NEDERLANDSCHE
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(Netherlands Commission for
International Nature Protection)

A HUNDRED YEARS OF MODERN WHALING

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INTRODUCTION TO "A HUNDRED YEARS OF MODERN WHALING"

The Netherlands Commission is happy to publish Professor SLIJPER's recent article on modern whaling. The present serious threat to the survival of several whale species as a result of relentless rapacious persecution is a matter of great concern to fauna preservationists.

The situation is ably expressed in a letter of 4th March 1965 from the Survival Service Commission, of the International Union for Conservation of Nature and Natural Resources, Morges (Switzerland), published in "The Times". This letter is reproduced in full with the consent of S.S.C. It reads as follows:

"Your excellent leading article of March 3rd on the plight of the whaling industry is welcomed by the Survival Service Commission of the International Union for Conservation of Nature and Natural Resources. May we say that the future of the industry is not the only issue at stake. The impending extinction of one or more species of whale is a matter of concern for the international conscience.

The Blue Whale is not only the largest animal in the world, but as far as is known, the largest animal there has ever been in the world (up to 160 tons*). In the 1930's they formed 82% of the antarctic whaling catch. By 1959 they formed less than 5% of the catch, and by 1964 there were under 2,000 Blue Whales left. Can we look on while the largest animal in the world is wiped out without at least raising a voice in protest at this fantastic example of human short-sightedness and greed. Also in serious danger are the fin and humpback whales.

Every animal and plant species is a unique part of the natural world and should be conserved for ethical, aesthetic and scientific reasons, in addition to the economic ones which apply to the

* See, however, also p. 34.

whales. There is no reason why the world stock of whales should not be conserved in perpetuity so that it can be caught humanely and continue to add to the world's supply of fats and proteins on the basis of a sustained yield. Indeed a method of doing this has been proposed by the International Whaling Commission's own scientific advisers.

Unfortunately, however, the present constitution of the International Whaling Commission prevents it from enforcing anything. It seems that we are in need of an International Authority capable of achieving the enforcement of rules based on scientific measurement so that the whales can continue to exist for the inestimable ultimate benefit of mankind."

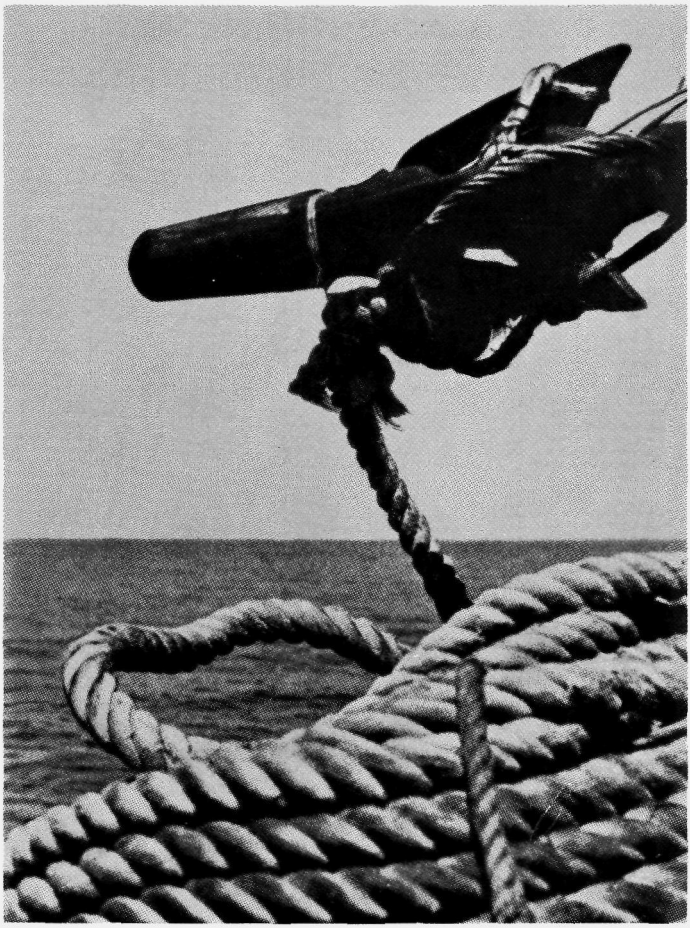

Fig. 1. Head of a shell harpoon with attached line at the bow of a Japanese catcher. Behind the shell (left) there are barbs which stick out when the animal has been hit. E. J. SLIJPER, *Verständliche Wissenschaft 80*, 1962

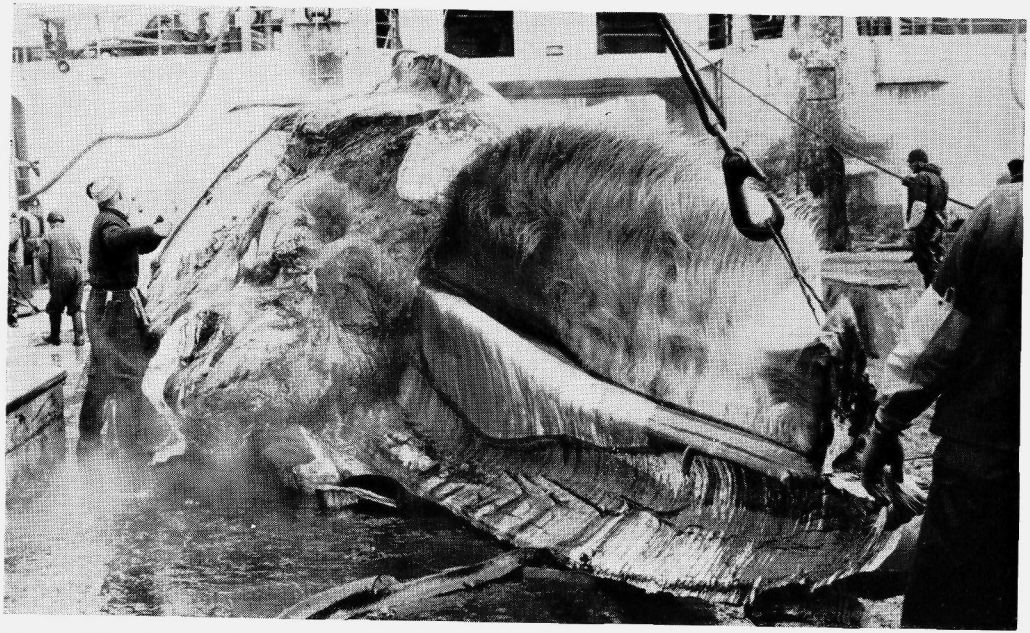

Fig. 2. This photograph, taken on board the "Willem Barendsz", shows the bottom of the upper jaw of a Fin Whale. The inner side of the right row of baleen plates with the fringe can be seen. The left baleen plates have already been removed. Photograph: W. L. VAN UTRECHT, Amsterdam

A HUNDRED YEARS OF MODERN WHALING

by E. J. SLIJPER

Zoological Laboratory, University of Amsterdam

On Thursday 18th February 1864 the newly built schooner "Spes et Fides" left the harbour of Vrengen, near Tønsberg, to go whaling in northern Norwegian waters. The 55 year old skipper, SVEND FOYN, is held to be the inventor of the harpoon gun and its shell harpoon. On board his ship therefore there were seven harpoon guns. In the first half of the 19th century, it is true, others had already experimented with similar whaling weapons, but SVEND FOYN was the first to use them with great success. At first the harpoons and shells were fired separately, but on the maiden voyage of the "Spes et Fides" experiments with a combined shell harpoon were carried out (Fig. 1). In combination with fast steamships this weapon brought about a complete turning point in whaling practice.

HISTORY

It is not known exactly when man began to hunt the great whales, but it is certain at any rate that a whaling industry already existed in Norway about the year 890 and that the Norwegians are probably the oldest whalers in the world. Nor do we know exactly what whale was hunted at that time, but it was in all probability the North Atlantic Right Whale, a species that is no longer found in large numbers but which in the old days made up a large part of the whale population not only throughout the Atlantic and the Arctic but also in Pacific and Antarctic waters. In the 11th century the Basques, the inhabitants of the coast along the bay of Biscay, began to hunt this animal, and in the following 5 centuries they developed whaling into a thriving industry and an important source of income. Besides the meat, there were two main products which made the animal very valuable: the oil and the baleen. The oil, which was primarily used for lighting, and the baleen plates,

which in an age when steel and elastic were still unknown, served as elastic material for whips, umbrellas, corsets, hoop-skirts and a number of other products.

For centuries the North Atlantic Right Whale was the main quarry of the whalers. When, however, in 1583 the Englishman JONAS POOLE and in 1596 HEEMSKERK, BARENDSZ en DE RIJP tried to find a northern route to the East, they were able to find some consolation for their failure by returning with tales of the great profusion of whales in these northern waters. They encountered there not only the North Atlantic Right Whale, but also a very similar type with an extremely large head and a white or yellow patch on the chin and throat, an animal that the Norwegians had long known by the name of Grønlandshval because it was met with in particular off Iceland and the west coast of Greenland. It is a real arctic species, which occurs throughout the Arctic Ocean, but seldom ventures far beyond the ice.

Together with the North Atlantic Right Whale the Greenland Right Whale has since the year 1600 been the much coveted object of the famous Greenland whaling, the industry which for two centuries provided the companies in England, Germany, Denmark and the Netherlands with such good profits. In the 18th and the 19th centuries the Americans also took a part in hunting these animals, not only in the Davis Strait and Baffin Bay but also in the Bering Strait and the Sea of Okhotsk. Furthermore, by that time the North Atlantic Right Whale and the Greenland Right Whale were no longer the only whales to be hunted. The Indians of the west coast of North America probably began as early as the 16th century to hunt the Californian Grey Whale, an animal which is found exclusively in the northern part of the Pacific Ocean. It was also the prey of the Japanese land stations, regarding which the earliest written record dates from 1606, but which perhaps were also in operation before that time. In addition to the North Atlantic Right Whale and the Californian Grey Whales, their commonest catch was in particular the Humpback Whale and perhaps now and then a Fin Whale or a Sperm Whale.

