Nomination

Ostrea edulis beds
EUNIS Code: A5.435
National Marine Habitat Classification for UK & Ireland code: SS.SMx.IMx.Ost

Definition for habitat mapping

Beds of the oyster *Ostrea edulis* occurring at densities of 5 or more per m^2 on shallow mostly sheltered sediments (typically 0-10m depth, but occasionally down to 30m). There may be considerable quantities of dead oyster shell making up a substantial portion of the substratum. The clumps of dead shells and oysters can support large numbers of the ascidians *Ascidiella aspersa* and *Ascidiella scabra*. Several conspicuously large polychaetes, such as *Chaetopterus variopedatus* and terebellids, may be present as well as additional suspension-feeding polychaetes such as *Myxicola infundibulum*, *Sabella pavonina* and *Lanice conchilega*. A turf of seaweeds such as *Plocamium cartilagineum*, *Nitophyllum punctatum* and *Spyridia filamentosa* may also be present (Connor *et al*, 2004).

Geographical extent

OSPAR Regions;
Biogeographic zones: 4, 6-9, 11
Region & Biogeographic zones specified for decline and/or threat: II

Natural oyster beds of the species *O.edulis*, are found in estuarine areas from 0-6m depth on sheltered but not muddy sediments, where clean and hard substrates are available for settlement. They used to occur in deeper water, down to 50m, on beds in the North Sea.

Application of the Texel-Faial criteria

O.edulis beds were nominated by two Contracting Parties and are being cited for OSPAR Region II. The criteria common to both nominations were decline and sensitivity, with information also provided on threat.

Decline

Naturally occurring beds of *O.edulis* are known to have been more abundant and widespread in OSPAR Region II in the 18th and 19th centuries when there were large offshore oyster grounds in the southern North Sea and the Channel. During the 20th century there was a significant decline in their abundance in European waters (e.g. Korringa, 1952; Yonge, 1960; Svelle *et al*., 1997; Kennedy & Roberts, 1999). 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.

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 (eg. 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 (TBT).

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. 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).
Oyster spat usually settle on the shells of adult oysters so substantial removal of an existing bed reduces suitable settlement areas for subsequent generations.

Threat

The main threats to naturally occurring *O.edulis* beds in the Greater North Sea have been over-exploitation for targeted fisheries as well as bycatch in beam trawling for other species,, poor water quality, and the introduction of other (warm water) races as well as of other oyster species. The dramatic declines seen in stock abundance in the

middle of the 19th century are attributed mainly to over-exploitation but there has also been damage by beam trawlers targeting other fisheries. By the late 19th century stocks were beginning to be depleted so that by the 1950s the native oyster beds were regarded as scarce. Overfishing in areas such as the Wadden Sea have been cited as a major contributing factor to the decline. 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 (eg. 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 detailed studies at particular locations. 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 and national records, as in the case of Belgium. The data provide a sound basis on which to get an accurate view of its status and decline in the Greater North Sea.

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). Habitat conditions in areas which previously supported oysters may also have changed and become unsuitable settlement areas.

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 (eg. Svelle *et al.,* 1997). The data provide a sound basis on which to report the threat to naturally occurring flat oyster beds and their decline in OSPAR Area II.

ICES evaluation

The ICES review of this nomination finds that there is good evidence of decline and threats to *O.edulis* beds in OSPAR Region II (ICES, 2002). The ICES review of the case for *O.edulis* to be listed as a species as well as a habitat is also relevant. This 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, eg. 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 and non-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 and naturally occurring beds 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) and beds have also been affected by beam trawling for other fisheries. More recent effects, such as those caused by TBT pollution, are also directly linked to human activities.

The main threats to *O.edulis* beds and the reason for their decline can be clearly linked to manageable human activities although natural causes such as disease and severe winters in the 1930's and 1940's have also played a part in their decline in the North Sea. Other studies in North America have reached the same conclusion, which is that destructive harvesting and overfishing can reduce the habitat extent of oyster reefs (e.g. Coen *et al.,* 1998)

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 directed fishery as well as other fisheries that can damage oyster beds, 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

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