MarLIN
Marine Information Network
Information on the species and habitats around the coasts and sea of the British Isles

Sublittoral coarse sediments in variable salinity (estuaries)

MarLIN – Marine Life Information Network
Marine Evidence–based Sensitivity Assessment (MarESA) Review

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The Marine Life Information Network, Marine Biological Association of the United Kingdom.

Please note. This MarESA report is a dated version of the online review. Please refer to the website for the most up-to-date version [https://www.marlin.ac.uk/habitats/detail/53]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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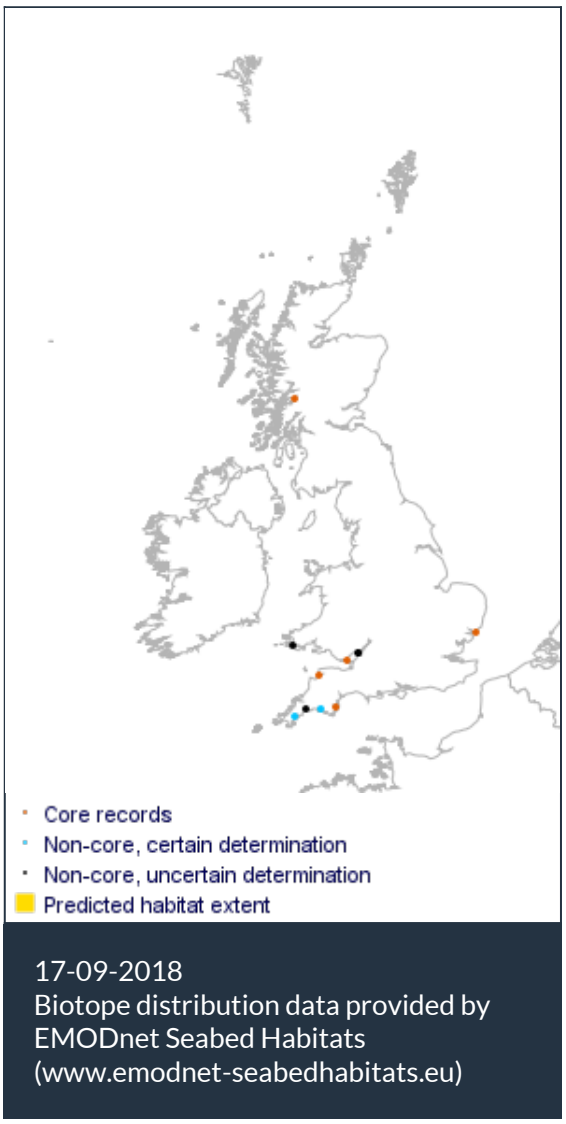

17-09-2018
Biotope distribution data provided by EMODnet Seabed Habitats (www.emodnet-seabedhabitats.eu)

Researched by Dr Heidi Tillin **Refereed by** This information is not refereed.

Summary

UK and Ireland classification

EUNIS 2008	A5.12	Sublittoral coarse sediment in variable salinity (estuaries)
JNCC 2015	SS.SCS.SCSVS	Sublittoral coarse sediments in variable salinity (estuaries)
JNCC 2004	SS.SCS.SCSVS	Sublittoral coarse sediments in variable salinity (estuaries)
1997 Biotope	SS.IGS.EstGS	Estuarine sublittoral gravels and sands

Description

Clean gravels and sands which occur in the upper reaches of marine inlets, especially estuaries, where water movement is sufficiently strong to remove the silt content of the sediment. The habitat typically lacks a significant seaweed component and is characterized by robust brackish-water tolerant fauna, particularly amphipods, robust polychaetes and mysid shrimps (JNCC, 2015).

Depth range

0-5 m, 5-10 m, 10-20 m

Additional information

-

Listed By

- none -

Further information sources

Search on:

G G JNCC

Sensitivity review

Sensitivity characteristics of the habitat and relevant characteristic species

The biotope is characterized by clean gravels that occur in the upper reaches of marine inlets, especially estuaries, where water movement is sufficiently strong to remove the silt content of the sediment. The habitat typically lacks a significant seaweed component and is characterized by a sparse but very robust brackish-water tolerant fauna. The biotope description refers to gobies *Pomatoschistus* and the shore crab *Carcinus maenas* as characterizing species. These are mobile and their abundance within examples of this biotope may change as they migrate to avoid unfavourable conditions. movements might alse be seasonal. In the Wadden Sea and, probably colder, northern parts of Britain, *Carcinus maenas* migrates to subtidal areas and remains there until spring when it migrates back to shallower waters.

