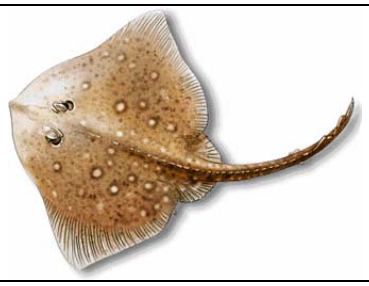
Nomination

Thornback ray *Raja clavata* (Linnaeus, 1758)



Geographical extent

OSPAR Regions: I, II, III, IV, V[7]

Biogeographic zones: 8,10,11,12,13,14,15,16

Region & Biogeographic zones specified for decline and/or threat: II & III.

Raja clavata inhabits mud, sand, shingle, gravel and rocky areas on the shelf and upper slope in the Northeast Atlantic and Mediterranean, also entering the Baltic and Black Seas, to West Africa. The southern limit of the range of *R. clavata* is uncertain. Southern African records may be *R. stralaeni* (Stehmann 1995; Compagno pers. comm.). It is most abundant in coastal areas at 10–60 m depth (shallower in cold temperate waters, deeper in warmer waters), commonly recorded to 100 m, and occasionally to at least 300 m. Estuaries and large shallow bays are important spring/summer spawning and feeding areas (Wheeler 1969; Stehmann & Buerkel 1984; Ellis *et al*. 2005a; Hunter *et al*. 2006).

The distribution of *R. clavata* in the centre of its North Sea range is contracting. At the beginning of the 20th Century, it was widely distributed over the southern North Sea, with centres of abundance in the southwestern North Sea and in the German Bight, north of Helgoland. Its area of occupancy is now only 44% of that in the 1980s (ICES WGEF in prep.). It is no longer present in the southeastern North Sea (German Bight), and catches in the Southern Bight now occur only in the west (ICES SGEF 2002). Distribution in the Mediterranean and Black Seas may be contracting (IUCN SSG in prep.).

Application of the Texel-Faial criteria

Global importance

The centre of distribution of *Raja clavata* is in the North Sea, where the species was formerly widespread and abundant, and the Celtic and Iberian Seas. The proportion of the global population located in the Mediterranean and on the African coast is uncertain, due to lack of data and widespread misidentification of skates and rays in these areas, but is estimated that at least 50% of the global population occurs in the OSPAR Maritime Area. Although this species is not of global importance under the Texel-Faial criteria, it should be noted that it is comprised of several genetically-distinct stocks, some of which (such as the important North Sea stock) occur wholly or primarily within the OSPAR Area. When applying OSPAR/Faial criteria, this is not enough to list *Raja clavata* as of global importance, but its relevance to OSPAR is clear.

[7] *There is some taxonomic debate over the occurrence in Region V*

Figure 1: Distribution of *Raja clavata* (from Stehmann & Bürkel in Whitehead *et al*. 1984)

Regional importance

Raja clavata is not of regional importance under the Texel-Faial criteria, although it is important to note that this species is comprised of several distinct genetic stocks which have some important centres of distribution and areas of essential habitat for *Raja clavata* within the OSPAR Area, including the Thames Estuary and Southeast English Channel (ICES WGEF in prep.; Martin *et al*. 2005).

Rarity

The species is decreasing in abundance or no longer present in several regions, but not rare.

Sensitivity

Sensitive to very sensitive. *R. clavata* has a slow growth rate (Cannizzaro *et al*. 1995; Walker 1999), reaching maturity at 7–10 years of age and a relatively large size (maximum length is 118 cm), and attaining a maximum age of at least 15 years (Walker 1999, ICES-FishMap). This species is oviparous, but has relatively low fecundity, laying on average fewer than 100 eggs *per annum* (estimates of ovarian fecundity vary widely: 38–167 *per annum* (Ellis *et al*. 2005c; ICES WGEF in prep.)). These biological constraints make this species susceptible to overexploitation when fishing pressure is high (Dulvy & Reynolds 2002, Abella & Serena 2005). Recovery from a depleted state and the recolonisation of areas from which it has been extirpated will also be very slow (the latter possibly greater than 25 years). Dulvy & Reynolds (2002) noted that *R. clavata* is sufficiently large-bodied to be vulnerable to local extinction, which has already occurred in parts of its range, and believed that "this species should be watched carefully". Walker & Hislop (1998) considered the average fishing pressure in the North Sea to be "probably too high for a steady population of *R. clavata*".