The Sperm Whale, which prefers to frequent warmer waters,

began to appear more frequently at the beginning of the 18th century in the catches of the whalers. The whalers of New England began at that time to extend their coastal activities into the high seas, where they hunted the Sperm Whale. Partly as a result of French, English and Portuguese participation, the hunt for Sperm Whales was practised very intensively until about the middle of the 19th century in both the Atlantic and Pacific oceans and in the Indian ocean. In 1846 there were still more than 600 ships lying in the harbour of Honolulu which had come there to trade their oil. The rise of the cotton industry in America and the gold rush, which drew many people, together with the fact that petroleum was first discovered in 1859, had such an effect on sperm whaling that by 1860 the industry of those days had practically come to a stop, even though the last sperm whalers did not return until 1925 for the last time to the harbour of New Bedford.

THE WHALES

Before we go on to discuss whaling, we should first like to devote some attention to the victims of the industry, the whales themselves.

The order of the whales (Cetaceans), that is if we restrict ourselves to the recent types, can be split up into two subdivisions: the baleen whales (Mystacoceti) and the toothed whales (Odontoceti). The former have baleen plates in their mouths, the latter teeth like any normal mammal. That the baleen whales are also descended from normal mammals is evident, however, from the fact that for a certain period of development before their birth the young still have rudimentary teeth in their jaws. These rudimentary teeth later disappear and in the last period of their development before birth triangular plates of horn grow downwards out of the palate, and these are known by the term "baleen" plates (Fig. 2). In the adult animal 300 to 400 of these horn plates hang down on both sides of the mouth like a row of curtains. On the inner edges they have a hairy fringe. All these hairs together form a kind of sieve, which traps food, while the water flows between

the plates and off to the side over the edge of the underlip (Fig. 3).

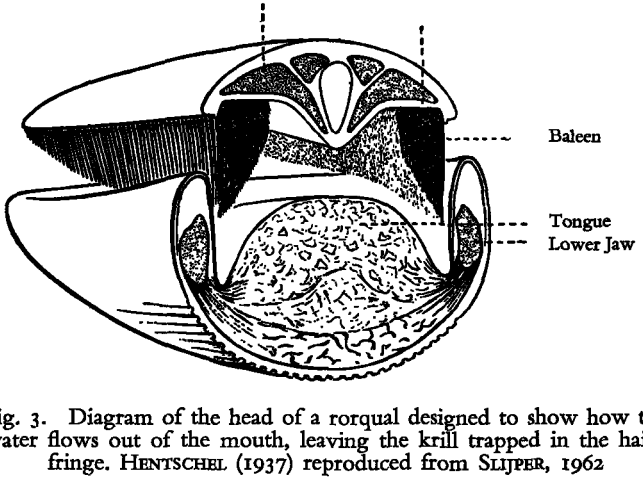

Fig. 3. Diagram of the head of a rorqual designed to show how the water flows out of the mouth, leaving the krill trapped in the hairy fringe. HENTSCHEL (1937) reproduced from SLIJPER, 1962

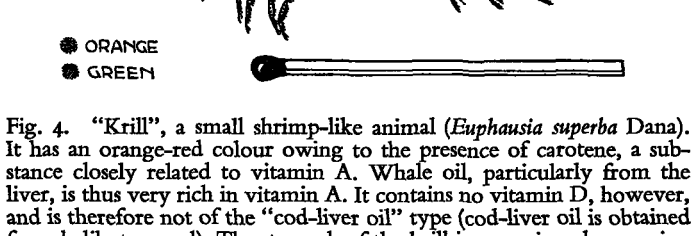

Fig. 4. "Krill", a small shrimp-like animal (*Euphausia superba* Dana). It has an orange-red colour owing to the presence of carotene, a substance closely related to vitamin A. Whale oil, particularly from the liver, is thus very rich in vitamin A. It contains no vitamin D, however, and is therefore not of the "cod-liver oil" type (cod-liver oil is obtained from halibut or cod). The stomach of the krill is green in colour owing to the presence of diatoms. SLIJPER 1962, revised MACKINTOSH and WHEELER (1929)

The sieve is necessary because the baleen whales feed chiefly on very small crustaceans which are somewhat similar to shrimps and which are known to whalers by the name of "krill" (Fig. 4). These creatures which are not longer than 7 centimetres, occur in cold waters in such enormous quantities that they sometimes give the sea a porridgy texture and a brownish red colour. By taking frequent mouthfuls of this porridge-like mass and sieving off the krill with its baleen plates the big whale is capable of consuming something of the order of several tons of food a day (Fig. 9). The krill in its turn feeds on much smaller organisms, chiefly diatoms, which can only be seen through a microscope. These diatoms contain a lot of fat. As a result the krill also contains much fat and the whale is able to store it in its layer of blubber and in its bones, and thus we are finally able to use the fat for the manufacture of soap and margarine.

In the cold waters, however, the krill is not always accessible. It is found in particular in a certain zone at a high latitude, a zone which is covered in winter by pack-ice. Then the whales are unable to catch their food and they migrate to the subtropics and tropics were they mate and where in the following year the young are born, but where food is not present in such abundance as in the polar seas. There are also no doubt areas in the tropics where the whales can find food, and it even appears that part of the stock spends an occasional summer in the warm waters, but the great mass migrates each spring to the cold areas and each autumn to the warmer areas.

The baleen whales (Figs. 5, 6, 7) can be subdivided into three groups. The first group, the right whales, comprises the Greenland Right Whale *(Balaena mysticetus* L.), which grows to a length of up to 16 metres, the 15-metre long North Atlantic Right Whale *(Eubalaena glacialis* Bonnat.) and the Pigmy Right Whale *(Caperea marginata* (Gray)) from the Antarctic, the length of which does not exceed 6 metres. They are all characterized by a bow-shaped upper jaw and long baleen plates (in the case of the Greenland Right Whale up to 4.5 metres) and by the absence of a dorsal fin and grooves on the breast and throat. The Greenland Right Whale

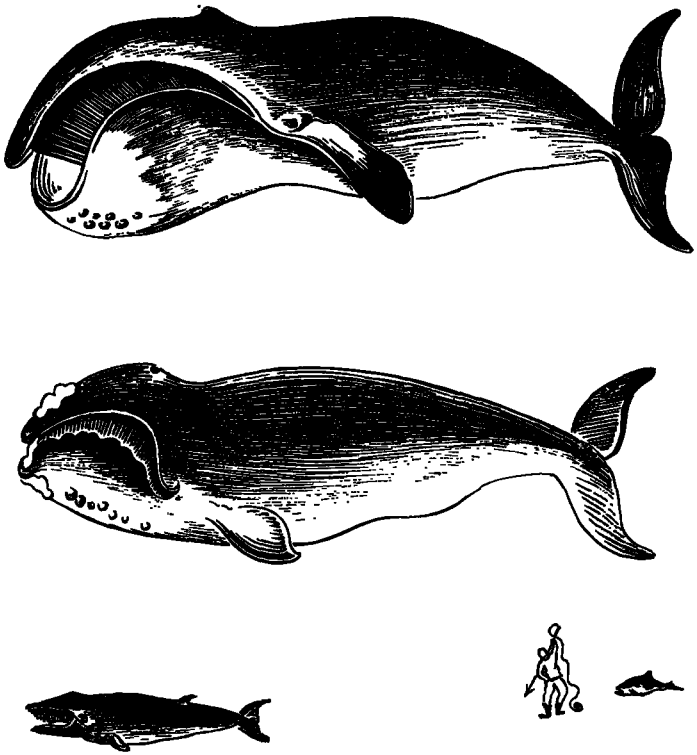

Fig. 5. The baleen whales Greenland Right Whale, North Atlantic Right Whale and Pigmy Right Whale are shown with a man and a Common Porpoise for comparison. SLIJPER, 1962

occurs only in the Arctic, while the North Atlantic Right Whale is a cosmopolitan, which is not often seen between the tropics, however.

The second group comprises only the Californian Grey Whale *(Eschrichtius gibbosus* (Erxleb.)), a 13-metre long species from the North Pacific. The animals have no dorsal fin, but short baleen plates and only 2–4 grooves on the breast and throat.

The rorquals, which make up the third group, all have a dorsal fin, while 70 to 100 groves run lengthwise over their breast and throat. Their baleen plates are short; the longest vary in length from 1 metre in the case of the Blue Whale *(Balaenoptera musculus* (L.)) to 25 cm in case of the Little Piked Whale *(Balaenoptera acutorostrata* Lacép.). The largest species and at the same time the largest

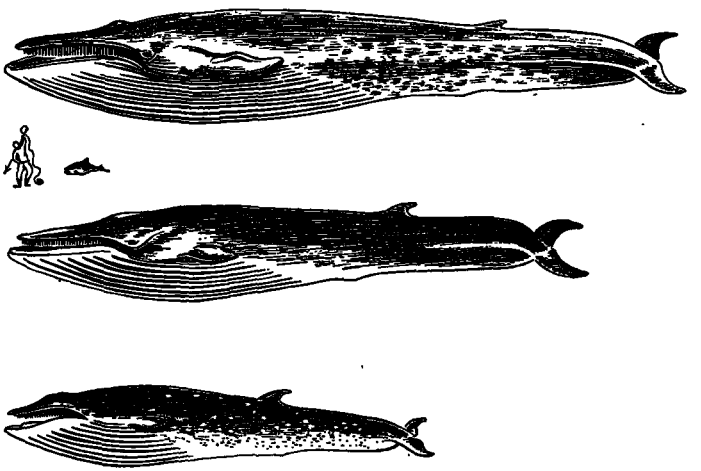

Fig. 6. The baleen whales Blue Whale, Fin Whale and Sei Whale. These animals are shown together with a man and a Common Porpoise for the sake of comparison. SLIJPER, 1962

