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

Ampharete falcata turf with *Parvicardium ovale* on cohesive muddy sediment near margins of deep stratified seas

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

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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/75]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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***Ampharete falcata* turf with *Nephrops* sp. from the southern edge of the north west Irish Sea.**
Photographer: Matthew Service
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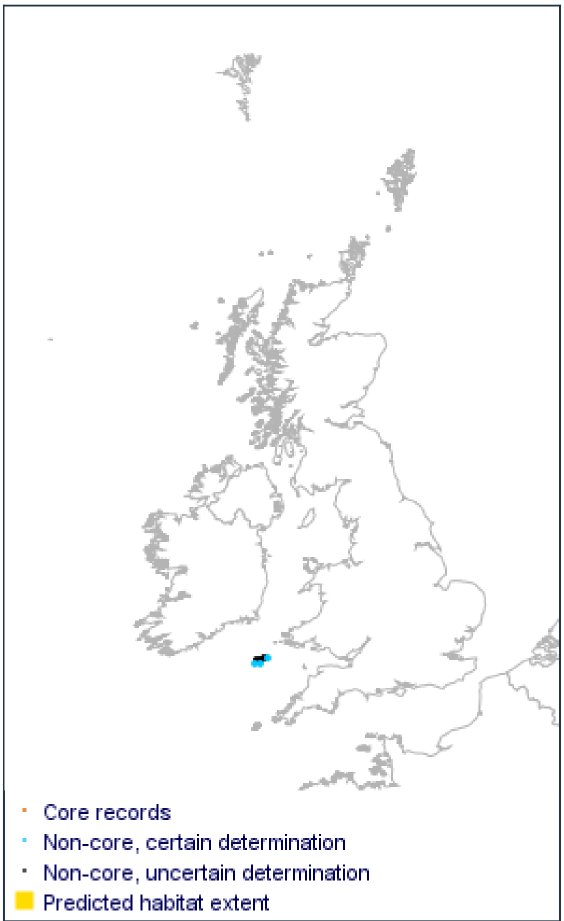

17-09-2018
Biotope distribution data provided by EMODnet Seabed Habitats (www.emodnet-seabedhabitats.eu)

Researched by Eliane De-Bastos & Jacqueline Hill **Refereed by** This information is not refereed.

Summary

UK and Ireland classification

EUNIS 2008	A5.371	*Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy sediment near margins of deep stratified seas
JNCC 2015	SS.SMu.OMu.AfalPova	*Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy sediment near margins of deep stratified seas
JNCC 2004	SS.SMu.OMu.AfalPova	*Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy sediment near margins of deep stratified seas
1997 Biotope	COS.COS.AmpPar	*Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy very fine sand near margins of deep stratified seas

Description

Dense stands of *Ampharete falcata* tubes which protrude from muddy sediments, appearing as a turf or meadow in localised areas. These areas seem to occur on a crucial point on a depositional gradient between areas of tide-swept mobile sands and quiescent stratifying muds. Dense populations of the small bivalve *Parvicardium ovale* occur in the superficial sediment. Other infauna in this diverse biotope includes *Abyssoninoe scopa* (*syn. Lumbrineris scopa*), *Levinsenia* sp., *Prionospio steenstrupi*, *Diplocirrus glaucus* and *Praxillella affinis* although a wide variety of other infaunal species may also be found. Both the brittlestars *Amphiura filiformis* and *Amphiura chiajei* may be present together with *Nephrops norvegicus* in higher abundance than the BlyrAchi or AfilEcor biotopes. Substantial populations of mobile epifauna such as *Pandalus montagui* and smaller fish also occur, together with those that can cling to the tubes, such as *Macropodia* spp. A similar turf of worm tubes formed by the maldanid polychaete *Melinna cristata* has been recorded from Northumberland (Buchanan, 1963). *Nephrops* trawling may severely damage this biotope and it is possible that such activity has destroyed examples of this biotope in the Irish Sea (E.I.S. Rees *pers. comm.* 2002). (Information taken from the Marine Biotope Classification for Britain and Ireland, Version 04.05: Connor *et al*., 2004).

Depth range

-

Additional information

-

Listed By

- none -

Further information sources

Search on:

G G G JNCC

Habitat review

Ecology

Ecological and functional relationships

- The characterizing and other species in this biotope occupy space in the habitat but their presence is most likely primarily determined by the occurrence of a suitable substratum rather than by interspecific interactions. *Ampharete falcata* and *Parvicardium ovale* are functionally dissimilar and are not normally associated with each other but do occur in the same muddy sediment habitats. There is no information regarding possible interactions between any species in the biotope. In addition to *Ampharete falcata* and *Parvicardium ovale* the biotope supports several bivalve species and a fauna of burrowing species such as *Amphiura filiformis*, *Amphiura chiajei*, *Nephrops norvegicus* and smaller less conspicuous species such as errant polychaetes, nematodes etc.
- The burrowing and feeding activities of *Amphiura filiformis* can modify the fabric and increase the mean particle size of the upper layers of the substrata by aggregation of fine particles into faecal pellets. Such actions create a more open fabric with a higher water content which affects the rigidity of the seabed (Rowden *et al*., 1998). Such destabilisation of the seabed can affect rates of particle resuspension.
- The hydrodynamic regime, which in turn controls sediment type, is the primary physical environmental factor structuring benthic communities such as COS.AmpPar. The hydrography also affects the water characteristics in terms of salinity, temperature and dissolved oxygen. It is also widely accepted that food availability (see Rosenberg, 1995) and disturbance, such as that created by storms, (see Hall, 1994) are also important factors determining the distribution of species in benthic habitats.

