; nostrils separated by broad interspace. Maximum length of 150cm; average about 120cm [72].
BALTIC DISTRIBUTION: Found occasionally in the Skagerrak (two records at Swedish Bohuslän coast in 1875 and 1944 [44]); single record in the Kattegat [15].
HABITAT: Sea floor, usually on rocky or seaweed-covered grounds; depth range of 1–125m [10].
PREY: Wide variety of invertebrates, such as crustaceans and molluscs; also bottom fishes [72].
REPRODUCTION: Egg-laying; egg development at about nine months; young about 16cm long at hatching [72].
FISHERIES AND USES: Taken as bycatch in bottom-trawl and artisanal fisheries [66]; occasionally caught by anglers [72].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Near Threatened Globally (in prep. 2008).
EU CONSERVATION MEASURES: None.

Greenland shark *Somniosus microcephalus* (Bloch & Schneider, 1801)

DESCRIPTION: Grey or brown; heavy-bodied, very large. Thought to grow up to 730cm, but usually 245–430 cm [10]. Spineless, equal-sized, lower dorsal fins [10].
BALTIC DISTRIBUTION: Migrates south from the North Atlantic and Arctic regions [4] to the North Sea and occasionally into the Skagerrak [52] and Kattegat [12]; found sometimes in winter off Swedish Bohuslän coast [44].
HABITAT: Continental shelves and upper slopes [10]; depths of 0–1,200m [45].
PREY: Seals, fishes, sea birds, squids (including giant squids), invertebrates and whales as carrion [10].

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SPOTTED RAY © MATTHIAS STEHMANN

REPRODUCTION: Female maturity at 450cm; live bearer; pups nourished by yolk; litters of 10; about 40cm at birth [10].
FISHERIES AND USES: Traditionally fished in Greenland, Iceland and northern Norway for liver oil and meat – fresh, dried and fetid – for human and sled-dog food [8]. Native peoples have used skin for making boots and teeth for making knives [8]. Mostly fished with hook and line, longline gear or gaffs. Often taken as bycatch in seal and whale nets and cod traps [8]. Recreational fisheries are developing (promoted as extreme tourism) [70]. Fished through iceholes [10].
BALTIC STATUS: HELCOM medium priority, decline not known, vulnerable [33].
IUCN RED LIST STATUS: Near Threatened Globally (2006).
EU CONSERVATION MEASURES: None.

Marbled electric ray *Torpedo marmorata* Risso, 1810

DESCRIPTION: Round shape; relatively long abdomen; large pelvic fins; two dorsal fins at mid-tail length, first one distinctly larger than second [72]. Colour variable above, marbled on darker brown background; underside is white to cream [72]. Up to 100cm in length; females mature at about 40cm; males at 30cm [66]. Large electric organs to the sides of the head.
BALTIC DISTRIBUTION: Found occasionally in the Skagerrak and Kattegat.
HABITAT: Benthic on soft as well as rocky bottoms; between 10 and 100m in depth [66].
PREY: Mainly small benthic fishes, but also invertebrates [72].
REPRODUCTION: Live bearer; pups nourished by yolk; gestation lasts about ten months; litter from 5–32 pups, depending on size of female [72].
FISHERIES AND USES: Taken as bycatch in coastal bottom-trawl fisheries [66].
BALTIC STATUS: HELCOM medium priority, probable decline, threatened migrant [33].
IUCN RED LIST STATUS: Least Concern Globally (in prep. 2008).
EU CONSERVATION MEASURES: None.

Electric ray *Torpedo nobiliana* Bonaparte, 1835

DESCRIPTION: Shape similar to *T. marmorata*; colour usually plain dark violet/brown above; underside white to cream [72]. Large electric organs to the sides of the head. Up to 180cm in length [66].
BALTIC DISTRIBUTION: Found occasionally in the Skagerrak.
HABITAT: Juveniles: benthic on soft bottoms. Adults: benthic, but frequently pelagic or semi-pelagic; from 10 to 150m [66].
PREY: Predominantly fishes [72].
REPRODUCTION: Live bearer; pups nourished by yolk.
FISHERIES AND USES: Taken as bycatch in coastal, bottom-trawl fisheries.
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Data Deficient Globally (in prep. 2008).
EU CONSERVATION MEASURES: None.

Single-record species

Oceanic whitetip shark *Carcharhinus longimanus* (Poey, 1861)

DESCRIPTION: Snout is short and rounded; large, rounded first dorsal fin; tips of first dorsal, pectorals and lower caudal fin lope have white tips [73]. Length up to 350 to 395cm [10].
BALTIC DISTRIBUTION: Single record in Swedish Gullmarsfjord (2004) [68].
HABITAT: Pelagic; oceanic.
PREY: Fishes, stingrays, sea turtles, marine mammal carrion, squids and crabs.
REPRODUCTION: Live bearer; pups nourished by placenta; 1–15 pups per litter; 12-month gestation; size at birth about 60–65cm [10].
FISHERIES AND USES: Taken primarily as bycatch in longline fisheries; fins valued for use in shark fin soup [10].
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Vulnerable Globally (2006).
EU CONSERVATION MEASURES: None.

Smooth hammerhead shark *Sphyrna zygaena* (Linnaeus, 1758)

DESCRIPTION: Large hammerhead without a notch at centre of head. First dorsal fin moderately high, second dorsal and pelvic fins low. Olive-grey to dark grey-brown above, white below. Grows up to 400cm [10].
BALTIC DISTRIBUTION: Single record in the Kattegat in 1937 [71].
HABITAT: Coastal shelves; surface to 20m deep or more [10].
PREY: Bony fishes, small sharks, skates and stingrays [10].
REPRODUCTION: Live bearer; pups nourished by placenta; 29–37 pups per litter; born at 50–60cm; matures at 210–240cm [10].
FISHERIES AND USES: Taken primarily as bycatch in longline fisheries in temperate and tropical waters (further south); fins highly valued for shark fin soup.
BALTIC STATUS: Unknown.
IUCN RED LIST STATUS: Near Threatened Globally (2000).
EU CONSERVATION MEASURES: None.

The use of cartilaginous fishes in Europe

Sharks, skates and rays have been fished in European waters for centuries, providing everything from basic sustenance to luxury items. Indeed, most of their body parts have been used at some time or another for specific purposes [24].

Today, fished cartilaginous fishes are sought or retained for their meat (for human consumption or pet food), fins (for the Asian delicacy, shark fin soup) and oil from their relatively large livers (which are used in cosmetics, lubricants and pharmaceuticals). The hides can be used for leather, while shark cartilage is an unproven yet popular alternative treatment for human disease. Sharks are also used for recreational purposes through sport fisheries (often 'catch and release') and ecotourism operations.

European demand for spurdog (*Squalus acanthias*) meat is strong and persistent enough to drive targeted fisheries around the world. Catches of spurdog in the Northeast Atlantic have declined by 90% since the 1970s [2] (along with the population); in response, imports from the Northwest Atlantic and the Pacific have increased. In Germany, the smoked belly flaps of spurdog are known as 'Schillerlocken' and commonly sold in fish markets. Germany's annual imports of spurdog (2,000t) put it among the top five importers of shark meat in the EU; it is the largest single importer of frozen spurdog meat since the late-1990s, receiving 25% of American and 20% of Canadian exports [2].

