CLIMATIC FORCING AS A FACTOR IN THE ASSESSMENT OF EUTROPHICATION AFFECTED REGIONS

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There is evidence of increased input of nitrogen and phosphates into the North Sea over the last fifty years. Biological changes in the plankton and benthos attributed to eutrophication have been linked to these enhanced inputs. North Sea Ministers and OSPAR responded by agreeing that nutrient inputs should have been reduced by 50% by 1995. Phosphate inputs were reduced by this date, but nitrogen has still not reached the target and if anything is increasing. The OSPAR has developed a strategy to designate the North Sea and other regions of the North east Atlantic into Non-problem areas, Problem areas and Potential problem areas for eutrophication using a suite of criteria considered to provide evidence of eutrophication e.g. algal blooms, fish kills, changes in benthos. What these procedures and plans have not taken into account are longer-term and wider-scale climatic effects that can produce similar symptoms to those caused by eutrophication. In our presentation we will describe long-term changes in the plankton of the North Sea based on results from the Continuous Plankton Recorder (CPR) survey. These results show evidence of a step-wise change in the whole ecosystem of the North Sea circa 1987/88. The change is evident in plankton, benthos, fish, nutrients and hydrography. An index of phytoplankton biomass from the survey has increased by 50% on an annual basis since this time, although there has been no increase in the main spring bloom months of March/April. These changes are evident at the same time in the ocean to the west of Scotland and so cannot be attibuted to eutrophication despite the scale of the increase. Geographically the region showing the greatest change in phytoplankton biomass anomalies is to the west of Danemark an area that also shows the greatest range in both winter and summer sea surface temperatures. There has also been a pronounced change in the composition of the phytoplankton with a reduction in diatoms and an increase in dinoflagellates over the last forty years that appears to be naturally forced. Finally it has been recently shown that components of the plankton have shown a biogeographic shift of 10° latitude in only forty years a change that is highly correlated with Northern Hemisphere temperatures. If temperatures in the seas around the British Isles continue to rise as projected by global warming further effects that may be attributed to eutrophication, but in reality are naturally forced can be expected. Or rising temperatures may enhance eutrophication in coastal waters. What is clear is that wider scale climatic effects need to be taken into account in assessing regional eutrophication patterns in OSPAR and in the Water Framework Directive.