

## A5.435 *Ostrea edulis* beds on shallow sublittoral muddy mixed sediment

### Summary

Natural stocks of flat oyster *Ostrea edulis*, and naturally occurring beds of *O. edulis* are known to have been more abundant and widespread in the 18th and 19th centuries with large offshore oyster grounds in the southern North Sea, the English Channel, the Irish Sea and off the southwest to north-west coasts of Ireland. OSPAR has listed *O. edulis* and *O. edulis* beds as threatened and/or declining in all regions where they occur. In the Wadden Sea, oyster beds are presently considered to be 'critical' (under immediate threat of extinction) and have therefore been added to a Red List of macrofaunal benthic invertebrates for the area. There is currently insufficient information, however, to determine the true distribution and extent of the habitat throughout the North East Atlantic region.

During the 20th century, the occurrence of *O. edulis* beds in European waters has declined, largely due to excessive harvesting and disease outbreaks. *O. edulis* beds are also sensitive to a wide range of pressures, such as: substratum loss, smothering, decrease in temperature, increase in wave exposure, increased water flow, abrasion and physical disturbance, synthetic compound contamination, introduction of microbial pathogens/parasites, heavy metal contamination, changes in oxygenation, introduction of non-native species and harvesting.

Management measures for this habitat include the continued regulation of the fishery, restoration plans, control of the spread of introduced species, reduction of the risk of transmission of disease, maintenance of a suitable habitat to support successful spat fall and the protection of water quality in areas designated as shellfish production areas.

### Synthesis

This habitat has a wide geographical distribution and although it is currently only reported from a few locations this may be an underestimate. There is insufficient information to provide quantified estimates of recent and possible future trends in quantity and quality, but historical records indicate that this habitat was previously significantly more abundant and widespread. Current records indicate it is now rare in many parts of its former range. It is also considered likely to be subject to a continuing decline in spatial extent, abiotic quality (substrate loss, smothering, removal of an existing bed reduces suitable settlement areas for spat), and biotic quality (introduction of microbial pathogens/parasites e.g. *Bonamia*).

Based on the significant declines in abundance and extent over the past 150 years this habitat has been assessed as Critically Endangered for both the EU 28 and EU 28+..

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Critically Endangered	A3	Critically Endangered	A3

### Sub-habitat types that may require further examination

None.

### Habitat Type

#### Code and name

#### A5.435 *Ostrea edulis* beds on shallow sublittoral muddy mixed sediment



*Ostrea edulis* beds on shallow muddy mixed sediments, Loch Thurnaig, Scotland (© G.Saunders).



*Ostrea edulis* beds on shallow muddy mixed sediments, Loch Thurnaig, Scotland (© G.Saunders).

### Habitat description

The flat or native oyster *Ostrea edulis* can occur on muddy fine sand or sandy mud mixed sediments. It is found along the western European coast from Norway to Morocco in the north-eastern Atlantic and in the whole Mediterranean Basin. Natural populations are also observed in eastern North America from Maine to Rhode Island, following intentional introductions in the 1940s and 1950s. *Ostrea edulis* 'beds' are defined by OSPAR as comprising five or more individuals per m<sup>2</sup>. There may be considerable quantities of dead oyster shell making up a substantial portion of the substratum.

Natural oyster beds are found in enclosed/wave sheltered and estuarine areas from the lower intertidal to around 6m depth on sheltered but not mud sediments, where clean and hard substrates are available for settlement. In the past they also occurred in deeper waters and offshore, down to 50 m, e.g. in the North Sea and the eastern Channel, but these beds are now mostly depleted.

Indicators of quality:

Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.

The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of *Ostrea edulis* which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is

a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. Such characteristics are usually assessed via fisheries statistics and the knowledge of fishers.

Characteristic species:

The clumps of dead shells associated with oyster beds and live oysters can support large numbers of ascidians, such as *Ascidiella aspersa* and *Ascidiella scabra*. Sponges such as *Halichondria bowerbanki* may also be present. Several conspicuously large polychaetes, such as *Chaetopterus variopedatus* and terebellids, as well as additional suspension-feeding polychaetes such as *Myxicola infundibulum* and *Sabella pavonina* may be important in distinguishing this biotope, whilst the Opisthobranch *Philine aperta* may also be frequent in some areas. A turf of seaweeds such as *Plocamium cartilagineum*, *Nitophyllum punctatum* and *Spyridia filamentosa* may also be present.