The porbeagle (*Lamna nasus*) is the highest value shark consumed by Europeans. Porbeagle steaks are traded in fresh and frozen form and sold in markets, restaurants and canteens. Fish retailers often use whole porbeagle or its parts for display purposes.

In an attempt to act as a responsible consumer, Germany has produced and promoted proposals to restrict international trade in spurdog and porbeagle under Appendix II of the Convention on International Trade in Endangered Species (CITES) (see Conservation – section 5).

RIGHT: PORBEAGLE AT FISH MARKET © MICHAEL GEORGE. FAR RIGHT: SCHILLERLOCKEN AT GERMAN FISH RETAILER © HEIKE ZIDOWITZ

Fishing pressure on Baltic cartilaginous fishes

Baltic fisheries taking cartilaginous fishes

The Baltic Sea has been fished intensively for centuries, but catch statistics on cartilaginous fishes are scant. Today the main commercial species are sprat, herring, cod, salmon and a few flatfishes. The ICES Working Group on Elasmobranch Fishes (WGEF) has analysed current and historical data on cartilaginous fish populations and fisheries in the Northeast Atlantic. Only activities in the Skagerrak, Kattegat and North Sea are included in these analyses, but not specified for each region. Data for the Baltic Sea are either scarce or excluded due to the low extent of fisheries. In this section, we look at Baltic cartilaginous fishes data from ICES and other sources.

ICES fisheries data

Catch data for cartilaginous fishes were retrieved from ICES fisheries data (using FAO FishStat Plus) for ICES areas IIIa – IIId. The processed data included all landings from 1973 to 2005 from the Baltic Sea and the adjacent Skagerrak. Landings of cartilaginous fishes have been recorded during this time by vessels from Belgium, Denmark, Germany, Iceland, the Netherlands, Norway, Sweden, and the United Kingdom. The German Democratic Republic and the Federal Republic of Germany submitted separate catch reports until German reunification in 1990. Landings were generally not recorded to the species level. Only a few species were classified separately; others were reported under species groups (see Table 3).

TABLE 3: Classification of cartilaginous fishes and species groups in ICES data

ICES category	Cartilaginous fish species or group
Cartilaginous fishes nei	Any cartilaginous fish species, not determined
Various sharks nei	Shark species, not determined
Dogfish sharks nei	Family: Squalidae *
"Picked" dogfish **	*Squalus acanthias*
Porbeagle	*Lamna nasus*
Tope	*Galeorhinus galeus*
Blue shark	*Prionace glauca*
Raja rays nei	Order: Batoids; genus: *Raja* ***
Common skate	*Dipturus batis*
Rabbit fish	*Chimaera monstrosa*

Nei = not elsewhere included.
* It is not clear whether this category also includes dogfishes of the family Etmopteridae (e.g. Etmopterus spinax) and catsharks of the family Scyliorhinidae.
** "Picked" dogfish is a misspelling of piked dogfish (spurdog), *Squalus acanthias*.
*** This group can also include species that were formerly known as Raja but have since been reclassified to another batoid genus (e.g. starry skate Raja radiata Amblyraja radiata).

SPURDOG AT FISH MARKET © MICHAEL GEORGE

Landings of several species of cartilaginous fishes were recorded from the Skagerrak and Kattegat by all the above mentioned countries. Catches were also reported from the Belts, the Sound and the Western Baltic (sub-divisions 22, 23 and 24) by Denmark, Germany and Sweden, and from southern and central parts of the Baltic Proper (sub-divisions 25 and 27) by Sweden.

"Picked" dogfish (*Squalus acanthias*), or spurdog, was landed by Belgium, Denmark, Germany, the Netherlands, Norway, Sweden and the United Kingdom. Main catches came from the Skagerrak and Kattegat from Danish, Swedish and Norwegian vessels, and to a lesser extent from the other countries. Landings from the Belts, the Sound, and the Western Baltic were very low (approximately 35t). Notably, a small amount (about 10t) was recorded from the Baltic Proper (sub-divisions 25 and 27) by Swedish fishing vessels. The total landing statistics reveal a clear and serious decline in spurdog abundance over the observed years (see Figure 3 overleaf). Indeed, since 1993 the landings per year have not exceeded 1,000t. Spurdog made up 79% of total landings of cartilaginous fishes from the Baltic. This figure is probably an underestimate given the likelihood that the category 'Dogfish sharks nei' also included spurdog.

Other shark species included in Baltic landings reports are tope (*Galeorhinus galeus*), porbeagle (*Lamna nasus*) and blue shark (*Prionace glauca*). About 10t of blue shark was caught during the years 1989–2004 in the Skagerrak/Kattegat, while

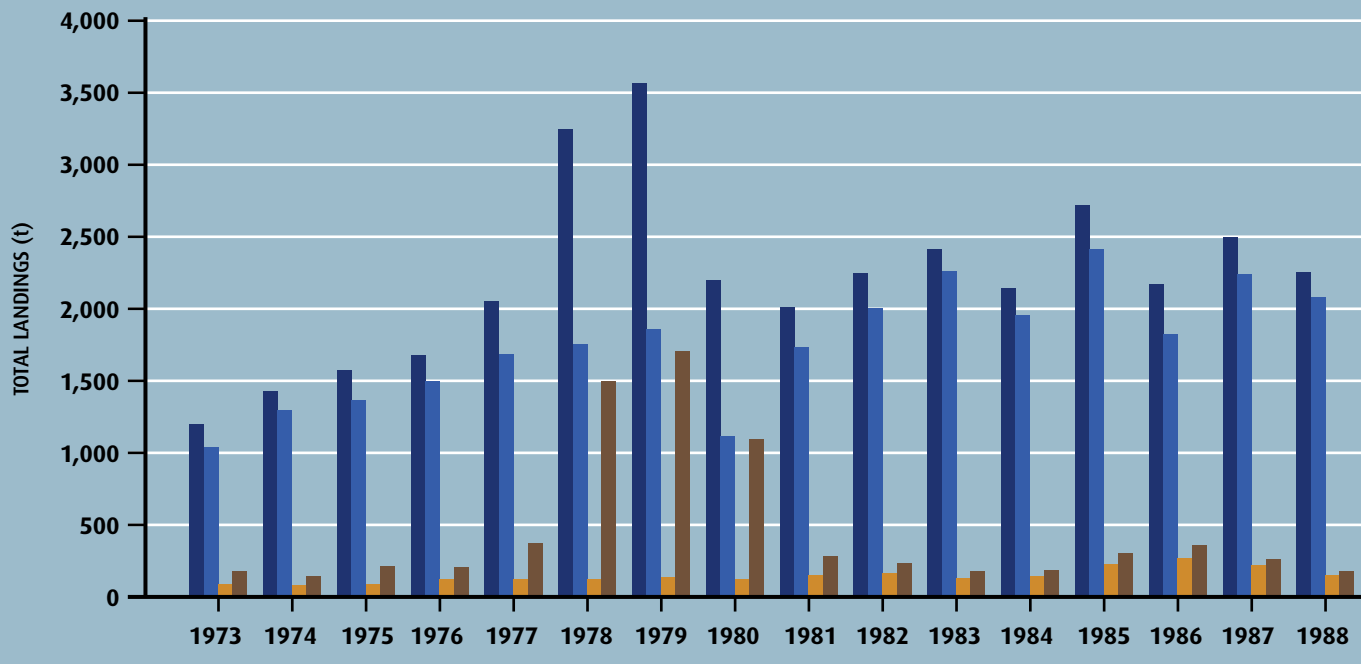
a very small amount of this species was reported in catches in the Belts by Danish fishermen. Less than 10t of tope was landed during 1999–2005 from the Skagerrak/Kattegat, while very small quantities of the species were taken from the Danish Straits, also by Danish vessels. Porbeagles, which were landed by Norway, Sweden and Denmark, were usually caught in the Skagerrak/Kattegat (approximately 1,355t), and to a lesser extent (approximately 6t) in the Danish Straits and the Western Baltic (sub-divisions 22, 23 and 24), according to Danish and Swedish fisheries data provided to ICES. In 2005, no porbeagle catches were recorded. Interestingly, these catches enhance our knowledge of these species' range: distribution data on tope are confined to the Skagerrak and Kattegat, but catch records reveal a more southerly distribution into the Danish Straits; the same is true for the blue shark.

