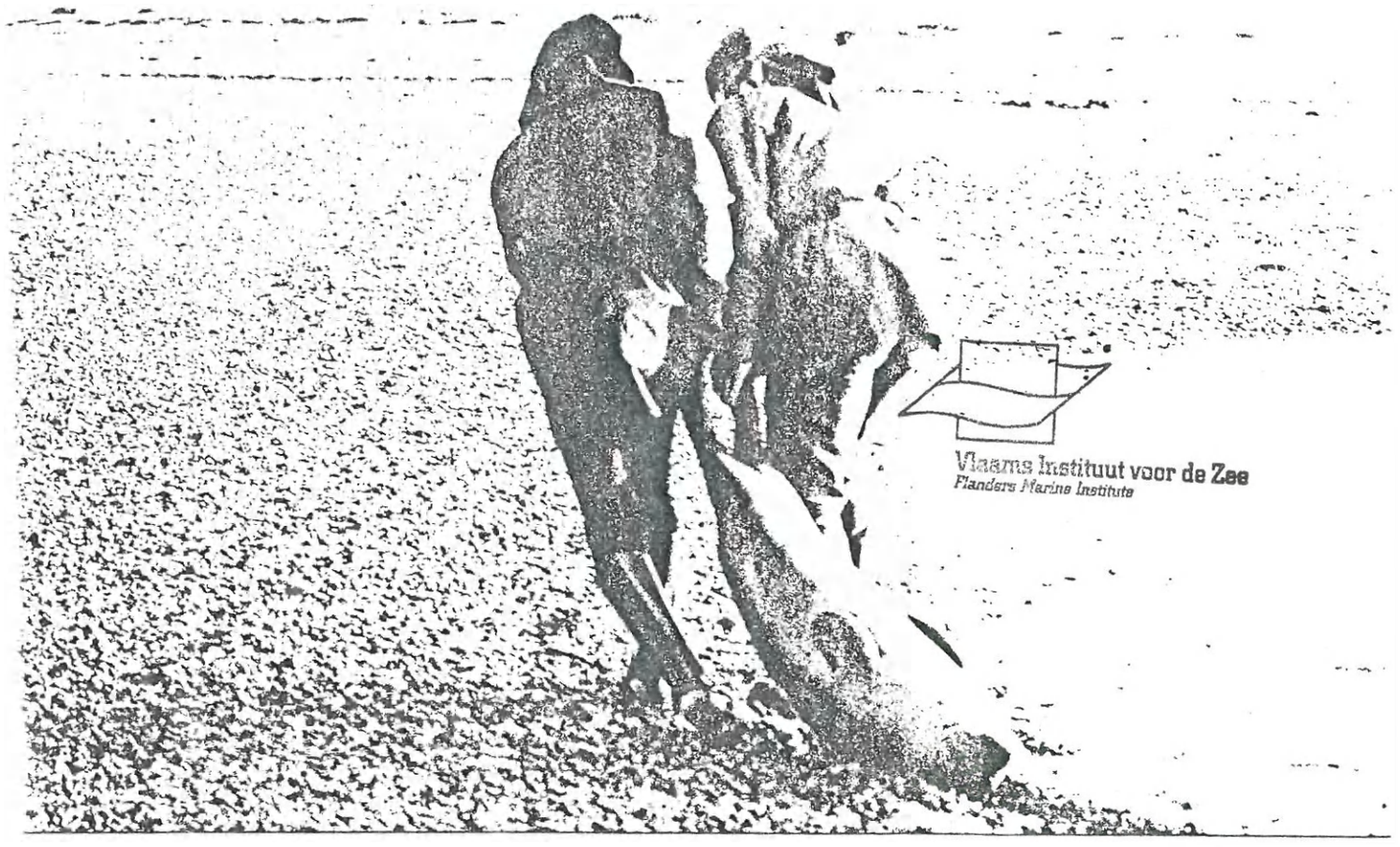
Lessons from the seal epidemic

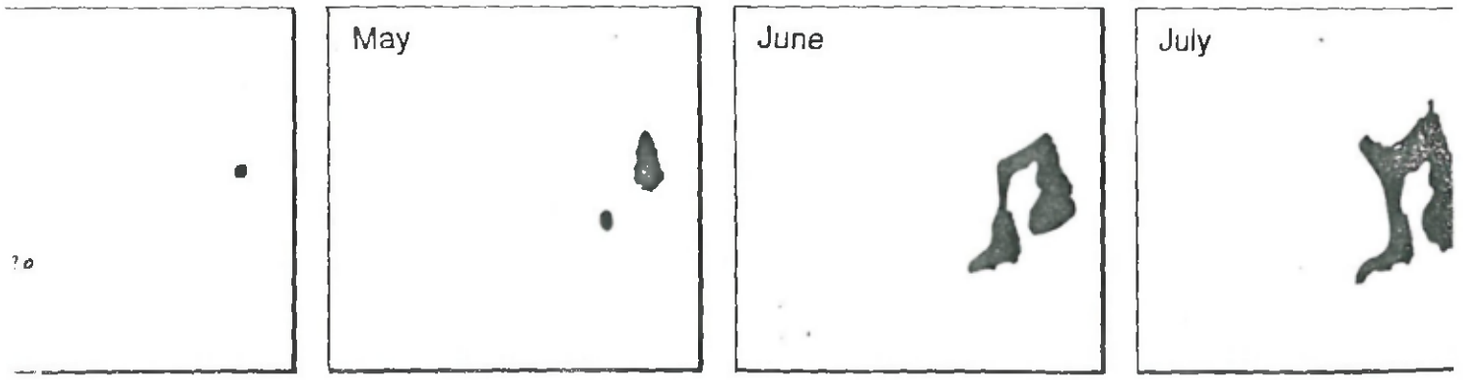
As the great seal epidemic finally abates, now is the time to start to evaluate what we have learnt from the whole episode

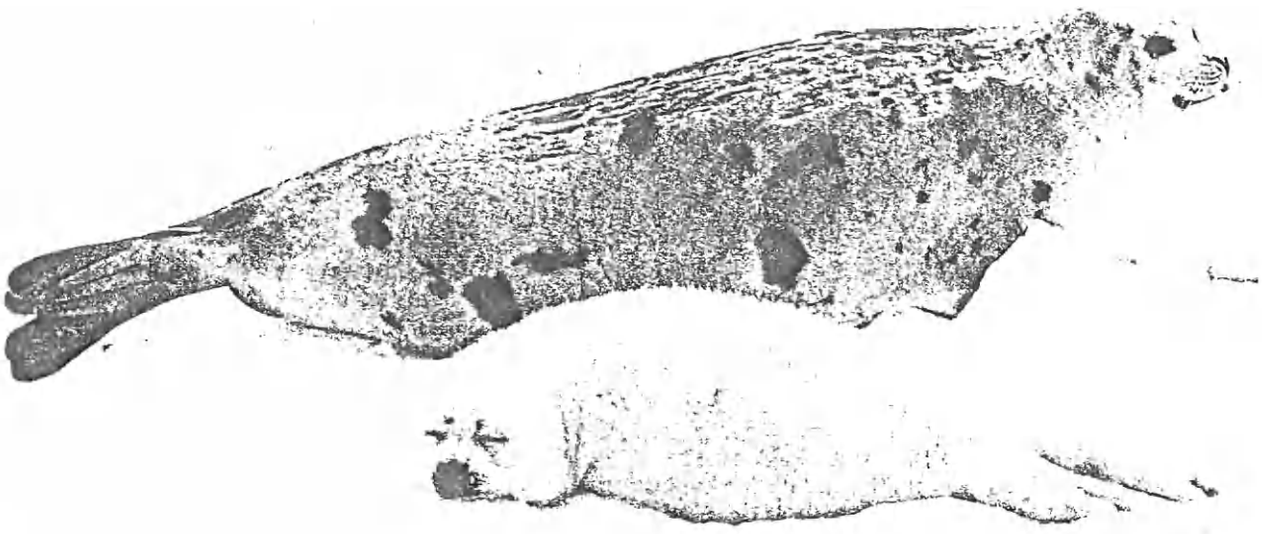
John Harwood



MORE THAN 16 000 dead seals have been washed up around the shores of the North Sea since April of last year. In some areas, such as the German and Danish Wadden Sea, there were more dead bodies than the best estimates of the size of the local population. So far, at least half the common seals in the North Sea have probably died, and in some areas mortality has been as high as 70 per cent. The grey seal, which is just as plentiful as the common seal in the North Sea, but much rarer in world terms, was not as severely affected; only about 200 bodies have been reported so far. All the available evidence suggests that some kind of infectious disease has been the primary cause of all these deaths.

