

Herring and Hydrocarbon Conflicts in the North Sea

Cornelia Pasche

Marine Affairs Department University of Rhode Island, USA

The interaction of the herring *Clupea harengus* with the oil and gas industry in the North Sea is reviewed. The population crash of the herring in the early 1970's and the subsequent closing of that important fishery between 1977 and 1983 has drawn considerable attention to the biotic and abiotic influences affecting the recruitment to the North Sea stock. Current accepted theory points to a change in oceanic current and the subsequent decrease in salinity in the North Sea region, resulting in a change in plankton availability for larval herring as the cause of the 1970's recruitment failure. The vulnerability of the herring population to large fluctuations in recruitment makes the maintenance of this fishery a difficult prospect.

The oil industry in the North Sea has shown steady increases in production over the last five years and analysis predict a continuation of the present trend. Hydrocarbons have been shown to have negative effects on various species, including herring, in particular the larval stages. Although high percentages of larvae die due to starvation and predation, further decreases may occur due to oil contamination either to the larvae themselves or to their planktonic foodsource. Herring and other fish species, particularly larval stages, were found to exhibit negative effects (i.e., increased mortality, reduced swimming and feeding activity, decreased O₂ uptake) when exposed to production water, refinery effluent and oil both directly and through high concentration exposed prey items.

A combination of naturally occurring reductions in larval numbers due to hydrographic changes and reductions due to hydrocarbon effects may result in dramatic stock changes before fishing quotas; hence fishing pressure can be altered. The adoption and use of the precautionary principle by the International North Sea Conference (INSC) and the Oslo and Paris Commissions (OSPARCOM) will allow regulations to be established on the side of the environment even in the face of scientific uncertainty. Further research along with insightful management is needed to better understand the dynamics of North Sea herring by itself as well as with the added parameters resulting from the oil and gas industry. A regional approach to environmental management has been developed in the North Sea by the continuation of INSC meetings and the creation of the North Sea Task Force (NSTF). The NSTF will fill gaps in the present scientific knowledge concerning the North Sea environment and its species, including herring.

Separating out the effects as being based purely on natural processes (i.e., salinity changes, plankton availability etc.) or also on hydrocarbon activity may not be possible. However, the use of bioindicators to determine potentially harmful conditions in the North Sea for particular species is being reviewed by the NSTF and OSPARCOM. Elevated levels of AHH and P450 monooxygenase, which have carcinogenic characteristics, have been detected in fish caught within 4000m of production platforms. Increased understanding of herring population dynamics through NSTF and other research and recognizing potentially harmful environmental (natural or not) conditions through monitoring programs by INSC and OSPARCOM may prevent drastic future reductions in the herring stocks in the North Sea.