As the characterizing species are mobile and their abundance may vary, the habitat is largely defined by the key environmental factors that structure the biotope: low and variable salinity and the presence of subtidal sands and gravels. The sensitivity assessments therefore specifically consider these factors as the basis of the assessment. If these change the biotological assembolage could alter to one more suited to the changed conditions and the biotope classification would change.

Resilience and recovery rates of habitat

This biotope comprises non-cohesive sediments that may be highly mobile, these contain little organic matter and are not suitable for burrowing infauna that require more sediment cohesion or attached epifauna that require stable hard substratum. The species that are present (if any) are robust animals that can withstand some physical disturbance and/or recover rapidly, or migrate as adults into the biotope. The biotope is primarily identified by the type of the substratum rather than the biological community, which may be absent, or if present, occur in extremely low abundance. Therefore the substratum type has been used primarily to indicate the sensitivity of this biotope and no species indicative of sensitivity were chosen.

Resilience assessment. As this biotope is characterized by low species -richness and is characterized by mobile fish and crabs, recovery is assessed as 'High' for any level of impact that affects only the species-poor, assemblage. The biotope would be considered to be sensitive to pressures that allowed the establishment of a permanent, species rich biological assemblage as low abundances and low species richness are characteristic of the biotope. If the key structuring habitat factors were altered the biotope cound not be considered to be recovered until typical conditions were restored.

Hydrological Pressures

	Resistance	Resilience	Sensitivity
Temperature increase (local)	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is characterized by a sparse assemblage (JNCC, 2015), rather than the presence of typical species: changes in temperature will therefore not alter the biotope (based on the abiotic habitat). Resistance to an increase in temperature is therefore assessed as 'High' and resilience as

'High' (by default) and this biotope is considered to be 'Not sensitive'.

Temperature decrease (local)	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is characterized by a sparse assemblage (JNCC, 2015) and is defined by environmental factors rather than the presence of typical species: changes in temperature will therefore not alter the biotope (based on the abiotic habitat). Resistance to a decrease in temperature is therefore assessed as 'High' and resilience as 'High' (by default) and this biotope is considered to be 'Not sensitive'.

Salinity increase (local)	None Q: Low A: NR C: NR	High Q: Low A: NR C: NR	Medium Q: Low A: Low C: Low

This biotope is characterized by the absence of species resulting from sediment mobility and abrasion (JNCC, 2015), rather than the presence of typical species. The reduced and variable salinity is a key environmental factor characterizing the habitat. A change in salinity to full would alter the habitat conditions leading to reclassification to SS.SCS.ICS.SSh or similar, and may result in colonization by species more typical of coastal and marine habitats such as *Balanus crenatus*, *Spirobranchus triqueter* and encrusting bryozoand and sponges. Species such as amphipods and mysids that are present within estuaries may be lost.

Sensitivity assessment. As the change in salinity represents a change in habitat type. Resistance to an increase in salinity is therefore assessed as 'None' and resilience is assesed as 'High' following restoration of habitat conditions (as the abiotic habitat will have recovered). Where species have low connectivity with other populations and have been lost from an estuarine system recolonization and recvoery of abundance may, however, be prolonged.

Salinity decrease (local)	Medium Q: High A: Medium C: Low	High Q: High A: Low C: High	Low Q: High A: Medium C: Low

This biotope is characterized by a sparse assemblage (JNCC, 2015), rather than the presence of typical species, present in variable or reduced salinity. A change at the pressure benchmark therefore refers to a change to reduced (for previously variable salinity examples) or a change to 'Low' salinity (<18ppt). A change in salinity would have little effect on the abiotic habitat but would result in a change in a key defining and structuring environmental factor. A change to reduced salinity could reduce species richness and the abundance of species typical of the habitat, although some species such as mysids may be able to tolerate very low salinities.

Sensitivity assessment. Resistance to a decrease in salinity to Low (<18ppt) is assessed as 'Medium' as the character of some examples of the habitat would be altered and some changes in species richness and abundance may occur. Resilience is assessed as 'High' following restoration of habitat conditions based on the immediate recovery of the character of the abiotic habitat and recovery within two years of most species that occur in the biotope. Biotope sensitivity is therefore assessed as 'Low'.

Water flow (tidal current) changes (local)	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

Changes in water flow at the pressure benchmark are considered unlikely to lead to alterations in the biotope as the biotope occurs in a range of tidal flows (JNCC, 2015) and wave action maystill result in sediment mobility, preventing the establishment of a more species rich biotope. Resistance is therefore assessed as 'High' and resilience as 'High' (by default) so that the biotope is considered to be 'Not sensitive'. If wave action and water flows were both reduced (at levels greater than the pressure benchmark) finer terrestrial sediments carried by riverine inputs may be deposited, depending on local sediment supply. Where deposition alters the sediment type these would allow the development of biological assemblages typical of the new habitat type, significantly altering the character of the habitat and leading to reclassification. The habitat would be considered sensitive to these changes.

