

SUBJECT Impacts of human activities on cold water corals and sponge aggregations**Advice Summary**

The available data are insufficient to determine the total amount - or percentage - of cold water coral or deep sea sponge habitats impacted by fishing in the past decade, although some information exists on locations where large catches have occurred (>100kg of corals or >1000kg of sponges). Recovery rates are highly variable among species and across sites. Possibilities for re-colonisation of impacted sites are poorly understood and depend on the degree of impact (e.g. whether any live fragments remain), seabed substrate, larval dispersal, and other factors.

Request***Impacts of human activities on cold water corals and sponge aggregations (OSPAR 2010/5)***

To provide advice on impacts of human activities on cold water corals and deep sea sponge aggregations including:

- a. total amounts and % of these habitats affected by human activity over the past decade, on a year by year basis, in the OSPAR Maritime Area;*
- b. specific sites within the North-East Atlantic where records show that more than 100kg of live coral or 1000 kg of live sponges have been trawled as a result of human activities in the past;*
- c. what is known about the status of coral reefs and sponge aggregations in these areas*
- d. recovery rates of these species if and when damaged or removed;*
- e. possibilities for re-creation of these habitats*

ICES Advice

- a. ICES is not able to estimate total amounts and percentage of cold water coral and sponge habitats impacted by human activity in the OSPAR area because the available data on coral and sponge distribution are highly patchy and very incomplete.
- b. Available records of corals (>100kg) and sponge (>1000kg) by-catch are plotted in Figure 1. Further detail on Survey trawl catches of *Geodia* in excess of 1000 kg in the Tromsøflaket area to the north of Norway is provided in Figure 2. It should be noted that there are very few quantitative records of catches of coral and sponge bycatch and it is likely that records known to ICES represent only a small fraction of actual catches of this size.
- c. There is good evidence for cold water corals and sponge habitats that are both impacted and in a natural state in the OSPAR area. Most areas of *Lophelia* known to be in a natural state are now protected. Very little is known about the status of sponge aggregations.
- d. Recovery of corals is poorly understood. There is a great variation in growth rates between species and sites; linear skeleton extension varies from less than a millimetre per year (*Desmophyllum*) to up to two centimetres per year (*Lophelia*). Recovery of sponges is even less well understood but explanted fragments of *Geodia baretii* grew into small sponges within 8 months and increased in weight by 40% over 1 year.
- e. In the absence of continued human pressure, recovery of coral habitats will depend on a number of factors including the degree of impact (e.g. whether any live fragments remain), seabed substrate and larval dispersal. In areas where no stable substrate remains, provision of artificial substrate may be beneficial to re-colonisation as coral can grow on man-made structures. Little is known about larval duration and dispersal capacity. Given suitable substrate, scattered normal sized colonies could be expected to re-appear after 50 to 100 years, however, the time that would be required for development of more structurally complex and diverse habitats, e.g. reefs and coral gardens, is not known but will likely be longer. There is no information available on potential for re-creation of deep-water sponge habitats.

Recommendation

The area known as the rose-garden to the SE of Iceland (see *Paragorgia* record in Figure 1) should be properly surveyed and considered for protection as it the only known habitat in the NE Atlantic for very large gorgonians.

Basis of advice

a. total amounts and % of these habitats affected by human activity over the past decade, on a year by year basis, in the OSPAR Maritime Area;

The vast majority of fishing is currently shallower than 1500 m depth and many cold water coral and sponge habitats to these depths are likely to be disturbed to some degree. Since corals are known to occur as deep as 3800 m, there is a significant proportion of potential cold water coral and sponge habitat in the OSPAR area that is out of reach of direct fishing disturbance.

Throughout the OSPAR region it is likely that the majority of trawling impact to cold water coral and sponge habitats happened during the 1970s, 1980s and 1990s. Fosså et al. (2002) estimated that between 30–50% of Norwegian reefs had been impacted to some degree by bottom fishing before 2000. There is no information in the most recent decade. Given that fishing effort has generally declined in offshore and deepwater areas and many coldwater coral habitats have been protected in the past decade, the relative proportion of coral habitats being affected by human activity has probably decreased.

