## Nomination

*Lophelia pertusa* reefs
EUNIS Code: A5.631 and A6.611
National Marine Habitat Classification for UK & Ireland code: SS.SBR.Crl.Lop

B.Bett © SOC

## Definition for habitat mapping

*Lophelia pertusa*, a cold water, reef-forming coral, has a wide geographic distribution ranging from 55°S to 70°N, where water temperatures typically remain between 4-8°C. These reefs are generally subject to moderate current velocities (0.5 knots). The majority of records occur in the north-east Atlantic. The extent of *L. pertusa* reefs vary, with examples off Norway several km long and more than 20m high. These reefs occur within a depth range of 200->2000m on the continental slope, and in shallower waters in Norwegian fjords and Swedish west coast. In Norwegian waters, *L. pertusa* reefs occur on the shelf and shelf break off the western and northern parts on local elevations of the sea floor and on the edges of escarpments. The biological diversity of the reef community can be three times as high as the surrounding soft sediment (ICES, 2003), suggesting that these cold-water coral reefs may be biodiversity hotspots. Characteristic species include other hard corals, such as *Madrepora oculata* and *Solenosmilia variabilis*, the redfish *Sebastes viviparous* and the squat lobster *Munida sarsi*. *L. pertusa* reefs occur on hard substrata; this may be *Lophelia* rubble from an old colony or on glacial deposits. For this reason, *L. pertusa* reefs can be associated with iceberg plough-mark zones. Areas of dead coral reef indicate the site supported coral reef habitat in the past and should be reported as this habitat type.

## Geographical extent

OSPAR Regions; All
Biogeographic zones: 12-14, 25
Region & Biogeographic zones specified for decline and/or threat: All

*Lophelia pertusa*, the reef-forming cold water coral, has a wide geographical distribution, ranging from 55ºS to 71ºN (Dons, 1944; Cairns, 1994). It is present in the Atlantic, Pacific and Indian Oceans and in the Mediterranean. In the OSPAR Maritime Area it is found from the Iberian Peninsula to Ireland, around the Rockall Bank, the Faroe Islands, and near the coast and on the shelf along the Norwegian coast (ICES, 199, 2002a) (Figure A). Currently the largest known *L.pertusa* reef lies off the coast of Norway on the Sula Ridge (Freiwald *et al.,* 1999). Patches and mounds of the coral appear to be more common that large reefs.

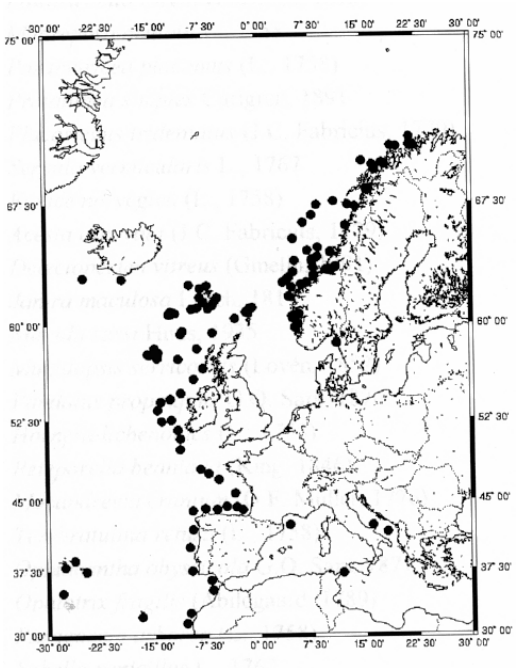
## Application of the Texel-Faial criteria

There were three nominations for *L.pertusa* to be included on the OSPAR list. The criteria common to all were the global or regional importance, decline, and sensitivity, with information also provided on threat.

*Global/regional importance*

The OSPAR area appears to be particularly important for *L. pertusa* because of the high proportion of the known occurrences of these reefs in the NE Atlantic. There is still uncertainty about how well the distribution of *L.pertusa* has been mapped in other oceans because of the widely scattered reported occurrences elsewhere.

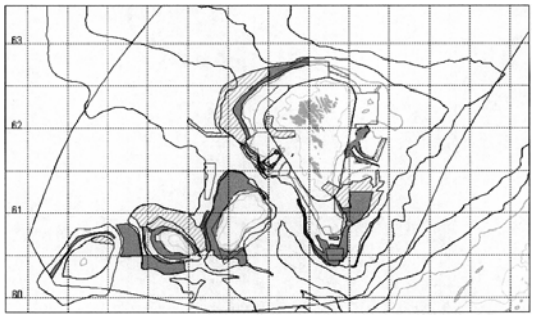
FIGURE A. Distribution of *L.pertusa* reefs in Europe. In ICES (1999) based on Freiwald (1998) and Hovland & Mortensen (1999).