Emergence regime changes	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

This pressure is 'Not relevant' to sublittoral biotopes.

Wave exposure changes (local)	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is found on shores that are judged to be moderately exposed sheltered or very sheltered (JNCC, 2015). The presence of this biotope across these three categories is considered to indicate (by proxy) that increases or decreases in wave exposure at the pressure benchmark are unlikely to lead to alterations to the biotope. Resistance is therefore assessed as 'High' and resilience as 'High' (by default) so that the biotope is considered to be 'Not sensitive'. If wave action and water flows were both reduced (at levels greater than the pressure benchmark) finer terrestrial sediments carried by riverine inputs may be deposited, depending on local sediment supply. Where deposition alters the sediment type these would allow the development of biological assemblages typical of the new habitat type, significantly altering the character of the habitat and leading to reclassification. The habitat would be considered sensitive to these changes.

Chemical Pressures

	Resistance	Resilience	Sensitivity
Transition elements & organo-metal contamination	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed** but evidence is presented where available. As this biotope is characterized by the lack of species, exposure to contaminants will not result in significant impacts.

Hydrocarbon & PAH contamination	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed** but evidence is presented where available. As this biotope is characterized by the lack of species, exposure to contaminants will not result in significant impacts.

Synthetic compound contamination	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed** but evidence is presented where available. As this biotope is characterized by the lack of species, exposure to contaminants will not result in significant impacts.

Radionuclide contamination	No evidence (NEv) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

No evidence was found.

Introduction of other substances	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed**.

De-oxygenation	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

As this biotope is characterized by the lack of species, de-oxygenation will not result in significant impacts. Biotope resistance is therefore assessed as 'High', and resilience as 'High' (by default) and the biotope is considered to be 'Not sensitive'.

Nutrient enrichment	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

As this biotope is characterized by the lack of species present due to sediment mobility, nutrient enrichment will not result in significant impacts. Biotope resistance is therefore assessed as 'High', and resilience as 'High' (by default) and the biotope is considered to be 'Not sensitive'.

Organic enrichment	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

As this biotope is characterized by the lack of species, organic enrichment will not result in significant impacts. Organic deposits are likely to be removed rapidly by wave action although in periods of calm an organic deposit may be rapidly colonized by oligochaetes or amphipods. Biotope resistance is assessed as 'High' as enrichment is likely to be very short-lived, and resilience is assessed as 'High' (by default), the biotope is considered to be 'Not sensitive'.

Physical Pressures

	Resistance	Resilience	Sensitivity
Physical loss (to land or freshwater habitat)	None Q: High A: High C: High	Very Low Q: High A: High C: High	High Q: High A: High C: High

All marine habitats and benthic species are considered to have a resistance of 'None' to this pressure and to be unable to recover from a permanent loss of habitat (resilience is 'Very Low'). Sensitivity within the direct spatial footprint of this pressure is therefore 'High'. Although no specific evidence is described confidence in this assessment is 'High', due to the incontrovertible nature of this pressure.

Physical change (to another seabed type)	None Q: High A: Medium C: NR	Very Low Q: High A: High C: High	High Q: High A: Medium C: Low

This biotope is characterized by pebbles, gravel and sand (JNCC, 2015). A change to a hard or artificial substratum would significantly alter the character of the biotope. The biotope is therefore considered to have 'No' resistance to this pressure (based on a change to a sediment habitat), recovery is assessed as 'Very low', as the change at the pressure benchmark is permanent. Biotope sensitivity is therefore assessed as 'High'.

Physical change (to another sediment type)	None Q: High A: Medium C: Low	Very Low Q: High A: High C: High	High Q: High A: Medium C: Low

The benchmark for this pressure refers to a change in one Folk class. The pressure benchmark originally developed by Tillin *et al.*, (2010) used the modified Folk triangle developed by Long (2006) which simplified sediment types into four categories: mud and sandy mud, sand and muddy sand, mixed sediments and coarse sediments. The change referred to is therefore a change in sediment classification rather than a change in the finer-scale original Folk categories (Folk, 1954). The change in one Folk class is considered to relate to a change in classification to adjacent categories in the modified Folk triangle. For coarse gravel and pebble habitats a change in one folk class may refer to a change to gravels, mixed sediments or muddy sands, sandy muds and muds. A change in sediment type would result in reclassification of the biotope (JNCC, 2015) and a change to mixed or fine sediments would likely result in the establishment of a species rich and more diverse community (depending on other habitat factors). Biotope resistance is therefore assessed as 'None' and resilience as 'Very low' as the change at the pressure benchmark is permanent. Sensitivity is therefore 'High'.

