

## A2.61 Seagrass beds on Atlantic littoral sediments

### Summary

Intertidal seagrass beds consist of two species *Zostera marina* and *Z.noltei* of which the former may extend into the subtidal. Whilst the majority of this habitat is hosted by EU 28 (>95%), intertidal *Z.noltei* beds are rare but present in southern Norway. Seagrasses stabilise the substratum as well as provide shelter and a substrate for many organisms. They are also very productive and a major source of food for wildfowl. Pressures and threats on this habitat result from pollution, eutrophication, leading to effects such as smothering by epiphytes and algal blooms, change of hydrological conditions, infilling, shellfish fisheries, trampling, coastal development, land reclamation, human intrusion for example driving across intertidal seagrass beds, and bait digging.

The protection of this habitat is often incorporated into legislation e.g. local by-laws and regulations as well as cross border agreements covering large geographical areas as in the case of the Wadden Sea. It is also a characteristic feature of several habitat types listed in Annex 1 of the Habitats Directive. Protected areas and zoning for example as part of Integrated Coastal Zone Management plans can provide a framework under which specific measures such as restrictions on activities like bait digging, clam raking and waste water management may be introduced. Transplantation experiments with seagrass have been attempted as a habitat restoration measure but with limited success to date.

### Synthesis

This habitat has a widespread distribution and is not limited to a few locations. Intertidal *Z. marina* beds may extend into the subtidal where they may develop into a perennial form with broad and long leaf and root systems (rhizomes) which survive in winter. The subtidal form disappeared in all but brackish regions around 1930 because of a disease and it is uncertain whether recovery is taking place. The intertidal form develops each year from seed and was not struck by the disease.

There are data on trends in quantity from many locations pointing to substantial historical declines in extent of this habitat over the last 150 years. Quality is also believed to have declined, due to both biotic and abiotic factors, however this is harder to quantify. The overall assessment is that habitat is Near Threatened on the basis of historical and recent declines in quantity and quality 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
Near Threatened	A1, A3, C/D3	Near Threatened	A1, A3, C/D3

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

*Zostera noltei* beds and those of *Ruppia* spp. (which only occur in brackish waters) should be assessed separately as these species respond in different ways to pressures and threats.

### Habitat Type

#### Code and name

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Intertidal seagrass bed, Dornoch Firth, Scotland, UK (© G.Saunders).



Intertidal seagrass bed, Dornoch Firth, Scotland, UK (© G.Saunders).

## Habitat description

Mid and upper shore wave-sheltered muddy fine sand or sandy mud can have high densities of *Zostera noltei* (formerly known as *Z.noltii* or *Z.nana*) and/or *Z.marina*. *Z.noltei* forms stands with a cover of delicate trailing narrow leaves up to about 20 cm long. It survives the winter as rhizomes, therefore the locations remain stable over many years. It may occur monospecific, or with *Z. marina* or *Ruppia* spp. and occasional plants of lower salt-marsh species such as annual *Salicornia* spp. or *Spartina anglica*, as stands of *Z. noltei* may not only pass downshore to *Z. marina* but also to communities of the lower saltmarsh, notably the *Salicornietum europaeae*. Exactly what determines the distribution of *Z. noltei* is not entirely clear. It is most characteristic of situations where the substrate dries out somewhat on exposure and, on flats with a gentle bar/hollow topography where it forms distinctive mosaics with *Z. marina*. It can also occur in shallow standing water and so is often found in small permanently submerged lagoons and pools, and on sediment shores where the muddiness of the sediment retains water and stops the roots from drying out. An anoxic layer is usually present some 5cm below the surface of the sediment.

There may be seasonal variation in the area covered by intertidal seagrass beds, as plants die back in winter. Intertidal seagrass beds may also be subject to heavy grazing by geese, which can reduce the extent of the plant cover significantly. The rhizomes of *Z.noltei* will remain in place within the sediment in both situations and plants towards the lower limit may remain winter-green.

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. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Total area covered, density of the intertidal beds and species

composition is, for example, used as a Water Framework Directive parameter for assessing ecological status.

The overall quality and continued occurrence of this habitat is dependent on the presence of *Zostera* spp. which creates the biogenic structural complexity on which the characteristic associated species depend. The density and the maintenance of a viable population of *Zostera* is therefore a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. OSPAR defines *Zostera* beds as areas where plant densities should provide at least 5% coverage although, more typically they are greater than 30%.

Characteristic species:

*Zostera noltei* in many areas is the dominant species of intertidal seagrass beds, *Zostera marina* also forms dense fields as in the German Wadden Sea and until recently in the Ems estuary. In brackish environments *Ruppia maritima* and/or *R. cirrhosa* can also occur. *Z. angustifolia*, which is often described in older literature is simply an ecotype of *Z. marina* which has narrower leaves and an annual life history strategy reproducing less by vegetative means in favour of seed production. This is an advantage in its less stable intertidal habitat. The subtidal variant of *Z. marina* which has longer and stronger leaves is perennial but was wiped out in northern Europe by a disease in the 1930's. The intertidal annual form was also affected but able to recover more easily.