Seasonal and longer term change

One of the key factors affecting benthic habitats is disturbance which in deep sediment habitats such as COS.AmpPar is minimal and so communities are often relatively stable. However, there may be some seasonal changes in the biotope such as recruitment of young, growth rates and abundance of adults. For example, growth rates of *Parvicardium ovale* are greatest in August (Rasmussen, 1973). The abundance of *Ampharete acutifrons* was observed to have seasonal variation with a peak in April, which had fallen by October to be followed by a new recruitment in spring of the next year (Price & Warwick, 1980).

Habitat structure and complexity

The biotope has very little structural complexity. On the surface of the sediment, the polychaete *Ampharete falcata* creates a turf of small tubes on the surface of muddy sediments in which some species, such as *Macropodia* spp. spider crabs, are able to live by clinging to the polychaete tubes. Within the sediment, burrowing species (for instance, *Nephrops norvegicus*) create habitats that cryptic species can use. Otherwise, the fauna uses the sediment for shelter without increasing structural complexity.

Productivity

Productivity in subtidal sediments is often quite low. Macroalgae are absent from COS.AmpPar and so productivity is mostly secondary, derived from detritus and organic material. Allochthonous organic material is derived from anthropogenic activity (e.g. sewerage) and natural sources (e.g. plankton, detritus). Autochthonous organic material is formed by benthic microalgae (microphytobenthos e.g. diatoms and euglenoids) and heterotrophic micro-organism production. Organic material is degraded by micro-organisms and the nutrients are recycled. The high surface area of fine particles provides surface for microflora. Being confined to mud, the polychaete *Ampharete falcata* is probably susceptible to predation. A related species *Ampharete acutifrons* is the principal food of flounders in spring and summer so *Ampharete falcata* may be an important food source.

Recruitment processes

Recruitment and settlement of *Parvicardium ovale* normally takes place in July-August (Rasmussen, 1973). *Ampharete falcata* is thought to have a benthic larvae (Connor *et al*., 1997(a)) so that its dispersive capability is severely reduced. Time of recruitment is unknown although in a similar species, *Ampharete acutifrons*, recruitment of young takes place in the spring (Price & Warwick, 1980). In a study of *Amphiura filiformis* populations in Galway Bay over a period of 2 years, O'Conner & McGrath (1980) were not able to identify discrete periods of recruitment. However, other studies suggest autumn recruitment (Buchanan, 1964) and spring and autumn (Glémarec, 1979). Using a 265µm mesh size, Muus (1981) identified a peak settlement period in the autumn with a maximum of 6800 recruits per m^2.

Time for community to reach maturity

An *Ampharete* biotope is likely to reach maturity very rapidly because the key species are short lived and reach maturity within a few months. *Parvicardium ovale* has a lifespan of less than a year (Lastra *et al*., 1993). There was no information found on the life-history characteristics of *Ampharete falcata*, however a related species *Ampharete acutifrons* was found to be an annual species (Price & Warwick, 1980). At a sub-littoral site in Swansea Bay, Warwick & George (1980) observed three cohorts of *Ampharete acutifrons* co-existing so reproduction probably takes place over a protracted period. Recruitment of a similar species *Ampharete acutifrons* varied between 46 and 8996 individuals per m^2 over a five year period (Price & Warwick, 1980), suggesting irregular recruitment and therefore time for the community to reach maturity.

Additional information

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Preferences & Distribution

Habitat preferences

Depth Range	
Water clarity preferences	
Limiting Nutrients	Not relevant
Salinity preferences	
Physiographic preferences	
Biological zone preferences	
Substratum/habitat preferences	
Tidal strength preferences	

Wave exposure preferences

Other preferences

Additional Information

Species composition

Species found especially in this biotope

Rare or scarce species associated with this biotope

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Additional information

There is little information available on the two key species, *Ampharete falcata* and *Parvicardium ovale* and individual species reviews have not been carried out.

Sensitivity review

Sensitivity characteristics of the habitat and relevant characteristic species

SS.SMu.OMu.AfalPova is a circalittoral biotope occurring at full salinity at depths between 50-100 m. The biotope is thought to occur on cohesive sandy muds, experiencing weak tidal streams, on a crucial point on a depositional gradient between areas of tide-swept mobile sand and quiescent stratified muds (Connor *et al.*, 2004). Dense stands of *Ampharete falcata* tubes protrude from the muddy sediments, appearing as a turf or meadow in localised areas characterize the biotope, with dense populations of small bivalve *Parvicardium ovale* occurring in the superficial sediment. In addition to *Ampharete falcata* and *Parvicardium ovale*, the biotope supports several bivalve species, a fauna of burrowing species and smaller less conspicuous species such as errant polychaetes, nematodes etc. The hydrodynamic regime, which in turn controls sediment type, is the primary physical environmental factor structuring benthic communities such as SS.SMu.OMu.AfalPova. The presence of suitable substratum is thought to primarily determine the occurrence of the biotope by supporting the development of turfs of *Ampharete falcata*. This species is therefore considered the key characterizing and structural species. Given that *Parvicardium ovale* occurs in high abundance and identifies this biotope, it is also considered an important characterizing species. Both species are the focus of this sensitivity assessment. In addition, this community may also support lobster *Nephrops norvegicus* and can consequently be the focus for fishing activity, which is considered in this assessment where relevant.

Resilience and recovery rates of habitat

Ampharete falcata is a small polychaete worm up to 18 mm in length, living mainly in soft sand at depths of between 30-90 m, in fragile tubes of sand or mud, attached to solid objects or lying across the seabed (Heath, 2005). Studies on population dynamics of *Ampharetidae* have largely been restricted to *Melinna elisabethae* (Hutchings 1973a,b as *Melinna cristata*) and *Melinna palmata* (Oyenekan, 1988), both from European waters. In each of these groups, spawning does not occur until the worms are 2 years old. *Melinna palmata* lives for 2-3 years and spawning occurs between May and July, whereas *Melinna elisabethae* spawns annually, each December, for several years after maturity, reaching population densities up to 5000/m^2 (Rouse & Pleijel, 2001). *Ampharete falcata* is thought to have a benthic larva (Connor *et al.*, 1997a) so that its dispersive capability is severely reduced, and duration of recruitment is unknown. In a similar species, *Ampharete acutifrons*, recruitment of young takes place in the spring (Price & Warwick, 1980). At a sublittoral site in Swansea Bay, Warwick & George (1980) observed three cohorts of *Ampharete acutifrons* co-existing. Therefore, reproduction probably takes place over a protracted period. Recruitment of the similar species *Ampharete acutifrons* varied between 46 and 8996 individuals per m^2 over a five year period (Price & Warwick, 1980), suggesting irregular recruitment and, therefore, time for the community to reach maturity. The abundance of *Ampharete acutifrons* was observed to vary with the season with a peak in April, fallen to a low by October, and followed by a new recruitment in spring of the next year (Price & Warwick, 1980).

