Nomination

Deep sea sponge aggregations

EUNIS code: A6.62
National Marine Habitat Classification for UK & Ireland code: Not defined

Geodia sponge ©Tomas Lundälf , Tjaernoe Centre for Underwater Documentation

Definition for habitat mapping

Deep sea sponge aggregations are principally composed of sponges from two classes: Hexactinellida and Demospongia. They are known to occur between water depths of 250-1300m (Bett & Rice, 1992), where the water temperature ranges from 4-10°C and there is moderate current velocity (0.5 knots). Deep-sea sponge aggregations may be found on soft substrata or hard substrata, such as boulders and cobbles which may lie on sediment. Iceberg plough-mark zones provide an ideal habitat for sponges because stable boulders and cobbles, exposed on the seabed, provide numerous attachment/settlement points (B. Bett, *pers comm.*). However, with 3.5kg of pure siliceous spicule material per m^2 reported from some sites (Gubbay, 2002), the occurrence of sponge fields can alter the characteristics of surrounding muddy sediments. Densities of occurrence are hard to quantify, but sponges in the class Hexactinellida have been reported at densities of 4-5 per m^2, whilst 'massive' growth forms of sponges from the class Demospongia have been reported at densities of 0.5-1 per m^2 (B. Bett, *pers comm.*).
Deep-sea sponges have similar habitat preferences to cold-water corals, and hence are often found at the same location. Research has shown that the dense mats of spicules present around sponge fields may inhibit colonisation by infaunal animals, resulting in a dominance of epifaunal elements (Gubbay, 2002).
Sponge fields also support ophiuroids, which use the sponges as elevated perches.

Geographical extent

OSPAR Regions; I, III, IV, V
Biogeographic zones: 22, 23
Region & Biogeographic zones specified for decline and/or threat: V, 22 & 23

Glass sponges (Hexactinellidae) tend to be the dominant group of sponges in the deep sea although demospongids such as *Cladorhiza* and *Asbestopluma* are also present. The massive sponges that dominate some areas include *Geodia barretti, G.macandrewi,* and *Isops phlegraei*. All are widely distributed in the NE Atlantic and reach considerable sizes with body weights of more than 20kg (Hougaard *et al.,* 1991; Klitgaard, 1995). They can occur at very high densities, particularly on the slope in areas where substrate and hydrographic conditions are favourable, and have been described as ostur "a restricted area where large sponges are strikingly common" (Klitgaard *et al.,* 1995). Sponges make up more than 90% of the biomass, excluding benthic fish and the sponges show high diversity with up to 50 species found in at least some of these areas.

Dense aggregations of deep sea sponges are known to occur in various places in the Northeast Atlantic (Klitgaard & Tendal, 2001). Examples have been found close to the shelf break (250m to 500m depth) around the Faroe Islands (Klitgaard & Tendal, 2001), along the Norwegian coast up to West Spitzbergen and Bjørnoya (Blacker, 1957; Dyer *et al.*, 1984; Fosså & Mortensen, 1998) and from the Porcupine Seabight (Rice *et al.*, 1990).

The diversity and abundance of sponges in some locations in the OSPAR Maritime Area rivals that of tropical reef systems. One study off the coast of northern Norway took grab samples from an area of less than $3m^2$, yielding 4,000 sponge specimens belonging to 206 species, 26 of which were undescribed (Konnecker, 2002). Material from a sponge field in the northern North Sea and other locations had a comparable diversity and density of sponges. The sponges also influence the density and occurrence of other species by providing shelter to small epifauna, within the oscula and canal system, and an elevated perch, for example for brittlestars (Konnecker, 2002). A study of 11 species of massive sponges from around the Faroe Islands found 242 associated species, 25% of which were recorded for the first time from Faroese waters (Klitgaard, 1995). There is also an affect on the habitat as the spicules remain in or on the sediment after sponges die forming dense mats, stabilising soft sediments or transforming others (Konnecker, 2002).

Application of the Texel-Faial criteria

Deep sea sponge aggregations were nominated in a joint submission by three Contracting Parties citing rarity, decline, and sensitivity, with information also provided on threat. The nomination was for Region V.