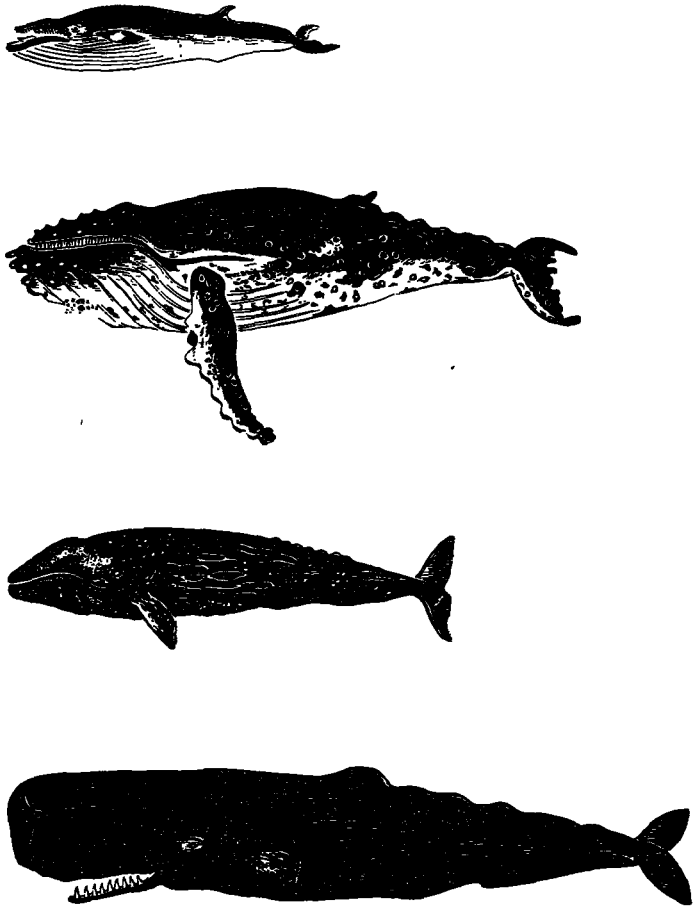

Fig. 7. More baleen whales (the Little Piked Whale, the Humpback and the Grey Whale) and the toothed Sperm Whale. This figure is not on the same scale as figures 6 and 7. SLIJPER, 1962

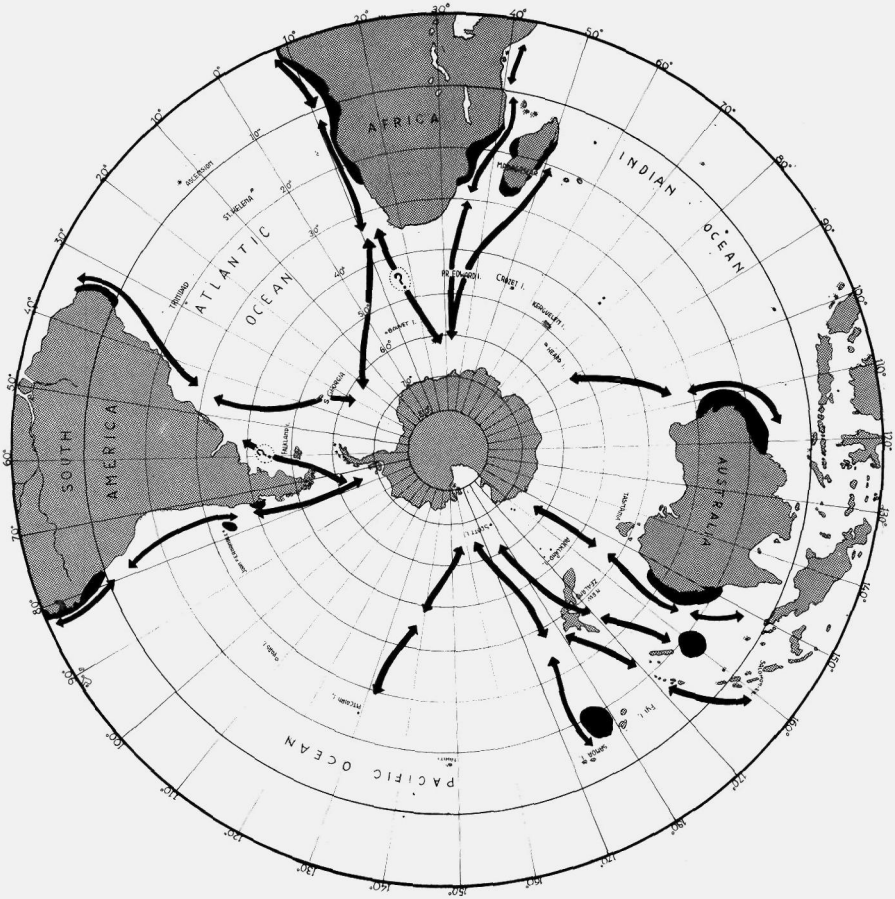

Fig. 8. Distribution and migration of the Humpback in the southern hemisphere. SLIJPER, 1962

Fig. 9. When the stomach of a rorqual is cut open, krill spill out over the deck of the factory ship. Photograph: W. L. VAN UTRECHT, Amsterdam

animal that has ever lived on earth is the Blue Whale with a maximum length of 33 metres and the maximum known weight of 136,400 kilogrammes. Their average length is 24 metres. The average length in the case of the Fin Whale *(Balaenoptera physalus* (L.)) is 21 metres and in the case of the Sei Whale *(Balaenoptera borealis* (Lesson)) 15 metres, in that of Bryde's Whale *(Balaenoptera brydei* (Olsen)) 13 metres, in that of the Humpback *(Megaptera novae-angliae* (Borowski)) 14 metres and in that of the Little Piked Whale 9 metres. With the exception of Bryde's Whale, they all take part in the annual migrations described above. The Humpback, which is easily distinguished by its long flippers and by the humps on its back and tail, keeps mainly to the coastal waters of the continents (Fig. 8) and was thus, together with the Sei Whale and the Sperm Whale, for centuries a principal quarry of the tropical and subtropical land stations. As regards the Sei Whale, probably only a part of the stock seeks the higher latitudes in the summer. Until recently it was assumed that the Little Piked Whale was rarely found in tropical waters. An investigation carried out by Netherlands scientists and based on observations made by the officers and crews of ships has revealed, however, that this is certainly not the case. But it is true of the Bryde's Whale, a species which differs from the Sei Whale mainly in the structure of the baleen plates and which, as far as is known, is restricted to the waters between Lat. 30° N and 30° S.

The second subdivision of the cetaceans comprises the toothed whales, animals which have teeth and no baleen. The only representative of this subdivision which has to be considered in respect of whaling on large whales is the Sperm Whale *(Physeter macrocephalus* L.) (Fig. 7), a species of which the males can attain a length of 18 metres, but of which the females do not grow longer than 12 metres. The Sperm Whale feeds mainly on cuttlefish, varying from fairly small ones to very large ones. More than once a so-called "giant squid" with a length of 10.5 metres and a weight of 184 kilogrammes has been found in its stomach. Cuttlefish are a soft and apparently easily caught food. All cuttlefish eaters therefore show a reduction of their teeth, a phenomenon which can

also be observed in Beaked Whales *(Ziphiidae)* and in Risso's Dolphin *(Grampus griseus* Cuv.). The Sperm Whale only has teeth in the lower jaw (Fig. 12), at least as far as the normal teeth which they cut are concerned, since in the gums of the upper jaw a number of rudimentary teeth are always to be found, an indication that the ancestors of this animal possessed a set of teeth in both jaws. They are polygamous. An old male animal is the leader of a school of females and the offspring which are not yet adult. These schools do not leave an area between Lat. 40° N and Lat. 40° S. The adult males, that in the vicious fights of the mating season have not been able to collect a harem, however, migrate in the summer to the cold waters of the Arctic and Antarctic.

All other toothed whales, with the exception of a Beaked Whale from the Pacific *(Berardius)*, are smaller than 10 metres. They could all be termed "dolphins", although in English the larger species are also known as "whales". With the Little Piked Whale a number of these species, such as the Bottlenose Whale *(Hyperoodon ampullatus* (Forster)), the Beluga *(Delphinapterus leucas* (Pallas)), the Killer Whale *(Orcinus orca* (L.)), the Bottlenose Dolphin *(Tursiops truncatus* (Mont.)) and the Common Dolphin *(Delphinus delphis* L.) are the prey of whalers in small ships and of the dolphin hunts which are carried out in numerous places in the world along the coasts or at the mouths of rivers.

WHALING

We have already seen above that man initially hunted the North Atlantic Right Whale, the Greenland Right Whale, the Californian Grey Whale, the Humpback and the Sperm Whale. While he only had at his disposal sailing ships, long boats propelled by oars and harpoons thrown by hand there could be no question of hunting any of the other large species. This is because these five animals are slow swimmers. Some of them, however, are known to be able to break into an "occasional sprint" which in the case of the Sperm Whale can be up to 16 miles per hour. Four or five miles an hour seems, however, to be their usual speed.

They can only achieve their top speeds when they have been some time on the surface. But the Sperm Whale often has to dive to the depth for his food. There are indications that these animals can dive to a 1000 metres and can remain under water for up to 90 minutes. When they surface again after such a deep dive they have exhausted their oxygen supply so completely that they are not capable of great speed.

The remainder of the above-mentioned species do not usually swim faster than 5 miles per hour; only the Humpback Whale is known to have a record speed of 10 miles per hour. A major factor in this respect is probably the thickness of their layer of blubber, which in the case of the Greenland Right Whale averages 50 cm but can reach a thickness of 70 cm in some places. For the Sperm Whale and Humpback figures of 12 to 18 cm are recorded. The thick layer of blubber is probably the reason why the carcasses of these animals stay afloat, although this is not always true of the Humpback.

The layer of blubber of the Fin Whale and Blue Whale has an average thickness of 8 to 14 cm, and that of the Sei Whale is certainly even thinner. This means that the carcasses of these animals do not stay afloat and that they must be inflated with the help of an air hose connected to their abdominal cavity if they are to be towed. Because of the thinness of the layer of blubber their bodies suffer much less quickly from overheating during rapid swimming than in the case of the "fat" species, and that is probably one of the reasons why the Blue Whale, the Fin Whale, the Sei Whale and Bryde's Whale are so much faster than the above-mentioned types. The first two are reported to have a sprint of 18 to 20 miles per hour and a cruising speed of 10 to 12 miles per hour, while the Sei Whale appears to have a top speed approaching 30 miles per hour.

This is the reason then why these fast rorquals were not hunted before the advent of steamships and harpoon guns. And this again is the reason why the year 1864 is regarded as the beginning of modern whaling and why the centenary of SVEND FOYN and the modern whaling industry should have been celebrated in 1964.

The fact that not so much emphasis was laid on celebration as had been hoped in whaling circles is attributable to the anything but festive state of whales and whalers in 1964.

How this came about will be clear to us when we realise just what a success the invention of SVEND FOYN has had.