In comparison to the shark catches, landings of rays and skates from the Baltic area were negligible (see Figure 3), reaching altogether only 5,000t in the years 1973–2005. The only skate recorded by species from the Baltic area is the common skate (*Dipturus batis*); less than 23t was recorded from the Skagerrak/Kattegat and, to a lesser extent, the Danish Straits by Danish fishermen. Other unclassified rays and skates (*Raja* rays nei) were reported from the Skagerrak/Kattegat by fishermen from Belgium, Denmark, Germany, Iceland, the Netherlands, Norway, Sweden and the United Kingdom. The highest landings from the Skagerrak/Kattegat region were reported by Denmark, Norway, Sweden and the Netherlands. From the Danish Straits and the Western Baltic (sub-divisions 22, 23 and 24), landings were only reported by Denmark, Germany and Sweden.

Catches of rabbit fish (*Chimaera monstrosa*), the only Baltic chimaera, were recorded from the Skagerrak and Kattegat, presumably caught in or near the Norwegian Deep. Since 2001, about 12t of this once discarded species was landed by Danish vessels.

Although no details of the gear used in Baltic fisheries were available with this data, one can assume that the gear catching cartilaginous fishes in the Baltic is similar to that taking these species in the North Sea. In 2006, the ICES-WGEF reported that demersal cartilaginous fishes were taken as bycatch in trawl fisheries for demersal bony fishes (roundfish and flatfish). Vessels using gillnets and longlines take rays (including skates) and pelagic sharks as targeted catch and incidentally. Most of the cartilaginous fish catch

Figure 3: Total landings (t) of cartilaginous fishes from the Baltic Sea, including the Skagerrak, from 1973–2005, separated into main species groups.



Data source: ICES fisheries data (FAO FishStat Plus)

TABLE 4: Baltic cartilaginous fish landings (kg) from 1995–2002 for ICES statistical rectangles 39G2–39G4, 38G2–38G4 and 37G2 of ICES fishing area IIId, sub-division 24.

Species/category	39G2	39G3	39G4	38G2	38G3	38G4	37G2
"Picked" dogfish *(Squalus acanthias)*	11	–	3	10	–	–	–
Small-spotted catshark *(Scyliorhinus canicula)*	12	–	96	792	–	–	20
Rays and skates, not determined	336	250	60	190	230	1,300	–

NB. A rectangle is half a latitude (30 minutes or nautical miles) and one longitude (equal to 60 nautical miles).
Data source: Danish Directorate of Fisheries logbook register

from the Baltic is likely taken as bycatch because quantities are too low to support targeted fisheries.

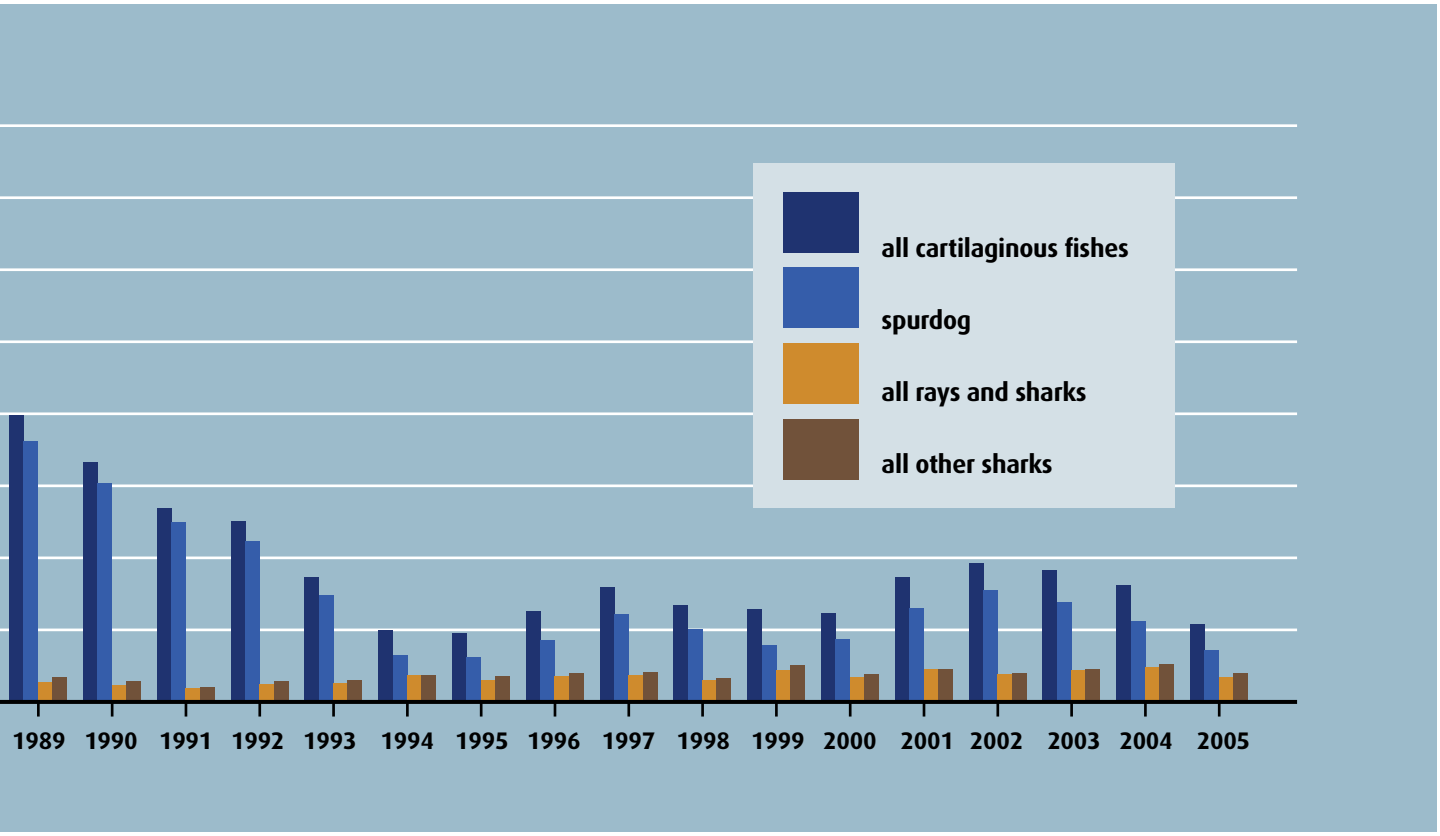
Rather than being classified by species-specific categories, the species are summarized in these data sets by super-ordinated categories such as 'all rajidae' or 'dogfishes not elsewhere included'. Data on minimum length are not available and fisheries data from logbook registries only cover vessels exceeding 10m in length. It is possible that small-spotted catsharks (*Scyliorhinus canicula*) and common skates (*Dipturus batis*) are included in Swedish catches of the aforementioned categories of dogfishes and rays, although fishing and landing is reportedly prohibited in Swedish waters for these species. Overall, the identification of Swedish *D. batis* and *D. linteus* (sailray) specimens, and possibly other skates, are doubtful.