## **Classification**

EUNIS:

Level 5 of the EUNIS classification (v1405).

A sub-habitat of 'Marine Atlantic infralittoral mixed sediment' (A5.43).

A sub-habitat of 'Atlantic shallow/infralittoral mixed sediment' (A5.4).

Annex 1:

1170 Reefs

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Shallow sublittoral mixed sediment

Shallow sublittoral rock & biogenic reef

EUSEaMap:

Shallow coarse or mixed sediments Shallow sublittoral rock and biogenic reef

IUCN:

9.4 Subtidal sandy

9.5 Subtidal sandy-mud

## Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?

No

### Justification

Historically (last century to about the 1930s), this habitat constituted a very significant feature of the North East Atlantic shallow sublittoral. This is no longer the case.

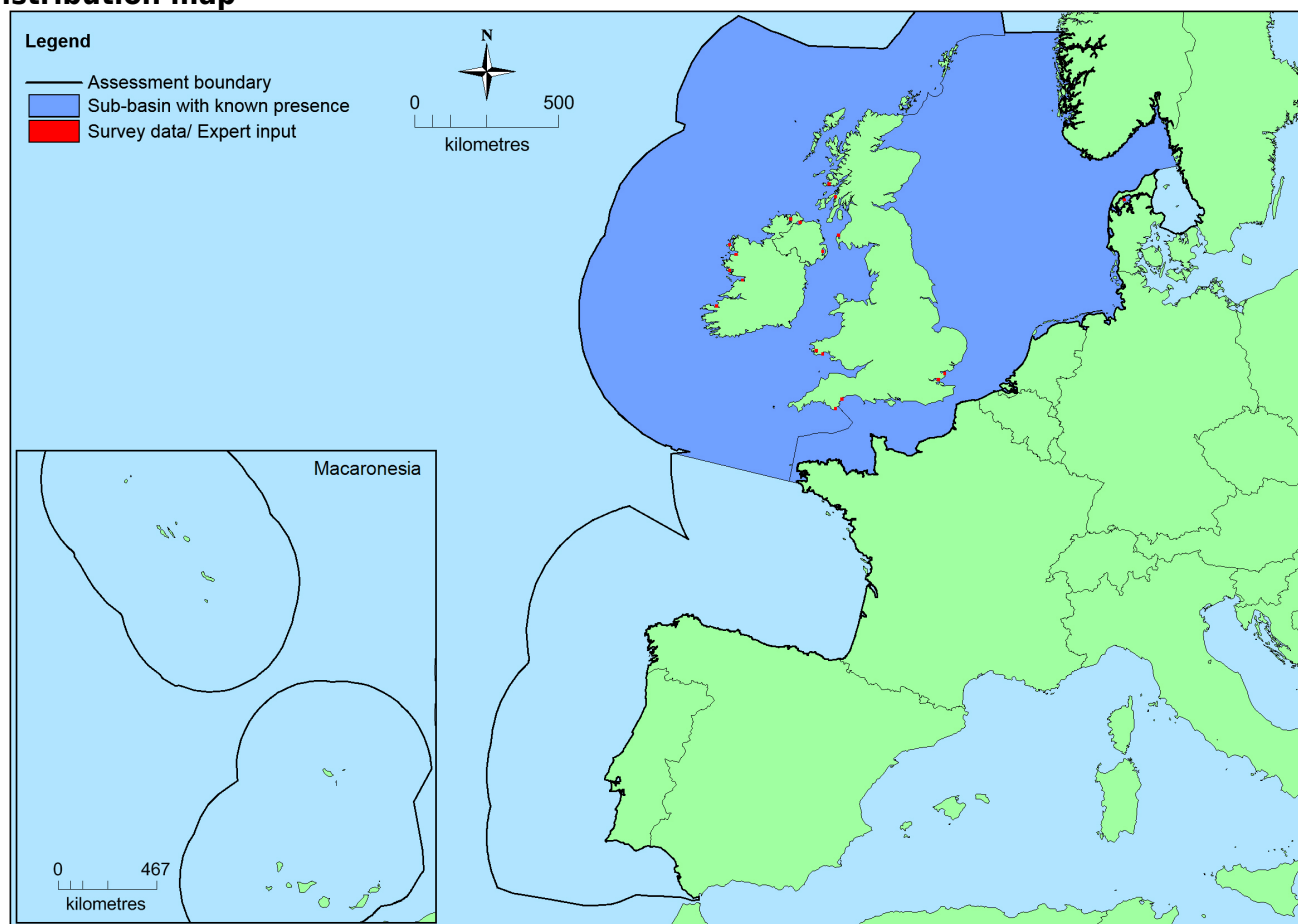
## Geographic occurrence and trends

Region	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>North-East Atlantic</i>	Celtic Seas: Present Greater North Sea: Present	Unknown Km <sup>2</sup>	Decreasing	Decreasing

## Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
<i>EU 28</i>	554,532 Km <sup>2</sup>	18	Unknown Km <sup>2</sup>	
<i>EU 28+</i>	>554,532 Km <sup>2</sup>	18	Unknown Km <sup>2</sup>	

## Distribution map



There are insufficient data to provide a comprehensive and accurate map of the distribution of this habitat. This map has been generated using EMODnet data from modelled/surveyed records for the North East Atlantic (and supplemented with expert opinion where applicable) (EMODnet 2010). EOO and AOO have been calculated on the available data presented in this map however these should be treated with caution as expert opinion is that this is not the full distribution of the habitat.

## How much of the current distribution of the habitat type lies within the EU 28?

*Ostrea edulis* is native to the North East Atlantic. There are indications that sublittoral beds occur, or have occurred in, Norway, but the extent and whether densities are consistent with the presence of beds is unknown.

### Trends in quantity

Naturally-occurring stocks of the flat or native oyster, *Ostrea edulis* are known to have declined markedly throughout the 18<sup>th</sup>, 19<sup>th</sup> and 20<sup>th</sup> Centuries. Natural stocks and naturally occurring beds of *O. edulis* were considerably more abundant and widespread in the 18th and 19th centuries with large sublittoral oyster grounds in the North Sea, English Channel, Irish Sea and Atlantic coast of Ireland. Beck *et al.* (2011) estimated that globally, 85% of oyster reefs have been destroyed with many remaining beds degraded to the point where they have limited or no ecological function.