STATISTICS OF THE CATCHES

Twenty years after the maiden voyage of "Spes et Fides" Norway alone had 34 land stations in operation, while in North and South America, in Japan, Korea, Australia and New Zealand numerous similar undertakings made a profitable living. The increasing demand for soap and margarine, which occurred about the beginning of the 20th century, the discovery of how to harden fats and the great exploratory expeditions to the Antarctic continent gave rise to the development of Antarctic whaling, which began in 1904 with a land station on South Georgia. With the use of floating factories, which with their fleet of catchers could operate everywhere in the open sea (Figs. 13, 15), this activity grew into a modern industry in which between 1930 and 1940 Norway, England, South Africa, Panama, Japan, Germany, the United States and Chili took part.

The last three countries did not return to the Antarctic after the war, but the Netherlands and Russia joined in, and the fleet grew from 15 floating factories and 129 catchers in 1946/47 to 21 floating factories and 261 catchers in 1961/62. After that the decline began. In 1963/64 16 expeditions with 190 catchers took part in Antarctic whaling.

Initially Norway took the lead here, also after the second world war. Gradually, however, Japan forged ahead and in 1963/64 the fleet consisted of 4 Norwegian, 4 Russian, 1 Dutch and 7 Japanese expeditions. There were also changes in the pattern of the catch. In 1932/33 it consisted of 80% Blue Whales and 20% Fin Whales. In 1951/52 the figures were 20% Blue Whales, 74% Fin Whales and 6% Humpbacks, while in 1963/64 the floating factories caught a total of 112 Blue Whales, 13,870 Fin Whales, 2 Humpbacks,

8,286 Sei Whales and 101 representatives of other baleen whales. To this must be added the catches of 37 land stations and 7 floating factories operating outside the Antarctic (the floating factories in the Northern Pacific; Fig. 16), the catches of South Georgia and the Sperm Whale catch, so that the total for the whole season comes to 63,119 large cetaceans. Antarctic whaling with floating factories yielded 216,450 tons of oil, with a value of something of the order of £ 16 million. When the value of the meat and other products is added, the total yield is of the order of £ 25 million.

The fact that notwithstanding these impressive figures whaling, at least in Western Europe, is no longer a lucrative business has gradually become evident to everyone from the newspaper reports of recent years. In the last two years only Japan and Russia have actually caught the quotas allocated to them as part of an international agreement. England participated for the last time in Antarctic whaling in 1962/63, and it has been reported in the press that in 1963/64 the Netherlands flag was flown for the last time on a whaler in action.

How difficult it has become to operate profitably can be seen immediately when the statistics of the catches are expressed in B.W.U. per C.D.W. B.W.U. stands for Blue Whale Unit, which is 1 Blue Whale or 2 Fin Whales or 2½ Humpbacks or 6 Sei Whales. C.D.W. means Catcher's Days Work, i.e. the catch per catcher per day. From 1953/54 to 1958/59 the yield in B.W.U. per C.D.W. in Antarctic waters remained practically constant. It amounted to 0.98, 0.91, 0.99, 0.95, 0.90 and 0.94 respectively. From 1959/60 to 1963/64, however, the corresponding figures were 0.73, 0.69, 0.51, 0.50 and 0.41 (Fig. 10) in spite of an increase in the average tonnage of the catchers in the last five seasons from 633 to 709 gross tons and in the average power from 2557 to 3011 I.H.P. (Fig. 11).

These simple data, comprehensible to everyone, are sufficient in themselves to give the impression that the rorqual stock in Antarctic waters has been seriously depleted, that reckless exploitation has been carried out here for many years and that drastic measures

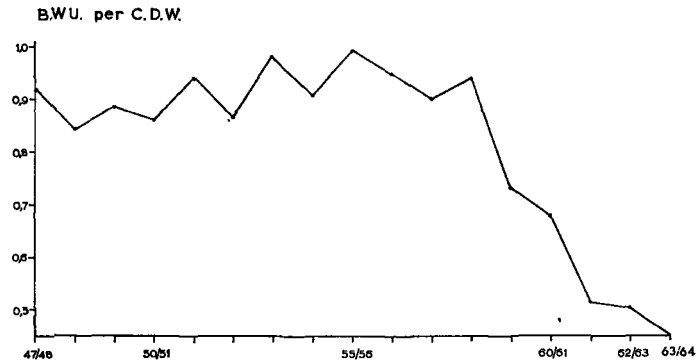

Fig. 10. The number of B.W.U. (Blue Whale Units) per C.D.W. (Catchers' Days Work) caught by the floating factories in antarctic waters from 1947/48 to 1963/64.

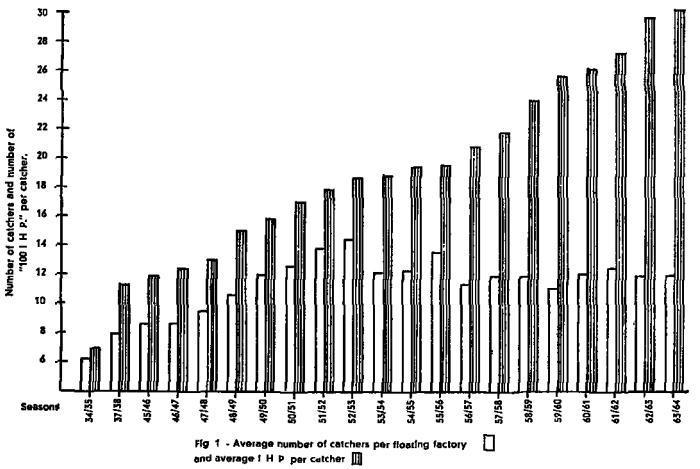

Fig. 11. This figure shows the increase of the power of the catchers in antarctic waters from 1934/35 to 1963/64. By mutual agreement between the companies the number of catchers per factory ship has been reduced again in recent years. *Norsk Hvalfangst-Tidende 53*, 1964, p. 221

will be necessary to save what there is to be saved. It is no wonder therefore that all this has provoked great disquiet not only amongst nature preservationists, who are worried about the continued existence of the largest animals which have ever lived on earth, but also in such organisations as the F.A.O., to which the world's reserves of food are of great concern, and not least of course in the International Commission on Whaling usually called the International Whaling Commission (the I.W.C.), the organisation in which the representatives of the governments of 17 whaling nations come together.

THE INTERNATIONAL CONVENTION

The I.W.C. is based on the International Convention for the Regulation of Whaling, which was signed on 2nd December 1946 in Washington DC. It includes all whaling nations with the exception of Spain, Portugal and Gabon, while Chili, Ecuador and Peru have signed a convention of their own with slightly different regulations.

The aim of the Convention is to exploit the present whale stocks in such a way that their volume is not reduced and that this source of oil and meat and other valuable products is preserved for posterity. The "schedule" of the Convention contains a number of regulations to this end. Thus, for example, capture of the Greenland Right Whale, the North Atlantic Right Whale (including the Southern variety) and the Californian Grey Whale has long been forbidden, except for hunts made here and there by the local population for these animals and which are on a very limited scale. As a result of all this it may be assumed that the population of Greenland Right Whales has been increasing again in recent years, also in North Atlantic waters. In the Davis Strait and Baffin Bay, and even off Labrador and New Foundland, they are sighted now and again. At the 1965 meeting of the I.W.C. Canadian scientists reported the increase in number of the species in the eastern Canadian Archipelago; during the summer they are quite common in Beaufort Sea. There is no certainty, however, that this stock has

grown from the original population. It is not impossible that immigrant North Pacific animals have formed the basis for a new Atlantic stock. The North Atlantic Right Whale and the Californian Grey Whale have also increased markedly in number in recent years, so that there is a hope that the complete protection of the Blue Whale and the Humpback in Antarctic and North Atlantic waters will have the same effect.

In addition, there is a minimum length limit for the various species hunted, it is forbidden to shoot calves or mothers accompanied by calves (lactating females), there is an open and a closed season and there are certain areas where whaling with floating factories is forbidden, at least as far as baleen whales are concerned. The most important rule, and that which presents the greatest difficulties in the discussions of the I.W.C., is that fixing the catch limit in B.W.U. for the floating factories operating in the Antarctic. This limit, which restricts the total catch of all these ships, amounted to 16,000 B.W.U. up to 1952/53, and then 15,000 (with an interval in 1960/61 – 1961/62 when there was no limit) and was subsequently reduced in 1963/64 to 10,000. In 1962/63 and 1963/64 it was not even possible to reach this limit in the time available. The catches were 11,306 and 8,429 B.W.U. respectively.

CONTROL

Whaling is regulated by the Bureau of International Whaling Statistics in Sandefjord and control is carried out by the officials of the government under whose flag the ship sails. Initially it was thought that this control could be regarded as reasonably reliable. In recent years, however, doubts have reached such a peak that plans were drawn up for an international control organisation. Each country participating in Antarctic whaling with floating factories will have the right to station observers on board other ships. The agreement was signed in 1963, but could not be put into effect in 1963/64 because of administrative and technical difficulties which appear to be so great that in 1964/65 it was again impossible to implement the agreement. There is moreover certainly a

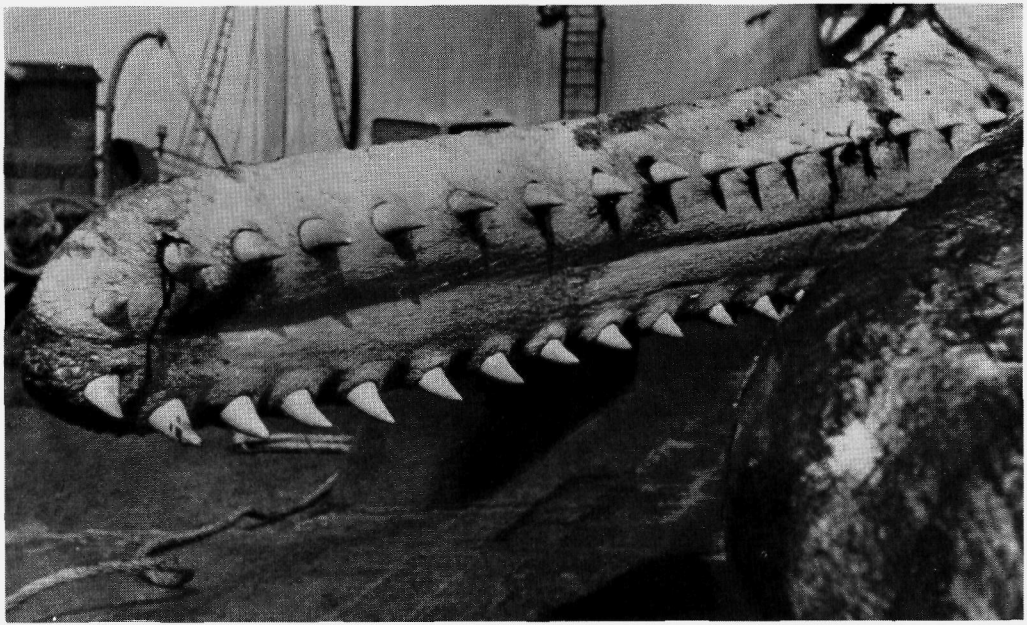

Fig. 12. Lower jaw of a Sperm Whale. The teeth yield ivory of very good quality, which is used for the manufacture of piano keys and small ivory objects. Photograph: W. VERVOORT, Leiden