Habitat structure changes - removal of substratum (extraction)	None Q: High A: Low C: NR	High Q: Low A: NR C: NR	Medium Q: Low A: Low C: Low

The process of extraction will remove the abiotic habitat; therefore a resistance of 'None' is recorded. As the sediments characterizing this biotope are non-cohesive, where small areas are impacted infilling is likely to be rapid following sediment redistribution by wave action or water action. As a result, resilience is assessed as 'High', and sensitivity as 'Medium'. Recovery where large volumes of shingle are removed over wide areas may lead to slower recovery if sediments are not available and/or water transport is limited.

Abrasion/disturbance of the surface of the substratum or seabed	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is characterized by a species-poor assemblage of robust species and the abiotope habitat (JNCC, 2015). The highly mobile or robust species present occasionally in this biotope are not specifically dependent on this biotope and most can avoid abrasion by swimming e.g. shrimp, mysids and fish. Resistance to this pressure is therefore assessed as 'High' and resilience as 'High' (by default) and this biotope is considered to be 'Not sensitive'.

Penetration or disturbance of the substratum subsurface	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is characterized by the absence of species through sediment mobility (JNCC, 2015), rather than the presence of typical species: abrasion will therefore not alter biotope character. The highly mobile or robust species present occasionally in this biotope may only be found in low abundance and are not specifically dependent on this biotope. Resistance to this pressure is therefore assessed as 'High' and resilience as 'High' (by default) and this biotope is considered to be 'Not sensitive'.

Changes in suspended solids (water clarity)	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope occurs in scoured habitats and it is likely, depending on local sediment supply, that the biotope is exposed to chronic or intermittent episodes of high-levels of suspended solids as rivers transporty fine silts and clays from terrestrial habitats. This biotope is characterized by a species-poor assemblage (JNCC, 2015) many of which such as shrimps and mysids can occur in highly turbid systems such as the Severn Estuary (Bamber & Henderson, 1994) , An increase or decrease in suspended solids is not considered to significantly alter this biotope as it is struvtured by physical factors such as reduced and variable salinity and the presence of clean sediments. Resistance to an increase or decrease in suspended solids is therefore assessed as 'High' and resilience as 'High' (by default) and this biotope is considered to be 'Not sensitive'. If an increase in suspended solids was accompanied by reductions in water flow and wave action then some deposition could occur, this is assessed through the physical change and siltation pressures.

Smothering and siltation rate changes (light)	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is characterized by a species-poor assemblage structured by the reduced and variable salinity and the coarse sediments (JNCC, 2015). In some estuaries such as the Severn, sediment re-suspension and mobilisation occurs at spring tides with resulting deposition during neap tides. Some deposition may therefore be part of the tidal cycle and the abiotic habitat that defines this biotope is not significantly affected.

Sensitivity assessment. The addition of a single deposit of fine sediments which will be removed by wave action or currents will therefore not alter the biotope. Resistance to this pressure is therefore assessed as 'High' and resilience as 'High' (by default) and this biotope is considered to be 'Not sensitive'.

Smothering and siltation rate changes (heavy)	High Q: High A: Medium C: NR	High Q: High A: High C: High	Not sensitive Q: High A: Medium C: Low

This biotope is characterized by a species-poor assemblage structured by the reduced and variable salinity and the coarse sediments (JNCC, 2015). In some estuaries such as the Severn, sediment re-suspension and mobilisation occurs at spring tides with resulting deposition during neap tides. Some deposition may, therefore, be part of the tidal cycle and the abiotic habitat that defines this biotope may not be significantly affected as fine deposits are remobilised and transported in the water column.

Sensitivity assessment. The addition of a single deposit of fine sediments is likely to be rapidly removed by wave action or currents will therefore not alter the biotope. Resistance to this pressure is therefore assessed as 'High' and resilience as 'High' (by default) and this biotope is considered to be 'Not sensitive'. Sensitivity will be greater where deposition is accompanied by reductions in wave action or water flows that reduce sediment transport.

Litter	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

Not assessed.

Electromagnetic changes	No evidence (NEv) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

Not relevant.

Underwater noise changes	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant.

