A5.61c Massive serpulid reefs with bivalves *Ostrea edulis*, *Mytilus galloprovincialis* and *Petricola lithophaga* on lower infralittoral rock

Summary

Quantity data is based on currently known localities of the habitat. Changes in extent have been inferred from the distribution of dead reefs. There is no quantitative or qualitative data relating to changes in quality. Positive and negative quality indicators are known but there is insufficient knowledge to set thresholds. Historically the most significant pressure has been eutrophication. This is likely to have caused the greatest reductions in quality. Since the collapse of the Soviet Union improved transboundary pollution measures have been implemented. This has led to a reduction in pressures. Introduction of alien pathogens, structural damage, pollution, littering and un-supervised tourism are further pressures known to affect the quantity and quality of the habitat.

Synthesis

In the EU28 the habitat type is assessed as Critically Endangered under Criterion A1, A2b and C/D1. For Criteria A1 and A2b there has been a reduction in extent >80%. This is based on expert knowledge of the distribution of dead reefs. For Criterion C/D1 there has been a severe decline in quality affecting >80% in the last 50 years. This is based on expert opinion of the shift in community composition.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Critically Endangered	A1, A2b and C/D1	Critically Endangered	A1, A2b and C/D1

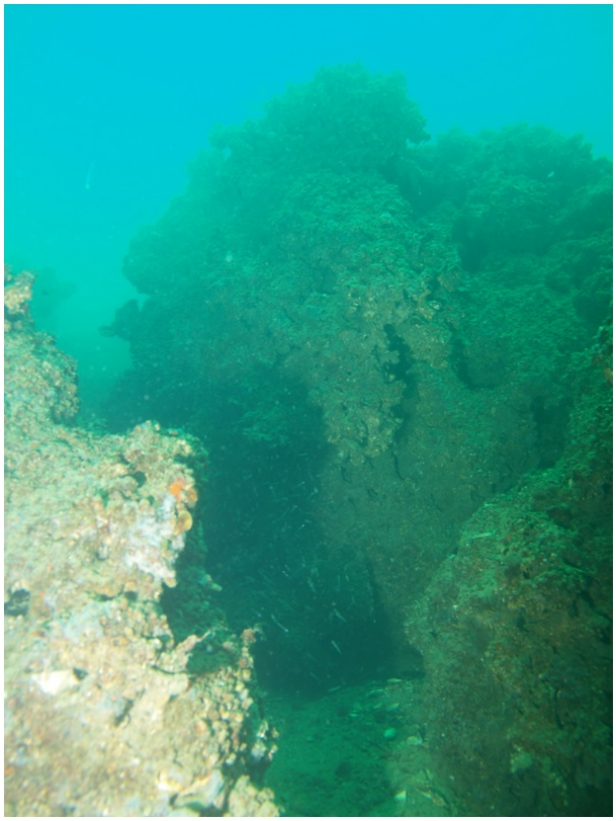
Sub-habitat types that may require further examination

None

Habitat Type

Code and name

A5.61c Massive serpulid reefs with bivalves *Ostrea edulis*, *Mytilus galloprovincialis* and *Petricola lithophaga* on lower infralittoral rock



Massive serpulid reefs with bivalves *Ostrea edulis*, *Mytilus galloprovincialis* and *Petricola lithophaga* on lower infralittoral rock, Maslen Nos, Bulgaria. (© Dragos Micu)

Massive serpulid reefs with bivalves *Ostrea edulis*, *Mytilus galloprovincialis* and *Petricola lithophaga* on lower infralittoral rock, Maslen Nos, Bulgaria. (© Dragos Micu)

Habitat description

Pontic serpulid reefs with oysters and mussels are massive erect biogenic structures attaining 7 m in height, 30-50 m length and 10 m width. They are distinguished by high three-dimensional complexity and irregular, branching or net shapes with serrated margins. The reefs are constructed mainly by serpulid polychaetes with *Ostrea edulis and Mytilus galloprovincialis* shells entwined in the matrix of calcareous tubes. The reefs occur along moderately exposed to sheltered coasts in clear marine waters, on bedrock and large blocks and boulders between 7–23 m depth. Many serpulid reefs are present in the area around Maslen Nos in Bulgaria (between Cape Korakya and Urdoviza Bay). Along the Bulgarian coast, the distribution extends from Varna in the north down to Rezovo in the south. Older literature records their existence along the Crimean and Romanian coasts, in the past 100-150 years. Nothing is known about their presence along the Turkish and Georgian coast. In Bulgaria the oysters on the reefs are no longer

alive, the last living oysters were photographed in the 1980s. However the reefs retain their function in the ecosystem, as oysters are replaced as filter-feeders by the blue mussel, *Mytilus galloprovincialis*, which has massively colonized the reefs.