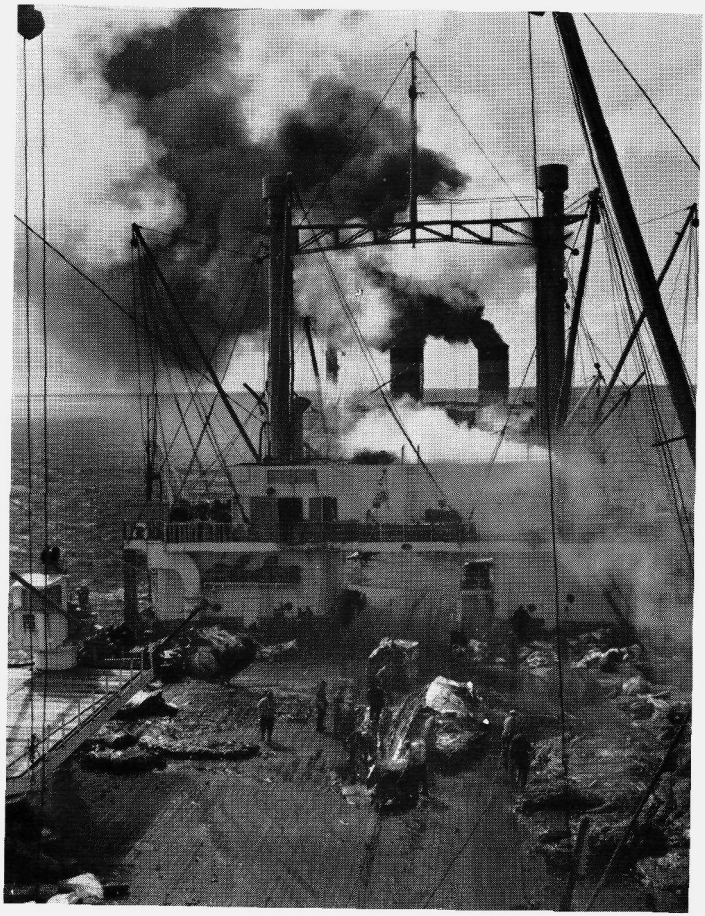

Fig. 13. Whale carcasses undergo further processing on the forward deck of the modern whaler, the "Willem Barendsz", after having been stripped of their layer of blubber on the after-deck (*flensing deck*). The meat can be deep-frozen and transported in separate refrigerator ships. It makes excellent food and has approximately the same taste as beef. It is widely eaten in Japan. Photograph: W. L. VAN UTRECHT, Amsterdam

need for such an agreement since in the last few years in particular there have been some very unpleasant occurrences which probably would not have happened if efficient control had been carried out.

Thus, for example, the explanation for the sudden disappearance of the Humpbacks from the waters in which the Eastern Australian and New Zealand land stations operate could be that in 1960/61 in Antarctic waters 4,000 Humpbacks were probably shot illegally and in 1961/62 a further 1,000. A number of Antarctic whaling expeditions on their homeward voyage in 1962 caught 371 Sperm Whales in the Indian Ocean, of which 125 had a length of 38 ft and 104 a length of 39 ft. In 1963 under the same circumstances 2,004 Sperm Whales were caught in these waters, and 1,210 of them were described as being 38 ft and 336 as 39 ft in the International Whaling Statistics; in 1964 1,581 out of 4,248 Sperm Whales had a length of 38 ft. Thirty eight feet is namely the minimum allowable length for the Sperm Whale, and everyone with knowledge of the industry knows that the fact that 60% of the animals were just the right length means that a very large number of undersized animals were administratively stretched to 38 ft. On a very modest scale this also happened occasionally in the Antarctic with respect to all species, but the impression is that this tendency has been growing in recent years, and this not only has an unfavourable effect on the stocks, but also renders the statistics unreliable. Since the statistics form the basis for all calculations of the population, it becomes very difficult to obtain a picture of the numerical trends in the stock. In the case of the Sperm Whale moreover, disregard of the length limit is extra harmful as it is almost the only restriction on the hunting of this animal. This length limit protects by far the majority of the females, of which in the waters concerned few attain a length of 38 ft. The fact that in the three seasons mentioned above approximately 50% of the catch in the Indian Ocean consisted of females is a clear indication of how necessary improved control in fact is, particularly because the same phenomenon is shown by the statistics of catches of Sperm Whales in the North Pacific (1964).

Because of the nature of the problem all measures taken by the I.W.C. to achieve its aims must be based on a thorough knowledge of the population dynamics of the animals concerned, while this in turn must be based on a thorough knowledge of their way of life, reproduction, migratory habits and other biological data. Special institutions for research on whales in England, Norway, Russia, Japan, the Netherlands (the former Netherlands Whale Research Group T.N.O.), Australia, the U.S.A. and Canada have been occupied ever since the second world war (and some even in pre-war days) in gathering and processing these data. In the last few years Chili and Peru have also begun to participate in the investigation. Add to this the very large volume of data on whaling published by the Bureau of International Whaling Statistics since 1927 and one obtains a wealth of detail available on few other animals living in their natural habitat.

Of the data obtained as a result of investigations by these institutions, mention should be made first and foremost of those concerning reproduction. In the course of the years tens of thousands of ovaries have been examined, an investigation which is facilitated by the fact that in the great whales the corpora albicantia (the connective tissue which constitutes the remains of the corpora lutea) do not disappear from the ovaries after some time, but remain in these organs for the whole of the rest of the animal's life (Fig. 17). This permits a determination of the number of times a particular animal has ovulated during its life. It is unfortunately not possible, however, to determine how many of these ovulations have resulted in pregnancy. With the help of these data, the pregnancy percentage of the females caught, the length of the foetuses and other information, it has been shown that the Fin Whale may be assumed to ovulate on average 2.8 times in two years, that it gives birth to one calf every two years and that it becomes sexually mature when it is approximately six years old. In the course of its whole life it probably produces an average of 12 calves (Fig. 18). During the first year of life the natural mor-

tality rate amongst the calves is probably fairly high; after this, however, it is thought to be slight.

Luckily there are means to determine the age of the animals with a degree of accuracy acceptable at any rate for statistical purposes. Use is made of organs in which there are indications which can be correlated with periodically recurring phenomena in the life of the animal. Put more simply, we may say that these animals have organs in which there are growth rings. Professor J. T. RUUD (Oslo) has used the baleen plates for this purpose since 1940. An investigation carried out by Mr. W. L. VAN UTRECHT and Mrs. C. N. VAN UTRECHT-COCK (Amsterdam) has revealed, however, that while these are suitable for providing information on the very recent life of the animals (e.g. the sexual cycle in the last 5 years), they can only be used to determine the age of animals belonging to the three youngest age groups. Much better prospects as far as this is concerned are presented by the ear plug, an elongated cone of a wax-like substance which is found in the external auditory meatus of the Baleen Whales (Fig. 19). The base of the cone embraces the top of the long tympanic membrane with the form of a glove finger. In this ear plug layers can be distinguished, which can be regarded as something in the nature of growth rings.

The only difficulty is that opinions differ as to how these layers must be interpreted. At first two layers per year were thought likely, but recent counts on ear plugs of Fin Whales which had been marked before 1940, and whose minimum age was thus known, tend rather to indicate one lamella per year or one and two lamellae in alternate years. The difficulty in the whole age question is that up to now no older animal of known age has been caught. This could be arranged by marking a large number of calves with special marking projectiles (Fig. 14), although this course meets with resistance from the gunners, who consider that it does not accord with their honour as hunters; Australian biologists have shown, however, that marking does not harm the animals, particularly if a special small mark is used. Moreover, for the calculations of the whale population trend it does not make very much difference whether a year is represented by one or two

layers in the ear plug since the only concern is to compare the catches of consecutive years, i.e. to ascertain the age composition trend of the stock.

Fig. 14. The whale marks of the National Institute of Oceanography in England consist of a 27 cm long stainless steel tube with a head made of lead. It is shot from a specially designed gun or a modified harpoon gun. The whale gives practically no evidence of fright when hit by the mark, and its body suffers no damage of any significance. Most of the marks are recovered from the muscle of the animals. SLIJPER, 1962

For the calculations of the whale population trend the above-mentioned data are supplemented by those resulting from the marking of whales. Before the second world war the "Discovery Investigations" had already fired off about 5,000 marks, and in the last 20 years ships of various nationalities, but particularly the Japanese, have added several thousand more.

The marks which are recovered can indicate not only the migratory movements of the animals, but also the number of the stock. If the number of marks recovered, for example, is 2% of the number of animals caught, and if the catch is a representative sample of the stock, it may be assumed that the total number of marked animals represents 2% of the stock. This calculation is only valid, however, if all the marks shot are recovered. This will of course never be the case, so that one must estimate how many have been lost. The fact that the estimate of this varies between 50% (Norwegian investigators) and 25% (Japanese, whose processing method is more intensive) means that certain reservations must be held with respect to this method.