Data from other sources

Other fisheries' data sources provide insight into catches of cartilaginous fishes in the Western Baltic, as well as more detailed information than that found in the ICES data (ICES offers no information on catches per statistical rectangle).

Data from the Danish Directorate of Fisheries show cartilaginous fish landings from 1995–2002 (see Table 4). Catches from sub-division 24 were reported primarily by Danish vessels (and one Swedish boat) and landed at ports in Denmark or outside Denmark.

These data reveal modest catches of "picked" dogfish (spurdog) and lesser spotted dogfish (*S. canicula*), as well as larger catches of skates and rays from the Baltic. The distribution of the lesser spotted dogfish further eastward into low salinity (about 8 PSU) areas, as demonstrated by this data, is notable.



Conservation

Conservation tools

There are many relevant global, regional and national regulatory tools available for conserving Baltic sharks, rays and rabbit fishes and their habitats.

International instruments

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). The IPOA-Sharks calls on all fishing nations to assess their cartilaginous fish populations and prepare national and regional plans of action for sharks in accordance with FAO technical guidelines [17]. The IPOA is, however, wholly voluntary and progress toward its implementation has been slow [7]. The EU only recently started to develop a Community Plan of Action (CPOA) for sharks; a final plan is anticipated by 2009. As of yet, there are no regional plans of action for sharks.

HELCOM

The Helsinki Commission, or HELCOM, aims to protect the Baltic Sea by fostering intergovernmental cooperation among the bordering countries. HELCOM is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area (also known as the Helsinki Convention). The Convention area covers the whole of the Baltic Sea area including inland waters. First signed in 1974 and revised in 1992, the Convention now claims all countries bordering the Baltic as well as the European Community as signatories. Governments of the Contracting Parties are obliged to implement HELCOM recommendations through their respective national programmes and legislation.

Although HELCOM offers no specific measures for the management or conservation of cartilaginous fish species of the Baltic, the Commission adopted a Red List of threatened and declining species of Baltic lampreys and fishes earlier this year (see Appendix 1). HELCOM maintains a joint working programme on Marine Protected Areas with the OSPAR Commission (see below) [35].

IBSFC

The International Baltic Sea Fishery Commission (IBSFC), defunct since January 2006, was established in 1973 by the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and Belts (the Gdansk Convention) [16]. The IBSFC obtained scientific advice from ICES and set catch limits for the four main commercially exploited fish species (cod, salmon, herring and sprat). This function is now performed by the European Commission and Council of Ministers. Neither regime has addressed the catch of cartilaginous fishes in the Baltic.

OSPAR

The Oslo-Paris Convention, or OSPAR, was founded in 1992 by combining the forerunning conventions, the Oslo Convention (Oscom) and the Paris Convention (Parcom). OSPAR provides a legal framework for international cooperation to protect the marine environment of the Northeast Atlantic. The OSPAR Commission is made up of government representatives of the 15 Contracting Parties and the European Commission.

Human activities are managed under OSPAR through six strategies, one of which involves the conservation of marine biodiversity and ecosystems. This strategy has four elements, including the assessment of species that are threatened or in decline and the development of measures for their protection. The list of species assessed as needing protection contains three cartilaginous fish species: the basking shark (*Cetorhinus maximus*), common skate (*Dipturus batis*) and spotted ray (*Raja montagui*). In 2007, Germany proposed eight species of cartilaginous fish for listing under OSPAR. Four of these occur in the Baltic: porbeagle shark (*Lamna nasus*), thornback ray (*Raja clavata*), spurdog (*Squalus acanthias*) and angel shark (*Squatina squatina*).

Although the Baltic Sea is not one of OSPAR's principal areas of focus, several Baltic countries (Denmark, Finland, Germany, Norway and Sweden, as well as the EU) are OSPAR Contracting Parties. In addition, a declaration of Ministers and an agreement on cooperation with HELCOM recognizes that the biodiversity and distribution of species in the Baltic Sea is strongly linked to the original OSPAR maritime area [58].

CITES

The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) provides an international legal framework to protect species from overexploitation through international trade. CITES Appendix I listings are reserved for species threatened with

extinction and essentially result in a ban on international trade in that species. Appendix II addresses species that could become threatened if international trade is not controlled; Appendix II listings aim to ensure trade is limited to sustainable levels by requiring exporting countries to issue permits, and to do so only after documenting that the trade will not have a detrimental effect on the species' wild populations [26].

The basking shark, whale shark (*Rhincodon typus*) and white shark (*Carcharodon carcharias*) are listed on CITES Appendix II. Germany has fought since 2003 to secure Appendix II listings for spurdog and porbeagle sharks. In 2004, support from other EU Member States was insufficient to advance the proposals to the 13th Conference of the Parties (CoP13) to CITES. Updated proposals were adopted by the EU with overwhelming support in late 2006 and then debated at CoP14 in June 2007 at The Hague. Both proposals received a majority of the votes in Committee, but fell short of the two-thirds majority required for adoption. Germany has pledged to attempt the listing of both spurdog and porbeagle again at the CITES CoP15 in 2010.

CMS

The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) is an intergovernmental treaty that provides a framework for conserving migratory species throughout their range.

Appendix I is reserved for species threatened with extinction; CMS Parties strive to protect these animals as well as their habitats and migratory routes. In addition, CMS facilitates concerted conservation action among Range States. CMS Appendix II is designed for migratory species that would significantly benefit from international cooperation, for which global or regional agreements among Range States are encouraged. Agreements range from legally binding treaties to less formal Memoranda of Understanding and can be adapted regionally.

