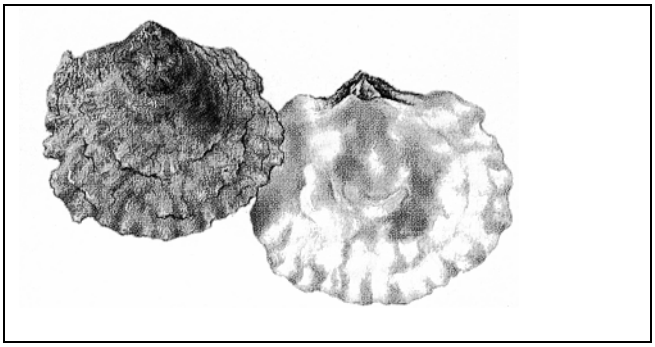
## Nomination

*Ostrea edulis,* Flat Oyster



## Geographical extent

OSPAR Region; I,II,III,IV
Biogeographic zones: 6,7,9,11,12,13
Region & Biogeographic zones specified for decline and/or threat: II/11

*Ostrea edulis* is a sessile, filter-feeding bivalve mollusc, associated with highly productive estuarine and shallow coastal water habitats. It is found naturally from the Norwegian Sea south through the North Sea down to the Iberian Peninsula and the Atlantic coast of Morocco, as well as in Mediterranean and Black Sea (Anon, 1999). It has also been cultivated in these areas as well as in North America, Australasia and Japan.

## Application of the Texel-Faial criteria

*O.edulis* was nominated for inclusion on the OSPAR list with particular reference to global/regional/importance, rarity, decline, role as a keystone species, sensitivity and threat, and as a priority for OSPAR Region II and *O.edulis* beds have been nominated as a habitat.

*Global/regional/local importance*

*O.edulis* only occurs locally outside the OSPAR area in the Mediterranean and the northern shore of the Black Sea. The population in the OSPAR Maritime Area is therefore considered to be of global importance.

*Decline*

Natural stocks of *O.edulis* are known to have been more abundant and widespread in OSPAR Region II in the 18$^{th}$ and 19$^{th}$ centuries when there were large offshore oyster grounds in the southern North Sea and the English Channel. During the 20$^{th}$ century its abundance declined significantly in European waters (e.g. Korringa, 1952; Yonge, 1960; Svelle *et al*., 1997). Around 700 million oysters were consumed in London alone in 1864, for example, and the UK landings fell from 40 million in 1920 to 3 million in the 1960s, and have never returned to these levels (Edwards, 1997).

The northern 'coldwater' population, which used to thrive in areas such as the Firth of Forth, Schleswig Holstein and the Dutch Wadden Sea is extirpated and the southern warmer water population has declined (Korringa, 1976). *O.edulis* has also virtually disappeared from Belgian waters (Svelle *et al.,* 1997). It was believed to be extinct in the Dutch Wadden Sea from 1940 although a small number were found in 1992 (Dankers *et al.,* 1999). In recent years natural beds have become re-established in the Danish Limfjord and now support a fishery.

*Keystone species*

The role of the flat oyster and oyster beds in the ecology of marine communities has led to it being considered a keystone species (e.g. Coen *et al.,* 1998). These functions include providing a solid surface for settlement by other species, cryptic habitat that provides protection and nursery grounds for small fish and other species, stabilising sediment, which may in turn provide some protection from shoreline erosion, and filtration of large quantities of water.

*Rarity*

Natural beds of *O.edulis* have become increasingly rare in the North Sea and the species is extremely rare in parts of its former range such as the Wadden Sea where its status is considered to be 'critical' (under immediate threat of extinction) and therefore on the Red List of macrofaunal benthic invertebrates of the Wadden Sea (Petersen *et al.,* 1996). The populations in deeper waters in the southern North Sea, such as on the Oyster Grounds, disappeared during the 19$^{th}$ and 20$^{th}$ centuries (e.g. Benthem Jutting, 1943).

*Sensitivity*

An assessment of the sensitivity of *O.edulis* based on a literature review by the Marine Life Information Network for Britain & Ireland (MarLIN) (Jackson, 2001), lists this species as being highly sensitive to substrate loss, smothering (e.g. Yonge, 1960), synthetic compound contamination (e.g. Rees *et al.,* 2001), introduction of microbial pathogens/parasites (Edwards 1997), introduction of non-native species and direct extraction. The best evidence relates to it

sensitivity to synthetic compounds and in particular tributyl tin.

Recovery is dependant on larval recruitment since the adults are permanently attached and incapable of migration. Recruitment is sporadic and dependent on the local environmental conditions, hydrographic regime and the presence of suitable substratum, especially adult shells or shell debris (Kennedy & Roberts, 1999). Recoverability is considered to be very low from substratum loss, smothering, extraction and introduction of microbial pathogens/parasites, in one case taking around 20 years (Spärck 1951, in Jackson 2001).

