

seven female harbor seals, *Phoca vitulina*, five of which were born at the West Berlin Zoo.

All four seal pools are lined with a greenish opaque glass. The animals can be easily seen moving in the water against this light coloured background.

The Penguin Pool: The penguin enclosure has an average area of 500 sq.ft, an average depth of 2 ft and a water volume of about 950 cu.ft. The pool was not made any bigger so that the water could be changed easily and give the public a good view of these rather small animals. The enclosure is separated from the visitors by a low wall made out of uneven blocks of stone. At the back of the pool there is a sandy shore which turns into a rocky slope. Breeding niches have been built into the rocks and 4 Humboldt's penguins, *Spheniscus humboldti*, and 7 black-footed penguins, *Spheniscus demersus*, breed there regularly. As well as these species, the enclosure contains rockhopper penguins, *Eudyptes cristatus*, two northern gannets, *Sula bassana*, four king cormorants, *Phalacrocorax bougainvillei*, three guano cormorants, *Ph. albiventer*, three great-black-backed gulls, *Larus marinus*, two herring gulls, *Larus argentatus*. The walls of spacious indoor accommodation can be covered with running water so that even in the summer the temperature does not exceed 15°C. A refrigerated room is available for storing up to two tons of fish at -1°C.

SEAL RESEARCH IN THE WADDENSEA

by Dr. J.L. van Haften, Research Institute for Nature Management, Arnhem, Netherlands.

In starting the Dutch part of the Waddensea, we know that around 1930 there was an estimated number of 2000 seals, *Phoca vitulina*. The fact that there was a bounty on the capture of seals at that time shows that they were probably much more numerous. This bounty system was connected with the suspected serious damage caused by seals to the fisheries. Our seal research began in 1950 when we were asked to see if there was something wrong with the seals because the number of seals permitted by the ministry of agriculture had not been shot for some years. This could be caused by a lesser value of the

skin, by a decreasing interest of the hunters or by a decrease of the number of seals. There were in fact several causes for a population decrease. In the first place it was the hunting pressure on the calves due to the value of their skins. This changed the population structure very much and resulted in a decrease in numbers. This was the principal cause, but there were others such as the method of hunting; shot cartridges instead of bullets were used and sometimes three animals were shot at in order to get one. The other two animals often died but could not be found in time. Another factor could have been an increase in the shrimpfisheries which, like the increasing water tourism, causes restlessness.

From 1961 the seals were totally protected in our country. Due to that measure we saw a population growth from about 900 seals in 1959 to about 1450 animals in 1968. The census is always carried out by aerial photography during the September mating season, using a sports plane. That the population of seals did not grow more rapidly must be mainly attributed to the hunting pressure in Germany and Denmark, where the seals are still not protected (in fact not protected at all). By tagging more than 100 seal calves we discovered that the German, Danish and Dutch seals have to be considered as one population. In 1969 the number of seals fell to about 1200, in 1970 it decreased further to about 950 specimens, in 1971 it still decreased to about 700, in 1972 to about 600 and in 1973 we could only count about 500 seals. Causes for this decrease could have been shortage of food, which is mainly flatfish, disease or pollution of the water. As to the food available we know that there is less fish in the Dutch Waddensea than in former times. But this is not sufficiently serious to markedly influence the seal population. Concerning the diseases we know, pneumonia, caused by lungworm, is often the cause of death in calves and yearlings. Other parasites as tape worm and lice are found also more frequently than before. Another fact is an increasing number of stillbirths and the greater occurrence of aborted calves than found in former times. Pollution seemed to be more important however. Firstly there is more and more oil on the beaches and on sandbanks (where the seals mostly rest), which may cause wounds of the skin. Although they are usually limited to the surface of the skin, infections or a great loss of blood may sometimes occur. Toxicological analysis of liver and blubber from dead seals

was carried out in 1969 and the following years. Amounts of D.D.T., aldrin, dieldrin and P.C.B.'s were found in the blubber of some seals. Although the amounts were sometimes rather high, they were not very alarming. Material from seals found dead in 1969, 1970, 1971 and 1972 showed that the amount of mercury in the liver and in the brains, especially in those of adult animals, were so high that it may be a serious cause of death of seals. The number p.p.m.'s in the liver were for instance 225, 765 and even more than 1000 and 2000 p.p.m.! In the brains 20 up to 30 p.p.m. mercury have been detected. Pesticides have also been found in the bodies of seals in England and along the south-east coast the levels are higher than in the rest of the English waters, but not up to the levels found in the Waddensea. The same goes for the German seals as far as I know.

By the recoveries of the tagged animals from all over the Waddensea between den Helder up to Esbjerg we learned about the population size and about their movements in the various seasons. They leave our part of the Waddensea in the autumn for deeper water and they come back again in the springtime. If we want to keep the seals in the Waddensea we must protect them together: Germany, Denmark and Holland. We must also work together in the research which we started in 1970 when Professor Kraft started his work in Nieder Sachsen. Then we established an international seal working-group and I hope this group is going to be enlarged in the near future with some German scientists especially from Schleswich Holstein.

It is a pity that Schleswich Holstein did not follow us in protecting the seals in the Waddensea this year (1973), and that they started to hunt the seals again. I believe, however, that our international working-group can be of great importance in advising the government of Schleswich Holstein as we do to other governments. We cannot do anything against these factors only by doing something alone, but we must do it all together. We must inform the people what is going on and this is the only way that we can keep our seals in our Waddensea.
