A5.14 Atlantic upper circalittoral coarse sediment

Summary

This habitat consists of tide-swept circalittoral coarse sands, gravel and shingle. In general, it extends from depths of over 15-20m and it can be found in tidal channels of marine inlets, along exposed coasts, and offshore. The associated biotopes are typically characterised by robust infaunal polychaetes (eg. *Pomatoceros triqueter)*, mobile crustacea and bivalves.

The habitat is intolerant to substratum disturbance and loss caused by demersal fishing activities and aggregate extraction. As well as direct removal, these activities can alter the sediment characteristics of the habitat and the associated species. Changes in water flow and wave exposure can also affect species richness when it results in high sediment mobility, rendering the sediment less suitable for burrowing deposit feeders. Chemical substances, such as oil pollutants, cause serious respiratory impairments in the bivalve communities associated with this habitat, in particular, their larval and embryonic stages. Beneficial management and conservation measures for this habitat include the regulation of fishing activities and dredging which damage, or disturb seabed communities.

Synthesis

This habitat has a large natural range in the North East Atlantic. A combination of survey data and modelling indicates that it does not have a restricted geographical distribution nor occur in only a few locations in the North East Atlantic and therefore qualifies as Least Concern under criterion B.

Most sedimentary benthic systems on the continental shelf of Europe have been modified by fishing activities, particularly bottom trawls and dredging, in the last 100 years and this habitat remains under fishing pressure and subject to aggregate extraction. Data for 2013/2014 has revealed that more than 60% of this habitat in the North Sea and Celtic Sea was subject to fishing pressure by bottom otter, beam and mid-water trawls. Coarse sediment communities have greater resilience and faster recovery rates that those in fine sediments but given that this is based on a single year of data and that this type of pressure has been taking place for decades it is likely to be an underestimate of the total area of this habitat which has been subject to such pressure.

Expert opinion is that there has been a substantial reduction in quality of this habitat, most likely an intermediate decline affecting more than 50% of its extent although it is clear that in some locations there has also been a severe decline. The severity will depend on factors such as the intensity and frequency of disturbance. This habitat has therefore been assessed as Vulnerable for both the EU 28 and EU 28+ because of both past and likely continuing declines in quality.

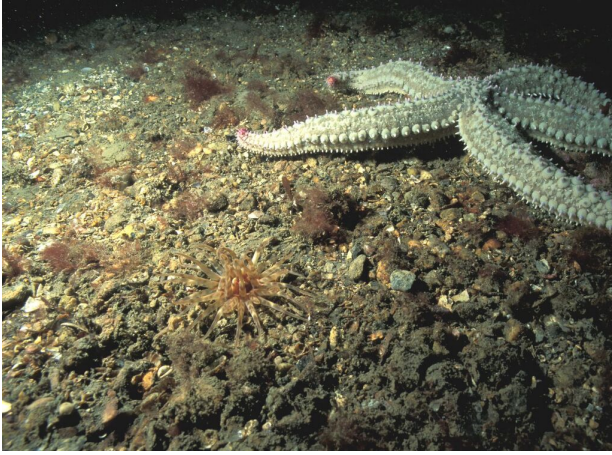| Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Vulnerable	C/D1	Vulnerable	C/D1

Sub-habitat types that may require further examination

None.

Habitat Type

Code and name

A5.14 Atlantic upper circalittoral coarse sediment

Seabed of coarse sediment in the upper circalittoral zone. East of Lundy Island, UK (© K.Hiscock).

Habitat description

This habitat comprises tide-swept circalittoral coarse sand, gravel, pebbles, shingle and cobbles which are often unstable due to tidal currents and/or wave action. It is typically found in depths of over 15-20m and is present in tidal channels of marine inlets and along exposed coasts and offshore. The associated biotopes are characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g. *Neopentadactyla*) may also be prevalent, along with the lancelet *Branchiostoma lanceolatum*. Where the sediment is mobile or unstable, the epibenthic fauna may limited to the keel worm *Pomatoceros triqueter* with barnacles and bryozoan crusts as these species have some resistance to abrasion and can rapidly colonise areas after successful spatfalls. In locations with weak or no current the fauna is dominated by polychaetes. Scallops may occur on the sediment surface in areas of shell gravel that are subject to some sand scour.

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.

Characteristic species:

These include: *Pomatoceros triqueter, Mediomastus fragilis, Lumbrineris* spp. and *venerid* bivalves. *Protodorvillea kefersteini, Neopentadactyla mixta*, *Echinocyamus pusillus, Ampelisca spinipes, Asterias rubens, Spiophanes bombyx, Abra alba, Branchiostoma lanceolatum Polygordius appendiculatus, Pisione remota, Sphaerosyllis bulbosa, Goniadella gracilis, Mediomastus fragilis, Glycera lapidum, Protodrilus*; ophiuroid *Amphipholis squamata, Ophiura albida*, oligochaete *Grania;* Nematoda and *Nemertina.*

Classification

EUNIS (v1405):

Level 4. A sub-habitat of 'Atlantic circalittoral coarse sediment' (A5.1).

