NOTORNIS

VOLUME NINE, NUMBER TWO - SEPTEMBER, NINETEEN SIXTY

ADELIE PENGUIN ROOKERIES IN THE ROSS SEA REGION

By H. J. HARRINGTON

Most of the Adelie Penguin *(Pygoscelis adelie)* rookeries that are known in the Ross Sea were visited in the 1955-1956 season, and briefly described by Austin (1956, *Bird Banding*). A record of any additional work carried out until the end of March, 1959, and known to the writer, is given in the following notes. Work done in the 1959-60 season is not discussed. Emperor Penguin rookeries were discussed in an earlier note (*Notornis* VIII, No. 5, July, 1959, pp. 127-132), but the discovery of Emperor Penguin and Adelie Penguin rookeries on Beaufort Island can now be recorded. A previous unpublished radiocarbon date is given for the Adelie Penguin colonisation of Beaufort Island. The location of skuaries is mentioned, along with records of nesting sites of the Snow Petrel *(Pagodroma nivea)* and Wilson's Petrel *(Oceanites oceanicus)* in the Cape Hallet district. The writer wishes to stress that he is not an ornithologist, and that visits to penguin rookeries were incidental to geological work with the New Zealand Geological Survey Antarctic Expedition, 1957-58, and the New Zealand Geological and Survey Antarctic Expedition, 1958-59.

Hallett Station: This large rookery was discovered by the ice-breaker, U.S.S. *Edisto,* in the 1955-1956 season. It is on Seabee Hook, which is a low spit projecting into Moubray Bay from the cliffs of Cape Hallett 70 miles south of Cape Adare. In the 1956-1957 season when the joint United States-New Zealand I.G.Y. station was built, the rookery was examined by the biologist Dr. Carl Eklund while *en route* to Wilkes Station (pers. comm.). A photograph of the rookery and observations made in the 1957-1958 season have been published by Harrington and McKellar (New Zealand Journ. Geol, Geophys., Vol. 1, 1958, pp. 571-6). They collected a flattened frozen body from the base of the 15 inches thick surface accumulation of bodies and guano, and its age, determined at the Nuclear Sciences Division, D.S.I.R., by the radiocarbon method using pieces of bone, is 1210 + — 70 years. From this age they inferred that the rookery was first colonised about 400 to 700 A.D.

When Hallett Station was built a large area was levelled by heavy machinery, and there was some difficulty in preventing the birds from re-invading the building area. It has been feared that this operation might damage the structure and stability of the rookery. However, Captain J. Cadwalader, U.S.N., who was at the station when it was built, informed me that there were then few birds nesting on the lower scree slopes of Cape Hallett at the eastern end of Seabee Hook, but that in the following year nests were spread much higher on those slopes. Apparently the birds displaced from the station area had the common sense to move and were not permanently driven away. In the 1957-1958 season it was noticeable in fact that no birds attempted

to re-occupy the station site, and the oil drum fence that had been built to keep them out was not needed. Similarly, they did not occupy tractor roads through the rookery. In the 1958-1959 season, Dr. W. Sladen spent a few days at this rookery during a visit by the U.S.S. *Staten Island.*

Antarctic Skuas *(S. skua maccormicki)* at Cape Hallett nest on a large triangular beach at the eastern end of Seabee Hook. By the end of the 1957-1958 season nearly all the adults and most of the chicks reared in the 1957-1958 season had been ringed, mainly by Mr. W. Ingham, a geophysicist with the first over-wintering party. The adults were guarding eggs and week-old chicks in mid-December, 1957. The chicks commenced their first short flights about 9th February and were all flying strongly by 19th February.

