

Sabellaria spinulosa reefs

EUNIS Code: A4.22 and A5.611

National Marine Habitat Classification for UK & Ireland code: SS.SBR.PoR.SspiMx and CR.MCR.CSab



S.spinulosa is a small, tube-building polychaete worm found in the subtidal and lower intertidal/sublittoral fringe. In most parts of its geographic range it does not form reefs but is solitary or found in small groups, encrusting pebbles, shell, kelp holdfasts and bedrock. When conditions are favourable dense aggregations may be found, forming reefs up to about 60cms high and extending over several hectares; these are often raised above the surrounding seabed. Reefs may persist in an area for many years although individual clumps may regularly form and disintegrate (Jackson & Hiscock, 2003; Jones *et al.*, 2000).

Definition for habitat mapping

The tube-building polychaete *Sabellaria spinulosa* can form dense aggregations on mixed substrata and on rocky habitats. In mixed substrata habitats, comprised variously of sand, gravel, pebble and cobble, the *Sabellaria* covers 30% or more of the substrata and needs to be sufficiently thick and persistent to support an associated epibiota community which is distinct from surrounding habitats. On rocky habitats of bedrock, boulder and cobble, the *Sabellaria* covers 50% or more of the rock and may form a crust or be thicker in structure. In some areas, these two variations of reef type may grade into each other. *Sabellaria* reefs have been recorded in depths between 10-50m BCD or more. The reef infauna typically comprises polychaete species such as *Protodorvillea kefersteini*, *Scoloplos armiger*, *Harmothoe* spp., *Mediomastus fragilis*, *Lanice conchilega* and

cirratulids together with the bivalves *Abra alba* and *Nucula* spp. and tube-building amphipods such as *Ampelisca* spp. Epifauna comprise calcareous tubeworms, pycnogonids, hermit crabs, amphipods, hydroids, bryozoans, sponges and ascidians. The characteristics of the reefs are linked to the density of aggregation and these are known to vary widely e.g. 120/m² in Belfast Lough, Northern Ireland and more than 4500/in the Wash on the east coast of England (in Hedrick & Foster-Smith, 2006). *S.spinulosa* reefs are often found in areas with quite high levels of natural sediment disturbance; in some areas of reef, individual clumps of *Sabellaria* may periodically break down and rebuild following storm events. *S.spinulosa* reefs have been recorded from all European coasts except the Baltic Sea, Skagerrak and Kattegat. Areas of dead *Sabellaria* reef indicate the site supported reef habitat in the past and should be reported as this habitat type

Geographical extent

OSPAR Regions: The OSPAR List indicates *S.spinulosa* reefs occur in all OSPAR regions but there is very limited evidence of their occurrence in Regions I and V.

Biogeographic zones: Warm-temperate pelagic waters, Lusitanian (Cold/Warm), Lusitanian-boreal, Cold-temperate pelagic waters, Boreal-lusitanian, Boreal, Norwegian Coast (Finnmark), Norwegian Coast (Westnorwegian), Norwegian Coast (Skagerrak)

Regions specified for decline and/or threat: II and III.

S.spinulosa reefs are known from all European coasts, except the Baltic and the waters of the Kattegat and Skagerrak, but are typically limited to areas with very high levels of suspended sediment. In the UK aggregations of *S.spinulosa* are reported to occur at a number of locations around the British Isles (OSPAR Regions II and III), although there are few records for Scottish waters. Not all of these aggregations could be described as "reefs", for instance where the species may only form superficial crusts on mixed substrata. On the German coast, intertidal and subtidal reefs have been reported from the Wadden Sea (OSPAR Region II) (Berghahn & Vorberg, 1993) and from the southern North Sea where Linke (1951) reported reefs up to 60 cm thick, 8m wide and 60m long. *S.spinulosa* has also been reported from the French coast, but without precise locations (Holt *et al.*, 1998).

Application of the Texel-Faial criteria

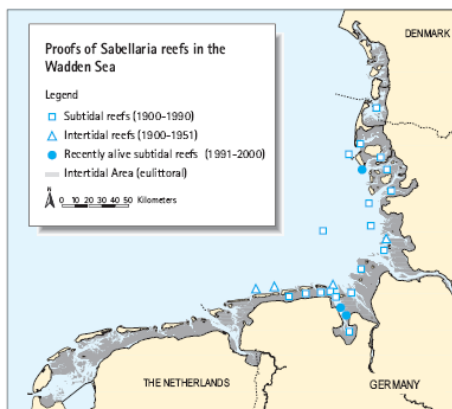
Nomination of *Sabellaria spinulosa* reefs to be placed on the OSPAR list cited sensitivity, rarity, ecological significance and decline, with information also provided on threat. The nomination was for all OSPAR regions but this has been modified in light of ICES advice and the habitat is now nominated for OSPAR Regions II & III as this is where most information is available.