Parvicardium ovale is a small obliquely oval cockle up to 13 mm in length that occurs where suitable muddy, sand and gravel substrata are present up to about 100 m (Hayward & Ryland, 1995b). *Parvicardium ovale* has a lifespan of less than a year (Lastra *et al.*, 1993). Recruitment and settlement normally takes place in July-August, with the greatest growth rates in August (Rasmussen, 1973). Gamete production in most bivalves seems to involve the planktonic larvae strategy, characterized by high fecundity and high metabolic cost (Vance, 1973; Bayne, 1976 cited in Dame, 1996).

Resilience assessment: Removal of the characterizing species *Ampharete falcata* and *Parvicardium ovale* would result in loss or re-classification of the biotope. However, little or no evidence specific to the life cycles of these characterizing species was found, and the assessment is based on the life history of similar species, so confidence in this assessment is low. An *Ampharete* biotope is likely to reach maturity very rapidly because the key characteristic species are short lived and reach maturity within a few months. *Parvicardium ovale* is very widespread and has a short lifespan of one year so it likely that reproduction occurs yearly. Although bivalves have been described as having variable recruitment success, likely to vary with environmental conditions, populations are likely to recover quickly from loss. Where perturbation removes a portion of the population or even causes local extinction (resistance **High**, **Medium** or **Low**) resilience is likely to be **High** for as long as recruitment from neighbouring areas is possible. However, *Ampharete falcata* populations are often separated by great distances, so even in areas of suitable habitat that are isolated, where total extinction of the population occurs (resistance **None**) recovery is likely to depend on favourable hydrodynamic conditions that will allow recruitment from farther away. Given the low energy environment where the biotope occurs and the low dispersal potential of *Ampharete falcata* benthic larvae, recruitment to recolonize impacted area may take longer. However, once an area has been recolonized, restoration of the biomass of both characterizing species is likely to occur quickly and resilience is likely to be **Medium** (full recovery within 2-10 years).

NB: The resilience and the ability to recover from human induced pressures is a combination of the environmental conditions of the site, the frequency (repeated disturbances versus a one-off event) and the intensity of the disturbance. Recovery of impacted populations will always be mediated by stochastic events and processes acting over different scales including, but not limited to, local habitat conditions, further impacts and processes such as larval-supply and recruitment between populations. Full recovery is defined as the return to the state of the habitat that existed prior to impact. This does not necessarily mean that every component species has returned to its prior condition, abundance or extent but that the relevant functional components are present and the habitat is structurally and functionally recognizable as the initial habitat of interest. It should be noted that the recovery rates are only indicative of the recovery potential.

Hydrological Pressures

	Resistance	Resilience	Sensitivity
Temperature increase (local)	Medium Q: Low A: NR C: NR	High Q: Low A: Low C: Low	Low Q: Low A: NR C: NR

There is no information on the response of the biotope to an increase in temperature. The important or key characteristic species are widely distributed in the north east Atlantic, with *Parvicardium ovale* occurring from Iceland to the Mediterranean and Canary Islands (Hayward & Ryland, 1995b). No specific information regarding the distribution of *Ampharete falcata* was found, but the congener *Ampharete acutifrons* occurs from the Artic to the Mediterranean (Hayward & Ryland, 1995b).

Schückel *et al.* (2010) investigated the temporal variability of macrofauna communities in the northern North Sea in relation to changes in temperature and/or changes in hydrography. The authors observed a significant negative correlation between total macrofaunal abundance, including of *Ampharete falcata*, and mean surface temperature (SST). Mean surface temperatures recorded varied between 13.4-16.6°C. Mean bottom temperatures remained more stable and varied between 6.7-7.6°C. The authors observed a strong decrease in mean abundance as a result of increased SST where increased SST mainly enhanced stratification, and contributed to a decrease in food availability for the benthic community at the site.

Parvicardium ovale was recorded in Norway in waters with annual temperatures varying between 1-11°C (Gulliksen & Bahr, 2001). Holte *et al.* (2005) investigated the variations in soft bottom macrofauna from stratified Norwegian basins. *Pavicardium ovale* occurred at the study sites, which experienced temperatures between 0.5-14°C.

Sensitivity assessment: The characterizing species of the biotope are widely distributed and likely to occur both north and south of the British Isles, where typical surface water temperatures vary seasonally from 4-19°C (Huthnance, 2010). Although no information was found on the maximum temperature tolerated by the characterizing species, it is likely that *Ampharete falcata* and *Parvicardium ovale* are able to resist a long-term increase in temperature of 2°C. However, the biotope occurs in the margins of stratified seas (Connor *et al.*, 2004), so an increase in temperature could result in enhanced stratification and consequently in restriction of food availability for the biotope community. Although stratification is not an instantaneous process, it may develop over time scales of hours in coastal waters (Nunes Vaz, 1990) so a short-term increase of 5°C may result in some adverse implications for the characterizing species. Resistance is therefore assessed as **Medium** (loss <25%), but with a Low confidence. Resilience is likely to be **High** so the biotope is considered to have **Low** sensitivity to an increase in temperature at the pressure benchmark level.