It is probable that some Skuas nest on the flat bare rocky areas on the top of Cape Christie, 6 miles away across Moubray Bay and Edisto Inlet. Scattered Skua nests and Wilson's Petrel nests were found also on Honeycomb Ridge, 20 miles to the north of the station on the west side of Moubray Bay. Snow Petrel and Wilson's Petrel nests also abound on the cliffs of Cape Christie and Felsite Island and on other cliffs and bare rock areas along the western side of Edisto Inlet, and there is a large Snow Petrel breeding area with accompanying Skua nests on the warm and lovely granite ridges surrounding Crater Cirque at the junction of the Tucker and Whitehall glaciers 28 miles S.S.W. of Hallett Station. Some scores of nests were seen under rock slabs, and the total population may be very large for a dense and large cloud of Snow Petrels flying towards it from feeding areas in the pack ice was observed by the writer in the 1958-1959 season from the deck of an ice-breaker lying about 25 miles off the mouth of the Tucker Glacier. The chicks were in adult plumage, but were not flying in mid-January, 1958.

Of all the stations in the Ross Sea, Hallett Station is the most attractive for ornithological and other biological work. Access to some of the breeding areas around the station is difficult after the sea-ice breaks up early in January, but would be improved if a helicopter or a small ice boat were stationed there. Topographic maps of the district compiled by E. B. Fitzgerald, are in course of publication by the New Zealand Geological Survey (D.S.I.R.) and the Lands and Survey Department.*

Cape Crozier: The Cape Crozier Adelie Penguin and Emperor Penguin rookeries were visited by G. Caughley (biologist) and M. Robb from Scott Base early in the 1958-1959 season before the departure of the Emperor Penguins and their chicks. In early January, 1959, Dr. W. Sladen and R. Penney flew to the larger Adelie rookery by helicopter from the U.S.S. *Staten Island* to do some banding, and in mid-January the writer and other members of the New Zealand Geological and Survey Antarctic Expedition travelled overland to Cape Crozier from Scott Base. During this visit no Emperor Penguins were seen save a lone chick bobbing about on a small ice-floe near the shore. The Emperor Penguin rookery is on sea-ice which forms during

* Since these notes were written, a summary of some of the results of a 1959 study of the penguins and skuas at Hallett Station has been provided by the biologist B. E. Reid in Antarctic II. 6, 1960, 211-213. He has estimated the population of the penguin rookery as 100,000 adult birds. The topographic map compiled by E. B. Fitzgerald has also been published.

winter in deep narrow gashes or inlets in the slowly moving face of the Ross Ice Shelf. Every few years an old gash must be abandoned as it moves seawards, and a new one must be adopted as its entrance opens and becomes accessible from the sea. Wilson and Cherry-Gerrard in their narratives of work done by the first and second Scott expeditions, have given good accounts of the troublesome and changing obstacles on the final approach to the Emperor Penguin rookery formed by the cliffs of Cape Crozier and the chaos of crevassed and shattered pressure ridges where the Ross Ice Shelf forces against the base of the cliffs. In daylight it can be easy to avoid descending the cliffs by approaching the rookery through the pressure ridges, but for regular visits during a prolonged examination it would be preferable and time-saving to have a heavy hammer, some light crow-bars or pitons and 500 feet of climbing rope to establish fixed ropes down one of the less steep faces on the cliffs.

The Adelie Penguin rookeries at Cape Crozier are easily accessible overland. The larger western rookery is indeed very large and densely populated, and might contain half-a-million or more adult birds. It spreads inland for nearly a mile on snow-free hillsides and shallow gulches which rise to a height of several hundreds of feet above sea-level. The penguins have fairly easy access to the site *via* a short boulder beach. Not all the available bare rock area is used by the penguins, possibly because parts of it are too far from the beach. The eastern rookery a few hundred yards away is much smaller, the population being only a few tens of thousands of birds, though the area available for colonisation is many square miles in area. Access is difficult for the penguins *via* the surf on steep low rock cliffs, and this eastern rookery must be regarded as an "overflow" from the main site. At it the layer or surface crust of guano and bodies is thin and patchy, whereas at the lower end of the main rookery it is many feet thick. This great thickness is caused partly by the funnelling of traffic through the lower part of the rookery, but even so it indicates that the main colony is no younger than those at Hallett and Beaufort Island, and might be older. A search in the deposit for bodies or bones that could be dated by the radiocarbon method was unsuccessful because the guano deposit is decomposed to a featureless brown humus. Survey stations established by B. Alexander have provided ground-control for compiling maps of this rookery from U.S. Navy air photographs.