Raja clavata feeds on all kinds of benthic animals, preferably crustaceans. This species is not sensitive to moderate eutrophication.

Keystone species

No information.

Decline

Patterns of decline in *Raja clavata* vary across the OSPAR Maritime Area, where this is one of the most important species of skate and ray in commercial fisheries. Trends are difficult to determine in most areas, since skates and rays are generally not distinguished by species in landings data and identification of *R. clavata* has been poor in some areas where species-specific data are available. However, there is little doubt that total ray landings have declined in some parts of the OSPAR Area (Figures 4 and 5), that declines have affected the largest species of rays most seriously (these have been replaced in landings by smaller less valuable species), and that *R. clavata* is sufficiently large-bodied to be vulnerable to depletion by the high levels of fishing effort prevalent in this region (Dulvy & Reynolds 2002).

Declines in this species have been most marked in OSPAR Region II. However, the species has also undergone historic declines elsewhere (Rogers & Ellis 2000; Ellis *et al*. 2005b,c; ICES WGEF 2006). The decline trend is less marked in OSPAR Region III, and unclear in IV (where some data indicate an increase). The following paragraphs review declines in OSPAR Regions II and III separately.

OSPAR Region II

Where data are available, the long term trend in abundance of *R. clavata* in historical and recent fishery-independent surveys in the North Sea and Eastern Channel has been markedly downward since the start of the 20th Century (Heessen 2003). Declines in abundance and contraction in the distribution of thornback ray stocks have been reported by Walker & Heessen (1996). Walker & Hislop (1998), several reports of the ICES WGEF, and in the ICES FishMap. The species is now considered by ICES to be depleted in this region, although local abundance is still high in some areas. ICES WGEF (2007 warns that the area of occurrence of *R. clavata* in the North Sea is becoming concentrated in the centre of its range (Figure 2). It is presently only 44% of the extent of the species in the 1980s (Figure 3). This patter should be regarded with caution particularly if the species is becoming more concentrated where fishing effort is high (it can result in unexpected fishery collapse, as for the Canadian cod stock (Rose & Kulka 1999)).

Figure 2: Distribution of *Raja clavata* in the North Sea 1980–2006 (from ICES WGEF in prep.)