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

There is no information on the response of the biotope to a decrease in temperature. Species are widely distributed in the north east Atlantic, with *Parvicardium ovale* occurring from Iceland to the Mediterranean and Canary Islands (Hayward & Ryland, 1995b). No specific information regarding the distribution of *Ampharete falcata* was found, but the congener *Ampharete acutifrons* occurs from the Artic to the Mediterranean (Hayward & Ryland, 1995b).

Schückel *et al.* (2010) investigated the temporal variability of macrofauna communities in the northern North Sea in relation to changes in temperature and/or changes in hydrography. The authors observed a significant negative correlation between total macrofaunal abundance, including of *Ampharete falcata*, and mean surface temperature (SST). Mean surface temperatures recorded varied between 13.4-16.6°C. Mean bottom temperatures remained more stable and varied between 6.7-7.6°C. The authors observed a strong decrease in mean abundance as a result of increased SST where increased SST mainly enhanced stratification, and contributed to a decrease in food availability for the benthic community at the site. And also that cold-temperate species, such as *Ampharete falcata*, are favoured by thermoclines and water mixing at different depths may affect small spatial patterns of macrofaunal species independent of increasing SST.

Méndez (2007) investigated the distribution of deep-water polychaete fauna in the Gulf of California according to varying environmental parameters, including depth, temperature, dissolved oxygen. The authors found that dominant species, including *Ampharete* spp. occurred within limited ranges of environmental parameters, not occurring at temperatures below 2°C.

Parvicardium ovale was recorded in Norway in waters with annual temperatures varying between 1-11°C (Gulliksen & Barh, 2001). Holte *et al.* (2005) investigated the variations in soft bottom macrofauna from stratified Norwegian basins. *Pavicardium ovale* occurred at the study sites, which experienced temperatures between 0.5-14°C.

Sensitivity assessment: The characterizing species of the biotope are widely distributed and likely to occur both north and south of the British Isles, where typical surface water temperatures vary seasonally from 4-19°C (Huthnance, 2010). Although no information was found on the minimum temperature tolerated by the characterizing species, it is likely that *Ampharete falcata* and *Parvicardium ovale* are able to resist a long-term decrease in temperature of 2°C or 5°C in the short-term. Furthermore, the biotope occurs in the margins of stratified seas (Connor *et al.*, 2004), so a decrease in temperature could result in reduced stratification and consequently enhanced food availability for the biotope community. Resistance and resilience are therefore assessed as **High** and the biotope is judged as **Not Sensitive**.

Salinity increase (local)	Low	High	Low
	Q: Low A: NR C: NR	Q: Low A: Low C: Low	Q: Low A: NR C: NR

SS.SMu.OMu.AfalPova is found within fully marine subtidal locations and it is highly unlikely that the biotope would experience hypersaline conditions. Although the study did not involve hypersaline conditions, Zettler *et al.* (2007) compared indices of ecological quality of benthic biodiversity along salinity gradients in the Baltic Sea, and suggested that *Parvicardium ovale* was not able to deal with wide variations in salinity.

Sensitivity assessment: There is little direct evidence of the effects of hypersaline conditions on the characterizing species of this biotope, *Ampharete falcata* and *Parvicardium ovale.* However, it is unlikely that the biotope community would be able to resist an increase in salinity to >40 psu, resulting in mortality of the characterizing species. Resistance is therefore assessed as **Low** (loss of 25-75%) but with low confidence. Once normal conditions are resumed, resilience is probably **High** so that sensitivity is therefore assessed as **Low**.

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

SS.SMu.OMu.AfalPova is found within fully marine subtidal locations and it is highly unlikely that the biotope would experience conditions of hyposalinity. However, it is likely that key components of the biotope community would not be resistant of a decrease in salinity. For example, Zettler *et al.* (2007) compared indices of ecological quality of benthic biodiversity along salinity gradients in the Baltic Sea, where salinities varied from 1.5-27.8 psu. *Parvicardium ovale* was considered not able to deal with the wide variations in salinity that occur in the study site. However, *Parvicardium ovale* was recorded in the Baltic Sea at near bottom salinity of 12-18 PSU (Gogina *et al.*, 2010).

Sensitivity assessment: Based on the evidence presented, it is likely that characterizing species *Parvicardium ovale* would resist a decrease in salinity from full to reduced conditions. No direct evidence of the effects of hyposaline conditions on characterizing species *Ampharete falcata* was found. Based on the species offshore preferences of between 30-90 m (Heath, 2005) it is unlikely that *Ampharete falcata* would be adapted and the community is unlikely to resist a decrease in salinity at the pressure benchmark level. As *Ampharete* is considered a key characterizing and structuring species of this biotope, loss of this species would result in the biotope being lost. Resistance is therefore assessed as **Low** (loss of 25-75%) but with low confidence. Once prior conditions resume, resilience is probably **High** so that sensitivity is, therefore, assessed as **Low**.

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

The hydrographic regime is an important structuring factor in sedimentary habitats. The most damaging effect of increased flow rate (above the pressure benchmark) could be the erosion of the substratum as this could eventually lead to loss of the habitat. Increased water flow rates are likely to change the sediment characteristics in which the species live, primarily by re-suspending and preventing deposition of finer particles (Hiscock, 1983). Tube building species *Ampharete falcata* is likely to depend on the weak (<0.5 m/s) tidal streams that characterize the biotope (Connor *et al.*, 2004), as it allows development of the fine sediment habitat. Additionally, the consequent lack of deposition of particulate matter at the sediment surface would reduce food availability. Decreased water movement would result in increased deposition of suspended sediment (Hiscock, 1983). An increased rate of siltation resulting from a decrease in water flow may result in an increase in food availability for the characterizing species and therefore growth and reproduction may be enhanced, but only if food was previously limiting.