In the North Sea, a considerable decline in oyster population and extent of sublittoral beds occurred in the 19<sup>th</sup> and 20<sup>th</sup> century, with *O. edulis* becoming increasingly rare in its former range. Populations in the deeper waters of the southern North Sea, such as on the Oyster Grounds, are known to have disappeared in this period. Similarly, a northern 'coldwater' population, which used to thrive in areas such as the Firth of Forth, Schleswig Holstein and the Dutch Wadden Sea, is considered to have been extirpated, while the remaining southern North Sea and English Channel 'warmer water' population has undergone substantial declines. Until the early 20th century natural oyster beds occurred in certain areas of the Belgian part of the North Sea, but *O. edulis* is now considered virtually extinct in the wild and the last official record dates back to 1933. Similarly, although *O. edulis* was a native species and *O. edulis* beds were once common in the German North Sea, they are considered extinct to have become extinct in German waters since the 1920s and in the Dutch Wadden Sea since 1940.

Oyster populations and associated bed habitat have also declined considerably or entirely disappeared from the Irish Sea and Atlantic coasts, with the extensive sublittoral oyster grounds recorded to be present in the 19<sup>th</sup> Century off Ireland's east, south-west and north-west coasts now substantially reduced due to excessive harvesting and more recent incidence of disease outbreaks.

In the UK, native oyster beds are currently sparsely distributed and are recorded from the River Crouch in eastern England; Dawlish Warren, the Dart estuary and the River Fal in the south west of England; Milford Haven in Wales; Loch Ryan and Loch Thurnaig in Scotland; Lough Foyle and Strangford Lough in Northern Ireland, but the main UK stocks are now located in the rivers and flats bordering the Thames Estuary, The Solent, River Fal, the west coast of Scotland and Lough Foyle. In Ireland *O. edulis* beds are confined to six bays, distributed along the west and north-west coasts. These are: Tralee Bay, Galway Bay, Kilkieran Bay, Clew Bay, Blacksod Bay and Lough Swilly. The Irish beds are considered to be stable although oyster density within many of these is low.