Knowledge of the distribution of deepwater sponges is even more patchy than that for corals so areas of overlap with fishing even less well known.

b. specific sites within the North-East Atlantic where records show that more than 100kg of live coral of 1000 kg of live sponges have been have been trawled as a result of human activities in the past;

There are many records of coral and sponge bycatch in commercial fishing operations, but very few include quantitative information. While research vessel surveys do usually record accurately the quantities of live coral and sponge bycatch, there are very few occasions when more than a few kg have been caught in the last decade. Figure 1 shows the few known records of catches exceeding 100kg from Norwegian, Scottish, Irish and Russian commercial and research surveys over the past 30 years.

There is much information on bycatch of reef forming corals from fishers, some of which has been verified by observers. There are verified records from Norway, Rockall and Porcupine Seabight. Fosså et al. (2000) gives 12 cases for *Lophelia* corals.

The likelihood that non-reef forming corals such as black corals, bamboo corals and gorgonians are ever encountered in quantities greater than 100 kg per trawl is low. This is mainly because they tend to be more sparsely distributed in the OSPAR area, do not form fused colonial reefs or mounds and some do not have a high retention rate in nets. However, some species such as *Paragorgia* may grow very large and by-catch may exceed 100 kg.

There is much information on sponge bycatch from fishers, some of which has been verified by observers. Examples of large hauls include: for the Faroes of 1–3 tons, the Norwegian shelf of 12 tons and south of Iceland of up to 50 tons, but there are no references to exact positions. Records from historical Norwegian fishing and research trawls also indicate several catches of less than 1000 kg (Table 1).

c. what is known about the status of coral reefs and sponge aggregations in these areas

It is unclear whether this request relates to the protected status of coral reefs and sponge aggregations or to their current physical condition.

With respect to protected status, large areas, including those in Norwegian waters, the Rockall area and on Hatton Bank, are now closed to bottom fishing to protect coral. In Norwegian waters, it is illegal to deliberately destroy coral reefs.

In relation to physical status there is no complete record. In Norwegian waters there is clear documented evidence of trawl damage in a number of areas. In the Rockall area, recent TV surveys have revealed areas of intact *Lophelia* reefs among larger areas of rocky reef or sedimentary seabed. There are also large areas of dead coral and coral rubble. It is generally difficult to ascertain if areas of dead coral are caused by the impact of trawling or represent the natural cycle of growth and decay of *Lophelia* reefs. Recent surveys on the Hatton Bank have shown undisturbed sites of *Lophelia* and non-reef forming corals both inside and outside the closed area.

In the Bay of Biscay, numerous records indicate historical occurrence of *L. pertusa*, *Madrepora oculata* and *Dendrophyllia cornigera* reefs between 160 m to 400 m. In recent video surveys, only rubble has been encountered in this depth range, sometimes associated with trawl marks. Between 400 and 1500m, a variety of cold water coral and sponge species occur, some of which have been impacted by fisheries.

d. recovery rates of these species if and when damaged or removed;

Previous reports on growth and age of cold-water corals suggest decennial life-spans with linear extension rates less than one centimetre. This picture is however not a general feature for all species, and growth rates around 2 cm yr⁻¹ is not uncommon (Mortensen and Buhl-Mortensen, 2005; Gass and Roberts, 2006).

In a study of growth of the gorgonian *Primnoa resedaeformis*, Mortensen and Buhl-Mortensen, (2005) found a linear skeleton extension between 1.5 and 2 cm. The growth rate slowed down when the colony exceeded a height of around 50 cm. In-situ measurements of *Paragorgia* at 50 m depth in Trondheimsfjorden, Norway indicated a growth rate varying within the colony from 2.2 to 4.0 cm per year.