CMS adopted a resolution on migratory sharks in 2005 and is now in the process of developing a landmark, global agreement for these species. Currently, basking, white and whale sharks are listed under the CMS Appendices. The CMS Scientific Council has determined that an additional 35 shark and ray species meet the criteria for listing under the CMS Appendices.

EU regulations

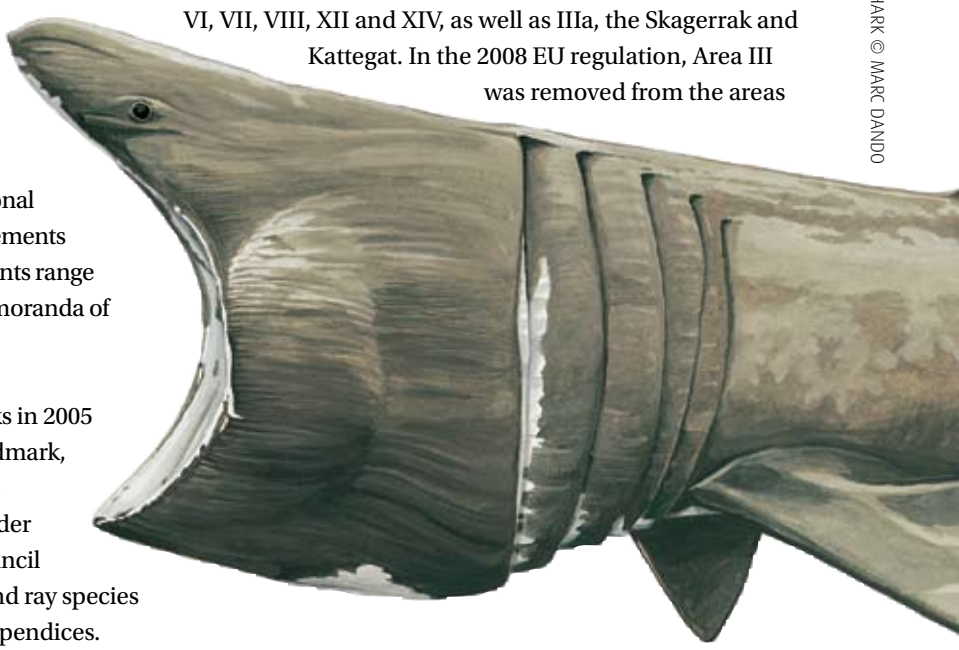
Apart from the Norwegian coast in the Skagerrak, the short coastline of the Russian Kaliningrad enclave and the Russian coastline on the Bay of Finland, the waters of the Baltic Sea are governed by the EU and its Member States.

EU fisheries management

As mentioned above, there is currently no holistic European plan for cartilaginous fishes, although fisheries management and recovery plans are mandated for commercial species under the EU Common Fisheries Policy and encouraged under IPOA-Sharks. To date, only a few measures are in place to safeguard sharks and rays from overfishing by EU vessels.

Since 2006, basking sharks and white sharks have been protected through a prohibition on fishing, retaining, transhipping and landing that applies to Community vessels [11].

The first EU total allowable catch (TAC) limit for spurdog of the North and Norwegian Seas (ICES Areas IV and IIa) was set in 1999 [37] at 8,870t. This limit has since been regularly reduced, but never enough to restrict fishing and promote recovery. Indeed, before 2005, spurdog TACs were roughly two times higher than actual catches. Of the 2008 TAC of 631t for this region, Denmark was allotted 57t and Germany 10t; Sweden took 1t. In 2007, an additional TAC (2,828t) was imposed for spurdog taken from adjacent EU and international waters of Areas I, V, VI, VII, VIII, XII and XIV, as well as IIIa, the Skagerrak and Kattegat. In the 2008 EU regulation, Area III was removed from the areas



BASKING SHARK © MARC DANDO

subject to spurdog limits, leaving the species unregulated in the Baltic after just one year of management. Germany received 31t of the 2008 TAC of 2004t.

In recent years, EU spurdog TACs have been limited to bycatch only; spurdog catch thereby cannot exceed 5% of the live weight of fish onboard a vessel. ICES has recommended one TAC of zero for all these areas.

In 1999, a TAC of 6,060t was introduced for skates and rays of the Family Rajidae of the North and Norwegian Seas (Areas IV and IIa). This limit was reduced annually and met the actual level of catches for the first time in 2006, at 2,737t.

Directed fisheries for deep-sea sharks are prohibited by EU regulations, but landings of these exceptionally slow growing species are still allowed through a bycatch TAC in areas V–X and XII (7,126t for 2006, 2,491t for 2007, reduced to 1,715t in 2008) that is allocated to EU Member States through national quotas. Restrictions on deep-water fishing gear are meant to reduce bycatch of deep-water sharks, but are more lenient (in terms of allowable depths) than the ICES advice.

After years of debate, the EU imposed its first 'precautionary' TAC for porbeagle sharks in 2008; areas of application include the Baltic (Area III). The current limit of 581t is on a par with recent landings from this exceptionally depleted population and is therefore unlikely to lead to rebuilding or even fishery restriction. Denmark received 30t of the 2008 porbeagle TAC; Germany was allotted 6t and Sweden 1t.

EU Finning Ban

In 2003, with Regulation 1185/2003, the EU banned the wasteful practice of shark finning in EU waters and on EU vessels through the best possible means: prohibiting the removal of shark fins at sea. Article 4 of the regulation, however, allows derogation from this key measure by national authorities. If vessels can prove it is necessary for processing, national authorities can issue "special fishing permits" to allow fishermen to remove shark fins onboard vessels, as long as the bodies are retained.

Germany and Lithuania are the only EU Member States bordering the Baltic that issue special fishing permits. Germany originally issued five permits, but decreased the number to three in 2007. Lithuania has issued one.

SMALL-SPOTTED CATSHARK © HEIKE ZIDOWITZ

EU conservation measures

The EC Habitats Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora was developed to protect biodiversity by designating ecologically valuable habitats as nature reserves. This programme mandates that EU Member States identify and protect habitats of special ecological importance, but only guards against declines from the status quo. As such, fishing is still allowed in protected areas as long as it does not lead to population decline [62]. Regulations on bycatch or targeted fisheries have not yet been imposed [62]. Germany has acted upon this Directive in the Baltic by implementing four nature reserves.

The Habitat Directive includes a list of animals and plants in need of strict protection. There are currently no cartilaginous fishes on this list, thus excluding them as priorities for protection.

Conservation action by Baltic countries

Sweden is the only Baltic country to offer specific protections for sharks and rays (beyond EU restrictions).

In 2004, Sweden prohibited the fishing and landing of numerous fish species from Swedish waters of the Skagerrak, Kattegat and Baltic Sea [21]. Cartilaginous fish species under this protective regulation include the small-spotted catshark, basking shark, common skate, thornback ray, and porbeagle. Sweden has secured 1t of the new 2008 TAC for porbeagle sharks, presumably for animals taken outside Swedish waters.