Cooper *et al.* (2007) investigated recovery of the seabed following marine aggregate dredging on the south east coast of England. The maximum spring tidal current velocity was ca. 1.3 m/s. The authors confirmed that the sediment became coarser with increased dredging intensity and that the seabed appeared extremely uneven, with these effects appearing to persist at least 8 years after cessation of dredging activities. *Ampharete* spp. were recorded from the study site characterized by high intensity of dredging activities soon after cessation, possibly because of the opportunistic life habits of this taxa.

On the other hand, *Parvicardium ovale* has been recorded in Norway in waters with current velocities up to 1.7 m/s (Gulliksen & Barh, 2001).

Furthermore, the biotope occurs near margins of stratified seas (Connor *et al.*, 2004). Changes in water flow are likely to affect the mixing of waters in the area and influence the extent of the stratified waters, consequently having an impact on the biotope. Increased flow rates may enhance mixing and allow expansion of the biotope's boundaries where suitable substratum occurs.

Sensitivity assessment: Sand particles are most easily eroded and likely to be eroded at about 0.20 m/s (based on Hjulström-Sundborg diagram, Sundborg, 1956). Although having a smaller grain size than sand, silts and clays require greater critical erosion velocities because of their cohesiveness. SS.SMu.OMu.AfalPova occurs in weak tidal streams (0.5 m/s) in localised areas on a crucial point on a depositional gradient between areas of tide-swept mobile sands and quiescent stratifying muds (Connor *et al.*, 2004). Based on the evidence presented, it is likely that characterizing species *Parvicardium ovale* would resist changes in water flow, and no direct evidence of the maximum flow velocity tolerance of characterizing species *Ampharete falcata* was found. Although changes in water flow (above the benchmark) would be likely to change the sedimentary regime in the biotope and consequently have implications on tube building *Ampharete falcata*, the cohesive nature of the sandy muds that characterize the biotope is likely to provide some protection to changes in water flow at the pressure benchmark. Resistance and resilience are therefore assessed as **High** and the biotope considered **Not Sensitive** to a change in water flow at the pressure benchmark level.

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

Changes in emergence are **Not Relevant** to the biotope, which is restricted to fully subtidal/circalittoral conditions. The pressure benchmark is relevant only to littoral and shallow sublittoral fringe biotopes.

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

Potentially the most damaging effect of increased wave heights would be the erosion of the fine sediment substratum as this could eventually lead to loss of the habitat. Furthermore, changes in wave exposure may influence the supply of particulate matter for tube building and feeding activities of the characterizing species. Decreases in wave exposure may influence the supply of particulate matter because wave action may have an important role in re-suspending the sediment that is required by the species to build its tubes. Food supplies may also be reduced, affecting growth and fecundity of the species.

Sensitivity assessment: No direct evidence of the specific tolerances of the characterizing species to changes in wave exposure was found. The depth of the biotope (>50 m) is likely to protect the biotope from anything other than the most severe change in wave action. Hiscock (1983) suggested that a Force 8 Gale could result in oscillatory wave induced water flow at 80 m of 0.09 m/s or ca 0.4 m/s at 50 m. A change in significant wave height of 3-5% is roughly equivalent to a change form from force 3-4. Therefore, it is unlikely to be significant in deep water biotopes. Resistance and resilience are therefore assessed as **High**, and the biotope is considered **Not Sensitive** at the benchmark level, but with low confidence.

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.

There is no information on the resistance of the key species in the biotope. Experimental studies with various species suggests that polychaete worms are quite tolerant of heavy metals (Bryan, 1984).

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

The biotope is considered to be This pressure is **Not assessed** but evidence is presented where available.

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

The biotope is considered to be This pressure is **Not assessed** but evidence is presented where available.

Radionuclide contamination	No evidence (NEv) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

No Evidence is available on which to assess this pressure.

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: Medium A: Medium C: High	High Q: High A: High C: High	Not sensitive Q: Medium A: Medium C: High

The biotope is dominated by opportunistic small bivalves and polychaetes near margins of stratified seas, which suggests that the biological community is likely to be adapted to the adverse effects of stratification. Variations in environmental conditions may cause the stratification boundaries to shift, potentially resulting in episodes on hypoxia in the biotope.

Méndez (2007) investigated the distribution of deep-water polychaete fauna according to varying environmental parameters, including dissolved oxygen. The author found that dominant species, including *Ampharete* spp. occurred within limited ranges of environmental parameters, not occurring at oxygen levels below ca 0.8 mg/l. Gogina *et al.* (2010a) suggested that *Parvicardium ovale* showed a strong positive correlation with dissolved oxygen. Holte *et al.* (2005) recorded *Parvicardium ovale* from stratified Norwegian basins with minimum oxygen values in deep water as low as 2.2 mg/l. Rosenberg *et al.* (1991) exposed benthic species from the NE Atlantic to oxygen concentrations of around 1 mg/l for several weeks, including species of small bivalves. After 11 days in hypoxic conditions, bivalve individuals were still alive, although individuals showed increased stretching of syphon out of the sediment. It is possible the *Parvicardium ovale* would deal with low oxygen in a similar way.

Sensitivity assessment: Direct evidence regarding the effect of de-oxygenation on the key species in the biotope or the biotope as a whole is limited. Cole *et al.* (1999) suggest possible adverse effects on marine species below 4 mg/l and probable adverse effects below 2 mg/l. Based on the evidence presented, the characterizing species are likely to only be affected by severe deoxygenation episodes. Resistance to de-oxygenation at the pressure benchmark level is likely to be **High.** Resilience of the biotope is likely to also be **High** and the biotope is therefore considered **Not Sensitive** to exposure to dissolved oxygen concentration of less than or equal to 2 mg/l for 1 week.