*Decline*

A number of studies have estimated the extent of *L.pertusa* in parts of the NE Atlantic and the changes that have taken place in recent years. This has been summarised by the ICES Study Group on mapping the occurrence of cold water corals (ICES 2000a). In the Norwegian EEZ, for example, *L.pertusa* is estimated to cover somewhere between 1,500 to 2,000km$^2$ of seabed, mostly concentrated between depths of 200-400m (Fosså *et al.,* 2000). Analysis of information collected by direct observation and fishermen's interviews suggest that between one-third and one half of the total reef area of Norway has been damaged to an observable extent (Ottesen *et al.,* 2000). The current and past distribution of *L.pertusa* reefs around the Faroe Islands also show changes, and these are thought to be due to fishing activity (S.H.í Jákupsstovu in ICES, 2002a) (FIGURE B).

FIGURE B. Distribution of current and past areas containing *L.pertusa* reefs around the Faroe Islands (S.H.í Jákupsstovu in ICES 2002a).




Solid shading - current distribution, hatched shading – known past distribution.

*Sensitivity*

The delicate structure and slow growth rate of *Lophelia* makes these coral reefs particularly vulnerable to physical damage. The growth rate is thought to be about 6mm per year implying that normal sized colonies of around 1.5m high are about 250 years old, and the reef structures seem to be relatively stable within a time scale of hundreds of years (ICES, 1999). The potential for *Lophelia* to recover after physical damage is uncertain but is probably dependent on the severity of damage and the size of the surviving coral fragments.

The effects of drill cuttings, water-based and synthetic drilling muds, and the variety of chemicals and contaminants including dissolved and dispersed oil which is known to enter the environment around offshore oil operations may have lethal and sublethal effects on corals, but there are few studies on this as yet (Rogers, 1999).

*Threat*

The principal threat to *L.pertusa* reefs is physical damage by fishing gear. There are documented instances of damage in N.W.European waters but these are most likely a minute fraction of the number of instances where such reefs have been damaged, given how widespread trawling has been, and the amount of habitat that is potentially suitable for corals in the NE Atlantic (ICES, 2002a). Petroleum industry developments with associated discharges of drilling mud and drill cuttings may also negatively affect the corals. Given the slow growth rate of the reefs, they may take centuries to recover from damage, if at all.

## Relevant additional considerations

*Sufficiency of data*

Offshore surveys, sampling programmes and anecdotal reports have provided information on the occurrence of *L.pertusa,* while sidescan sonar images and photographs have been particularly useful in showing the damage to reefs from trawling activity. Large parts of the OSPAR Maritime Area do however remain unexplored and it is therefore likely that both damaged and undamaged reefs have still to be discovered.

*Changes in relation to natural variability*
The damage observed on *Lophelia* reefs affected by trawling is extensive and in some cases totally crushed reefs are all that remain. This is undoubtedly greater than any changes which would be expected through natural fluctuations in the extent of *L.pertusa* reefs.

*Expert judgement*

The dramatic effects of trawling damage on *L.pertusa* reefs, and the widespread occurrence of this activity, suggests that *L.pertusa* reefs are under considerable threat. This is supported by scientific evidence. The extent of damage and decline in extent of *L.pertusa* reefs is well known in some areas but is based on expert judgement in others.

ICES evaluation

The ICES review of this nomination finds that there is good evidence of declines and threat to *Lophelia* reefs. In particular, ICES report that there is good evidence of decline in OSPAR Regions I, II, III, and V. Occurrence in Region IV is not well known, but given the distribution of deep-water trawling it is likely that damage/decline has occurred there as well. ICES also note that there is good evidence that the principal current threat comes from bottom trawling. As the technology to undertake such trawling in hard habitats develops further, areas of *Lophelia* reefs have come under threat (ICES, 2002b).

## Threat and link to human activities

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

*Relevant human activity:* Fishing, hunting, harvesting; oil & gas exploration and exploitation. *Category of effect of human activity:* Biological – physical damage to species; Chemical – hydrocarbon contamination, Physical, - substratum change.