Since 2008, an addition to this regulation [22] forbids targeted fishing for spurdog with nets and longlines; trawl fishermen must obtain special permits in order to keep spurdog caught as bycatch. Sweden limits anglers to one spurdog during a 24-hour period.

Conclusion

There is a general misconception that the Baltic Sea, due to its low salinity, extreme hydrological circumstances and physical barriers, is devoid of sharks, rays and chimaeras.

In actuality, more than 30 such species have been found in its waters (including the Skagerrak), some commonly. Indeed, all the cartilaginous fish species that occur in the eastern and northern North Sea also inhabit the Baltic, albeit in much lower numbers. These individuals form the fringe of the species range, rather than separate populations, and yet deserve consideration in terms of their contribution to the overall health and stability of populations and the surrounding environment. Further research into the physiological limits of distribution as well as abundance, population structure and migration associated with Baltic Sea sharks and rays, is necessary for a more complete picture of their status and conservation needs.

Available data on catch of sharks and rays from the Baltic reveal a surprisingly active fishery in the Skagerrak and Kattegat and even the Western Baltic. Fishery trends for commercially important species in the Baltic mimic the declines documented for North Sea sharks, skates and rays. Notably, the annual catch of spurdog from the Baltic in the late-1980s is about on a par with today's allowable catch limits for the whole of EU waters (2,500t).

Call for action

Sharks, rays and chimaeras of the Baltic Sea are poorly studied and have virtually no protection. Most existing EU management of cartilaginous fishes excludes the Baltic, and collection of fisheries data for these species is lacking throughout the region. HELCOM and IBSF (although the latter no longer exists) have not provided any fisheries recommendations or regulations specific to Baltic cartilaginous fishes. Our understanding and conservation of these species has suffered as a result of this inattention.

Although it is not surprising to find records of highly migratory Atlantic shark species (such as the porbeagle shark) venturing eastward into the central Baltic Sea, it is extremely surprising that fisheries' catch records indicate relatively high numbers of some species (such as spurdog and small-spotted catsharks) as far east as sub-region 24 and 25 (Western Baltic and Baltic Proper).

This report shows that sharks, rays and chimaeras are present in the Baltic Sea, particularly in the transitional waters of the Skagerrak and Kattegat, and that their populations have been and still are subject to indirect fishing pressure and, in some cases, ongoing targeted fishing. Safeguards for these species could help protect the region's biodiversity and perhaps provide a conservation buffer for the particularly depleted shark and ray populations based in the North Sea. Any fisheries taking cartilaginous fishes from the Baltic should be subject to stringent, precautionary management, if allowed at all.

Shared responsibility for conservation

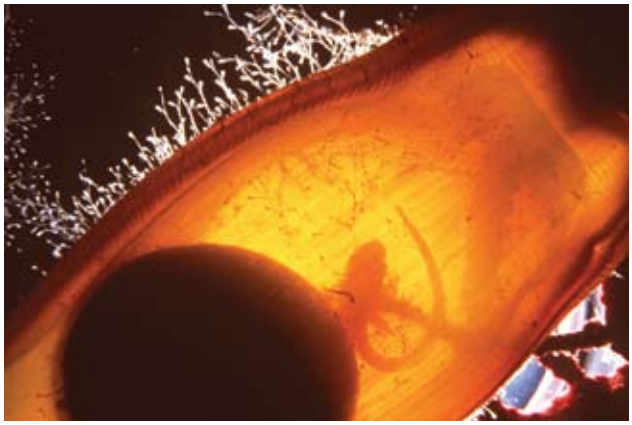
The serious state of most European shark and ray populations today brings conservation responsibilities for all EU Member States. Even countries with few or no native sharks or rays have much to offer in terms of ensuring sustainable fisheries for these species and recovery of depleted populations. For instance, Baltic nations with even minor populations of spurdog or porbeagle sharks are considered Range States under CITES and can therefore play a leadership role in securing associated beneficial limits on international trade. Similar arguments can be made for other international agreements. Moreover, the contentious annual TAC setting debates within the European Council of Fisheries Ministers urgently need the strong voices of both responsible, affected fishing countries and neutral nations, which are free from vested interests. Indeed, leaving decisions on allowable catches solely to the States with the greatest economic interest is unlikely to lead to the precautionary management approach warranted for such slow-growing species.

Sharks, rays and chimaeras of the Baltic Sea are poorly studied and have virtually no protection. Most existing EU management of cartilaginous fishes excludes the Baltic, and collection of fisheries data for these species is lacking throughout the region.

Recommendations

In order to enhance the understanding of and outlook for sharks, rays and chimaeras, we urge Baltic country governments to:

- promote ICES advice for EU shark and ray fisheries restrictions, especially minimal catch limits for spurdog, porbeagle, skates/rays and deep-water sharks, with the European Commission and within the European Council of Fisheries Ministers;
- ensure that EU regulations covering cartilaginous fishes found in the Baltic Sea (particularly spurdog) apply to the Baltic Sea;
- collaborate to establish complementary, precautionary fisheries regulations on Baltic sharks and rays for which ICES advice has not yet been developed;
- facilitate species-specific population assessments and long-term monitoring surveys for cartilaginous fishes of the Baltic;
- require size and species-specific reporting of shark and ray catches (i.e. discards and landings) data;
- investigate appropriate size limits on shark and ray landings (i.e. minimum, maximum or a combination thereof) for maximizing survival of the age classes most critical to population health;
- determine the fishing gear and methods used to catch Baltic sharks and rays, as well as the associated discard mortality;



CATSHARK EGG-CASE © KURT AMSLER/ARDEA LONDON

- secure measures to protect key Baltic shark and ray habitats, such as fishing closures, gear restrictions and protected areas;
- encourage research on the influence of salinity and anoxic environments on the distribution, abundance, migration, stock structure, life-cycle and reproductive rates of sharks and rays in the Baltic;
- adopt national legislation to protect shark and ray species listed under wildlife conventions and/or considered by the IUCN to be Endangered or Critically Endangered;
- promote the adoption of Germany's proposals to list and conserve additional sharks and rays under OSPAR, particularly those species found in the Baltic: porbeagle, spurdog, angel shark and thornback ray;
- continue to support Germany's proposals to list spurdog and porbeagle under CITES;
- ensure the adoption of a requirement that all sharks be landed with their fins attached (to end finning and improve data collection);
- actively promote and participate in the development and timely adoption of a European Community Plan of Action for Sharks; and
- encourage sound shark and ray management proposals by the EU delegations to international fisheries bodies around the world.

RABBIT FISH © ERLING SVENSON/UW PHOTO

Appendices

Since 1948, the World Conservation Union (IUCN) has been assessing the conservation status of species on a global scale. The IUCN Red List of Threatened Species™ highlights taxa that are threatened with extinction in order to promote their conservation. The list provides objective and scientifically based information on the current status of biodiversity through the use of the IUCN Red List Categories and Criteria [39].