Nutrient enrichment	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not sensitive Q: NR A: NR C: NR

Increased nutrients are most likely to affect abundance of phytoplankton which may include toxic algae (OSPAR, 2009). This primary effect resulting from elevated nutrients will impact upon other biological elements or features (e.g. toxins produced by phytoplankton blooms or de-oxygenation of sediments) and may lead to ‘undesirable disturbance’ to the structure and functioning of the ecosystem. With enhanced primary productivity in the water column, organic detritus that falls to the seabed may also be enhanced, which may be utilized by the deposit feeders in the community.

Parvicardium exiguum and *Ampharete grubei* are both found in areas rich in silt and organic content (Lastra *et al.*, 1993; Holme, 1949) and so the key species are likely to be similar. Hiscock *et al.* (2005a) suggested that *Ampharete* spp. might be favoured by nutrient enrichment, but the overall species diversity is likely to decline.

Sensitivity assessment: The community, and hence the biotopes, may change to one dominated by nutrient enrichment resistant species, in particular polychaete worms. However, the biotope is considered to be **Not Sensitive** at the pressure benchmark that assumes compliance with WFD good status.

Organic enrichment	Low Q: Low A: NR C: NR	High Q: Low A: Low C: Low	Low Q: Low A: NR C: NR

Borja *et al.* (2000) *Ampharete* spp. and *Parvicardium ovale* to their Ecological Group I 'Species very sensitive to organic enrichment and present under unpolluted conditions (initial state)'. These results confirm suggestions that *Parvicardium ovale* has a strong negative correlation with total organic content (Gogina *et al.*, 2010a). Furthermore, Holte *et al.* (2005) investigated the variations in soft bottom macrofauna from stratified Norwegian basins. *Parvicardium ovale* showed preferences for open areas and was recorded in highest abundances at sites where total organic carbon (TOC) was relatively low (10 mg/g) compared to sites where it was absent with TOC as high as 69 mg/g. However, *Parvicardium ovale* has been recorded in intertidal mudflats supporting high primary production in France, with an annual total primary production input of 466 gC/m^2/yr, of which only 157 gC/m^2/yr was exported (Leguerrier *et al.*, 2003). These results suggest that the community under study had approx. 300 gC/m^2/yr available, but it was not clear of the exact proportion of organic matter reaching the seafloor.

Sensitivity assessment: SS.SMu.OMu.AfalPova is found in areas of fine sediment where organic content will generally be higher than coarse sediments. *Parvicardium exiguum* and *Ampharete grubei* are both found in areas rich in silt and organic content (Lastra *et al.*, 1993; Holme, 1949) and so the key species are likely to be similar. However, the evidence presented is not directly comparable to the pressure benchmark. It is however likely that some mortality of the characterizing species is likely to occur as a result of organic enrichment. Resilience is therefore assessed as **Low** (25-75% loss), but with low confidence. Resilience is likely to the **High** and the overall sensitivity of the biotope judged as **Low**.

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.

	Resistance	Resilience	Sensitivity
Physical change (to another seabed type)	None Q: High A: High C: High	Very Low Q: High A: High C: High	High Q: High A: High C: High

If the sediment that characterizes this biotope were replaced with rock substrata, this would represent a fundamental change to the physical character of the biotope. The characterizing species would no longer be supported and the biotope would be lost and/or re-classified.

Sensitivity assessment: Resistance to the pressure is considered **None**, and resilience **Very Low**, given the permanent nature of this pressure. Sensitivity has been assessed as **High**. Although no specific evidence is described, confidence in this assessment is 'High' due to the incontrovertible nature of this pressure.

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

SS.SMu.OMu.AfalPova is only recorded from cohesive sandy muds (Connor *et al*., 2004), and characterizing species *Ampharete falcata* exhibits specific preferences for fine sediment substrata that provides the material for tube building activities. In the Baltic Sea, *Parvicardium ovale* has been shown to have a strong positive correlation with medium grain size (Gogina *et al*., 2010a).

Sensitivity assessment: In SS.SMu.OMu.AfalPova, change in Folk class from mud and sandy mud to sand or muddy sand (based on the Long, 2006 simplification) would mean a change from mud and sandy mud to sand or muddy sand, or to gravelly mixed sediment. The characterizing species are unlikely to be resistant of such a change in sediment type, no longer being supported, and hence lost from the biotope. The biotope is likely to be lost, so resistance is therefore assessed as **None** and resilience as **Very Low**, given the permanent nature of this pressure. The biotope is considered to have **High** sensitivity to a change in seabed type by one Folk class.

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

Sedimentary communities are likely to be highly intolerant of substratum removal, which will lead to partial or complete de-faunation, expose underlying sediment which may be anoxic and/or of a different character and lead to changes in the topography of the area (Dernie *et al*., 2003). Any remaining species, given their new position at the sediment/water interface, may be exposed to unsuitable conditions. Newell *et al.* (1998) state that removal of 0.5 m depth of sediment is likely to eliminate benthos from the affected area. Some epifaunal and swimming species may be able to avoid this pressure. Removal of 30 cm of sediment will remove species that occur at the surface and within the upper layers of sediment, such as the characterizing species of this biotope. For example, dredging operations were shown to affect large infaunal and epifaunal species, decrease sessile polychaete abundance and reduce the numbers of burrowing heart urchins (Eleftheriou & Robertson, 1992). For example, Cooper *et al.* (2007) investigated recovery of the seabed following marine aggregate dredging on the south-east coast of England. The authors confirmed that the sediment became coarser with increased dredging intensity and that the seabed appeared extremely uneven, with these effects appearing to persist at least 8 years after cessation of dredging activities. *Ampharete* spp. were recorded from the study site characterized by high intensity of dredging activities soon (<1 year) after cessation of dredging.

Sensitivity assessment: Extraction of 30 cm of sediment will remove the characterizing biological component of the biotope so resistance is assessed as **None**. Newell *et al.* (1998) indicate that local hydrodynamics (currents and wave action) and sediment characteristics (mobility and supply) strongly influence the recovery of soft sediment habitats. The biotope occurs in low energy environments, so resilience is therefore judged as **Medium** (see resilience section). Sensitivity has been assessed as **Medium**.

