

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Character of the oil spill.

In January 1993, 84700 tonnes of light Norwegian Gullfaks crude oil were released, over a period of a few days, and under severe wind and wave conditions, into the varied coastal environments of south Shetland. A conventional oil slick did not form, and there was almost no stranding of oil on the shoreline. The oil, which was of a type particularly apt to dispersion, was thoroughly mixed into the turbulent sea, and currents moved it mainly to the west and north, although a significant quantity was also carried a great distance to the south where, in similar manner to the oil carried northwards, it was deposited in a small area of fine sediments on the sea bed. The deposition of oil in deeper sediment basins is unusual, and makes this oil spill different, in that its major ecological impact was on subtotal marine ecology and fisheries, rather than coastal ecology. Unusually, a small fraction of the oil (less than 1%) was carried onto the land, either along with salt spray or as aerosol. This gave rise to fears for human and animal health, and for a short time oil appeared to have contaminated soil and vegetation near the coast: in total about 12% of the coastline of Shetland was affected by the oil in some way, however slight. There can be no doubt, however, that *the impact of the Braer oil spill was overwhelmingly on the marine, rather than the land, environment.*

Environmental and ecological impact South Shetland is, to some extent, Shetland in microcosm. It has a varied but narrow economy, depending on fishing, aquaculture, shell fishing and agriculture. It is also rich in scenic and heritage values. Like most oil spills, this had damaging environmental and ecological effects, and the ESGOSS was formed to assess the magnitude of these impacts on the full range of ecosystems, as well as to co-ordinate appropriate monitoring programmes.

The impact of any oil spill can be measured by changes to habitats that were damaged, by mortalities of plants and animals, and by sub-lethal effects on both short and long time-scales. The *Braer* oil spill had several unique aspects. These were not only a product of the way the oil was mixed with the sea and the corresponding absence of oil stranding on the coast. They were also due to Shetland-specific ecological and economic circumstances. For example, there were a number of salmon farms that were affected, a circumstance which, quite apart from its serious economic and social implications, gave scientists a unique opportunity for monitoring a captive species; the amount of scientific data on prior conditions, eg, on otters and birds, was much greater than would be expected for comparable coastlines elsewhere in the UK; the dependence of the economy on fishing demanded more vigorous attention than usual from government marine laboratories; and the heritage interest, as expressed by the presence of areas with statutory designations, was considerable.

Assessment of effects

In the course of this Report we have described and commented on the measurement of changes and disturbances to species and to ecosystems. In summary, we have determined that in all areas of concern, except for the rate of degradation of small areas of oil that remain in the fine sediments in deeper water to the west and south of Shetland, the impact has been minimal both in extent and duration. Specifically, we found that:

- For farmed salmon, samples from all the affected sites had, by the end of July 1993, virtually normal PAH values, and no taint.
- For farmed salmon, there was no sign that there was any resuspension of sediment that might contaminate fish in cages.
- For all species of wild fish, contamination in samples from within the Fisheries Exclusion Zone fell rapidly, and by April 1993 the ban on fishing was correctly lifted.
- For shellfish there is still evidence (May 1994) of low levels of contamination in some species, and fishing remains prohibited. Further tests will be made in summer 1994.
- For the residual oil in the sea bed west and south-east of Shetland Id, there is no evidence of any effects on whitefish and shellfish.
- For sandeels, a species of critical importance to several food chains, and an important indicator species for the contamination of sea bed sediments, there is no change in distribution around south Shetland following the oil spill.
- For sandeels in areas where the sea bed was relatively strongly contaminated with oil, there was evidence of some physiological response to oil contamination, but none of effects on sandeel populations.
- For benthic communities in areas of fine sediment affected by oil, there were disturbances to populations but not such as to disrupt community structure significantly; there were some increases in characteristic opportunistic and oil tolerant species of macrofauna; abundance of some indicator meiofauna species had declined.
- For near-shore and inter-tidal coastal areas, there is little evidence of hydrocarbon contamination, and residual sediment toxicity is negligible.
- For the coastal macrobenthos, the oil does not appear to have affected communities significantly.
- For rocky shores, any impact was small and limited to coastlines near the wreck. Overall, the oil spill has had a surprisingly light effect on near-shore and coastline habitats.
- For seals, otters and cetaceans, the short-term effects of the oil spill have been negligible.
- For all species of birds, direct mortality was low by comparison with other spills or periodic wrecks, and there were no signs of sub-lethal toxic effects (apart from some minor effects on kittiwakes). Populations of shags and black guillemots in the immediate area of the spill were reduced, but there were no

effects on breeding success in these or any other species.

- For species on land, effects were confined to very small areas (eg, damage to bryophytes was localised to a 10 m band between Garths Wick and Garths Ness). Effects on livestock, plants, grazing land and soils have proven to be very slight and short-lived.

One area of concern remains. This relates to the rate of degradation of the quantities of oil in the fine sediments in relatively deep water, and in some of the south-western voes. We must stress that the areas are relatively small, and that insufficient time has elapsed to assess the rate of biological degradation. Comparison with oil in sediments elsewhere in the North Sea indicates that in most sediments the half-life of the oil will be approximately one year, so that concentrations can be expected to fall rapidly towards background levels, and become negligible within 4 or 5 years. There are a few small areas where oil concentrations are relatively high (above 10,000 ppm). Here biodegradation is expected to be very slow and the oil may persist for decades. There may also be a persistence of the more toxic aromatic compounds in these areas for a longer period of time. It is therefore essential that for these areas west of Burra the MLA programmes of survey and measurement of oil in sediments and of any possible biological effects should continue. However, the monitoring programmes have shown that even these small areas of high contamination have, at least so far, had no adverse effects on the quality or health of fish in Shetland grounds.

General conclusions

Overall, the impact of the oil spill on the environment and ecology of South Shetland has been minimal. Adverse impacts did occur but were both localised and limited. The resilience of ecosystems and species populations has already been powerfully demonstrated, and provides confidence and reassurance for the future. The ESGOSS is unable to predict with certainty that further adverse effects will not appear at some time in the future. Such effects, however, could only be limited in size and extent, because both the areas and populations affected by the oil spill are small fractions of the total environment and ecological richness of Shetland. Nevertheless, there is further assurance in that MLA, SNH, SOTEAG, SMRU, RSPB and other bodies will continue their regular and occasional surveys and monitoring programmes. We consider that there are no particular areas of this work that need to be enhanced, but we would welcome continuation of the study sandeels because of their particular importance to marine food chains. The only lingering area of concern lies on the sea floor, where further monitoring is essential, but we expect, on the basis of other work. The surrounding present information, that even there, and even if the oil persists in the sediments for some time into the future, there will not be significant biological consequences.

Lessons to be learned

In accordance with our Terms of Reference we have considered the major lessons to be learned in the field of impact assessment. Our reflections are given in detail in *Chapter 15*, where we explain recommendations in three main fields. First, we recommend priorities for survey and monitoring work. Second, we recommend improvements in contingency planning for impact assessment, notably by the nomination of a standby Co-ordinator of a Monitoring Liaison Group. Third, we make recommendations on the funding of environmental impact assessment work at oil spills, notably by seeking to ensure that the polluter pays. We also advocate a clearer approach to the organisation of wildlife response, and make suggestions for the better fulfilment of information needs. A list of main recommendations is given at the end of that Chapter.