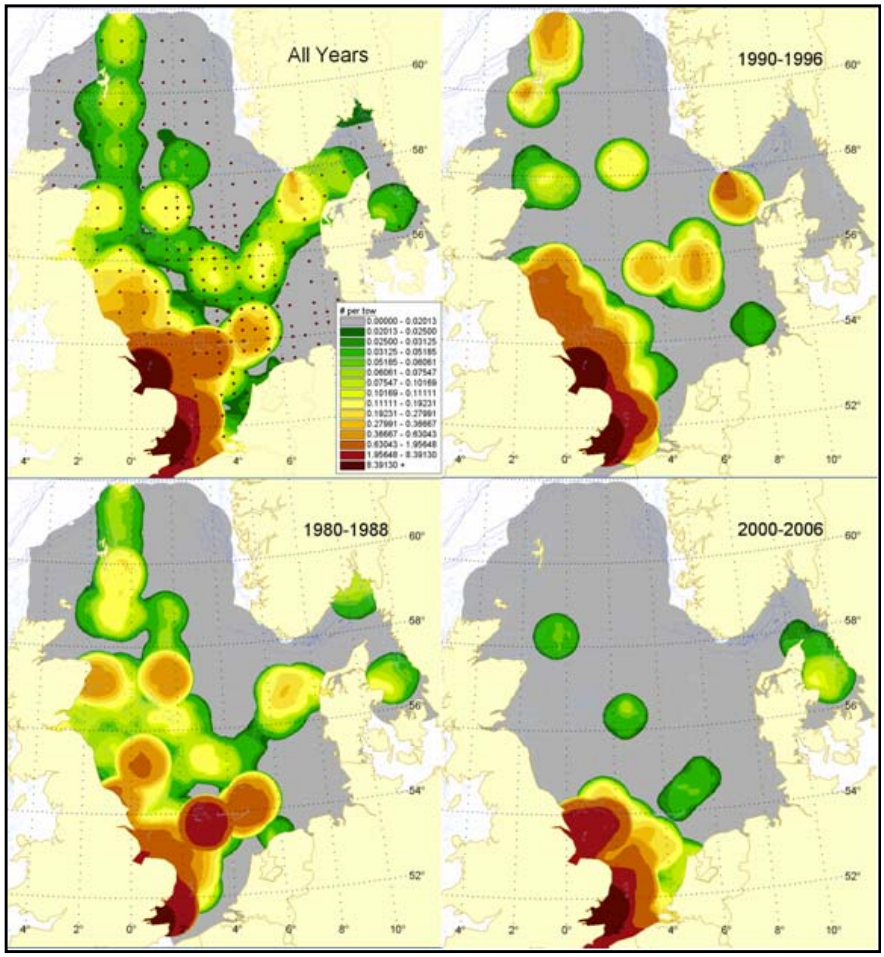
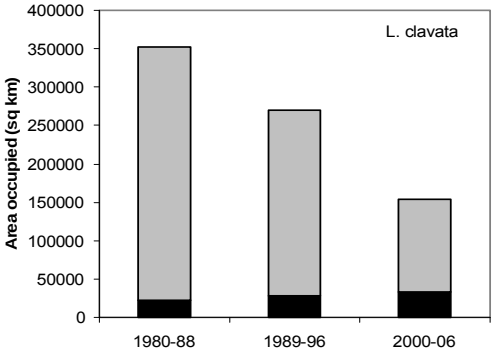


Figure 3: Area of North Sea (km^2) occupied by *Raja clavata* during the three periods 1980–2006 illustrated in Figure 2. (Source: ICES WGEF in prep.)



Key: Light shading represents total area of distribution, dark shading represents area with high abundance.

The DELASS project (Heessen 2003) reported that the "probability of having a haul with at least one *R. clavata* is estimated to be 16 times higher for the period 1967-1976 compared to the most recent years, 1993-2002. One hundred years ago, the distribution area of the stock included almost the whole North Sea. Today, survey data show a stock concentrated in the waters around the Thames Estuary." The DELASS report remarked: "Apparently, there are still patches left in the North Sea with stable local populations. Whether the number of patches will remain high enough to sustain a North Sea population in the long-term is, however, unknown" (Heessen 2003).

Commercial catch records (which represent combined landings of all species of skates and rays) from the North Sea, Skaggerrak, Kattegat and Eastern Channel also exhibit a steep downward trend (Figure 4). The interpretation of these aggregated data, which show a clear decline in the weight of total landings, needs to take into account a change in the overall species composition of catches. The largest species of skate and ray have declined most seriously over this period. Common skate *Dipturus batis* has been extirpated. *Raja clavata* has undergone a serious decline and contraction of range (as described above), while smaller species have become more abundant in surveys and landings (Walker & Heessen 1996). Figure 4 therefore likely under-represents the decline in the proportion of *R. clavata* in commercial landings. However, the lack of long-term data on the species composition in commercial catches prevents further analyses.

OSPAR Region III

Although *Raja clavata* is still one of the most important commercial species in the inshore fishing grounds of the Celtic Sea, historic declines have occurred in some areas in Region III, including in the NW Irish Sea (Rogers & Ellis 2000; Ellis *et al*. 2005b; ICES WGEF 2006). Dulvy *et al*. (2000) identified a decline in abundance of this species in surveys in the Irish Sea from 52.8% of skate catches in 1958-64, to 42.7% in 1988-97. The relative abundance of *R. clavata* declined from 64.4% in 1988 to 44.7% in 1997, and biomass also fell (all landings declined gradually, but the abundance and biomass of smaller species rose). ICES WGEF (2008) notes that changes in trawl method and sampling strategies mean that drawing definitive conclusions on the basis of these comparisons is difficult.