Abrasion/disturbance of the surface of the substratum or seabed	None Q: High A: High C: High	Medium Q: Low A: Low C: Low	Medium Q: Low A: NR C: NR

SS.SMu.OMu.AfalPova can be affected by fishing activity in areas such as the northern Irish Sea, where the community may also contain *Nephrops norvegicus* (Connor *et al.*, 2004). Fauna that inhabit or construct tubes, such as characterizing species *Ampharete falcata* are likely to be particularly vulnerable to damage or disturbance by beam trawls (Kaiser & Spencer, 1996). Furthermore, *Parvicardium ovale* lives infaunally in soft sediment, usually within a few centimetres of the sediment surface. Physical disturbance, such as dredging or dragging an anchor, would be likely to penetrate the upper few centimetres of the sediment and cause physical damage to the small bivalves.

Ball *et al.* (2000a) investigated the long- and short-term consequences of a *Nephrops* trawl fishery on benthos and environment of the Irish Sea comparing samples taken before and after fishing activity. Of the two inshore and offshore sites analysed, that both occurred in similar fine sand and silt-clay sediment, the offshore station occurs at a depth and sediment type similar to that of this biotope and a sparse benthic macrofauna was observed dominated by small polychaetes and a few crustaceans and bivalves. *Ampharete falcata* was among the species present at the control site but absent from the fished grounds at both inshore and offshore sites. However, *Ampharete acutifrons* was among the species found at the fished grounds but not at the control sites. Overall, the authors found that the numbers of species, species richness and biomass had all dropped after trawling.

Kaiser *et al.* (2006) undertook a meta-analysis of different fishing gears on a range of habitats. The authors concluded that the footprint of the impact and the recovery of communities varied with gear and habitat types. For example, mud habitats were shown to have substantial initial impacts by otter trawling but the effects tended to be short lived with an apparent long-term positive post-trawl disturbance response from the increase of small bodied fauna.

Furthermore, SS.SMu.OMu.AfalPova occurs in cohesive sandy muds (Connor *et al.*, 2004). Abrasion events caused by a passing fishing gear, or scour by objects on the seabed surface are likely to have marked impacts on the substratum and cause turbulent resuspension of surface sediments. When used over fine muddy sediments, trawls are often fitted with shoes designed to prevent the boards digging too far into the sediment (M.J. Kaiser, pers. obs., cited in Jennings & Kaiser, 1998). The effects may persist for variable lengths of time depending on tidal strength and currents and may result in a loss of biological organization and reduce species richness (Hall, 1994; Bergman & Van Santbrink, 2000; Reiss *et al.*, 2009) (see change in suspended solids and smothering pressures).

Sensitivity assessment: The characterizing species are considered likely to be damaged and removed by abrasion, particularly the turf of *Ampharete falcata* as these protrude from the muddy sediments and are not physically robust. Resistance to abrasion is therefore assessed as **None**. Resilience of the biotope is likely to be **Medium** given that the low energy of the biotope may impede immediate recolonization by the characterizing species (see resilience). The biotope is therefore considered to have **Medium** sensitivity to abrasion or disturbance of the surface of the seabed.

Penetration or disturbance of the substratum subsurface	None Q: High A: High C: High	Medium Q: Low A: Low C: Low	Medium Q: Low A: Low C: Low

Activities that disturb the surface of the mat and penetrate below the surface would remove a significant proportion of the turf of *Ampharete falcata*, as well as remove/damage infaunal species such as *Parvicardium ovale* within the direct area of impact.

Furthermore, penetrative events caused by a passing fishing gear are also likely to have marked impacts on the substratum and cause turbulent re-suspension of surface sediments (see abrasion pressure). When used over fine muddy sediments, trawls are often fitted with shoes designed to prevent the boards digging too far into the sediment (M.J. Kaiser, pers. obs., cited in Jennings & Kaiser, 1998). The effects may persist for variable lengths of time depending on tidal strength and currents and may result in a loss of biological organization and reduce species richness (Hall, 1994; Bergman & Van Santbrink, 2000; Reiss *et al*., 2009) (see change in suspended solids and smothering pressures).

Sensitivity assessment: The biotope could be lost or severely damaged, depending on the scale of the activity (see abrasion pressure). Therefore, a resistance of **None** is suggested. Resilience is probably **Medium**, and therefore the biotope's sensitivity to this pressure ifslikely to be **Medium**.

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

The biotope occurs in sheltered areas, in fine sediments, subject to high suspended sediment loads. Therefore, the important characteristic species are unlikely to be impacted by an increase in suspended sediments. Suspended sediment and siltation of particles are likely to be important for tube building in *Ampharete falcata*, so a decrease in suspended solids may reduce material available for tube building. For most benthic deposit feeders, food is suggested to be a limiting factor for body and gonad growth, at least between events of sedimentation of fresh organic matter (Hargrave, 1980; Tenore, 1988). Consequently, increased organic matter in suspension that is deposited may enhance food supply on the seabed. A decrease in the suspended sediment and hence siltation may reduce the flux of particulate material to the seabed. Since this includes organic matter, the supply of food to the biotopes would probably also be reduced.

Sensitivity assessment: An increase in suspended solids at the pressure benchmark level is unlikely to affect the characterizing species of this offshore biotope. Although a decrease in suspended matter in the biotope could result in limitation of material for tube building activity of *Ampharete falcata*, the species is not likely to suffer mortality due to its ability to also use sand for tube building. Resistance and resilience of the biotope are assessed as **High,** so the biotope is considered **Not Sensitive** to a change in suspended solids at the pressure benchmark level.