With the help of knowledge of the trend in the catches in connection with the capacity of the whaling vessels, the above-

mentioned data on the reproduction, the age composition of the stock and changes in this composition, and using estimates of the size of the population, biologists of the Scientific Committee of the I.W.C. tried repeatedly in the years 1950-1960 to gain an insight into the situation of the Fin Whale stock in the Antarctic. The fact that the average length of the whales caught decreased from 67.9 to 66.8 ft between 1947 and 1960 could certainly not be called alarming. A fact which was disturbing, however, was that the percentage of immature animals rose from about 14% to about 30%. This could be an indication of a decline in the stock, but the change could equally well occur if the population were increasing. Moreover nothing was known of the effect of the constantly increasing competition between the floating factories and the catchers, which could very well have led to the selection of young, inexperienced and thus more easily caught animals.

Calculations based on the age composition also indicated an unfavourable situation, but in view of the very limited data and the lack of reliability of the method of age determination, this information was not convincing either. In addition, it was by no means certain that the age composition of the catch could be considered as representative of that of the stock. It has since emerged that the English and Norwegian investigators were not so far from the truth with their calculations, but the basic data underlying their work were so questionable at the time and had so many gaps that the results were anything but suitable for trying to convince the economically interested parties. That it was desirable to limit the catch was clear to everyone; that it was an absolute necessity, however, could not be proved, particularly as the catch expressed in B.W.U. per C.D.W. fluctuated around the same figure from year to year and there was no clear evidence of the effect of the increase in the capacity of the catchers on this indicator. The main reason was that there was no clear idea of the effect of the limited processing capacity of the factory ship on the yield of the catchers. This capacity can have a limiting effect on the catch since it is forbidden to build up large stocks of unprocessed animals.

As a result of all this it gradually became clear that the above-mentioned biological institutions were capable of collecting the basic data, but that the further processing and interpretation should be entrusted to experts in the field of population dynamics. The International Whaling Commission appointed for this purpose in 1960 a committee of three experts, namely S. J. HOLT (F.A.O., Rome), Prof. Dr. D. G. CHAPMAN (University of Washington, Seattle), and K. R. ALLEN (Pacific Biological Station, Nanaimo, B.C.). At a later date they added a fourth member, J. A. GULLAND (Fisheries Laboratory, Lowestoft).

In order to obtain the basic data for the work and to be able to gauge their value, the committee had two long meetings with the Scientific Committee. All the data which the institutions possessed were made available. Together with the ten thousands of punched cards of International Whaling Statistics, these were processed with the help of electronic computers. The final report was presented to the I.W.C. in 1963, while a supplementary report was put forward for discussion in 1964 in Sandefjord. The year 1964 was important as regards the whole question since as early as 1960 "the Commission declared their intention to be that the Antarctic catch limit should be brought into line with the scientific findings not later than 31st July 1964, having regard to the provisions of Article V (2) of the Convention".

All members of the Scientific Committee who saw the committee of experts at work and also saw its results were amazed at what it was able to achieve with the data available. Without this help it would never have been possible to arrive at such conclusive results. On the other hand, however, it should also be mentioned that the committee was fortunate to the extent that it had access to a large number of very recent Japanese data on the age composition of the stock, that the catch figures of 1960-1964 were sufficient in themselves to demonstrate the sharp decline in the stock and that a decrease in such a stock happens to be easier to prove as the situation deteriorates.

The committee approached its task in very different ways. It used various non-interdependent data and methods and with the help of both the whalemarks and of the yield trend and age composition trend arrived at identical results. It introduced a new unit for the catch (number of animals per C.D.W. in relation to the average tonnage of the ships), it carried out separate calculations for the various areas of the Antarctic and established a correlation between the age and length of the animals which made it possible to convert into ages the length of animals caught as shown in the International Whaling Statistics. This applied only to the younger age groups, but they were found to provide sufficient information to calculate the mortality rate by comparing successive seasons.

Taking the present situation as a starting point the committee first calculated what the optimum population of Blue Whales, Fin Whales and Humpbacks in Antarctic waters would be. By optimum population is meant a stock which remains constant at a maximum catch. This is naturally smaller than the maximum population of Blue Whales which is assumed to have existed in 1905 and that of Fin Whales in 1930. When whales are caught from such a stock, the number initially decreases. As a result more food becomes available, the duration of life and the birth rate increase and the natural deaths decrease. A number of animals are caught which would otherwise have died a natural death, and finally a new balance is reached: the optimum stock. On the basis of the existing populations the optimum stock consists of 100,000 Blue Whales, 200,000 Fin Whales and 15,000 Humpbacks. The last figure relates only to the Eastern and Western Australian sectors. As regards the other Antarctic areas, no calculations were possible owing to a lack of accurate data on the Humpback. The population of Blue Whales and Humpbacks was probably optimal in the years before the second world war, and that of the Fin Whale about 1950. From an optimum stock of this size approximately 6,000 Blue Whales, 1,000 Humpbacks and 20,000 Fin Whales per annum could be taken.

The committee also came to the conclusion that on 1st July 1963 the stock in Antarctic waters consisted of 1,000 to 1,500 Blue

Whales, 1,000 to 1,500 Humpbacks (in the Australian sectors) and 40,000 Fin Whales, and that the maximum allowable catch, i.e. a catch which would allow the stock to remain at the same level, was 200 Blue Whales, 100 Humpbacks and 4,800 Fin Whales per annum. Any catch quota below this amount will cause the stock to increase again. If it is desired to reach the optimum stock and thus the maximum catch again as quickly as possible, the catching of Blue Whales and Humpbacks will have to be discontinued completely for 50 years and that of Fin Whales for 8 years.

The Scientific Committee of the I.W.C. declared itself to be in complete agreement with the conclusions of the committee of four. It considered them highly reliable from the first, but its trust was still further strengthened by the committee's forecast for the 1963/64 season. This forecast made in July 1963, was that with the fleet used in 1962/63 not more than 14,000 Fin Whales could be caught in 1963/64, despite a total limit of 10,000 B.W.U., which would mean in fact approximately 17,500 Fin Whales. The catch was 13,870 using 89% of the capacity of 1962/63, but with considerably better weather than in the previous season, which compensated for this 11% decline.

MEASURES TAKEN

In 1963 the International Whaling Commission already took into account to a limited extent the conclusions of the experts by completely forbidding hunting of the Humpback in Antarctic waters and only allowing hunting of the Blue Whale between latitudes 40° and 50° South and longitudes 0-80° East. According to Japanese investigations, there is in this area of the Kerguelen a separate stock of so-called "Pygmy Blue Whales", a dwarf race in which the animals become sexually mature at a length smaller than 65 ft (the Blue Whale at approximately 75 ft). In addition, they have a shorter tail and shorter baleen plates in relation to the body length. The animals have also been observed in Australian and South African waters, but are said to exist in the above-mentioned area,

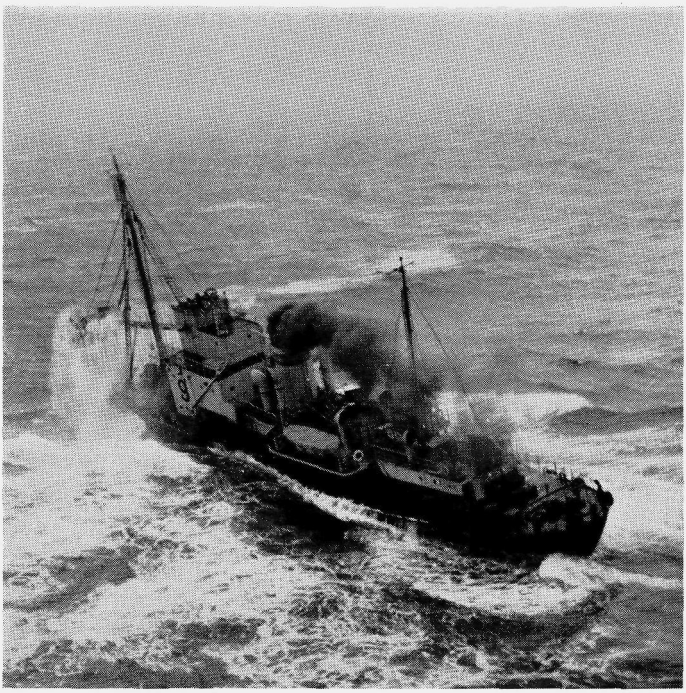

Fig. 15. A catcher of the "Willem Barendsz" crosses the bow of the factory ship at full speed. Note the crow's nest in the mast for the look-out and the gangway between the bow and the bridge. Photograph: W. L. VAN UTRECHT, Amsterdam

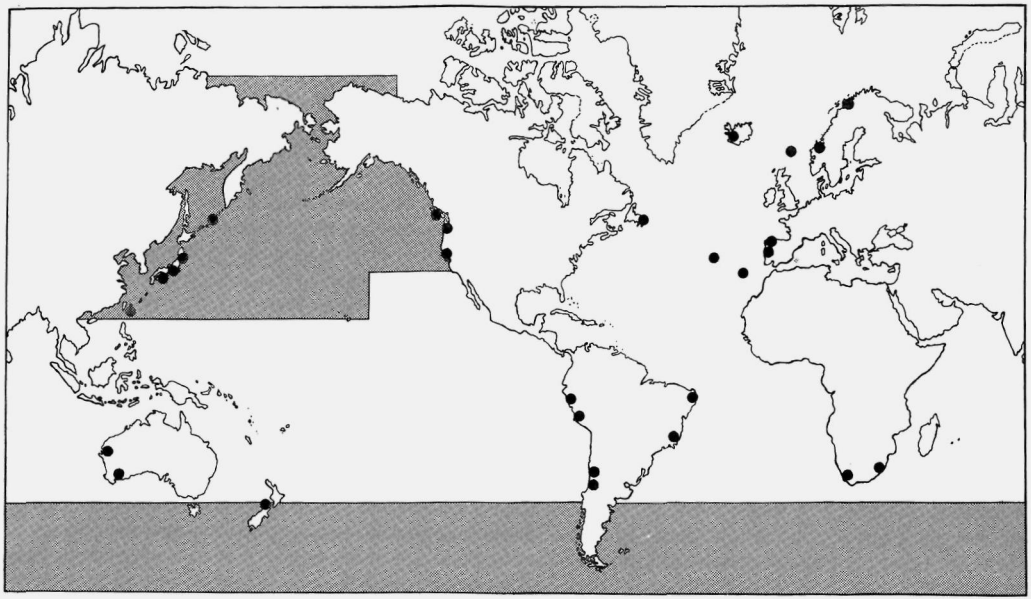

Fig. 16. This chart shows the locations of the land stations which were in operation in 1963. In the waters depicted in grey the catching of baleen whales with the help of floating factories was permitted in the 1963/64 season. *Norsk Hvalfangst-Tidende* 53, 1964, p. 197