Indicators of quality:

Suitable biotic indicators of quality include the presence of living and growing sections of serpulid reef, the presence of living oysters and the species composition and diversity of associated fauna and flora. Suitable abiotic indictors of quality include the water quality and circulation (i.e. exposure to nutrient enriched currents – upwellings, gyres) and the presence of litter (nets, plastic bags) and anthropogenic structural damage to the reef. There is insufficient information to set indicator thresholds required for monitoring purposes.

Characteristic species:

Ostrea edulis is Regionally Extinct in Bulgaria and Romania. Its situation is uncertain in Ukraine and Russia,

while it is known with certainty that flat oysters still live on the Turkish coast of the Black Sea. At present serpulid reefs are colonised by blue mussels Mytilus galloprovincialis and sponges, overgrown by red (*Delesseria ruscifolia*) and brown (*Zanardinia typus*) sciaphilic algae, and abundantly populated by crabs (*Eriphia verrucosa*), a variety of blennies, gobies, scorpionfishes, wrasses and damselfish and riddled with the boreholes of drilling *Petricola lithophaga*.

Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS (v1405):

Level 5. A sub-habitat of 'infralittoral biogenic reefs' (A5.6)

Annex 1:

1170 Reefs

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Littoral rock and biogenic reef

EUSeaMap:

Not mapped

IUCN:

12.1 Rocky shoreline

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

Yes

Regions
Black

Justification
The reefs are currently insufficiantly researched. However, they are unique to the Black Sea.

