

# The Dogger Bank - A Potential MPA

## Location

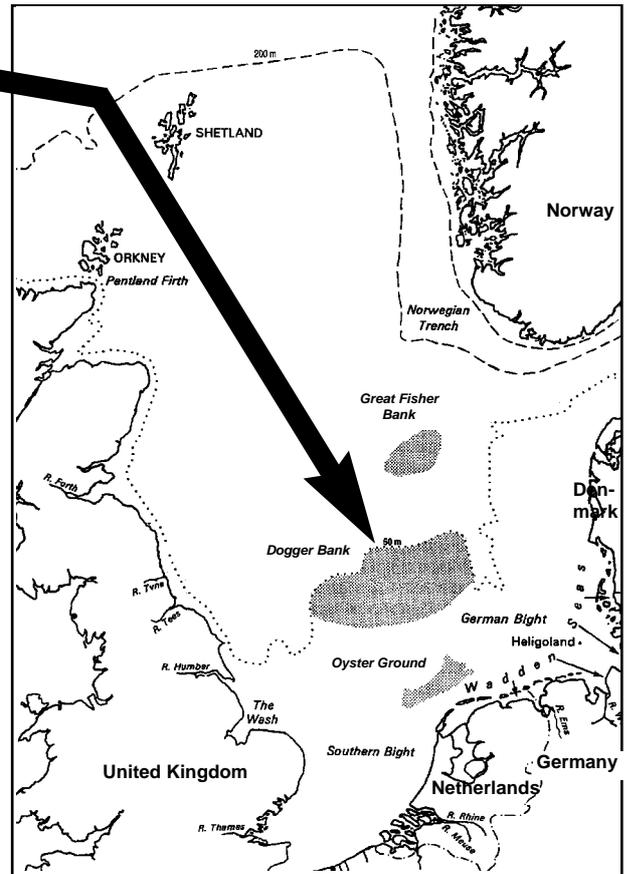
The Dogger Bank is situated in the central North Sea.

## Potential Reason for Selection

The Dogger Bank is unusual in that it exhibits year-round phytoplankton production. It is situated at the point of transition for benthic communities from those typical of the southern North Sea, to those representative of the northern North Sea and possesses a number of distinct benthic community types. The Bank is important in terms of fisheries, and has recently experienced significant changes in benthic community structure – possibly as a result of anthropogenic activity. The potential of the Bank for restoration is therefore apparent. Being a distinct topographic entity, identification of the Dogger Bank as a protected area with defined boundaries is relatively straightforward.

## Site Description - Physical Description

The Dogger Bank is an area of relatively shallow seabed, situated in the southern central North Sea. The bank is approximately 300km in length, the outer boundary being defined by the 40m-depth contour. The shallowest areas of the bank are approximately 18 meters in depth. The bank is composed of soft sediment, predominantly fine sand incorporating shell debris, which gives way to muddy sands in deeper areas.



**Justification for the Potential Selection of the Dogger Bank as an Offshore Marine Protected Area**

Hydrographically, the Dogger Bank is swept by weak currents generated by the convergence of Atlantic water masses from the north and residual flows from the English Channel. Little continuous sediment suspension occurs, other than during stormy periods. Most of the water column does, however, remain mixed throughout the year. Water in the area of the Dogger Bank has been reported to have a high humic content, most likely resultant from riverine discharge.

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## Plankton

The vertical mixing of the water column over most of the Bank, unusually, produces a high degree of phytoplankton production throughout the year. During dense bloom conditions encountered during spring, a significant proportion of phytoplankton appears to sink to the seabed. The production of grazable phytoplankton does not appear to be sufficient to meet copepod energy requirements, and this may be related to limited nitrogen levels in the central North Sea. Indeed, the lowest concentrations for nitrates and phosphates for this region have been recorded on and to the south of the Bank, with highest values being found in bottom waters to the north of the Bank.



## Benthos

The macrofauna of the Dogger Bank has been subjected to a number of investigations. Fundamentally, its macrofauna is characterised by a community of the bivalve mollusc *Tellina fabula* in its central area and a community of the brittlestar *Amphiura filiformis* at the edges of the Bank. However, there appears to have been a number of changes in benthic community structure over time and it has also been suggested

that the Dogger Bank may represent the junction of a number of benthic community types.

Research work undertaken by Dyer et al. (1983), has suggested that the northern slopes of the Dogger Bank form a distinct benthic region, as do the shallower regions of the southern part of the Bank. It is possible that differences in mixing, primary production, circulation patterns and infusion of channel water and associated plankton are likely to be influential in maintaining these biologically distinct regions. On a larger scale, it has been indicated that the Bank forms the boundary between mixed and seasonally stratified water to the south and north of the North Sea respectively. This boundary is reflected in distribution of assemblages both of infauna and epifauna. The fact that southern mixed waters tend to be warmer, in their bottom layers, than northern stratified waters may therefore explain why many northern species are not found south of the Bank.