Trawling is very widespread in areas where *L.pertusa* occurs and damage to reefs from the activity of trawlers has been documented in a number of places. The best known examples are probably off the coast of Norway where there were anecdotal reports of trawlers using their gear to crush the corals to clear areas before fishing before these reefs were protected by the Norwegian government (Fosså *et al.,* 1999). Here and elsewhere there are also sidescan sonar images and photographs revealing the extent of damage to these and other reefs including furrows, mostly likely caused by trawl doors moving through areas of coral, lost nets tangled with corals, crushed reefs and broken coral strewn on the seabed (e.g. Bett *et al*., 2001: Wheeler *et al.,* 2001; Fosså *et al.,* 2000)

Another indication that trawling is the cause of damage to *Lophelia*, and that such damage is widespread, comes from that many records of *Lophelia* in commercial trawl hauls, where the coral was only known to occur because of the broken pieces brought to the surface by fishing gear (Hall-Spencer *et al.,* 2002).

## Management considerations

Closed areas for particular types of fishing have been introduced in some areas to protect *L.pertusa* reefs and could be applied more widely to protect this habitat. This is a matter that falls within the remit fisheries organisations rather than OSPAR, although OSPAR can communicate an opinion on this to the relevant bodies and introduce any relevant supporting measures that fall within its own remit if such measures exist or are introduced in the future.

## Further information

*Nominated by:*
Norway, UK, WWF

*Contact persons*:
Sabine Christiansen, North-East Atlantic Marine Ecoregion Programme
Hongkongstr.7
D-20457 Hamburg
GERMANY

David Connor, Joint Nature Conservation Committee, Monkstone House, Peterborough PE1 1UA, UK.

Eva Degre, Directorate for Nature Management, Tungasletta 2, N-7485 Trondheim, Norway.

*Useful References:*

Bett, B.J., Billett, D.S.M., Masson, D.G. & Tyler, P.A. (2001). RRS Discovery cruise 244, 7-10 August, 2000. A multidisciplinary study of the environment and ecology of deep-water coral ecosystems and asociated seabed facies and features (The Darwin Mounds, Porcupine Bank & Porcupine Seabight). SOC, Cruise Report No.36. 108pp.

Cairns, S.D. (1994). Scleractinia of the Temperate North Pacific. *Smithsonian Contributions to Zoology.* 557. 150pp.

Dons, C. (1944). Norges korallrev. *Det Kongelige Norske Videnskabers Selskabs Forhandlinger* 16:37-82.

Fosså, J.H., Mortensen, P.B. & Furevik, D.M. (2000). Lophelia-korallrev langs Norskekysten forekomst og tilstand. *Fisken og Havet* 2-2000. Havforskningsinstituttet, Bergen.

Freiwald, A. (1998).. Geobiology of *Lophelia pertusa* (Scleractinia) reefs in the north Atlantic. Habilitation thesis. University of Bremen, 116pp.

Hall-Spencer, J., Allain, V. & Fosså, J.H. (2002). Trawling damage to NE Atlantic ancient coral reefs. *Proc.R.Soc.London*, B. Online paper 01PB0637.

Hovland, M. & P.B.Mortensen, (1999). Norske korallrev og prosesser i havbunnen. Jon Greig forlag. 155pp.

ICES (1999). Ecological functioning and integrity of marine ecosystems *L.pertusa* reefs. IMPACT 99/4/Info.3-E. Submitted by Norway. ICES Working Group on Impacts on the Marine Environment. Brest, 15019 November, 1999.

ICES (2002a). Report of the Study Group on Mapping the Occurrence of Cold Water Corals. ICES CM 2002/ACE:05. Ref:E, WGECO.

ICES (2002b). Report of the Working Group on Ecosystem Effects of Fisheries. Advisory Committee on Ecosystems. ICES CM 2002/ACE:03.

Ottesen, J.M., Harvey, S.M., Lamont, P.A. & Gage, J.A. (2000). Seabed photography, environmental assessment and evidence for deep-water trawling on the continental margin west of the Hebrides. *Hydrobiologia* 44, 173-183.

Rogers, A.D. (1999) The biology of *Lophelia pertusa* (Linnaeus 1758) and other deep-water reef-forming corals and impacts from human activities. *International. Rev.Hydrobiol*. 84(4): 315-406.

Wheeler, A.J., Billett, D.S.M., Masson, D.G. & Grehan, A.. (2001). The impact of benthic trawling on NE Atlantic coral ecosystems with particular reference to the northern Rockall Trough. ICES CM 2001/R:11.