Catch rates in the coastal waters of the Irish Sea appear steady in recent years according to beam trawl survey data (Ellis *et al*. 2005b), but these data tend to sample juveniles more effectively and do not provide appropriate trends for the relative abundance of adult fish (IUCN SSG in prep.). Additionally, although preliminary analyses of recent survey data indicate that the relative abundance of *R. clavata* has been stable in recent years, Celtic Seas catches of all skates and rays combined have been falling (Figure 5), despite the absence of catch quotas or any relevant gear restrictions. These declines in landings are associated with changes in species composition and relative abundance (ICES WGEF in prep.). Because larger species have declined more seriously than smaller, more fecund and abundant species, which have partially replaced the former in catches, the decline in the proportion of *R. clavata* in commercial landings may be under-represented by Figure 5. However, ICES WGEF point out that further work on temporal trends in species composition is required.

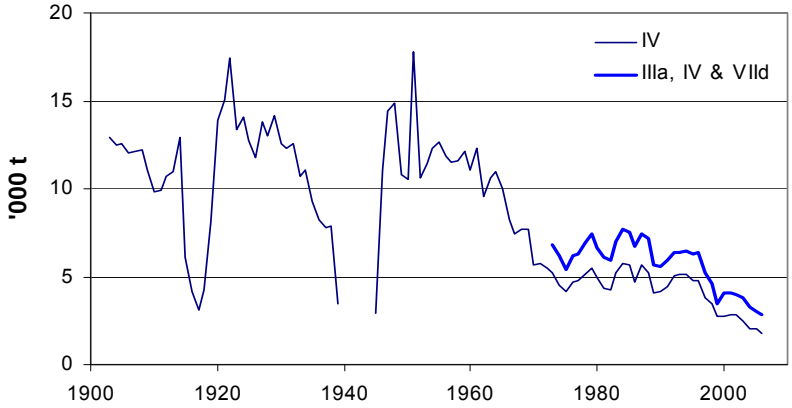
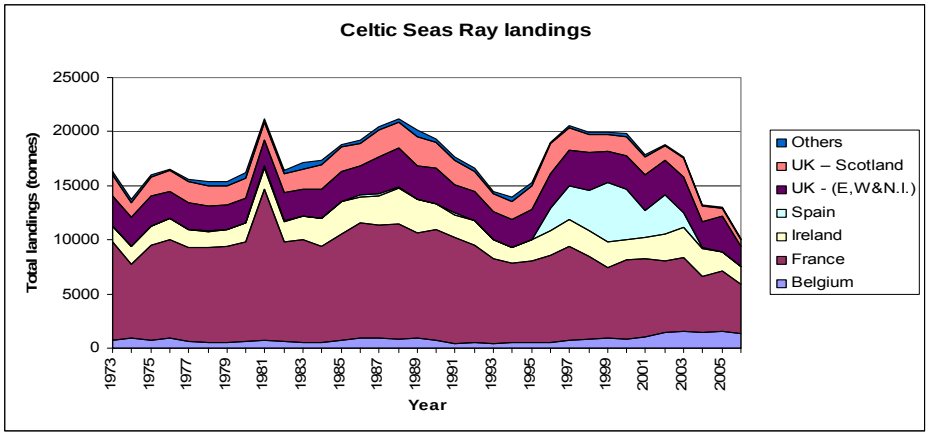


Figure 4: Total international landings of skates and rays in the North Sea, Skaggerrak, Kattegat and Eastern Channel since 1903. (Source ICES WGEF in prep.)

Figure 5: Total combined landings (t) of all species of skates and rays in the Celtic Seas, 1973–2006. (Source ICES WGEF in prep.)