I have already discussed the epidemic's ethical and political lessons for scientists in an earlier article with Peter Reijnders ("Seals, sense and sensibility", *New Scientist*, 15 October 1988). This article is about the scientific and conservation lessons. It may seem a little premature but, although more about the causes and consequences will undoubtedly come to light over the next year, European scientists have gained a remarkable insight into the epidemic in a very short time. This is something of a triumph because wildlife diseases are notoriously difficult to investigate. For example,





Harp seals may have brought the virus with them when overcrowding forced them south in 1987

Bruce Coleman

2: Risky business for the Mediterranean's monk seals

SMALL populations are very vulnerable to any of a number of chance events: a run of bad years for survival or reproduction: catastrophes, such as an epidemic, which can wipe out a large section of the population; and loss of genetic variability, which can affect survival and fecundity and limit the population's ability to respond to environmental change. Often these effects conspire together to form what Michael Soulé, president of the Society for Conservation Biology, has called an "extinction vortex", sucking the population towards oblivion.

The extinction vortex threatens almost any species whose numbers drop below about 1000 individuals. All the surviving populations of Mediterranean monk seals are well below this level and must be at considerable risk. But modelling work that I have carried out for the European Commission with Sarah Durant from the department of applied biology at the University of Cambridge shows that we can predict when the remaining populations of monk seal are most vulnerable by monitoring certain demographic indicators. No single indicator possesses all the desirable attributes of having high predictive power, providing plenty of warning, and occurring during the history of every population. But we did identify two useful classes of indicators.

"High risk" indicators, such as a complete failure to produce or rear any pups in two successive years, or the proportion of females dropping below a quarter, are very good at predicting extinction but by then it is too late to save the population. However, they are very useful for identifying populations that are beyond salvation.

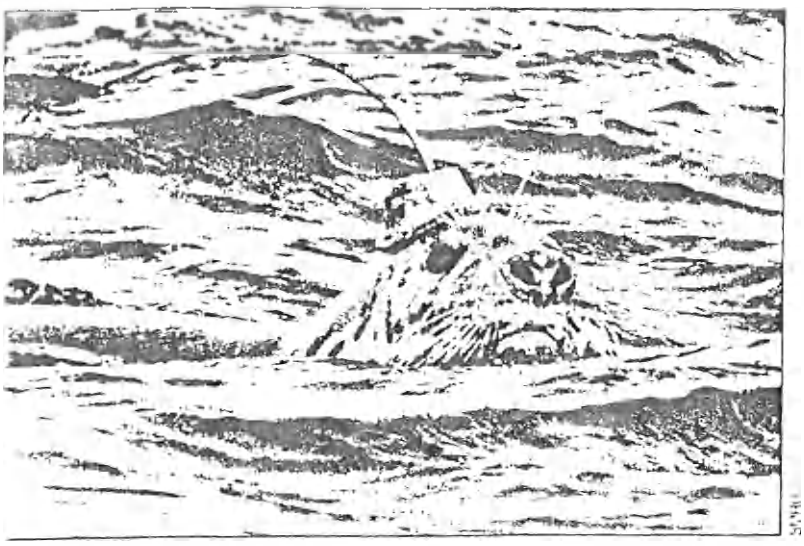
"Low risk" indicators, such as a complete failure to produce pups in one year or a fall in the proportion of adult or juvenile females to below a quarter, do give plenty of warning. But extinction does not inevitably follow and there is some danger of crying wolf. Nevertheless, we can reduce the chances of extinction considerably if we take immediate action to increase the survival of adults or juveniles.

Fortunately, it is quite easy to monitor many of these indicators for monk seals. In Mauritania, where the seals still breed on open beaches, they are relatively tame and researchers can count, sex, and age the animals directly. In the Mediterranean the seals have retreated to remote caves to rest and have their pups. Researchers there are using automatic cameras to photograph each seal as it enters the cave so that they can identify individuals and determine their size and sometimes even their sex.

These techniques provide powerful tools for identifying those populatioins that can be saved, and for making the best use of scarce resources. □

J. Trilpin/WWF/Bruce Coleman

Phocine distemper virus may prove yet another force threatening the vulnerable Mediterranean monk seal with extinction



A seal fitted with a radiotransmitter that will reveal the animal's movements around the North Sea

▸ in 1988, when adult harp seals appeared on the east coast of England and in the Netherlands. If the seal virus is endemic, but relatively harmless, in harp seal populations, this invasion of harp seals could account for the sudden appearance of the virus among seals in the North Sea in 1988, and for the occasional mass deaths of seals which are reported in old natural history books.