Regeneration experiments have been performed with the sponge *Geodia baretti* (Hoffmann *et al.*, 2003). It was found that explants (2–4 cm³) had rounded off and closed all openings after 2 days, and after 8 months had reorganized and grown into a small sponges with canal system and cortex. The weight increase of the explants over 1 year was 40%.

e. possibilities for re-creation of these habitats

Little is known about larval duration and dispersal capacity of corals, although a nearby source of living colonies would provide the best chance of re-colonisation. Colonisation of oil platform legs in the North Sea at sites distant from other known living *Lophelia* indicates that larvae may drift for at least 2-3 weeks. There is little doubt that reef forming corals will settle upon large artificial substrate such as oil rigs and wrecks, but there is also evidence that they will settle on any hard substrate including lost fishing gear. In areas where reefs have been smashed to such an extent that no stable substrate remains, provision of artificial substrate may be beneficial to re-colonisation. If suitable undisturbed substrate is still present in a damaged coral habitat, scattered colonies in excess of 50cm diameter could be expected to re-appear after 30 years. However, much longer time is needed for a structurally complex and diverse coral habitat to develop.

Based on the estimate presented by Mortensen and Buhl-Mortensen (2005) it takes around 20–30 years for the gorgonian *Primnoa* to reach a colony height of 60 cm. Recruitment is thought to be sporadic and it is not known how long a structurally complex and diverse habitat would take to develop.

Nothing is known about the re-establishment of sponge communities in deep water.

Sources

- Fosså, J. H., Mortensen, P.B. and Furevik, D. M. 2000. *Lophelia*-korallrev langs norskekysten. Forekomst og tilstand. Fisken og havet nr. 2, 2000.
- Fosså, J. H., Mortensen, P. B. and Furevik, D. M. 2002. The deep-water coral *Lophelia pertusa* in Norwegian waters: distribution and fishery impacts. *Hydrobiologia*, 471: 1–12.
- Gass, S. E. and Roberts, J. M. 2006. The occurrence of the cold-water coral *Lophelia pertusa* (Scleractinia) on oil and gas platforms in the North Sea: Colony growth, recruitment and environmental controls on distribution. *Marine Pollution Bulletin*, 52: 549–559.
- Hoffmann, F., Rapp, H. T., Zöller, T. and Reitner, J. 2003. Growth and regeneration in cultivated fragments of the boreal deep water sponge *Geodia barretti* Bowerbank, 1858 (Geodiidae, Tetractinellida, Demospongiae). *Journal of Biotechnology*, 100: 109–18.
- ICES. 2010. Report of the ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC). ICES CM 2010/ACOM:26.
- Mortensen, P. B. and Buhl-Mortensen, L. 2005. Morphology and growth of the deep-water gorgonians *Primnoa resedaeformis* and *Paragorgia arborea*. *Marine Biology*, 147: 775-788.