Key to IUCN Red List classification:
NE: Not Evaluated
DD: Data Deficient
LC: Least Concern
NT: Near Threatened
VU: Vulnerable
EN: Endangered
CR: Critically Endangered

Key to HELCOM classification:
NE, DD, LC, NT, VU, EN, and CR the same as IUCN Red List classification
TM: Threatened Migrant

Key to national Red Lists:
DE = Germany, SW = Sweden, GE = in George 2003 [29]

*Assessments dated 2002, 2003, 2006, 2007 and 2008 used version 3.1 (2001) of the IUCN Categories and Criteria. Assessments dated 2000 used version 2.3 (1994).

**Fishing and landing in Swedish waters prohibited by Fisheries directive [21].

NB. IUCN assessments listed as 'in prep. 2008' have been finalised and will be reflected in the 2008 IUCN Red List.

National Red Lists have been provided to HELCOM by all states adjacent to the Baltic Sea [33]. Only the Swedish and German lists contained cartilaginous fishes (see Appendix 1). National Red Lists are usually compiled by nature conservation departments, e.g. the German Federal Agency for Nature Conservation. National Red List assessments reflect, in a condensed way, the knowledge of a large number of specialists.

APPENDIX 1: LIST OF THREATENED AND DECLINING SPECIES OF CARTILAGINOUS FISHES OF THE BALTIC SEA
Comparison of species status as assessed by HELCOM, IUCN [39] (also refer to IUCN key) and national governments of Baltic Sea countries.

Scientific name	HELCOM priority list 2007	HELCOM Red List 2007	Global IUCN Red List with: assessment year *, regional assessment NE-Atlantic	National Red Lists
Alopias vulpinus	High priority, significant decline	CR	VU (in prep. 2008)	TM (DE 1996)
Amblyraja radiata	High priority, significant decline	EN	VU (in prep. 2008)	EN (GE 2003)
Carcharhinus longimanus	–	–	VU (2006)	–
Cetorhinus maximus	High priority, significant decline	EN	VU (2000), EN (2000)	EN (SW 2005) **
Chimaera monstrosa	Medium priority, decline not known	VU	NT (2007)	VU (SW 2005)
Dasyastis pastinaca	Medium priority, probable decline	TM	NT (in prep. 2008)	TM (DE 1996, 2006)
Dipturus batis	High priority, significant decline	CR	CR (2006)	CR (SW 2005) **, CR (GE 2003)
Dipturus linteus	–	–	LC (in prep. 2008)	–
Dipturus oxyrinchus	–	–	NT (2007)	–
Echinorhinus brucus	–	–	DD (2003)	–
Etmopterus spinax	Medium priority, decline not known	VU	LC (in prep. 2008), NT (in prep. 2008)	VU (SW 2005)
Galeorhinus galeus	High priority, significant decline	EN	VU (2006)	VU (SW 2005); EN (GE 2003)
Galeus melastomus	High priority, significant decline	EN	LC (in prep. 2008)	–
Hexanchus griseus	High priority, significant decline,	CR	NT (2000)	CR (GE 2003)
Lamna nasus	High priority, significant decline	CR	VU (2006), CR (2006)	TM (DE 1996, 2006), EN (GE 2003), CR (SW 2005) **
Leucoraja circularis	–	–	EN (in prep. 2008)	
Leucoraja fullonica	Medium priority, probable decline	TM	NT (in prep. 2008)	TM (GE 2003)
Mustelus asterias	–	–	LC (2000)	–
Oxynotus centrina	–	–	VU (2007)	–
Prionace glauca	Medium priority, probable decline	TM	NT (2000)	TM (DE 1996)
Raja clavata	High priority, significant decline	EN	NT (2000)	VU (SW 2005) **, CR (GE 2003)
Raja montagui	High priority, significant decline	EN	LC (2007)	–
Rajella fyllae	–	–	LC (in prep. 2008)	–
Scyliorhinus canicula	High priority, significant decline	EN	LC (in prep. 2008)	DD (SW 2005) **
Scyliorhinus stellaris	–	–	NT (in prep. 2008)	–
Somniosus microcephalus	Medium priority, decline not known	VU	NT (2006)	DD (SW 2005)
Sphyrna zygaena	–	–	NT (2000)	–
Squalus acanthias	High priority, significant decline	CR	VU (2006), CR (2006)	EN (SW 2005), CR (GE 2003)
Squatina squatina	High priority, significant decline	EN	CR (2006)	–
Torpedo marmorata	Medium priority, probable decline	TM	LC (in prep. 2008)	–
Torpedo nobiliana	–	–	DD (in prep. 2008)	–

Appendices

APPENDIX 2
Multi-lingual species list of cartilaginous fishes of the Baltic Sea

Scientific name	English[a]	German[b]	Danish[c]	Norwegian[d]
Alopias vulpinus	Common thresher shark	Gewöhnlicher Fuchshai	Rævehaj	Revehai
Amblyraja radiata	Starry skate, thorny skate	Sternrochen	Tærbe	Klorokke, Kloskate
Carcharhinus longimanus	Oceanic whitetip shark	Weißspitzen-Hochseehai	Hvidtippet haj	
Cetorhinus maximus	Basking shark	Riesenhai	Brugde	Brugde
Chimaera monstrosa	Ratfish, rabbit fish, ghost shark	Seekatze, Seeratte	havmus	Hågylling, Havmus
Dasyatis pastinaca	Common stingray	Gewöhnlicher Stechrochen	Europæisk pigrokke, Pilrokke	Pilrokke, Pilskate
Dipturus batis	Common skate, blue ray	Glattrochen	Skade	Storskate, Glattrokke, Glattskate
Dipturus linteus	Sailray	Weißrochen	Hvidrokke	Hvitrokke, Hvitskate
Dipturus oxyrinchus	Longnose skate	Spitzrochen	Plovjernsrokke	Spisrokke, Spisskate
Echinorhinus brucus	Bramble shark	Brombeerhai	Sømhaj	
Etmopterus spinax	Velvet belly shark	Kleiner Schwarzer Dornhai	Sorthai, Almindelig sorthaj	Blåmage, Svarthå
Galeorhinus galeus	Tope, school shark	Hundshai	Gråhaj	Gråhai
Galeus melastomus	Blackmouth dogfish, blackmouth catshark	Fleckhai	Ringhaj	Hågjel, Rødhå
Hexanchus griseus	Bluntnose sixgill shark	Großer Grauhai	Seksgællet haj	Kamtannhai
Lamna nasus	Porbeagle	Heringshai	Sildehaj	Håbrann
Leucoraja circularis	Sandy ray	Sandrochen	Sandrokke	Sandrokke, Sandskate
Leucoraja fullonica	Shagreen ray	Chagrinrochen	Gøgerokke	Nebbrokke, Nebbskate
Mustelus asterias	Starry smoothhound	Weißgefleckter Glatthai	Stjernehaj	Glatthai, Hvitflekket glatthai
Oxynotus centrina	Angular roughshark	Gefleckte Meersau	Almindelig trekanthaj	
Prionace glauca	Blue shark	Blauhai	Blåhaj	Blåhai
Raja clavata	Thornback ray	Nagelrochen	Sømrokke	Piggrokke, Piggskate
Raja montagui	Spotted ray	Fleckrochen	Storplettet rokke	Flekkskate
Rajella fyllae	Round ray	Fyllarochen	Fyllas rokke	Rundskate
Scyliorhinus canicula	Lesser spotted dogfish, small-spotted catshark	Kleingefleckter Katzenhai	Småplettet rødhaj	Rødhai, Småflekket rødhai
Scyliorhinus stellaris	Nursehound, greater spotted dogfish	Großgefleckter Katzenhai	Storplettet rødhaj	Storflekket rødhai
Somniosus microcephalus	Greenland shark	Grönlandhai, Eishai	Grønlandshaj, Almindelig Havkal	Håkjerring
Sphyrna zygaena	Smooth hammerhead shark	Gewöhnlicher Hammerhai, Glatter Hammerhai	Almindelig hammerhaj	Hamerhai
Squalus acanthias	Spurdog, spiny dogfish, piked dogfish	Gewöhnlicher Dornhai	Almindelig pighai	Piggha, Pighai
Squatina squatina	Common angel shark	Meerengel, Gewöhnlicher Engelhai	Havengel	Havengel
Torpedo marmorata	Marbled electric ray	Marmorierter Zitterrochen	Marmoreret elrokke	Flekket el-rokke
Torpedo nobiliana	Electric ray	Schwarzer Zitterrochen	Sort elektrisk rokke, Sort elrokke	