Skua nests at Cape Crozier are concentrated near the upper ends of Adelie Penguin rookery, but solitary nests were found as far south as the top of the cliffs above the Emperor Penguin rookery. In mid-January a few Skuas were hatching eggs, but most were guarding chicks up to a week or a fortnight old.

Beaufort Island: In mid-January, 1959, a large new Adelie Penguin rookery was discovered on a beach below the south-western cliffs of Beaufort Island. A distant photograph of these cliffs has been published by Harrington (1958, p. 601). Captain J. Cadwalader informed me that the possibility of a rookery occurring there was first raised by Dr. W. Sladen, who noticed possible guano stains on the lower parts of the cliffs when passing the island in the U.S.S. *Staten Island* in mid-January. He sent a signal to Captain Cadwalader in the U.S.C.G. *Northwind* asking for an inspection by helicopter. Captain Cadwalader confirmed the existence of a large rookery, and Mr. R. Penney was

landed there, made a preliminary examination and banded a group of birds. On 23rd to 25th January, E. B. Fitzgerald (Surveyor), Dr. Charles Johnson (U.S. Geological Survey), G. Caughley (biologist, Scott Base) and the writer were landed there for 48 hours from the U.S.S. *Arneb* by courtesy of Captain Cadwalader. The rookery is of about the same size as that at Hallett Station, and mainly occupies a beach half-a-mile long and up to 400 yards wide formed by progradation of storm-wave beaches parallel to the base of the cliffs. A small part of it is on a remnant of a 100ft. moraine bench at the foot of the cliffs, and it was probably the guano stain on it that was first noticed by Sladen.

A pit was dug by Johnson and the writer through one of the main beach hummocks occupied by the birds, and disclosed a little over 2ft of guano and bodies. This deposit was not frozen hard like the Hallett deposit, and was wet and stinking and nearly as decomposed as the deposits at Cape Crozier. However, after some searching the body of a chick suitable for radiocarbon dating was found 3 inches above the base of the deposit. Its bone material was dated by the Nuclear Sciences Division, D.S.I.R., and the result, 1150 + — 45 years, indicates that this rookery was first colonised at about the same time as the Hallett rookery, that is no later than 800 A.D., and possibly as early as 400 A.D. It is interesting to note that the thicknesses of the guano deposits at Adelie Penguin rookeries provide a rough measure of their relative ages.

The skuary at Beaufort Island is on a sloping shelf above the cliffs, 600ft. to 1000ft. above the rookery. Some birds were sitting on eggs, and others had not laid eggs. The breeding dates of this Skua colony therefore appear to be about the same as at Cape Bird, a week or two later than at Cape Crozier, and a month later than at Cape Hallett.

It was suspected that there might be another contemporary or abandoned penguin rookery on a 25ft. bench on the north side of the island. A photograph of this bench taken from an ice-breaker, has been published (Harrington, N.Z. Journ. Geol. and Geophys., Vol. 1, 1958, p. 600). An attempt to visit it during the 1959 landing was foiled by weather and lack of time, but subsequently Mr. Stephen O. Wilson of the United States Antarctic Program, has informed me by letter that he observed an Emperor Penguin rookery on that bench while passing it on the U.S.S. Glacier on 5th November, 1956. The writer did not observe Emperor Penguins on it, or in the adjacent sea, when passing the island on the U.S.S. *Glacier* on 12th December, 1958, but probably by that time the birds had departed to the open sea. If the birds nest only on the bench, and not on the adjacent sea-ice, the rookery must be a small one. Emperor Penguin chicks observed on ice-floes in McMurdo Sound by Captain Cadwalader may have come from Beaufort Island, or from Cape Crozier, or from an undiscovered rookery.

A detailed map of Beaufort Island has been prepared from Mr. Fitzgerald's ground surveys and U.S. Navy aerial photographs and is about to be published by the Lands and Survey Department. The site of the Adelie Penguin rookery has been named Cadwalader Beach. At its northern end there are fine warm camping sites, or a site for a small hut, adjacent to a fine stream of snow-melt water. Access by sea is normally easy, but can be difficult if pack ice has accumulated along the shore.