Danish scientists have already collected blood samples from seals around Greenland to look for traces of the virus. During the 1989 pupping season, biologists from Canada, Norway and the Soviet Union will attempt to obtain blood samples from all of the populations of harp seals in the North Atlantic. However, there is already some tantalising evidence in support of this idea. Don Bowen, of the Canadian Department of Fisheries and Oceans, gave Campbell Cornwell blood samples taken from five captive common seals caught on the east coast of Canada. These animals may have mixed with harp seals off Newfoundland in the spring, and although none of the seals has shown any sign of the disease, two of them do have antibodies to the morbillivirus.

Attempts to model the epidemiology of PDV have underlined how little we know about the distribution and movements of seals away from their regular pupping and resting sites. Scientists at the Sea Mammal Research Unit recognised this gap in our knowledge several years before the epidemic, and developed a range of telemetry devices for tracking seals at sea and for monitoring their behaviour. Now, as part of studies supported by the Department of the Environment, the National Trust and the International Fund for Animal Welfare, we are following six grey and common seals, all of which appear to have been exposed to the virus, as they swim around the North Sea. Information from these animals will help to refine the epidemiological models and possibly predict whether more Scottish seals will die next year.

Although the epidemic has now killed thousands of common seals and hundreds of grey seals there is no evidence that either species is threatened with extinction because of it. But another species of European seal could be at risk. The Mediterranean monk seal is one of the world's 12 rarest mammals. The total population is probably fewer than 1000, and it may be as small as 500. The largest surviving colony is on the Atlantic coast of northern Mauritania, ironically well outside the Mediterranean, and some animals probably move between Mauritania and the much smaller colony at the Desertas Islands in Madeira.

If PDV does spread to monk seals, and if it affects them as badly as it has common seals, the consequences could be disastrous because such small populations are incredibly vulnerable to extinction from catastrophes such as this (see Box 2). Francisco Reiner and Miguel Lacerda, two Portuguese divers, recently reported the first sighting of a common seal in Madeira during July 1986. The animal was later found dead. Given the propensity for wandering that seals infected with PDV have shown, there is a real risk that monk seals could be exposed to the virus over the next few years. So there is an even greater incentive than before to monitor the Atlantic population of monk seals carefully. This may prove even more difficult than it should because Didier Marcheseaux, a young French biologist who had dedicated years to a detailed study of the Mauritanian seals, was tragically killed in October when a landmine exploded under his jeep.

The North Sea epidemic has also underlined the importance of disease in the population dynamics of large vertebrates. Ecologists have always thought that disease was important in the dynamics of invertebrate populations but, until recently, there was a general feeling that disease was a rare and unimportant phenomenon for most wild animals. This is definitely not the case.

Many species do not occur uniformly across all the suitable habitat that is available to them. Instead they aggregate into a number of subpopulations, often with limited exchange between them. Catastrophes, such as an epidemic of disease, can reduce a subpopulation to such a small size that chance processes, which it could otherwise cope with perfectly well, will lead to its extinction. If the species has already been reduced to a handful of such subpopulations, as is the case with many endangered species, then the entire species could disappear in this way. Although a mass vaccination programme is probably unnecessary in the case of seals in the North Sea, it may be advisable for some really rare species. Certainly conservationists need to think carefully about developing a set of rules to help them to decide when a vaccination programme is necessary.

Finally, are we any nearer to knowing whether pollution contributed to the scale and severity of the epidemic? It is tempting to correlate the apparently lower mortality of seals in Scotland with the fact that organochlorine pollution is generally less severe in Scottish waters. But it is too early to be certain that mortality really is low in Scotland. The dead seals that have been analysed so far have not shown unusually high levels of organochlorines but, without information on the levels in seals that survived the epidemic, these results are difficult to interpret. As part of a study funded by the Department of the Environment, the Sea Mammal Research Unit plans to collect blood samples and small blubber biopsies from seals that survived the epidemic at several sites in England, Scotland and Ireland. We will analyse these in collaboration with researchers at the University of Liverpool to see if there is any relationship between resistance to disease and the burden of pollution.

A month ago, I was just one of many scientists from all of the North Sea countries that suffered the seal epidemic who met at Texel in the Netherlands to discuss our research plans for 1989. One thing is certain: the seal epidemic is already one of the best-documented case studies of the effect of a disease on a population of wild animals. But there is much more to come. At Texel, we were able to examine more than a third of the animals that died, and there is detailed information and a large bank of tissue samples from more than a thousand of the corpses. The collaborative projects we planned at Texel will allow us to build up a detailed picture not only of the effects of phocine distemper but also of the distribution of a wide range of environmental contaminants that turn up in European seals. Two of the most positive outcomes of the whole tragedy will be even closer cooperation among the seal biologists of Europe, and a much improved understanding of the importance of disease for wildlife, which should help us to deal with future epidemics. □

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