Decline

Subtidal *S.spinulosa* reefs are reported to have been lost in at least five areas of the north east Atlantic (Jones *et al.*, 2000).

Large subtidal *S.spinulosa* reefs were common along the slopes of the northern tidal inlets of the German Wadden Sea in the 1920s (Hagmeier & Kändler, 1927) but have been largely lost since that time. Riesen & Reise (1982) reported that extensive subtidal *S.spinulosa* reefs were lost from the Lister Ley, island of Sylt, between 1924 and 1982 and Reise & Schubert (1987) reported similar losses from the Norderau area. Only three living reefs were found during surveys in the early 1990's compared to 24 during the 19th century (Figure A). In the late 1990's, samples taken from the subtidal reefs in the German Wadden Sea consisted largely of compact lumps of empty tubes. In 2000, one of these reefs had diminished drastically in extent with the remainder in poor condition although dredge samples were occupied by many tiny tubes with living worms inside. The third reef which had covered about 18ha could no longer be detected when repeat surveys were carried out in 2002,

Figure A. Changing occurrences of *S.spinulosa* reefs in the Wadden Sea (Wadden Sea Secretariat, 2005)



In the UK there are reports of reefs being lost in Morecambe Bay (Taylor & Parker, 1993),

the Wash and the Thames (Warren & Sheldon 1967). In the western North Sea a report comparing records from 1986 and 2000 suggest an increase in distribution and densities in the western North Sea (ICES, 2007).

Rarity

True stable reefs, as opposed to crusts of *S.spinulosa*, are believed to be rare or have a very restricted distribution (Holt *et al.*, 1998).

Sensitivity

The findings from many studies on the sensitivity of *S.spinulosa* have been brought together in reviews by Holt *et al* (1998), Jones *et al* (2000) and Jackson & Hiscock (2003) and can be found on the MarLIN website www.marlin.ac.uk. The highest sensitivity is to substratum loss and displacement as the worms are fixed to the substratum and cannot reattach once dislodged, or rebuild their tubes if removed from them. Recruitment rates are high however and recovery could be quite rapid as this species is often one of the first to settle on newly exposed surfaces.

S.spinulosa does not appear to be particularly sensitive to changes in water quality (Holt *et al.*, 1998), but is both sensitive and vulnerable to physical damage. It is probably tolerant to smothering in the short term although this will affect feeding and growth and may interfere with reproduction depending on the timing.

S.spinulosa appears to be very tolerant of water quality variation, but is potentially vulnerable to the short-term and localized effects of mineral extraction and the effects of oil dispersants on the larvae. Overall, however, it has been concluded that *S.spinulosa* seemed unlikely to show any special sensitivity to chemical contaminants (Jackson & Hiscock, 2003).

Well-developed, more stable reefs seem to be very scarce, and this apparent rarity suggests that an unusual set of environmental factors and/or circumstances is required for their formation. It might, therefore, be expected that they would display sensitivity to some factor or factors, but Jones *et al.*, (2000) report there is little information from which to gain any insight into this

Ecological significance

S.spinulosa reefs can provide a biogenic habitat that allows many other associated species to become established and acts to stabilize cobble, pebble and gravel habitats. They contain a more diverse fauna with

sometimes more than twice as many species and almost three times as many individuals than nearby areas where *S.spinulosa* is absent (NRA, 1994). The reefs are of particular nature conservation significance when they occur on sediment or mixed substrata areas as they enable a range of other species to occur that would not otherwise be found in such areas.

Threat

The greatest impact on this biogenic habitat is considered to be physical disturbance. Dredging, trawling, net fishing and potting can all cause physical damage to erect reef communities (Riesen & Riese, 1982) although studies by Vorberg (2000) on a similar species (*S.alveolata*) indicated only minor damage to tubes from shrimp fisheries and rapid recovery. Vorberg (2000) has also suggested that shrimp vessels used around the mid-20th century would have had insufficient force to damage robust *S.spinulosa* reefs. Nevertheless, populations, especially if as loose aggregations, may be displaced by mobile fishing gear and therefore a precautionary intolerance rating of 'intermediate' has been suggested for this species in the sensitivity assessments carried out for the Marine Biological Information Network (*MarLIN*). Other physical disturbance from the installation of infrastructure such as pipelines and wind turbines may also have a detrimental effect.

Aggregate dredging often takes place in areas of mixed sediment where *S.spinulosa* reefs may occur and could therefore damage reefs. Apart from direct removal, the impact of this activity on their long-term survival is unknown, but suspension of fine material during adjacent dredging activity is not considered likely to have detrimental effect. Pollution has been listed as one of the major threats to *S.spinulosa* in the Wadden Sea and may have partly contributed to their replacement by *Mytilus edulis* beds.