[a] FAO Species catalogues [8, 66]; ICES WGEF Report (2006) [37]; Wheeler (1978) [72].
[b] George and Zidowitz (2006) [30].
[c] Møller and Nielsen (2000) [52]; Østergaard (2002) [56]; Carl (2003) [6]; Organisation for Economic Co-operation and Development (1990) [57]; Muus and Nielsen (1999) [53].
[d] Appleby (1999) [3]; Flintegård (1987) [25]; Organisation for Economic Co-operation and Development (1990) [57]; Lehtonen (1990) [47]; Anon. (2000) [1].
[e] Kullander (2003) [43]; Organisation for Economic Co-operation and Development (1990) [57]; Lehtonen (1990) [47].
[f] Koli (1990) [42]; Organisation for Economic Co-operation and Development (1990) [57]; Lehtonen (1990) [47]; Varjo (1981) [77].
[g] Grabda and Heese (1991) [31].
[h] Virbickas, J. (2005) [78].
[i] Ricker (1973) [64]; Rass (1983) [63]; Virbickas, J. (2005) [78].

Swedish[e]	Finnish[f]	Polish[g]	Lithuanian[h]	Russian[i]
Rävhaj		Kosogon	paprastoji jūrų lapė	акула пелагическая, акула-лисица
Klorocka	Kynsirausku	Raja promienista	žvaigždėtoji raja	Zvezdchatyi skat
Årfenhaj	Valkopilkkahai	Żarłacz białopłetwy	ilgapelekis pilkasis ryklys	
Brugd	Jättiläishai	Długoszpar a. rekin gigantyczny	milžinryklis	
Havsmus	Sillikuningas	Chimera a. Przeraza	europinė chimera	Evropeiskaya khimera
Spjutrocka, Stingrocka	Keihäsrausku	Ogończa pastynak	paprastasis dygliauodegis	
Slätrocka	Silorausku	Raja gładka	švelnioji raja	Gladkiy skat
Blaggarnsrocka, Vitrocka	Valkorausku	Raja głębinowa	baltasnukė raja	
Plogjärnsrocka	Vannasrausku	Raja ostronosa	ilgasnukė raja	
Tagghaj	Okahai	Rekin kolczasty	paprastasis krokodilinis dygliaryklis	
Blåkäxa	Pikkuhai	Kolczak a. kolczak czarny	naktinis juodasis dygliaryklis	Nochnaya
Gråhaj	Harmaahai		paprastasis sriubinis ryklys	акула суповая
Hågäl	Punahai	Piłogon	juodažiotis pjūklauodegis katryklis	
Sexbågig kamtandhaj,	Kidushai	Sześcioszpar	pilkasis šiašiažiaunis ryklys	акула шестижаберная
Håbrand, Sillhaj	Sillihai	Żarłacz śledziowy	atlantinis silkiaryklis	
Sandrocka	Hietarausku	Raja piaskowa	apvalioji raja	
Gökrocka, Gökrocka	Käkirausku	Raja kosmata	šagreninė raja	
Nordlig hundhaj, Glatthaj			žvaigždėtasis kiauniaryklis	
Trekantshaj		Brązosz	paprastasis tribriaunis ryklys	кот морской, центрина
Blåhaj	Sinihai	Żarłacz błękitny	melsvasis ryklys	акула синяя, Sinyaya akula
Knaggrocka	Okarausku	Raja nabijana a. Ciernista	dyglioji raja	скат шиповатый, лисица морская, Morskaya lisitsa
Fläckrocka	Tähtirausku	Raja gwiaździsta	Montegiu šlakuotoji raja	
Rundrocka	Pyörörausku	Raja listnik	apvalioji raja	
Småfläckig rödhaj	Pistepunahai	Rekinek psi	mažadėmis katryklis	Obyknovennaya koshach'ya akula
Storfläckig rödhaj	Täpläpunahai	Rekinek panterka a. Plamisty	žvaigždėtasis katryklis	акула большая пятнистая, Akula-koshka
Håkäring	Holkeri	Rekin polarny	arktinis ryklys	
Hammarhaj	Vasarahai	Rekin młot a. głowomłot pospolity	paprastasis kūjaryklis	молот-рыба
Pigghaj	Piikkihai	Koleń	paprastasis dygliaryklis	акула колючая/катрановая, катран, собака морская, нокотница, Obyknovennaya kolyuchaya akula
Havsängel	Merienkeli	Anioł morski a. Raszpla	europinis plokščiakūnis ryklys	ангел морской, расшпиль
Marmorerad darrocka	Marmorisähkörausku	Drętwa pstra	marmurinė torpeda	скат мраморный, Obyknovennyi
Darrocka	Silmäsähkörausku, Sysisähkörausku	Drętwa brunatna	tamsioji torpeda	

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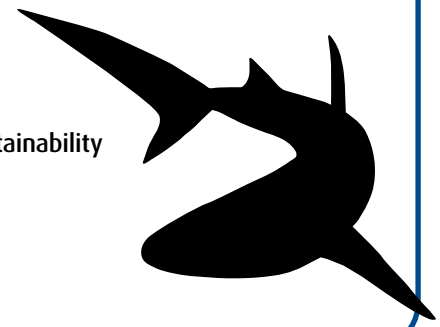
THE SHARK ALLIANCE

The Shark Alliance is a not-for-profit coalition of non-governmental organisations dedicated to restoring and conserving shark populations by improving European fishing policy. Because of the influence of Europe in global fisheries and the importance of sharks in ocean ecosystems, these efforts have the potential to enhance the health of the marine environment in Europe and around the world.

The mission of the Shark Alliance is two-fold:

- To close loopholes in European policy regarding the wasteful and unsustainable practice of shark finning;
- To secure responsible, science-based shark fishing limits for long-term sustainability and ecosystem health.



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