Elsewhere, in recent years, oyster beds have become re-established through natural recolonisation in the Danish Limfjord and now support a fishery. Prior to 2009 the stock in Limfjord had grown rapidly, following good recruitment of oysters over several years in the early part of the decade but here has been no sign of recruitment to the stock since 2006 and consequently a subsequent decline of the stock which was still apparent in 2013. Fishery scientists and fishermen in the Limfjord consider that the current fall in the oyster stock is a repeat of the historical pattern of irregular recruitment to the fishery.

- Average current trend in quantity (extent)  
EU 28: Decreasing  
EU 28+: Decreasing
- Does the habitat type have a small natural range following regression?  
No

### Justification

Although there has been a significant regression of this habitat since the last century the EOO is >50,000km<sup>2</sup>, therefore it is not considered to have a small natural range.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?

No

### Justification

Although there has been a significant regression of this habitat since the last century the EOO is >50,000km<sup>2</sup>, therefore it is not considered to have a small natural range.

## Trends in quality

Over-exploitation in the middle of last century following the increased demand that accompanied improved rail transport. TBT used on ships in the early 1980s caused stunted growth and probably affected reproductive capacity. Current records indicate viable beds of *O. edulis* species are rare throughout much of its former range. Introduction of the oyster drill *Urosalpinx cinerea* and the common slipper shell *Crepidula fornicata* which compete and degrade the grounds that encourage native oyster recruitment have further reduced the quality of the habitat. Severe winters in 1947 and 1963 were believed to have led to high *O. edulis* mortalities in the UK. On the east coast of the UK, stock levels have not yet recovered to the pre-1963 levels. The parasitic protozoan *Bonamia ostreae* has also caused massive mortalities in England.

- Average current trend in quality

EU 28: Decreasing

EU 28+: Decreasing

## Pressures and threats

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The main pressures and threats are: fishing, disease, non-native species, aquaculture, water quality, invasive species. Climate change affecting distribution, spawning, *Bonamia*, genetic integrity. Competition with the Pacific oyster *Crassostrea gigas* may also be an issue where the niches they occupy overlap.

### List of pressures and threats

#### Biological resource use other than agriculture & forestry

Marine and Freshwater Aquaculture

Intensive fish farming, intensification

#### Pollution

Marine water pollution

Toxic chemical discharge from material dumped at sea

Synthetic compound contamination

#### Invasive, other problematic species and genes

Invasive non-native species

## Conservation and management

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*O.edulis* has been subject to exploitation and cultivation in countries surrounding the North Sea for many centuries. Management measures should take account of the native oyster's continuing association with husbandry and cultivation practices as well as wild harvesting and fishing. Essential 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 a suitable habitat to support successful

spat fall.

The Shellfish Growing Waters Directive provides for protection of the water quality of areas designated as shellfish production areas in Europe. In Ireland, these include production areas for *O. edulis*. Council Directive 2006/88/EC stipulates minimum measures to be taken in response to suspected or established cases of certain diseases in aquaculture. Specifically in respect of *O. edulis*, infections of *Bonamia* and Microcytosis are covered by this Directive. However, this is a tool for management of aquaculture products and does not include guidance for managing diseases in wild populations. In some countries management or restoration plans exist, or are under way, for certain regions e.g. in Denmark, while restoration programmes are under consideration in the UK and Northern Ireland.

## **List of conservation and management needs**

### **Measures related to wetland, freshwater and coastal habitats**

Restoring/Improving water quality

### **Measures related to marine habitats**

Other marine-related measures

Restoring marine habitats

### **Measures related to hunting, taking and fishing and species management**

Regulation/Management of hunting and taking

Specific single species or species group management measures

### **Measures related to special resource use**

Regulating/Managing exploitation of natural resources on sea

## **Conservation status**

Annex 1-type

1170: MATL U2, MMAC FV

OSPAR has listed *Ostrea edulis* and *O. edulis* beds as threatened and/or declining in all regions where they occur.