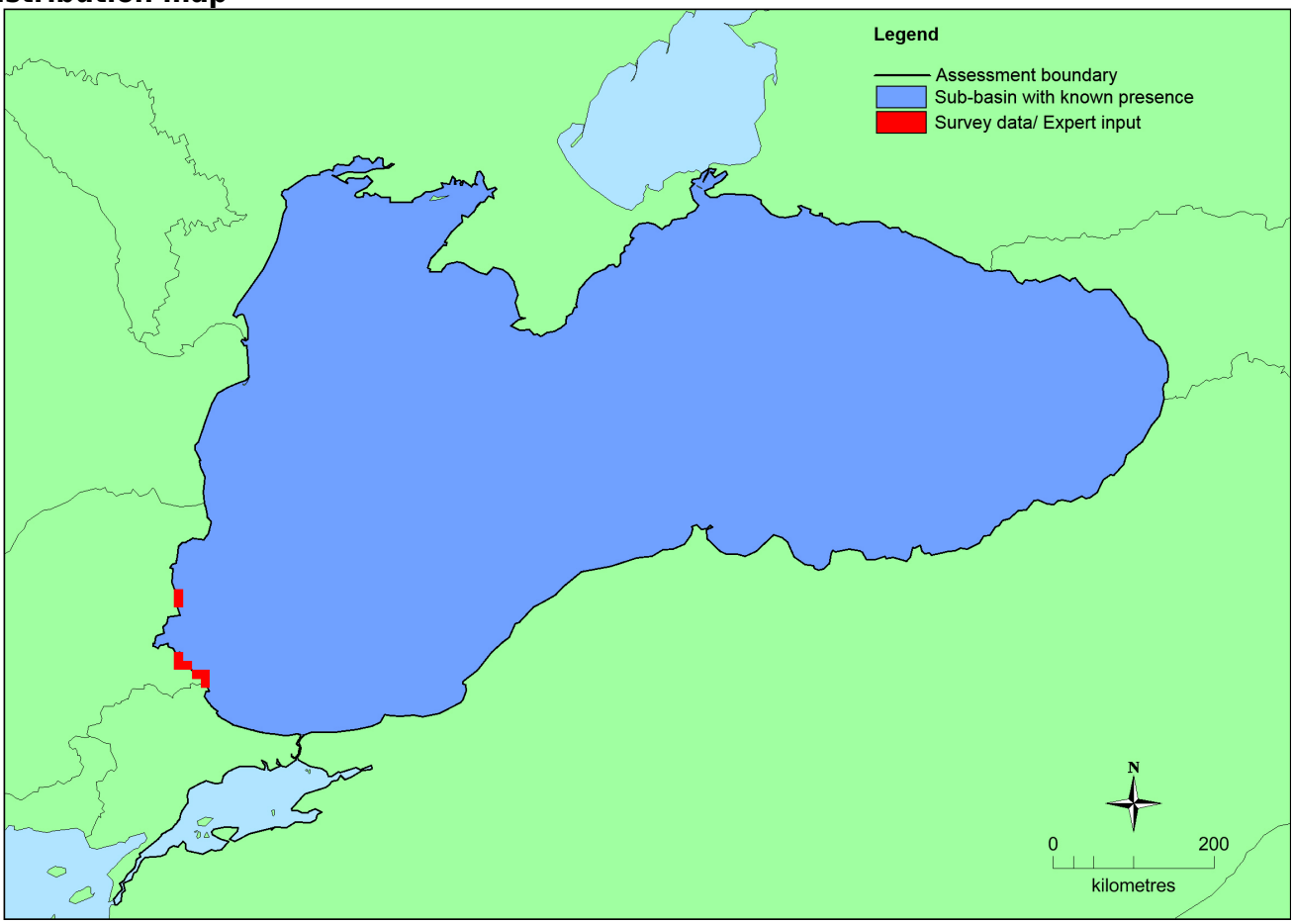
Geographic occurrence and trends

Region	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Black Sea	Black Sea: Present	Unknown Km^2	Decreasing	Decreasing

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	2746 Km^2	8	Unknown Km^2	
EU 28+	2746 Km^2	8	Unknown Km^2	

Distribution map



This map has been generated based on expert opinion. The map has been used to calculate AOO and EOO. The map should be treated with caution as it does not necessarily reflect the full distribution of the habitat.

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

100%. All known examples are within the EU28. It is possible that it also occurs in Crimea and along the Turkish coast. However, this is not supported by quantitative or qualitative data.

Trends in quantity

In the historic period (pre 1965) the habitat extent is believed to have been stable and in a pristine state in Bulgaria. There are no quantitative or qualitative data to support this. This is based on expert opinion of the known pressures and threats present during this period.

In the current period (1965 to present day) the habitat extent has decreased sharply due to die-offs of reefs. This started with the northernmost distribution of the habitat. Live reefs persisted in southern Bulgaria into the 1980s. The main pressure affecting extent is alien pathogens and pollution. As the habitat is typically in remote locations development pressures are lower. There is a pressure from fishermen deploying fixed fishing installations over the reef sites and inflicting structural damage to the reefs.

In the future the habitat extent is predicted to remain stable providing the current environmental conditions remain stable.

- Average current trend in quantity (extent)
  EU 28: Decreasing
  EU 28+: Unknown
- Does the habitat type have a small natural range following regression?
  Yes
  Justification
  The habitat had a small range to begin with and an even smaller one following regression in the EU. The habitat has undergone an important decline in the last 50 years (See trends in quantity)
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  Yes
  Justification
  The habitat can only occur in certain condition. The distribution of these suitable places is very restricted and the habitat cannot expand into new areas.

Trends in quality

In the historic period (pre 1965) quality is believed to have been stable. No quantitative data is available support this as the habitat was first described in 2008. This is based on expert opinion and photographic evidence from the 1980s.

In the current period (1965 to present day) the quality has decreased sharply due to the introduction of alien pathogens of oysters, eutrophication and pollution afflicting serpulids. There is no data to support this. It is based on expert opinion of the habitat and its likely response to known pressures. For instance, during the period up to the 1990s wide spread and severe eutrophication occurred in Black Sea. This was most notable in the western Black Sea. This is likely to have caused a decline in biotic quality of the habitat as key species are highly sensitive to these conditions.