Annex 1:

1110 Sandbanks slightly covered with seawater all the time

1160 Large shallow inlets and bays

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Shallow sublittoral coarse sediment

EUSeaMap:

Shallow coarse or mixed sediments

IUCN:

9.4 Subtidal sandy

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

Justification
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)
North-East Atlantic	Bay of Biscay and the Iberian Coast: Present Celtic Seas: Present Greater North Sea: Present Macaronesia: Present Kattegat: Present	Unknown Km^2	Unknown	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	4,881,445 Km^2	3,701	>84,576 Km^2	The area estimate for this habitat has been derived from a synthesis of EUNIS seabed habitat geospatial information for the European Seas but is recognised as being an underestimate. No precise figure
EU 28+	>4,881,445 Km^2	>3,701	>84,576 Km^2	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
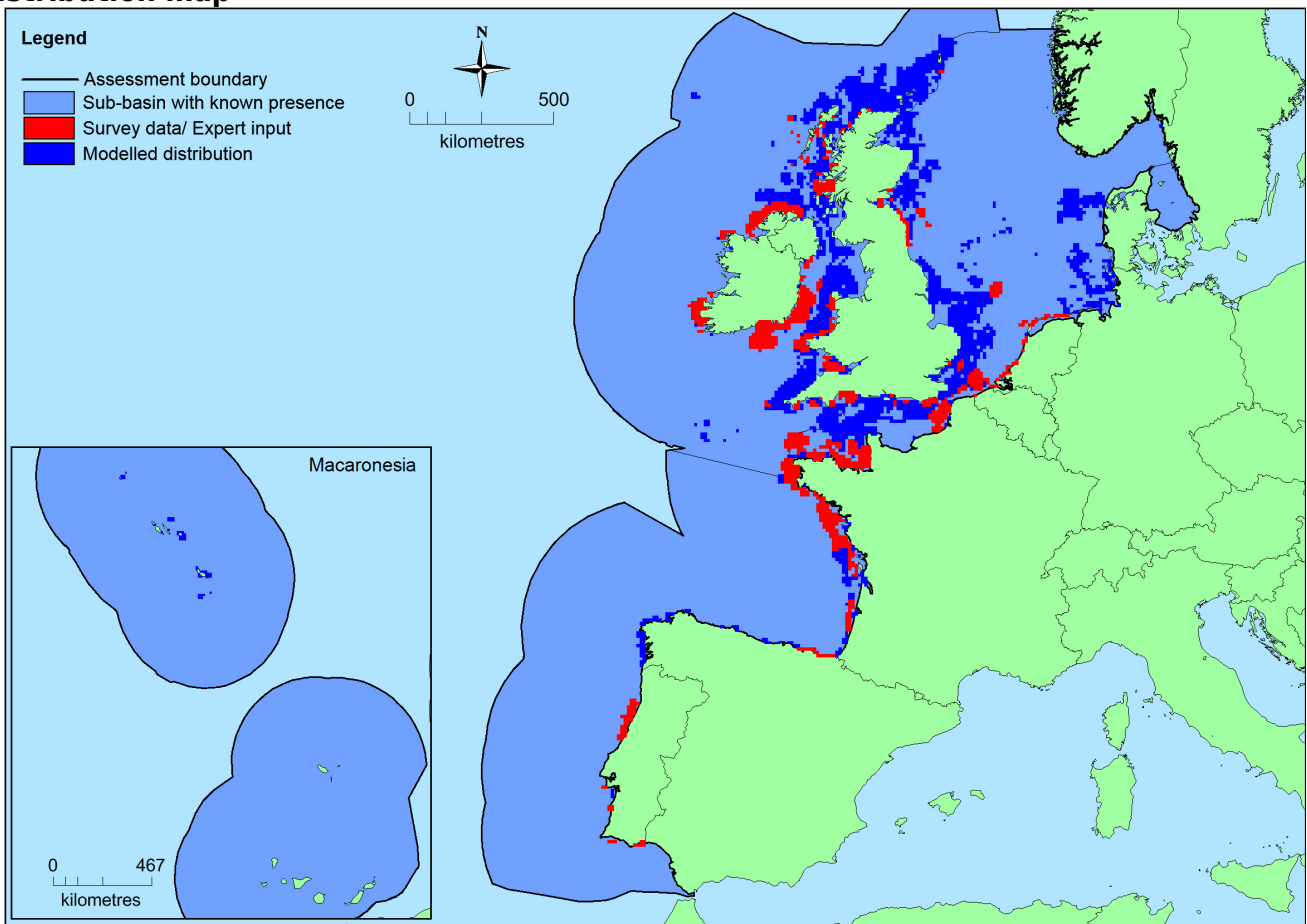
There are insufficient data to provide a comprehensive and accurate map of the distribution of this habitat. This map has been generated using EMODnet data from modelled/surveyed records for the North East Atlantic (and supplemented with expert opinion where applicable) (EMODnet 2010). EOO and AOO have 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?