Rarity

There is no comprehensive overview of the distribution of deep-sea sponge aggregations within the OSPAR area but they appear to be limited to particular areas where hydrographic conditions are favourable, as they need a supply of current-borne organic particles (Klitgaard et al., 1995; Konnecker, 2002). This is thought to be the reason for the abrupt upper and lower bathymetric limits of a sponge field mapped in the Porcupine Seabight and around the Faroes for example (Rice *et al.,* 1990; Klitgaard et al., 1995). As the recorded localities of specific sponges are often separated by large distances, and as they generally have short-lived larval stages, there are likely to be widespread breeding populations of sponge fields across the North Atlantic (Konnecker, 2002). The extent to which the limited records of dense aggregations are an artefact of sampling programmes is not clear at the present time.

Decline

There are no quantitative data on decline of sponge aggregations in the OSPAR Maritime Area but they are known to be taken in fishing nets. Analysis of questionnaire returns from fishermen operating around the Faroe Islands indicate that this habitat existed in the past, but that there are now fewer areas with dense sponge aggregations (Klitgaard & Tendal, 2001). Where demersal fisheries and sponge aggregations occur in the same locations there is a high probability of impact and decline.

Sensitivity

Due to their body structure, sponges are sensitive to increased turbidity, which can lead to smothering. Little is known about the tolerance of sponges to toxic pollution of the water column although this may result in a higher than normal rate of abnormal and deformed spicules in a couple of species (Konnecker, 2002). This may be an issue if there are sponge fields in the vicinity of offshore oil and gas facilities.

Information indicates that dominant sponge species are slow growing and take several decades to reach large size (Klitgaard & Tendal, 2001). The habitat and the rich diverse associated fauna is therefore likely to take many years to recover if adversely affected (Konnecker, 2002).

Threat

Physical disturbance to the seabed is the main threat to deep sea sponge aggregations but the extent to which this takes place is not clear. Sponges are known to be taken in fishing nets but less is known about the effects of those that are not brought up, for example, dislodging or smothering. There are anecdotal reports of sponges being brought up less and less frequently as the same area is fished, which also suggests some impact.

A more recent potential threat is the collection of large numbers of sponges as part of bioprospecting operations. They are of particular interest because of the many different chemical compounds found in their tissues, and may have important pharmaceutical properties, especially as antibiotic and anti-cancer agents (Konnecker, 2002).

Relevant additional considerations

Sufficiency of data

The existence of sponge fields in the deep Atlantic and continental shelf has long been known and documented with detailed taxonomic records from the 19th century. In more recent years film taken by Remotely Operated Vehicles has provided more information on the appearance and density of the sponges on the seabed. Despite this little is known about the vast majority of the sponges beyond the locality where they have been recorded and, in many cases, this may be the only record.

Changes in relation to natural variability

Little is known about the natural variability in abundance, extent and ecology of deep sea sponge fields.

Expert judgement

Expert judgement has played a part in putting forward this nomination. This is because there is mostly qualitative data on the extent and threat to this habitat. The main consideration is that sponge fields are known to be impacted by, and therefore threatened by, certain fishing operations and should therefore be listed by OSPAR.

ICES evaluation

ICES confirmed that there are no quantitative data on either a threat or decline to the habitat apart from a single report from OSPAR Region I indicating a decline. They conclude that there is insufficient evidence for the nomination but note that in many areas, there is a common pattern of bottom trawling in increasingly deeper water

where sponge aggregations are known to occur. Taking this into account, they consider it seems reasonable to expect that the vulnerability and threat to the habitat is high (ICES, 2002). This is consistent with the case being made on the basis of expert judgement.

Threat and link to human activities

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

Relevant human activity: Fishing, hunting, harvesting; bioprospecting. *Category of effect of human activity:* Physical – substratum change including smothering, Biological – removal of target and non-target species, physical damage to species.

Deep sea fishing is the main human activity that is a threat to this habitat. The extent to which it is causing damage to sponge fields is difficult to quantify.

Management considerations

Closed area for particular types of fishing are used to protect certain habitats and species in the NE Atlantic and could be applied more widely to protect this habitat. This is a matter that falls with the remit of fisheries organisations rather than OSPAR, although OSPAR can communicate an opinion on its concern about this habitat to the relevant bodies and introduce any relevant supporting measures that fall within its own remit (such as MPAs) if such measures exist or are introduced in the future.

Further information

Nominated by:

Iceland, Portugal, UK.

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Useful References:

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