In the future the habitat quality is expected to slowly decrease due to erosion of reefs (both natural and due to anthropogenic structural damage) and impaired rebuilding capacity due to there being very few remaining live serpulid colonies. The quality will need high levels of protection to remain stable and possibly human intervention in order to improve.

- Average current trend in quality
  EU 28: Decreasing
  EU 28+: Unknown

Pressures and threats

Eutrophication as a result of nutrient enrichment (N, P and organic matter) is the most significant historic pressure on the habitat. Since the 1990s this pressure has reduced due to tighter controls on pollution in the catchment of the Danube and other rivers which enter the north-west Black Sea. Whilst this pressure is now reduced it is still a continuing threat in the current and future periods. This is especially true for non EU countries surrounding the Black Sea which are not bound by the agreements such as the Water Framework Directive (WFD).

Biotic factors affecting impaired biological performance of serpulids and regional extinction of oysters still need to be researched, but remain a threat.

Littering and structural damage inflicted by fishermen can affect the abiotic quality of the habitat. Physical rubbish can damage the structure of the habitat (i.e. sponges and other invertebrates). Oil and other chemicals can damage the abiotic and biotic quality. These reduce the water quality resulting in a reduction in sensitive species.

Un-supervised tourism can reduce the biotic quality of the habitat. This can cause disturbance and

displacement of species. It can also damage the physical structure of the habitat.

List of pressures and threats

Human intrusions and disturbances

Other human intrusions and disturbances

Pollution

Pollution to surface waters (limnic, terrestrial, marine & brackish)
Nutrient enrichment (N, P, organic matter)
Input of contaminants (synthetic substances, non-synthetic substances, radionuclides) - diffuse sources, point sources, acute events
Marine water pollution
Input of litter (solid waste matter)

Natural biotic and abiotic processes (without catastrophes)

Interspecific faunal relations
Introduction of disease (microbial pathogens)

Conservation and management

Most locations where the habitat occurs are found within protected areas in Bulgaria. This provides protection in theory. However, most human pressures in these areas are not regulated or mitigated.

List of conservation and management needs

No measures

Measures needed, but not implemented

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 spatial planning

Establish protected areas/sites
Legal protection of habitats and species

Measures related to hunting, taking and fishing and species management

Other species management measures
Regulation/Management of fishery in marine and brackish systems

Measures related to urban areas, industry, energy and transport

Other measures
Urban and industrial waste management

Measures related to special resouce use

Regulating/Managing exploitation of natural resources on sea

Conservation status

Annex 1:

1170: BLS U1

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

The habitat may be able to recover reduced extent through intervention, but this is unproven and research is required.

The habitat will recover naturally from quality degredation. This can be achieved by removing and controlling pressures. Intervention can also be used to improve the quality of the habitat. For pressures such as littering, the rubbish can be cleared.

Effort required

10 years	20 years
Through intervention	Through intervention

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	>80 %	unknown %	unknown %	unknown %
EU 28+	>80 %	unknown %	unknown %	unknown %

In the EU there has been >80% reduction in the last 50 years. This is based on expert opinion of the distribution of dead reefs. The habitat is not known to occur in the EU28+.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	2746 Km^2	Yes	Unknown	Yes	8	Yes	Unknown	CR	Yes
EU 28+	2746 Km^2	Yes	Unknown	Yes	8	Yes	Unknown	CR	Yes

The AOO and EOO are intrinsically very small for the EU states. Declines in abiotic and biotic quality are likely to continue due to weak enforcement of regulations. There have been significant declines in the recent past which have left the habitat in a fragile state. The habitat exists at less than 5locations, and there are no plausible human activities or stochastic events that may drive the habitat to be CR or Collapsed within a very short time period.

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	%	Severe %	unknown %	unknown %	unknown %	unknown %
EU 28+	>80 %	Severe %	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%

In the EU states there has been a severe decline affecting >80% extent. This has occurred within the last 50 years. This has affected both biotic and abiotic factors. It is not possible to decouple these. This is based on expert opinion. There is no quantitative or qualitative data available.

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.

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	CR	DD	CR	DD	EN	CR	DD	CR	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	CR	DD	CR	DD	EN	CR	DD	CR	DD	DD	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	A1, A2b and C/D1	Critically Endangered	A1, A2b and C/D1

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

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15/07/2015

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17/12/2015

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