The infaunal community of this habitat is characterised by polychaetes *Scoloplos armiger*, *Pygospio elegans* and *Arenicola marina*, oligochaetes, spire shell *Hydrobia ulvae*, and bivalves *Cerastoderma edule* and *Macoma balthica*. The green algae *Ulva* spp. may be present on the sediment surface.

## Classification

EUNIS (v1405):

Level 4. A sub-habitat of 'Atlantic littoral sand' (A2.6).

Annex 1:

1130 Estuaries

1140 Mudflats & sandflats not covered at low tide

1160 Large shallow inlets and bays

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Littoral sediment

EUSEaMap:

Not mapped

IUCN:

9.10 Estuaries

12.2 Sandy shoreline and/or Beaches, Sand Bars, Spits etc.

12.4 Mud Shoreline and Intertidal Mud Flats.

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

Yes

Regions

Atlantic

Justification

This habitat occurs in all the sub-basins of the North East Atlantic. It can cover extensive areas where the tidal range, shelter and substrate are suitable (e.g. the Firth of Forth in Scotland, Wadden Sea). In other parts of the region, such as Macaronesia (Lanzarote) there are only fragmented populations of *Z.noltei*.

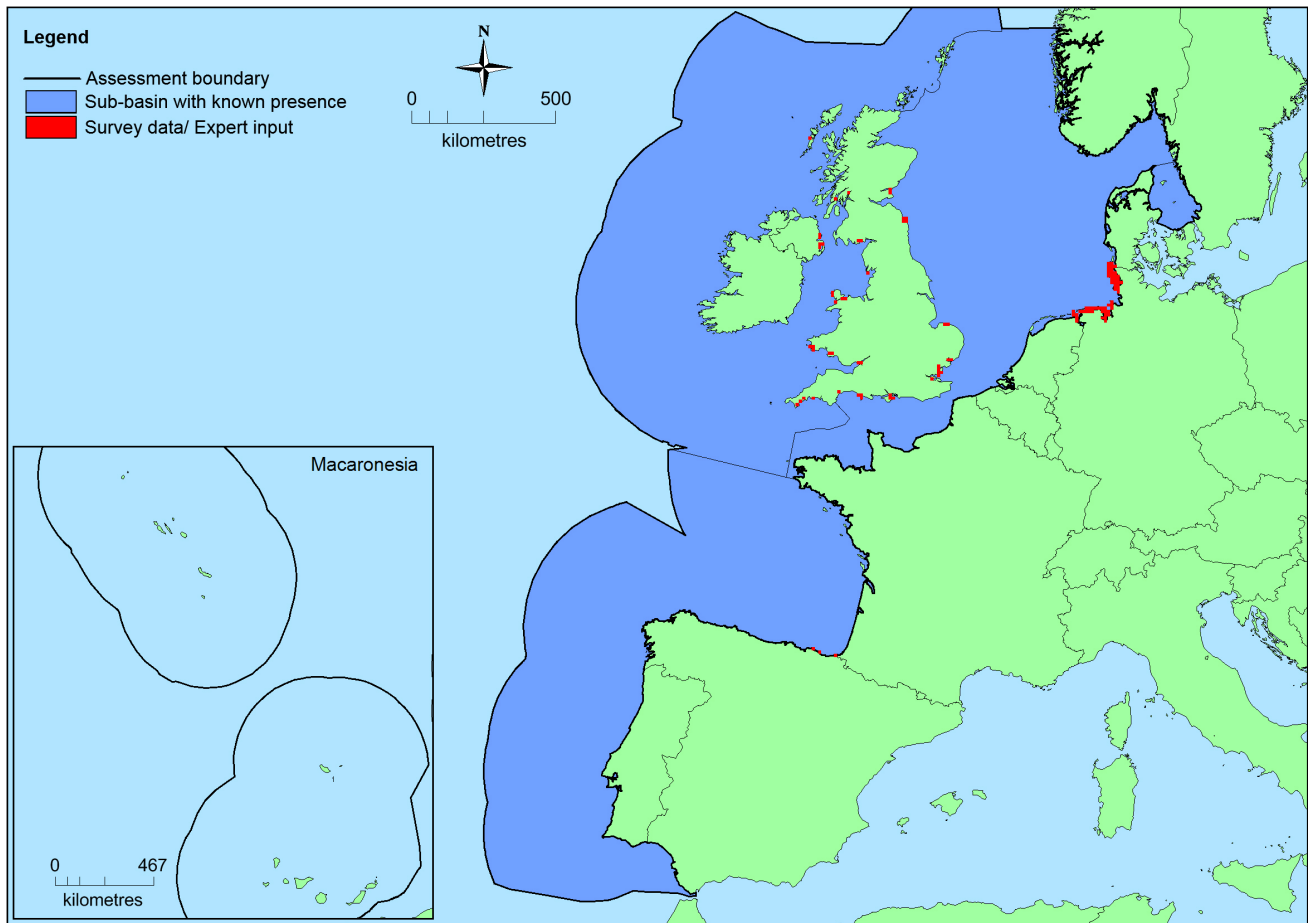
**Geographic occurrence and trends**

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>	Bay of Biscay and the Iberian Coast: Present Celtic Seas: Present Kattegat: Present Greater North Sea: Present Macaronesia: Uncertain	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>	925,933 Km <sup>2</sup>	113	Unknown Km <sup>2</sup>	EOO and AOO have been calculated on the available data. Although this data set is known to be incomplete the figures exceed the thresholds for threatened status.
<i>EU 28+</i>	>925,933 Km <sup>2</sup>	>113	Unknown Km <sup>2</sup>	EOO and AOO have been calculated on the available data. Although this data set is known to be incomplete the figures exceed the thresholds for threatened status.

**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?**

Intertidal seagrass beds are present in suitable conditions across the region. Whilst the majority is hosted by EU 28 (>95%), intertidal *Z.noltei* beds are rare but also present in southern Norway. The Norwegian Red List (2010) estimates that this amounts to less than 1% of the European population. They also occur in other parts of Europe (the Mediterranean and Black Sea) but are considered as separate habitats.

### **Trends in quantity**

There has been a massive loss in the quantity of this habitat across the entire region over the last 150 years. This trend is based on information on reports, scientific literature and from sources such as aerial photos for the 1930's (in Germany) and survey data.

Over the last 50 years the trends have been variable with both increases and decreases as well as reports of the habitat being relatively stable. In Germany for example a decrease of 26% or even 40% (including later land claimed areas) has been reported since the 1930s' and in the Canary Islands it is no longer present (the last records were made in 1991/2). In the UK the changes recorded have ranged from -90% to +240%, whereas the habitat is reported as being relatively stable or increasing over the last 50 years in northern Spain. In the Netherlands there has been hardly any recovery although *Z.noltei* has come back in some saltmarsh areas. In France the large intertidal beds in Arcachon Bay (the largest in Europe covering around 70km<sup>2</sup>) were nearly wiped out in the 1930s' following wasting disease. This was followed by a slow recolonization and then another decline, of 33% between 1988 and 2008, in recent years. This habitat is