This habitat occurs in the EU 28+ (e.g. Norway, Isle of Man, Channel Islands). The percentage hosted by the EU 28 is likely to be between 85-90% but there is insufficient information to establish the exact figure.

Trends in quantity

It is difficult to establish the quantity of this habitat as it often has a patchy distribution, grading into other soft sediment habitats, or interspersed amongst rocky areas. Even where the extent of this habitat or its associated biotopes has been mapped in detail (e.g. as part of resource assessments for sand and gravel extraction or within marine protected areas) there is a lack of information on trends. Some changes in the occurrence of the underlying substrate have been reported e.g. from coarse sediments and stones in the 1950s to fine sand in 1992 on parts of the Dogger Bank, but no analysis of changes in the habitat. Overall trends are unknown.

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

This habitat has a widespread distribution. In the North Sea locations where it has been reported, include the Hinder Bank off the Thames estuary, the Dogger Bank, the Texel Rough, Klaver Bank and Borkum Reef.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  This habitat has a widespread distribution. In the North Sea locations where it has been reported, include the Hinder Bank off the Thames estuary, the Dogger Bank, the Texel Rough, Klaver Bank and Borkum Reef.

Trends in quality

The substantial extent of the likely impact of bottom fishing gears on this habitat throughout the North East Atlantic region is apparent from many studies including analyses which have combined VMS data with sensitivity maps of benthic habitats and disturbance caused by surface abrasion for the continental shelf area of the North East Atlantic. Qualitative observations have revealed trends in the relative abundance of common species and changes in the associated communities from some locations. Off the coast of Belgium, for example, parts of areas first surveyed in the 1920s have experienced a shift from typical gravel epifauna toward a more typical sand bottom epifauna. In the Kattegat, around 50% of coarse sediment habitats were trawled over during a 3 year study period but with a low intensity. As most was fished less than twice a year it was considered to have a high recoverability from associated impacts in this area.

Most recently, an analysis of the fishing intensity of EU trawlers (bottom otter, beam and mid-water trawls) using Automatic Identification System (AIS) ship tracking data over one year (2013/2014) shows high coverage in all European coastal waters and over the continental shelf. When combined with the modelled distribution of EUNIS marine habitat types it is possible to examine the extent of likely impact on a particular benthic habitat. For example, over this time period around 60% of the area of upper circalittoral coarse sediment habitat was subject to such fishing pressure in the North Sea and Celtic Sea. Scientific evidence, supplemented with expert judgement to develop fisheries measures in protected areas for the Dutch sector of the North Sea, indicated that the most significant threat to the conservation status of the Dogger Bank comes from bottom gear, notably from beam trawling with tickler chains. The main effect is on abiotic conditions, hence on structure and function, which results in reduction of the abundance of typical species. This initial effect is greater in sandy then muddy bottom however this is compensated somewhat by shorter recovery times where the seabed is predominantly sandy.

More information is available where this habitat coincides with aggregate dredging sites. In such situations there have been changes in community composition and degradation of habitat quality but also recovery when areas are left undisturbed. For example, a ten year study of the physical and biological impact of aggregate dredging along the French coast of the Eastern English Channel reported a change in the structure of the community from one of coarse sands with *Branchiostoma lanceolatum* to one of fine sands with *Ophelia borealis*, *Nephtys cirrosa*, and *Spiophanes bombyx*, with local dominance of the opportunistic, sessile *Pomatoceros triqueter* on bare shingles. Species richness was fully restored after 16 months although the community structure differed from the initial one corresponding to the new type of sediment.

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

Pressures and threats

This habitat is vulnerable to disturbance or loss of seabed sediments, for example through dermersal

fishing activity or aggregate dredging can both dislodge or remove the infauna and sessile epifauna associated with this habitat. An increase in water flow and wave exposure can also affect the species richness because of associated changes in sediment character, primarily by re-suspending and preventing deposition of finer particles and creating a high sediment mobility. One consequence is that the habitat can become less suitable for burrowing deposit feeders.