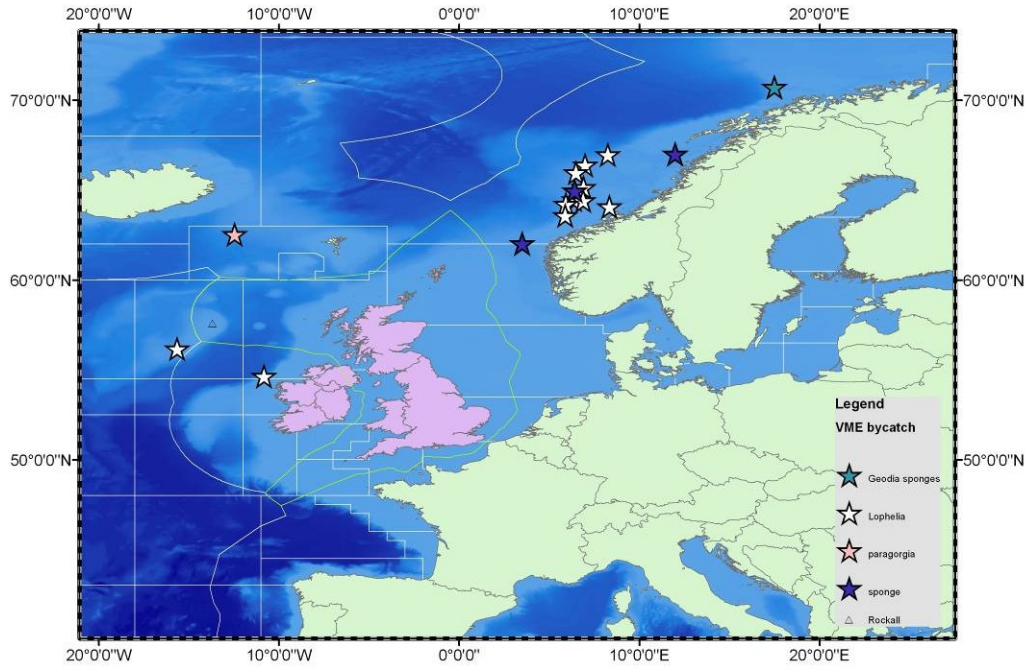


Figure 1 Confirmed cases where bycatch of corals and sponges >100kg have been observed in trawls by fishing and/or research vessels.

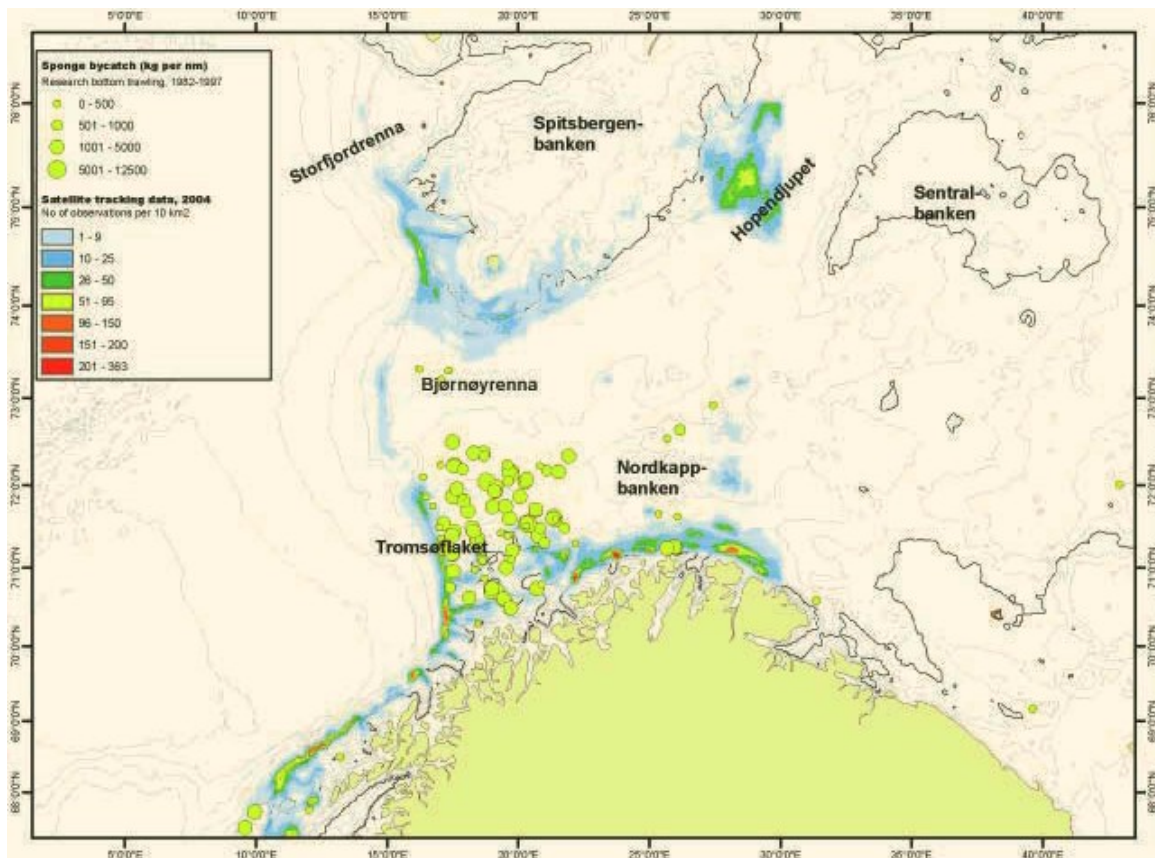


Figure 2 Areas where large quantities of *Geodia* sp. sponges were taken in bycatch in northern Norway (1982–1997).