Other Regions

ICES WGEF (in prep.) reports that in OSPAR Region IV (Bay of Biscay and Iberian waters) an analysis of trawler fleet landings per unit effort since 1996 indicates that there has been a decrease in skate abundance (mainly cuckoo ray *Leucoraja naevus* and thornback ray *Raja clavata*) in most parts of ICES Area VIII since the maximum reached in 1998. Landings have also shown a decrease from 1996, but have been more stable in recent years. Other data series show no trend or recent increases. Overall, there is no clear trend in this Region. Data from Region I are poor. There is no target fishery here for skates and rays, which are taken as bycatch in other demersal fisheries. Fishery-independent surveys have not recorded large numbers of *R. clavata*, but this species may have been misidentified as a smaller and more abundant ray.

Threat

The primary threat to *Raja clavata* is from commercial fisheries, both target and bycatch. Even when target ray fisheries are closed, bycatch in demersal fisheries targeting other species will continue to cause mortality of this species. This combination of target fisheries and bycatch in demersal fisheries has resulted in the widespread extirpation of some larger bodied species of rays from the OSPAR Area, and has the potential to drive highly sensitive species to extinction.

Despite historic declines, this is still one of the most abundant rajids in the North-eastern Atlantic and Mediterranean, and an important component of some mixed demersal trawl fisheries. It is also taken by longlines and in set nets, which may be used to target seasonal aggregations of mature females as these enter coastal nursery grounds to deposit eggs. The flesh is utilized fresh or frozen. *R. clavata* is also targeted by recreational anglers (Ellis &

Walker 2000) and very small numbers are taken for display in public aquariums. The IUCN Red List Assessment for this species is Near Threatened (Ellis & Walker 2000).

OSPAR Region II

Capture in commercial fisheries has resulted in the extirpation of this species from large areas of its former range in the North Sea. Improved awareness of these declines have resulted in the reduction of quotas for all skates and rays in this area and closure of target ray fisheries, but there is no species-specific management for *R. clavata*.

OSPAR Region III

Historic stock declines have been reported in the Celtic Seas, although these are not as severe as in Region II. The threat to *R. clavata* in the Celtic Seas has been suggested to be higher than in Region II because there is no TAC for rays in this region and mesh-size regulations are probably not restrictive as there are very few directed fisheries for this and other ray species.

Relevant additional considerations

Sufficiency of data

No accurate and complete species-specific landings data are available for *Raja clavata* in the OSPAR Maritime Area, where all species of skates and rays are combined in catch records. Fishery-independent survey data are available in the form of the various groundfish and beam trawl surveys conducted by national fisheries laboratories as *R. clavata* is most abundant on the inner continental shelf. However, it may still not be possible to assess acurately the status of *R. clavata* throughout its range. Data for the North Sea (OSPAR Region II) are, however, sufficient to demonstrate a serious decline in its abundance and distribution. There is also some evidence of declines elsewhere, particularly in some areas of the Celtic Seas (OSPAR Region III).

Changes in relation to natural variability

Though little is known about stock structure, recent genetic studies (Chevolot *et al*. 2005, 2006; Ragazzini 2005; Ragazzini *et al*. submitted) show high variability. This evidence, combined with the results of tagging studies (Steven 1936; Walker *et al*. 1997; Hunter *et al*., 2006) suggest that there may be several genetically-discrete stocks in North European and Mediterranean waters.

Expert judgement

As the information on population size is incomplete for this species in the OSPAR Maritime Area, expert judgement has played a significant part in this nomination. It rests on recognition that threats to the thornback skate are known, that such threats occur in the Area, and that they have led to significant declines of the species in some Regions, which could also occur or have already occurred elsewhere.

ICES Evaluation

The ICES Working Group on Elasmobranch Fisheries has regularly reviewed information on this species. Management advice has been provided for the North Sea stock since 2005, and will be developed for the Celtic Seas stock for the first time later in 2007. Historical and contemporary fishery-independent survey data indicate that *R. clavata* have declined in the North Sea, especially in terms of the area occupied (ICES-FishMap).

ICES advice for the North Sea stock is as follows: "*R. clavata* abundance has decreased significantly over the past century in the North Sea, and that the area occupied here has significantly decreased since 1990. Although local abundance remains high, the North Sea stock is considered depleted. Target fisheries should not be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level. If the fisheries for rays continue to be managed with a common TAC for all ray species, this TAC should be set at zero."