Species richness is expected to decline as bivalves in general are particularly intolerant of tri-butyl tin (TBT) an active component in antifouling paints. In addition, contact with oil causes an increase in energy expenditure and a decrease in feeding rate, resulting in less energy available for growth and reproduction. Larval and embryonic stages of bivalves are particularly intolerant of heavy metal contamination. Climate change and its associated changes in water flow may also be a threat for this habitat.

List of pressures and threats

Biological resource use other than agriculture & forestry

Fishing and harvesting aquatic resources
Professional active fishing
Benthic dredging

Pollution

Marine water pollution
Toxic chemical discharge from material dumped at sea
Synthetic compound contamination

Natural System modifications

Extraction of sea-floor and subsoil minerals (e.g. sand, gravel, rock, oil, gas)
Alteration of sea-floor/ Water body morphology

Climate change

Changes in abiotic conditions
Water flow changes (limnic, tidal and oceanic)
Wave exposure changes

Conservation and management

Beneficial management measures include the control of demersal fishing activity and the regulation of activities which damage or disturb seabed communities such as aggregate dredging and offshore construction work. Establishing undisturbed areas may also be beneficial by helping to facilitate the recolonisation of previously degraded areas. The control of chemical discharges can reduce the risk of toxic effects on associated species.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality

Measures related to marine habitats

Restoring marine habitats

Measures related to spatial planning

Establish protected areas/sites

Measures related to hunting, taking and fishing and species management

Regulation/Management of fishery in marine and brackish systems

Measures related to special resouce use

Regulating/Managing exploitation of natural resources on sea

Conservation status

Annex 1:

1110: MATL U2, MMAC U1

1160: MATL U2, MMAC FV

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

Studies on the recovery of coarse sediment habitats following aggregate dredging indicate that the tidal stress regime is an important consideration in recovery times. In highly energetic conditions recovery may take less than 2 years but under other conditions recovery may take more than 20 years. If the sediment composition is altered the species composition may be different to that which existed before the habitat was damaged.

Effort required

10 years	20 years
Naturally	Naturally

Red List Assessment

Criterion A: Reduction in quantity

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

Some localised changes in extent of this habitat have been recorded but there is insufficient information to determine any overall trends in quantity of this habitat in the North East Atlantic. This habitat has therefore been assessed as Data Deficient under Criterion 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^2	Yes	Yes	no	>50	Yes	Yes	no	No
EU 28+	>50,000 Km^2	Yes	Yes	no	>50	Yes	Yes	no	No

There has been a decline in quality of this habitat due to disturbance of benthic communities resulting from mobile demersal fishing gears in particular and localised effects on various timescales associated with aggregate dredging. This trend is considered likely to continue, however the distribution of the habitat is such that the identified threats are unlikely to affect all localities at once. Furthermore this habitat has a large natural range in the North East Atlantic region and as EOO >50,000 km^2 and AOO >50, this exceeds the thresholds for a threatened category on the basis of restricted geographic distribution. This habitat has therefore been assessed as Least Concern under criteria B 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	>50 %	Intermediate %	unknown %	unknown %	unknown %	unknown %
EU 28+	>50 %	Intermediate %	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%

Most sedimentary benthic systems on the continental shelf of Europe have been modified by fishing activity in the last 100 years and this remains a significant pressure. Mobile demersal fishing gears such as otter trawls and beam trawls, disturb the upper layers of the sediment and damage both the associated eipfauna and shallow infaunal communities . Associated increases in suspended sediments may also have a smothering effect on filter feeders. The degree of any damage will depend on the gear, frequency of use and species present. A recent analysis of the fishing intensity of EU trawlers (bottom otter, beam and mid-water trawls) using Automatic Identification System (AIS) ship tracking data over one year (2013/2014) shows high coverage in all European coastal waters and over the continental shelf. When combined with the modelled distribution of EUNIS marine habitat types it is possible to examine the extent of likely impact on a particular benthic habitat. For example, over this time period around 60% of the estimated area of upper circalittoral coarse sediment was subject to such fishing pressure in the North Sea and Celtic Sea. Coarse sediment communities have greater resilience and faster recovery rates that those in fine sediments but given that this is based on a single year of data and that this type of pressure has been taking place for decades it is likely to be an underestimate of the total area of this habitat which has been affected. Aggregate extraction also has a localised effect on this habitat with the longevity of the effect depending on the local conditions and timescale.

Expert opinion is that there is likely to have been a substantial reduction in quality of this habitat - an intermediate decline in quality affecting more than 50% of this habitat in the North East Atlantic region although it is also possible that more than 30% has been subject to a severe decline. This will depend on factors such as the intensity and frequency of disturbance. 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	DD	LC	LC	LC	VU	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	DD	DD	DD	DD	LC	LC	LC	VU	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
Vulnerable	C/D1	Vulnerable	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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Date of assessment
25/08/2015

Date of review
19/01/2016

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