Smothering and siltation rate changes (light)	Low Q: Low A: NR C: NR	High Q: Low A: Low C: Low	Low Q: Low A: NR C: NR

Smothering by 5 cm of sediment is likely to lead to the death of some of the organisms in the biotope. *Ampharete falcata* is a small polychaete worm up to 18 mm in length (Heath, 2005). The populations of this tube dwelling polychaete will probably be unable to feed or respire resulting in some mortality. Some individuals may be able to reborrow through the sediment but survival is probably dependent on the speed at which new tubes can be built, otherwise mortality may occur due to predation. Some of the burrowing fauna, such as the small bivalve *Parvicardium ovale*, is unlikely to be affected by smothering beyond re-establishing burrow openings or moving up through the sediment. Although, there is evidence of synergistic effects on burrowing activity of marine benthos and mortality with changes in time of burial, sediment depth, sediment type and temperature (Maurer *et al*., 1986).

Sensitivity assessment: No direct evidence was found regarding the ability of the characterizing species to deal with this pressure. However, some mortality of characterizing species *Ampharete falcata* is likely to occur as a result of a 'light' deposition of fine sediment in a discrete event. Resistance is therefore assessed as **Low** (loss 25-75%), with low confidence. However, resilience is likely to be **High** and the biotope is considered to have **Low** sensitivity at the pressure benchmark level.

Smothering and siltation rate changes (heavy)	Low Q: Low A: NR C: NR	High Q: Low A: Low C: Low	Low Q: Low A: NR C: NR

Smothering by 30 cm of sediment is likely to lead to the death of some of the organisms in the biotope. *Ampharete falcata* is a small polychaete worm up to 18 mm in length (Heath, 2005). The populations of this tube dwelling polychaete will probably be unable to feed or respire resulting in some mortality, although, polychaete species have been reported to migrate through depositions of sediment greater than the benchmark (30 cm of fine material added to the seabed in a single discrete event) (Maurer *et al*., 1982). It is unclear whether the small bivalve *Parvicardium ovale* would be able to migrate vertically through the deposited sediment to re-establishing burrow openings.

Sensitivity assessment: No direct evidence was found regarding the ability of the characterizing species to deal with this pressure. However, some mortality of both characterizing species *Ampharete falcata* and *Parvicardium ovale* is likely to occur as a result of a 'heavy' deposition of fine sediment in a discrete event. Resistance is therefore assessed as **Low** (loss 25-75%), with low confidence. Resilience is however likely to be **High** and the biotope is considered to have **Low** sensitivity at the pressure benchmark level.

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	Not relevant (NR) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

No Evidence is available on which to assess this pressure.

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

Ampharete falcata, *Parvicardium ovale* and some of the other species in the biotope may respond to vibrations from predators or excavation by retracting their palps into their tubes. However, the characterizing species are unlikely to be affected by noise pollution and so the biotope is assessed as **Not Sensitive**.

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

SS.SMu.OMu.AfalPova is a circalittoral biotope (Connor *et al.*, 2004) and therefore not directly dependent on sunlight.

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 to biotopes restricted to open waters.

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

The biotope occurs in deep water where available light is very low. Of the characterizing species, *Parvicardium ovale* lives infaunally and *Ampharete falcata* has only two simple eyespots, so have no or poor visual perception and unlikely to be affected by visual disturbance such as shading. Therefreo, this pressure is probably **'Not relevant'** to this biotope.

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

The key characterizing species in the biotope are not cultivated or likely to be translocated. This pressure is therefore considered **Not Relevant**.

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

Although several non-native species of polychaete and mollusc have invaded British waters there are none that are likely to affect SS.SMu.OMu.AfalPova. Although there is always the potential for this to occur, this pressure is considered **Not Relevant**.

Introduction of microbial pathogens	No evidence (NEv) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

A record of the parasitic polychaete *Heamatocleptes terebellidis*, normally associated with lamella-worm *Terebellides stroemmii*, has also been recorded from *Ampharete falcata* in the Irish Sea (O'Reilly, 2016). The authors recognized that the parasite is likely to be under-recorded but probably widely distributed due to its clandestine habits, as it has only been recorded from Sweden, where it was originally recorded. The parasite is known to live inside the coelom of *Terebellides stroemmii*, and other polychaetes. No further information of the potential impacts on the polychaetes' health and survival were provided.

Sensitivity assessment: No direct evidence of the biotopes being affected by the introduction of microbial pathogens was found as with which to assess this pressure.

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

It is extremely unlikely that any of the species indicative of sensitivity would be targeted for extraction. Even in areas where *Nephrops norvegicus* is present, trawlers are likely to avoid clogging of the nets by the high densities of *Ampharete* tubes. This pressure is therefore considered **Not Relevant**.

Removal of non-target species	None Q: High A: High C: High	Medium Q: Low A: Low C: Low	Medium Q: Low A: Low C: Low

SS.SMu.OMu.AfalPova can be affected by fishing activity in areas such as the northern Irish Sea, where the community may also contain *Nephrops norvegicus* (Connor *et al*., 2004). Fauna that inhabit or construct tubes, such as characterizing species *Ampharete falcata* are likely to be particularly vulnerable to damage or disturbance by beam trawls (Kaiser & Spencer, 1996). Direct, physical impacts are assessed through the abrasion and penetration of the seabed pressures, while this pressure considers the ecological or biological effects of by-catch. Species in this biotope, including the characterizing species *Ampharete falcata* and *Parvicardium ovale*, may be damaged or directly removed by static or mobile gears that are targeting other species (see abrasion and penetration pressures). Loss of the *Ampharete falcata* turf, along with the dense community of *Parvicardium ovale*, would alter the character of the biotope resulting in re-classification, and would alter the physical structure of the habitat resulting in the loss of the ecosystem functions such as secondary production performed by these species.

Sensitivity assessment: Removal of the characterizing species would result in the biotope being lost or re-classified. Thus, the biotope is considered to have a resistance of **None** to this pressure and to have **Medium** resilience, resulting in the sensitivity being judged as **Medium**.

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