Introduction of light or shading	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant. This biotope is characterized by species-poor mobile coarse sediments. A change in light-levels is unlikely to direct alter the biotope.

Barrier to species movement	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant.

Death or injury by collision	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant' to seabed habitats. NB. Collision by grounding vessels is addressed under surface abrasion.

Visual disturbance	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant.

Biological Pressures

	Resistance	Resilience	Sensitivity
Genetic modification & translocation of indigenous species	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

None of the typical species associated with this bitope such as mysids, amphipods crabs or fish are translocated and this pressure is therefore considered 'Not relevant'. Salmon and trout may use estuaries as migration routes and could be exposed to farmed escappes allowing genetic mixing. However, this would not alter the character of this biotope.

Introduction or spread of invasive non-indigenous species	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

The high levels of abrasion resulting from movement of gravels and sands and the subsequent sediment instability will limit establishment of all but the most highly scour resistant invasive non-indigenous species (INIS) and no direct evidence was found for effects of INIS on this biotope. The low levels of organic matter retained by this biotope, are considered to additionally inhibit permanent colonization by invasive species.

Sensitivity assessment. Overall, there is no evidence of this biotope being adversely affected by non-native species. Resistance is therefore assessed as 'High', and resilience as 'High' (by default), and the biotope is considered to be 'Not sensitive'.

Introduction of microbial pathogens	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

As this biotope is characterized by a species poor biological assemblage apart from crabs and fish and estuarine invertebrates (JNCC, 2015), this pressure is considered to be 'Not relevant'. Species within the biotope may be infected and pathogens and parasites of *Carcinus maenas* are described below. However, the presence of these pathogens and parasites is unlikely to alter biotope classification and this pressure is considered to be 'Not reelvant'.

The most well known parasite of *Carcinus maenas* is the rhizocephalan barnacle *Sacculina carcinini*. This parasite infects by larval settlement on the exoskeleton and subsequent infection into the haemocoel by injection through a chitin 'needle' at the base of a hair on one of the legs of the host. Any larvae that do not settle adjacent a hair base do not survive (Smith, 1907). *Sacculina carcini* castrates male and female *Carcinus maenas* and prevents moulting for the rest of the crabs life (Naylor, 2000; Thresher *et al.*, 2000 and references therein). Infected crabs with sexually mature parasites carry a reproductive externae in the same way as females carry an egg-mass when they are berried. The externae is distinguishable from an egg-mass because it is smooth

rather than granular (Naylor, 2000).

Carcinus maenas is the 1st host of the acanthocephalan helminth *Profilicollis botulus* which infects eider ducks (*Somateria mollissima*) by ingestion of infected crabs. Juvenile eider ducks suffer some mortality from heavy infections and crabs are infected by eggs of the parasite from duck faeces(Thompson, 1985).

Small *Carcinus maenas* (3-11 mm CW) can be attacked by the parasitoid platyhelminth *Fecampia erythrocephala*. This parasitoid is 8-12 mm long and replaces much of the digestive gland in the haemocoel. Infection is usually 1 worm per crab but may be as many as 4. Once the worm is mature it exits the crab, killing it in the process. Prevalence in natural populations is about 7% and Kuris *et al.*, (2002) suggested *Fecampia erythrocephala* may be a useful biocontrol where introduced *Carcinus maenas* are a pest because it kills crabs before they can mature and breed.

Removal of target species	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

As this biotope is characterized by a species poor biological assemblage abnd defined on the basis of abiotic factors this pressure is considered to be 'Not relevant' as removal of species will not alter the biotope classification. Within the habitat species are unlikely to be targeted. Fish that move through the estuary may be targeted as estuaries provide nursery grounds and migration routes for a number of species and some, such as eel, salmon and sea trout may be targeted both commercially and recreationally. *Carcinus maenas* may also be targeted by commercial and recreational harvesters as 'peelers', the soft shelled crabs that have recently moulted and that are used as bait. This collecting takes place in intertidal habitats rather than subtidal.

Removal of non-target species	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

As this biotope is characterized by a species-poor biological assemblage and defined on the basis of the salinity regime and sediments (JNCC, 2015), this pressure is considered to be 'Not relevant'. A removal of species would not alter the biotope classification. it should be noted however, that some estuaries, while species poor, may contain large numbers of individuals and these contribute to ecosystem services such as secondary production that support higher trophic levels such as fish and birds. The Severn Estuary, for example, contains large numbers of shring, *Crangon crangon* and mysids such as *Neomysis integer*, that move within the estuary in response to environmental factros such as turbidity, tides, salinity and temperature (Bamber & Henderson, 1994).

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