*Threat*

The main threats to *O.edulis* in OSPAR Region II have been over-exploitation for fisheries, poor water quality, and the introduction of other (warm water) races as well as other oyster species. The parasitic protozoan *Bonamia ostreae* is also known to have caused massive mortalities of *O.edulis* in France, the Netherlands, Spain, Iceland and England (Edwards, 1997).

Poor water quality and the resulting pollution specifically in the case of tributyl tin antifouling paints is known to have stunted growth of *O.edulis* and may also have affected reproductive capacity (Rees *et al.*, 2001)

Oyster grounds have been degraded in some areas by the introduced alien species *Crepidula fornicata*. This species is a filter feeder creating 'mussel mud' which degrades the grounds and hinders recruitment to oyster beds although the dead shells provide a surface on which the oyster spat do settle. The American oyster drill *Urosalpinx cinerea* is another alien species and is a predator of the flat oyster.

The cultivation and spread into the wild of the Pacific oyster *Crassostrea gigas* is another threat as there is a possibility that it may take over the niche of the native oyster and therefore limit the opportunities for recolonisation by *O.edulis*. At the present time it is unclear whether this is likely to happen (e.g. Drinkwaard, 1999; Reise, 1998; Nehring, 1998).

## Relevant additional considerations

*Sufficiency of data*

Data on the status of naturally occurring stocks of *O.edulis* is available from a number of sources including landings records, benthic sampling and detail studies at particular locations. This information is considered to be a sufficient basis on which to determine that the species has declined in OSPAR Region II and is under threat from a variety of human activities.

*Changes in relation to natural variability*

Natural causes such as disease and severe winters may have contributed to the decline of *O.edulis* in the North Sea. There were high mortalities following severe winters such as those experienced in 1947 and 1963 for example, and in the UK the east coast stock has not recovered to the pre-1963 levels (Anon, 1999). Many other factors also affect oyster stock abundance as the species has a very variable recruitment from year to year. These include temperature, food supply, and hydrodynamic containment in a favourable environment. It may also be the case that spawning stock density or biomass may be too low in many areas to ensure synchronous spawning or sufficient larval production for successful settlement (Jackson, 2001).

*Expert judgement*

Changes in the distribution and abundance of *O.edulis* and *O.edulis* beds, have been recorded in many parts of its former range in the North Sea. This includes information from studies of specific areas such as the Wadden Sea (Reise & Schubert, 1987: Reise *et al.,*1989) and national records, as in the case of Belgium (e.g. Svelle *et al.,* 1997). The data provide a sound basis on which to report the threat to this species and its decline in OSPAR Area II.

*ICES evaluation*

The ICES review of this nomination by the states that there is good evidence of widespread decline of natural stocks of *O.edulis* and that overexploitation, the introduction of other (warm water) races and other oyster species, disease, and severe winters have all contributed to the decline of this species (ICES, 2002). ICES also report that there are some signs of recovery, e.g. in the outer Skagerrak area, and along the Normandy coast, where specimens are occasionally found.

## Threat and link to human activities

*Cross-reference to checklist of human activities in OSPAR MPA Guidelines*
*Relevant human activity:* Fishing, hunting, harvesting; landbased activities; aquaculture/mariculture. *Category of effect of human activity:* Biological – removal of target

species, introduction of microbial pathogens or parasites, introduction of non-indigenous species; Chemical – synthetic compound contamination

There is a long history of collection and cultivation of *O.edulis* in northern Europe. The dramatic declines seen in stock abundance in the middle of the 19th century are attributed mainly to over-exploitation. By the late 19th century stocks were beginning to be depleted so that by the 1950s the native oyster beds were regarded as scarce (Korringa, 1952; Yonge, 1960; Edwards, 1997). Overfishing in areas such as the Wadden Sea have been cited as a major contributing factor to the decline (e.g. Reise, 1982; Jackson, 2001). More recent effects, such as those caused by TBT pollution, are also directly linked to human activities.

## Management considerations

The flat oyster has been subject to exploitation and cultivation in countries surrounding the North Sea for many centuries. Management measures need to take account of the fact that it was and continues to be subject to husbandry and cultivation practices as well as fishing (Anon, 1999). Useful management measures include continued regulation of the fishery, control of the spread of introduced species, reduction of the risk of transmission of disease, and maintenance of suitable habitat to support successful spatfall.

## Further information

*Nominated by:*
Belgium, Netherlands.

*Contact persons:*
Gerhard Cadee, Netherlands Institute for Sea Research, PO Box 59, 1790 AB Den Burg Texel, Netherlands.
Jan Haelters & Francis Kerckhof, Management Unit of the North Sea Mathematical Models, 3e en 23e Linieregimentsplein, 8400 Oostende, Belgium.

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