ICES management advice for rays in OSPAR Region III, requested for the first time in 2007, was in preparation while this nomination was being prepared.

In reviewing the nomination for *R. clavata* ICES confirmed that the North Sea stocks have declined and there is sufficient information to justify listing the species for the OSPAR Region II (Greater North Sea). ICES considered, however, that there was insufficient data to conclude that *R. clavata* should be listed as a threatened and/or declining species in OSPAR Region III.

Threat and link to human activities

Cross-reference to checklist of human activities in OSPAR MPA Guidelines

Relevant human activity: Fishing, hunting, harvesting; *Category of effect of human activity:* Biological – removal as target and non-target species by fisheries.

There is a clear link between the decline of *Raja clavata* and fisheries. *R. clavata* was so common in

the German Wadden Sea at the end of the 19th Century that a target fishery developed in Ostfriesland. At Amrum, Föhr and Norderney, up to 1000 specimens were caught per low tide. Since the beginning of the 1950s, landings in Germany and the Netherlands decreased dramatically, and the stocks showed clear signals of overfishing (large specimens were no longer caught). The species is now extinct in the Wadden Sea (Westernhagen 1998), and mostly restricted to the south-western North Sea, from the Thames to the Wash (ICES WGEF 2006; ICES-Fishmap). The threat from fisheries in the North Sea (OSPAR Region II) should be falling with reductions in quotas and in fishing effort. The threat from fisheries in the Celtic Seas (OSPAR Region III), however, is not yet under similar mitigation efforts: there is no quota for ray species here and mesh-size restrictions are not considered to be effective.

Management considerations

In 1999, a Total Allowable Catch was introduced for all species of North Sea skates and rays combined (Table 1). This was almost twice actual landings in 1999 and 2000 and had no impact on fishing effort. The TAC was reduced significantly in subsequent years, but remained significantly higher than catches until 2006. Management advice has been provided by ICES for the North Sea stock of *R. clavata* since 2005, as follows:

- Target fisheries should not be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level.
- If fisheries for rays continue to be managed with a common TAC for all ray species, this TAC should be set at zero.

In 2006, the skate and ray TAC became slightly lower than the previous year's landings (but was exceeded). In 2007, the TAC set is for by-catch only. It is again lower than the previous year's landings and likely restrictive. However, bycatch is defined as not more than 25% by live weight of the catch retained on board, which is too high. ICES advice has not been adopted, other than in Sweden where *R. clavata* fisheries and landings are not permitted. ICES Advice for the North Sea stocks of skates and rays should be adopted. If species-specific TACs are set, these should be zero for *Raja clavata* and other large-bodied species. Bycatch of *R. clavata* should be minimized through gear restrictions and/or seasonal closures of critical areas in the Southern North Sea (including the Wash and outer Thames Estuary) and the English Channel. Incidentally caught specimens should be immediately returned alive into the sea.

ICES Advice for the Celtic Seas is still awaited, but should also be adopted when available. Management measures desirable here include species-specific quotas for skates and rays, set at zero for the largest-bodied species, seasonal closures of inshore spawning, nursery and feeding grounds, and other measures to minimize bycatch.

Quotas should also be adopted elsewhere in the ICES/OSPAR Areas, covering all regions fished. All catch and landings records should be species-specific. Locations of critical habitat should be identified where seasonal closures could contribute to the management of this species.

This species is classified as Near Threatened in the IUCN Red List (Ellis & Walker, 2000), though this is currently under review. In the HELCOM area, at the edge of its range, *Raja clavata* is classified as endangered under IUCN regional criteria (Fricke in press).

HELCOM have included *R. clavata* in the HELCOM List of threatened and/or declining species and biotope/habitats in the Baltic Sea area.

Further information

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Table 1. Total Allowable Catch (TAC, tonnes) for North Sea rays and skates, and EC landings. (Source: ICES WGEF in prep.)

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
TAC	6060	6060	4848	4848	4121	3503	3220	2737	2190*
Landings	3038	3708	3684	3649	3502	2322	2846	2793	

* The 2007 TAC is a by-catch quota only. These species shall not comprise more than 25% by live weight of the catch retained on board.

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