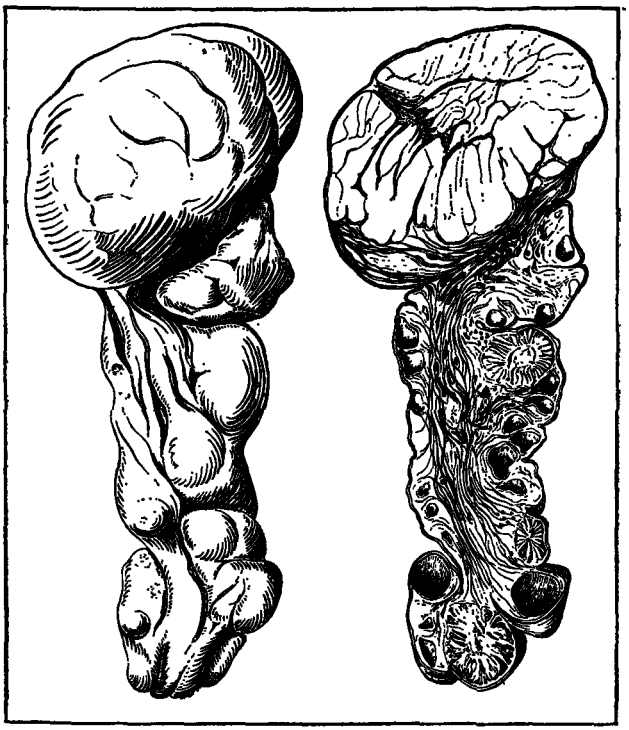

Fig. 17. Ovary of a pregnant Fin Whale with (right) a longitudinal section of this organ. At the top is the yellow body (corpus luteum), which is formed after bursting of the follicle and fertilization of the egg. It continues to function until the end of the pregnancy. The ovary also contains several white bodies (corpora albicantia), which are evidence of earlier ovulations, together with a number of follicles (dark patches).
SLIJPER, 1962

particularly in the summer, as a separate and still very seldom hunted population.

Blue Whales and Humpbacks have been caught in such small numbers in recent years that the above-mentioned measures required barely any sacrifice on the part of the whaling industry. When it is realised, however, that for the 1963/64 season the I.W.C. authorised a catch of some 17,500 Fin Whales, while the situation only permitted a catch of 4,800, it is no wonder that an actual catch of 13,870 Fin Whales caused a further considerable deterioration of this situation. The committee of experts has calculated that in 1963/64 the stock decreased to 35,000 animals with a maximum allowable catch of 4,000 per year and (with the same whaling capacity as in 1962/63) a maximum possible catch of 12,000 in 1964/65. The committee also calculated that if the 400 Blue Whales per annum considered allowable by the Japanese in the Kerguelen area were to be taken, these would include 70 ordinary Blue Whales since it is impossible to differentiate between these animals and the "Pygmy Blues" until they are lying dead on the deck. The Kerguelen sector is the only Antarctic area in which a reasonable stock of ordinary Blue Whales still exists. In the other sectors hardly a single specimen of this species was observed last season, although this must certainly be partly attributable to the fact that the whaling was mainly carried out at low latitudes. As a result of all this the I.W.C. decided in 1964 to forbid the catching of the Blue Whale throughout the Antarctic. Since Japan, Russia and Norway have signed a protest against this resolution, however, the rule was not applied in 1964/65. Only 19 Pygmy Blue Whales and one ordinary Blue Whale were caught in that season, however.

A number of international nature conservancy bodies, including the World Wildlife Fund, and other institutions including first and foremost the F.A.O., have made an urgent request to the International Whaling Commission to apply also effective measures with respect to the Fin Whale. The F.A.O. has even stated that it will withdraw its assistance in the investigation into population dynamics if the Commission does not make good its promise of 1960.

.The I.W.C., and more specifically the four countries economically interested in the Antarctic laid particular stress, however, on the clause "having regard to the provisions of Article V (2) of the Convention" contained in the promise. And Article V (2) under d states that: "(The amendments of the Schedule) shall take into consideration the interests of the consumers of whale products and the whaling industry". At the meeting in 1964 the I.W.C. has interpreted this to mean that it is not the importance of supplying food for the human race in the long run which is of primary concern, but rather the direct financial gain. In 1964 therefore the biologists did not succeed in persuading the governments concerned to take the necessary and, it must be admitted, very drastic measures. Even during the meetings in fact it was found to be impossible to obtain the 75% majority vote required to carry any resolution, so that the limit of 10,000 B.W.U. would have remained if Norway, the Netherlands, Japan and Russia had not agreed amongst themselves not to exceed 8,000, although the experts had calculated that it would only be possible to catch 7,000 B.W.U. at the most. The accuracy of the Commission's calculation emerged when the catch of the 1964/65 season was found to amount to 6,984 B.W.U., made up of 19 Blue Whales, 7,305 Fin Whales and 19,845 Sei Whales. Four thousand Fin Whales can be regarded as having been the allowable amount, so that the stock of this species has certainly decreased still further.

All this was lamentable, even if it was perhaps not difficult to understand in view of the fact that 8,000 B.W.U. have a value of approximately £ 25 million, that the ships represent a heavy investment and that the question arises who is to compensate the interested parties if whaling is discontinued. In addition, there is the aspect of the need for the products. As regards the need for fats in the world as a whole, whale oil, which forms 2% of the world production of fats and 4-5% of the production of animal fats, plays a very subsidiary role. Nevertheless, there are countries, such as Japan, where not only the oil but primarily the meat is of quite considerable importance.

THREAT OF EXTINCTION?

The question which naturally occupies the nature preservationists is to what extent there is a threat of extermination of these whales if no appropriate measures will be taken. This depends primarily on how long it is still possible to go whaling without financial loss. Probably it will have to be discontinued before the populations have been so depleted that their recovery is no longer possible. It also depends on whether the rules regarding the Blue Whale and the Humpback are observed and on whether in the warmer waters reserves still exist from which the ravaged stocks in Antarctic waters could be supplemented if no more were caught.

In the investigation into the distribution of whales on the basis of observations made by ships' officers and crews, which was begun in England and continued in the Netherlands on a larger scale, there were indications that not all Blue and Fin Whales and not all Humpbacks migrate every year to the cold waters. A more detailed study will be needed to show whether these indications are correct and also whether it is a case of animals occasionally missing a season in the colder waters or whether there is perhaps a more or less permanent stock in the warm areas, from which the Antarctic could possibly be repopulated. It is also possible that as the total stock is reduced, the percentage of animals remaining in the warm latitudes increases since the food situation no longer forces them to migrate. An indication of this was the fact that the majority of the North Atlantic Humpback stock probably no longer migrates so far north as in former times. A more detailed investigation into this aspect will probably not be easy to carry out since it is extremely costly and the whaling industry at the present time will be anything but willing to provide large sums for the purpose.

The enormous catch of Sei Whales in the 1964/65 season has posed new problems for the biologists. It is unmistakably linked with the sharp decline of the stocks of Blue and Fin Whales. The question is, however, to what extent this decline could contribute to a real increase in the stock of Sei Whales. That this may have

been the case is not completely beyond the realms of possibility as, owing to the considerable reduction in the numbers of the two other species, large quantities of food became available for the Sei Whale, to which whalers used to pay little attention in former days. An indication tending to substantiate such a hypothesis is to be found in a recent publication of BANNISTER and GAMBELL (1965), who on the basis of catches and of observations from helicopters showed that, in the area off Durban at least, the number of Sei Whales has actually increased recently. It is not to be expected, however, that this can have much influence on the stock in the Antarctic, particularly as the catch of this particular species was so much larger last season. The committee of four is even of the opinion that the catches in that season far exceeded the maximum allowable.

On top of all this, there is the fact that the whale situation is precarious not only in the Antarctic, but also in other areas where whaling is practised. In North Atlantic waters the Blue Whale and the Humpback are already protected, while in recent years not more than some 500 Fin and Sei Whales have been caught. But the alarm is sounding in particular for the North Pacific, where last season in an area only a quarter of the size of the Antarctic 7 floating factories and 17 land stations caught no less than 18,300 whales. The sharp increase in the whaling capacity in these waters in the last few years has prompted the I.W.C. to appoint two separate committees, one of biologists and the other of government representatives, which will have the task of examining the special problems of this area. As a first result of the activities of these committees the I.W.C. decided in 1965 that from 1966 onwards full protection shall be given to Blue and Humpback Whales, in the North Pacific.

Moreover, in recent years there has also been less optimism than hitherto with respect to the future of the Sperm Whale. A special committee of the I.W.C. made a study of this subject in November 1963, while the results of calculations published in a recent work indicate that the maximum allowable catch along the Pacific coast of South America has now been reached or possibly

even exceeded, so that any further increase in the catch will lead to a decline of the stock.

The whole picture is a very sad one, and about 1st January 1965 it could thus be said that of the Spes et Fides in whaling fostered by SVEND FOYN, only the hope still remained. Since then faith has not yet been completely restored, but developments have taken place which have done something to relieve the bleakness of the future of whales and whaling.

THE MOST RECENT MEASURES

The largely unsatisfactory result of the meetings in 1964, and the strong protest from the F.A.O. which followed, prompted the I.W.C. to convene a special conference from 3rd to 6th May 1965, which was entirely devoted to the problem of the catch in Antarctic waters. The committee of four, all members of which were present, had calculated that 4,000 Fin Whales and 3,000 Sei Whales (2,500 B.W.U. in all) could be regarded as the maximum allowable catch for 1965/66. As regards the Sei Whale, this estimate is perhaps somewhat conservative as so few reliable data are available as yet for the calculation of the population dynamics of this species. Although the I.W.C. was not able to reach a decision on the very small quota of 2,500 B.W.U., it may be said that in comparison with previous years a considerable step was taken in the right direction. It was unanimously decided to fix the total maximum catch in 1965/66 in the Antarctic at 4,500 B.W.U., a step which for Japan in particular represents a great economic sacrifice. The sharp criticism of that country in articles published recently in the New Scientist (Vol. 26, pp. 358 and 416, 1965) must therefore certainly be regarded as undeserved, as is borne out by the fact that the F.A.O. representative at the conference expressed his appreciation of the resolution.