*Tellina fabula*

In relation to changes in the benthic fauna of the Dogger Bank, comparisons in data collected in the early 1950's and the late 1980's show particularly marked changes for some deposit-feeding polychaete worms. Densities of *Spiophanes bombyx* and *Scoloplos armiger* increased markedly, while a significant decrease in the densities of the suspension feeding polychaete *Myriochele oculata* was recorded. In addition, extensive patches of the bivalve mollusc *Spisula subtruncata* were found in the north-eastern border of the Bank, during early surveys. These were generally seen to be absent during the 1980's when only relatively few specimens were found. Instead, high numbers of small, short lived bivalve molluscs such as *Montacuta bidentata* and *Tellina fabula* were observed. Changes in the abundance of certain brittle star species have also been recorded. In terms of the biomass of the benthos, investigations have revealed a decrease in the biomass in the north-eastern area of the bank, while other areas have exhibited a 2.5 to 8 fold increase. It has been hypothesised that such changes may have resulted from eutrophication, increased contaminant loading in sediments, temperature anomalies, or fisheries impacts.



*Spisula subtruncata*

### Fisheries

The area of the southern North Sea has been identified as being important for a number of commercial fisheries, including cod, haddock, plaice, sole, dab and sandeel. The Dogger Bank has previously been identified as an important spawning ground for herring, and an

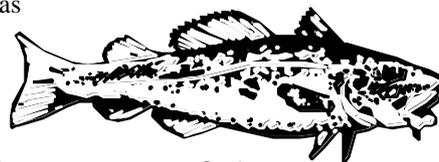


Sole

and ray, but fisheries for these species have declined significantly since the late 1970's. There is evidence, however, that herring, after a period of apparent absence, are re-using spawning sites located just to the south and south-west of the Bank.

Accounts of the exact importance of the Dogger Bank to fisheries appear to vary. Purdom & Garrod (1990) report an increase in fishery for haddock, cod and plaice since 1950. Other researchers suggest that this increase is negligible in relation to the whole North Sea

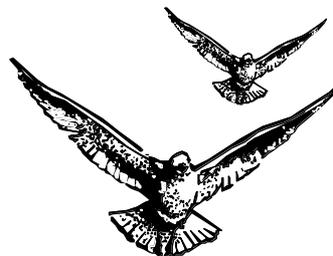
and that the area has been unimportant for commercial fisheries for the past 10 years. The 1993 North Sea Quality Status Report



Cod

identifies that the area of the southern North Sea including the Dogger Bank, may be swept by fishing gears that penetrate the sediment between 1-2 times per year.

While fishing effort is uneven, and certain areas will be fished many times while others nearby may be completely missed, it is possible that the Dogger Bank might be exposed to negative impacts resulting from fishing activity. Indeed the change in the dominance of the long lived bivalve *Spisula subtruncata* in favour of smaller, short lived bivalve species could potentially result from fishing related disturbance of the benthic environment.



### Seabirds

The area has been identified as an important feeding ground for fulmars, particularly in autumn and winter, when high densities have been reported in the area. Other species known to feed on the Dogger Bank include: gannets; kittiwake; guillemot; razorbill and gulls. Studies have indicated that the greatest use of the general area including the Dogger Bank, is outside the breeding season between September and February by fulmars, herring gulls, great black-backed gulls and kittiwake.

### Water Quality

Concentrations of dissolved heavy metals are low in the central North Sea, but heavy metals associated with particular matter show elevated concentrations in the vicinity of Dogger Bank. Comparisons with coastal sediments show that the highest concentrations of lead and cadmium are found in the fine fraction of sediments and

the top 10m in the eastern and southern part of the Bank. The fine fractions of the sediment have lead levels twice that of sediments from German Bight. Observed levels of some heavy metals suggest the Dogger Bank is a potential "sink" for these elements. Furthermore, concentrations of several organochlorine pesticides and polycyclic aromatic hydrocarbons in the sediments are reported to be comparable to those of coastal areas. Several macrofauna species show higher concentrations of heavy metals and organochlorines than in coastal regions.

Studies on dab have shown higher percentages of several diseases on the Dogger Bank when compared to surrounding areas. The high fish disease rates and low zooplankton activity may be linked to the high levels of PCBs around the Bank.

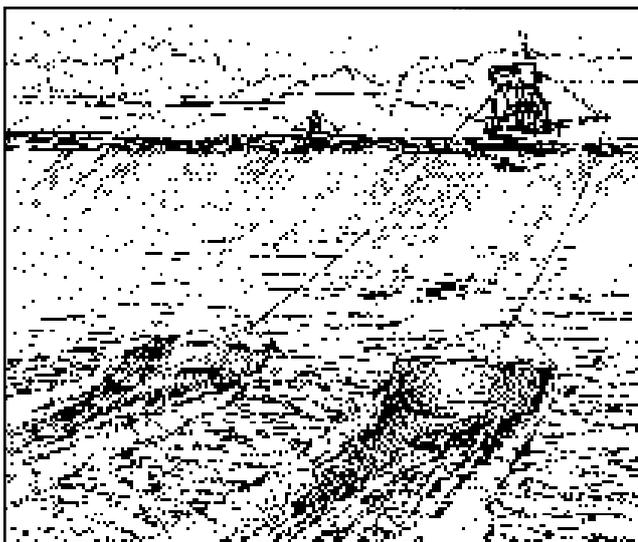
### **Existing/Proposed Protection**

The Dogger Bank is not currently subject to specific environmental protection.

### **Likely Management Issues**

As has already been identified, land-based sources of pollution, fisheries and eutrophication may present potential management issues. The southern North Sea is also subjected to intensive petroleum exploitation, resulting in potential management implications.

Text prepared by Chris Berry



### **References/Further Reading**

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