Oyster beds are considered to be 'critical' (under immediate threat of extinction) and have been placed on the Red List of macrofaunal benthic invertebrates of the Wadden Sea.

## **When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?**

Recovery is dependent on the presence of suitable habitat and on larval recruitment since the adults are largely sessile and have no capability for relocating or migrating. 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 substrate loss, smothering, harvesting and introduction of microbial pathogens/parasites, with evidence from a single observation indicating a period of around 20 years. Oyster spat usually settles on the shells of adult oysters so substantial removal of an existing bed reduces suitable settlement areas for subsequent generations. *Ostrea edulis* are already subject to restoration programmes that involve spat collection and laying. Although a different oyster species, evidence from re-stocking experiments in Chesapeake Bay demonstrate the great difficulty in recovering stocks and the need for both larval rearing and building of reefs to obtain even very localised recovery.



**Effort required**

20 years
Naturally

**Red List Assessment****Criterion A: Reduction in quantity**

Criterion A	A1	A2a	A2b	A3
EU 28	unknown %	unknown %	unknown %	>90 %
EU 28+	unknown %	unknown %	unknown %	>90 %

There has been a very significant reduction (>90%) of the quantity of this habitat over the last 150 years. Microbial pathogens/parasites, and habitat loss are threatening processes that are likely to cause continuing decline in quantity and/or quality within the next 20 years although this trend has not been quantified. Because of the historical reduction in extent, this habitat has therefore been assessed as Critically Endangered under Criteria A for both the EU 28 and EU 28+.

**Criterion B: Restricted geographic distribution**

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50,000 Km <sup>2</sup>	Yes	Yes	No	18	Yes	Yes	No	No
EU 28+	>50,000 Km <sup>2</sup>	Yes	Yes	No	18	Yes	Yes	No	No

This habitat has a wide geographical distribution but, based on current knowledge, is believed to only be present in a limited number of locations. It is considered likely to be subject to a continuing decline in spatial extent, abiotic quality (substrate loss, smothering, removal of an existing bed reduces suitable settlement areas for spat), and biotic quality (introduction of microbial pathogens/parasites e.g. *Bonamia*). Microbial pathogens/parasites, and habitat loss are threatening processes that are likely to cause continuing decline in quantity and/or quality within the next 20 years. This habitat has therefore been assessed as Endangered under Criteria B2 for both the EU 28 and EU 28+.

**Criterion C and D: Reduction in abiotic and/or biotic quality**

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	30 %	fairly substantial %	unknown %	unknown %	50 %	substantial %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %



Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%
EU 28+	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%

There has been a decline in quality of this habitat in the last 50 years. Whilst this cannot be quantified, expert opinion is that it has been at least fairly substantial. Over-exploitation in the middle of last century followed an increased demand stimulated by rail transport. The antifoulant tributyl tin (TBT) used on ships in the early 1980s caused stunted growth and probably affected reproductive capacity. Current records indicate viable beds of *O. edulis* species are rare throughout much of its former range. Introduction of the oyster drill *Urosalpinx cinerea* and the common slipper shell *Crepidula fornicata* which compete and degrade the grounds that encourage native oyster recruitment have further reduced the quality of the habitat. There has also been believed to have been a substantial historic reduction in quality associated with the loss of this habitat following exploitation in the 18th and 19th centuries. This habitat has therefore been assessed as Vulnerable under Criteria C/D for both the EU 28 and EU 28+.

### Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	unknown
EU 28+	unknown

There is no quantitative analysis available to estimate the probability of collapse of this habitat type.

### Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	DD	DD	DD	CR	LC	EN	LC	NT	DD	VU	DD	DD	DD	DD	DD	DD	DD
EU28+	DD	DD	DD	CR	LC	EN	LC	NT	DD	VU	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Critically Endangered	A3	Critically Endangered	A3

### Confidence in the assessment

Medium (evenly split between quantitative data/literature and uncertain data sources and assured expert knowledge)

### Assessors

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### Contributors

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### Reviewers

K.Hiscock.

### Date of assessment

06/08/2015

## Date of review

11/01/2016

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