Obviously, the final aim has not been reached by this reduction from 8,000 to 4,500 B.W.U. At the same time, however, the Commission decided unanimously that all members shall press their governments to make further reductions in the quota in the

next two seasons. With regard to the 4,500 B.W.U. a new sentence of paragraph 8a of the "Schedule" to the Convention reads: "There shall be a reduction for the years 1966/67 and 1967/68 that will assure that the total catch for 1967/68 will be less than the combined sustainable yield of the Fin and Sei stocks, as determined on the basis of more precise scientific evidence". In this way it is hoped to introduce for the 1967/68 season a quota which is lower than the maximum allowable catch, so that from then on the stocks will have an opportunity to recover. May this decision act as a spur to induce in the governments concerned a growing sense of responsibility for the preservation of the reserves which the earth provides for mankind.*

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* To Gulland (1965) the only solution of the difficulties in maintaining the stocks seems to be that whales must belong to someone, most appropriately to the United Nations or one of its specialised agencies. This is an optimistic and attractive idea, but doubtless it will raise many and probably unsurmountable juridical objections.

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Fig. 18. As the whale calves are born under water (singly in 99% of cases) and must be able to swim with the mother immediately, they are very complete when they emerge. The pregnancy lasts approximately eleven months and the calves are born in warm waters. After their birth the young are fed for about six months by the lactating mother; suckling takes place under water. A Blue Whale has a length of about 7 meters and a weight of some 2,000 kg at birth. The young found inside pregnant females taken in antarctic waters have often already attained a considerable length, like this foetus from a Blue Whale (5.20 m). The shooting of pregnant females unfortunately cannot be avoided or prohibited since in the water the two sexes of these rorquals are very similar. Photograph: W. L. VAN UTRECHT, Amsterdam

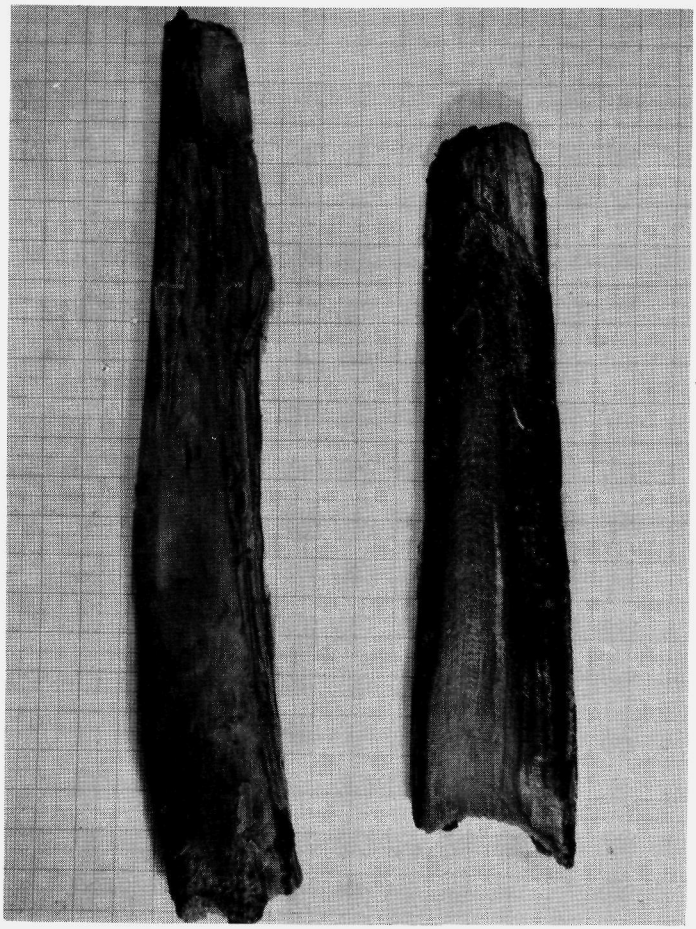

Fig. 19. Two ear plugs of a Fin Whale. The right one has been cut lengthwise so that the layers, or growth rings, can be seen. Photograph: W. L. VAN UTRECHT, Amsterdam

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PUBLICATIONS OF THE NETHERLANDS COMMISSION FOR INTERNATIONAL NATURE PROTECTION

"Mededelingen" (Information Bulletins)

1929 *Nos. 1–6*, the contents of which include: account of the foundation-meeting of the Commission on 10 July, 1925; account of the formation in July, 1928, of the "Office International pour la Protection de la Nature" at Brussels; and correspondence with the Netherlands Indies and other countries.

1929 *No. 7*, containing: correspondence with the Netherlands Indies; resolutions adopted at the Fourth Pacific Science Congress at Bandung in May, 1929; and the establishment of the Albert Park in the Belgian Congo.

1930 *No. 8*, containing: correspondence with the Netherlands Indies; the whale-population; hunting in the British Colonies; and resolutions adopted at the 7th International Ornithological Congress at Amsterdam in June, 1930.

1931 *No. 9*, containing: correspondence and information about nature protection and laws concerning hunting and the protection of game; trade in animals; the "Congrès International pour la Protection de la Nature" held in Paris, June 30–July 4, 1931; report on an expedition to Abyssinia by Messrs. B. PH. BARON VAN HARINXMA THOE SLOOTEN and G. A. BROUWER; and a list of nature reserves in countries other than the Netherlands.

1934 *No. 10*, containing: information about the protection of nature in the Netherlands East and West Indies; account of the International Conference for the Protection of Fauna and Flora in Africa, held in London in November, 1933; nature protection in various countries (including the history of the

foundation of the Kruger Park); threatened animal species; and a list of extinct animal species.

1935 *Supplement to No. 10*, containing: information about the protection of nature in the Netherlands Indies by CH. KIÈS; survey of the data received from the Netherlands Indies, with biological annotations in respect of various animal species by JHR. F. C. VAN HEURN and Mrs. A. HEYNSIUS-VIRULY.

1937 *No. 11*, containing: information from the Netherlands Indies and other countries; threatened animal species; protection of the primitive races (especially in New Guinea); first registration of the elephant herds on Sumatra's East Coast, Sumatra's West Coast and Tapanuli by JHR. F. C. VAN HEURN; lecture by F. J. APPELMAN, October 11, 1935; a reserve for Varanus komodoensis by W. ESHUIS JR.; and other articles.

1938 *No. 12*, containing: report on the investigation concerning protection of the Papuan Mountain Tribes in Netherlands New Guinea; a survey of wild life conditions in Atjeh, with special reference to the Orang-Utan, by C. R. CARPENTER; a survey of the fixed trek-routes of elephants in South Sumatra, and some data on rhinos by W. GROENEVELDT.

1947 *No. 13*, containing a treatise on fauna and nature protection in Netherlands New Guinea by J. H.WESTERMANN.

1952 *No. 14*, containing the report on a journey to the Udjung Kulon Game Reserve, Java (1950) by A. HOOGERWERF.

1955 *No. 15*, containing articles on modern whaling and biological investigations with regard to whales by JOHAN T. RUUD and E. J. SLIJPER; zoological investigations in the Albert Park, Belgian Congo, by R. VERHEYEN; Indonesian orchids and

their preservation by L. COOMANS DE RUITER; Varanus komodoensis by A. HOOGERWERF; nature protection in Surinam and the Netherlands Antilles by J. H.WESTERMANN.

1955 *No. 16*, containing a map (scale 1 : 400,000, year 1938) of part of Northern Sumatra, showing the Gunung Löser Game Reserve and adjacent reservations as well as some proposed nature reserves; explanatory notes by JHR. F. C. VAN HEURN.

1956 *No. 17*, containing a report on a tour to East Africa and the Belgian Congo, 1955, by F. J. APPELMAN; and an article on nature protection, also by F. J. APPELMAN.

1959 *No. 18*, containing an article on the contribution of zoological gardens to the preservation of wild fauna, by F. J. APPELMAN; a report on vanishing and threatened species in the Netherlands, by G. A. BROUWER; data on bears and beavers in Europe, and on the Eldi deer, Mesopotamian Fallow deer and the Przewalski horse, by C. H. J. MALIEPAARD; data on land conservation, fauna preservation and game management in East Africa and New Zealand, by F. J. APPELMAN.

1965 *No. 19*, containing a commemoration of F. J. APPELMAN by J. H. WESTERMANN; and an article on modern whaling, by E. J. SLIJPER.

"Bijdragen" (Contributions)

(Reprints of articles in the Dutch language on international nature protection, from *Natuur en Landschap*, periodical of the 'Contact-Commissie voor Natuur- en Landschapsbescherming').

1961 *No. 1*, containing an article on the Serengeti National Park, Tanganyika, by F. J. APPELMAN.

1962 *No. 2*, containing articles on recent developments in the

delta of the Río Guadalquivir, Spain, by P. G. DE VRIES, and the Charles Darwin Foundation for the Galápagos, by F. J. APPELMAN.

1963 *No. 3*, with the following contributions: The Italian National Park Gran Paradiso, by M. F. I. J. BIJLEVELD; Nature Emergency Fund, Netherlands, by LEONHARD HUIZINGA; Commercialization of game on behalf of fauna protection, by F. J. APPELMAN; limnology and protection of nature, by P. LEENTVAAR.

1964 *No. 4*, containing: The World Wildlife Fund, its first two years, by M. F. I. J. BIJLEVELD; the Pribilof Islands, by G. J. VAN OORDT; In memoriam Professor Dr. Victor van Straelen, and the national parks of Congo and Rwanda, by F. J. APPELMAN.

1965 *No.5* containing: In Memoriam F. J. Appelman, by A. SCHEYGROND; the evolution of the concept of nature protection, by FRANÇOIS BOURLIÈRE (Dutch translation of his article in I.U.C.N. Bulletin, New Series, No. 10, 1964); man and nature in the Soviet Union, by S. P. TJALLINGII.

Copies of the Information Bulletins Nos. 10-19 may be had at f 3 a copy. Copies of the Contributions to *Natuur en Landschap* may be had free of charge.

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