not currently present in Belgium.

Outside EU 28 the habitat is recorded as being fragmented in Norway with decrease in number of localities of occurrence of the characteristic species, *Z.noltei* since the 1990s.

- 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*

This habitat does not have a small natural range, being reported from locations as widely separate as the Outer Hebrides off the west coast of Scotland and the southern North Sea coasts of Germany.

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

No

*Justification*

This habitat does not have a small natural range, being reported from locations as widely separate as the Outer Hebrides off the west coast of Scotland and the southern North Sea coasts of Germany.

## **Trends in quality**

There has been a substantial decline in quality of this habitat over the last 150 years as part of the massive reduction in its extent. The quality of remaining beds is also believed to be reduced for a variety of reasons. In Germany, for example, this is because following the large losses of intertidal beds, the hydrological conditions are believed to have changed and led to a reduction in the density of *Zostera* in the intertidal beds.

- Average current trend in quality

EU 28: Decreasing

EU 28+: Decreasing

## **Pressures and threats**

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OSPAR consider that the widespread loss of seagrass is largely a combination of the direct and indirect impacts of the rapid growth in human activities in the coastal zone. Pollution, eutrophication leading to effects such as smothering by epiphytes and algal blooms, change of hydrological conditions including wave exposure, infilling, shellfish fisheries, trampling, coastal development, land reclamation, human intrusion for example driving across intertidal seagrass beds and bait digging are some of the anthropogenic pressures on this habitat.

### **List of pressures and threats**

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

Fishing and harvesting aquatic resources

Professional active fishing

Leisure fishing

Bait digging / Collection

#### **Human intrusions and disturbances**

Other human intrusions and disturbances

Trampling, overuse

#### **Pollution**

Pollution to surface waters (limnic, terrestrial, marine & brackish)

- Nutrient enrichment (N, P, organic matter)
- Marine water pollution
  - Oil spills in the sea
  - Toxic chemical discharge from material dumped at sea

### **Natural System modifications**

- Human induced changes in hydraulic conditions
  - Landfill, land reclamation and drying out, general
  - Modification of hydrographic functioning, general
  - Dykes, embankments, artificial beaches, general

## **Conservation and management**

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The protection of this habitat is often incorporated into legislation aimed at conservation of the seagrass beds e.g. local by-laws and regulations as well as cross border agreements covering large geographical areas as in the case of the Wadden Sea. It is also a characteristic feature of several habitat types listed in Annex 1 of the Habitats Directive. The establishment of protected areas and zoning as part of Integrated Coastal Zone Management plans has also been beneficial. These designations and plans can provide a framework under which specific measures such as restrictions on activities such as bait digging, clam raking and waste water management may be introduced. Transplantation experiments with seagrass have been attempted as a habitat restoration measure but with limited success to date.