Coastal engineering works (mainly dike and dam building) may have also had a negative influence by changing the hydrological regime in parts of the Wadden Sea (Vorberg, 2000).

Relevant additional considerations

Sufficiency of data

Changes in the extent of *S.spinulosa* reefs have been recorded in some parts of its range. There is limited information of the sensitivity of *S.spinulosa* particularly in relation to chemical contamination and on rates of recovery in areas where reefs have been damaged. A

better knowledge of the natural variation in extent, density and population structure of reefs, is also required (Jackson & Hiscock, 2003).

Changes in relation to natural variability

Natural variability will play a part in changes in the extent of this habitat type. *S.spinulosa* occurs in high densities on subtidal gravels that are likely to be disturbed every year or perhaps once every few years due to storms. Where it exists as loose crusts, death may occur through break-up due to wave action. Increased wave action may also mobilize the pebble and gravel substrata on which *S.spinulosa* often occurs, resulting in abrasion and mortality. High levels of recruitment mean that recovery could be quite rapid, say within a year but timescales for the re-establishment of reefs are not clear (Jackson & Hiscock, 2003). Changes may also take place in response to changes in circulation patterns caused by tidal currents, storm tides or ice winters (Vorberg, 2000).

Expert judgement

Expert judgement has played a part in putting forward this nomination because data on the extent and decline of this habitat are limited to a few well studied locations. There is however a good basis on which to consider it to be threatened given the clear link between certain activities and damage to *S.spinulosa* reefs and the widespread nature of some of those activities in the OSPAR Maritime Area.

ICES evaluation

OSPAR (2001) considered this habitat to be threatened and/or declining across the whole OSPAR area. The Leiden Workshop concluded that evidence for both the decline of and threat to *Sabellaria spinulosa* reefs was strong across the whole OSPAR area. ICES agree that evidence for both decline and threat to this habitat is sufficient, but only in OSPAR Regions II and III.

Threat and link to human activities

Cross-reference to checklist of human activities in OSPAR MPA Guidelines

Relevant human activity: Fishing, hunting, harvesting, extraction of sand, stone and gravel, constructions, coastal defence measures, aquaculture/mariculture, dumping of solid waste and dredged spoils, placement and operation of submarine cables and of pipelines.

Category of effect of human activity: Physical - substratum removal, substratum change, water flow rate changes, Biological – physical

damage to species, removal of non-target species.

There are clear links between human activity and threat to *S.spinulosa* reefs. The most significant is physical damage caused by benthic trawling. The loss of the large *S.spinulosa* reefs in the Wadden Sea has been attributed to the long-term effects of fishing activity and it has been noted that in the Thames and Wash commercial fishermen sought out areas of *S.spinulosa* before trawling for shrimp, and appear to have destroyed the reefs along with their associated shrimp fishery in the process (Warren & Sheldon, 1967 Reise & Schubert, 1987). There are also reports of fishermen destroying such reefs (as potential obstacles to trawls) with heavy gear prior to shrimp fishing (Riesen & Reise, 1982). A similar detrimental effect was reported during the 1950s in Morecambe Bay (UKBAP, 2000). One recent study into recovery of dredged areas recorded an initial “colonisation community” of macrofauna and in a low intensity dredged site 7 years for biological recovery although it cannot be assumed that this is applicable to other more intensively dredged areas or for other locations (Cooper *et al.*, 2007).

Management considerations

Management of marine activities and, in particular, certain fishing practices will be important in preventing further threat and decline of this habitat. Known reef areas could be protected through site safeguard for example under the OSPAR MPA programme or as part of the *Natura 2000* network being established through the EU Habitats Directive. It should also be noted that as the larvae are strongly stimulated to metamorphose and settle on the tubes of both living and dead worms, conservation management could usefully be directed towards the protection of both living and dead reefs. Zoning to ensure that aggregate extraction does not take place on reef habitats is another management option and will depend on sufficient knowledge of the distribution of reef habitat. Management proposals need to reflect the dynamic nature of reefs which can colonise, evolve and degrade rapidly. Research into the stability, rate of establishment, and recovery of damaged reefs will also be important as will better knowledge of the environmental conditions under which they do so and natural variation in extent, density and population structure of *S.spinulosa* reefs (Gubbay, 2007).

S.spinulosa has been placed on the Red List of Macrofaunal Benthic Invertebrates of the Wadden Sea, and the reefs are the subject of a specific UK Biodiversity Action Plan. As biogenic reef features they are covered by the EU Habitats Directive and could therefore be included in the *Natura 2000* network.

Further information

Nominated by: UK

Contact persons:

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This is an updated version of the case report that appears in the OSPAR Publication: Case Reports for the OSPAR List of threatened and/or declining species and habitats. OSPAR Publication number 2008/358. Information in the case report has been updated by Dr Susan Gubbay under contract to OSPAR