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

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

- Restoring/Improving water quality
- Restoring/Improving the hydrological regime

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

- Restoring marine habitats

#### **Measures related to spatial planning**

- Establish protected areas/sites
- Legal protection of habitats and species

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

- Regulation/Management of fishery in marine and brackish systems

### **Conservation status**

Annex 1:

1130 MATL U2

1140 MATL U2, MMAC XX

1160 MATL U2, MMAC FV

OSPAR

"Zostera beds" are a threatened and/or declining habitat in OSPAR regions I, II, III & IV.

*Z.noltei* has been assessed as Vulnerable on the basis of IUCN criteria B2ab (iii, iv) under the HELCOM (2013) red list species assessment.

The Norwegian 2010 Red List, assessed *Z.noltei* as Endangered on the basis of IUCN criteria B2ab (i, ii, iii, iv, v).

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

Rapid recolonisation of damaged beds is possible if the disturbance causing the seagrass decline is limited in time and space and if seedlings originating from the sediment bank or from neighbouring populations experience suitable growth conditions the following year. If the seedlings die and recolonisation must rely on spreading from neighbouring populations, the process can be very slow. Partial recovery may take 10 years and full recovery may take 25 years.

**Effort required**

10 years	20 years
Naturally	Naturally

**Red List Assessment**

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**Criterion A: Reduction in quantity**

Criterion A	A1	A2a	A2b	A3
EU 28	25-30 %	Unknown %	Unknown %	40-50 %
EU 28+	25-30 %	Unknown %	Unknown %	40-50 %

This habitat is assessed as Near Threatened under criterion A. There have been some substantial reductions in the extent of this habitat in some areas in the last 50 years (e.g. by around 99% in Mondego estuary, Portugal, 33% in Arcachon Bay, France and 90% in UK Essex estuaries). There have also been significant increases (by more than 250% in the Cromarty Firth, Scotland and more than 45% in Strangford Lough, Northern Ireland). Historical declines are believed to have been substantial (by around 40% in the north Frisian Wadden Sea, 17% in the east Frisian Wadden Sea). The current situation is reported as either unknown or stable and no estimates have been made of future trends. This habitat has therefore been assessed as Near Threatened 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>	Unknown	Unknown	No	>50	Unknown	Unknown	No	No
EU 28+	>50,000 Km <sup>2</sup>	Unknown	Unknown	No	>50	Unknown	Unknown	No	No

This habitat has a large natural range in the North East Atlantic region. The precise extent is unknown however as EOO >50,000km<sup>2</sup> and AOO >50, this exceeds the thresholds for a threatened category on the basis of restricted geographic distribution. Trends are unknown. The distribution of the habitat is such that the identified threats are unlikely to affect all localities at once. This habitat has therefore been assessed



as Least Concern under criteria B1(c) B2 (c) and B3 and Data Deficient for all other criteria.

### 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	Unknown %	Unknown %	Unknown %	Unknown %	<30 %	fairly substantial %
EU 28+	Unknown %	Unknown %	Unknown %	unknown %	<30 %	fairly substantial %

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%

The characteristic species of this habitat *Zostera noltei* is known to be highly sensitive to substrate loss, smothering, change in wave exposure, introduction of non-native species and extraction of other species, such as cockles. Both historic and more recent declines in quality have been observed but are difficult to quantify. Historically a reduction in quality over around 30% of this habitat is considered likely. More recent declines are likely to be less. This habitat has been assessed as Near Threatened under criterion C/D3 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	NT	DD	DD	NT	LC	LC	LC	DD	DD	NT	DD	DD	DD	DD	DD	DD	DD
EU28+	NT	DD	DD	NT	LC	LC	LC	DD	DD	NT	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
Near Threatened	A1, A3, C/D3	Near Threatened	A1, A3, C/D3

## Confidence in the assessment

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

## Assessors

North East Atlantic Working Group: Saunders, G., Gubbay, S., Tyler-Walters, H., Dankers, N., Otero-Ferrer, F., Forde, J., Fűrhaupter, K., Haroun Tabraue, R., Sanders, N.

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## Reviewers

Fűrhaupter, K.

## Date of assessment

06/08/2015

## Date of review

18/12/2015

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