Cape Bird: The three smaller rookeries at Cape Bird were visited by Caughley, Fitzgerald, Johnson and the writer following the visit to Beaufort Island. The colonies are distributed along a coast several miles long which nearly everywhere seems suitable for penguin occupation. The southern rookery seems to be expanding and flourishing, and is on a large 100 ft. moraine bench some distance inland. At its southern end Caughley located the group of birds that had been banded by Austin in the 1955-1956 season, and did further banding. The middle rookery is on a low gravel fan at the lower seaward end of a broad valley draining from cliffs below the Mt. Bird ice-cap a mile inland. In recent years it has suffered the disaster of being nearly washed away by a flash flood, probably caused by the sudden eruption of a sub-glacial stream from the ice-cap. Only a few remnants of the rookery remain perched on gravel patches a foot or so above the present outwash fan. This flood seems to have occurred since the visit by Austin, and possibly in the 1957-1958 summer. Many of the displaced birds may have moved to the southern rookery. Judging from the thickness of remnant patches of guano the middle rookery had been occupied for only, say, 400 years, but this could not be confirmed because no material suitable for radiocarbon dating was found. Nevertheless this general area may have been colonised for as long as the Hallett and Beaufort Island rookeries, for areas of weathered guano were found at places that have not been inhabited recently. At one place, on a 5 ft. beach to the south of the middle rookery the old biological deposit was not obvious, because the surface gravel had weathered clean, but it showed up as a distinctive brown layer when a shallow trench was scraped out with an ice axe. Long abandoned rookeries might be found at other sites in the Ross Sea region in the same way. The northern rookery is on a slope of glacial outwash where the edge of the ice-cap descends to sea-level at Cape Bird. The total population of all three Cape Bird rookeries seems to be comparable with the population at Cape Hallett and Beaufort Island, say roughly somewhere between 70,000 and 200,000 adult birds.

Skua nests at Cape Bird are as usual close to the penguin rookeries, but are found at many other places on bare rock areas to heights of 400ft above sea-level, and particularly on the top of the white trachyte headland a mile south of the southern rookery. At the time of our visit a few Skuas were guarding chicks, most were sitting on eggs, and a few had not yet laid eggs.

Cape Royds: The small Cape Royds rookery has been visited frequently in recent seasons, mainly by sightseers calling at the Shackleton hut, but also by biologists including G. Caughley and R. Penney in the 1958-1959 season.

Near it there is an old abandoned rookery marked on the Shackleton expedition's detailed map of Cape Royds.*

Koettlitz Glacier Moraine: In his book on the first Scott expedition, Armitage records that he observed a concentration of Skuas while travelling from Hut Point to the Blue Glacier across the rough hills of moraine lying on the ice of the lower part of the Koettlitz

* Since these notes were written, full-time work by two biologists in the summer 1959-1960 on the penguins and skuas of the Cape Royds district has been reported by E. C. Young in **Antarctic** II, 6, 1960, 225-228. The population of penguins is about 1300 adult birds.

Glacier at the head of McMurdo Sound. These birds may be living on the shell-fish which are found stranded on the surface of sea-ice in McMurdo Sound, or may be flying further afield for feeding, but there is also a slim chance that they might be "farming" an undiscovered penguin rookery in that district.

Franklin Island: At the south-west end of Franklin Island a very large Adelie Penguin rookery occupies a beach similar to Cadwalader Beach at Beaufort Island. Since it was discovered by Borchgrevink in 1900 this colony seems to have been visited only once, by the biologist R. Barwick, who landed from H.M.N.Z.S. *Endeavour* in the 1957-1958 season (see Brodie, New Zealand Journ. Geol. and Geophys., Vol. 2, 1959, pp. 108-119).

Inexpressible Island, Terra Nova Bay: A small Adelie Penguin rookery on Inexpressible Island near the northern end of Terra Nova Bay was found by the Northern Party of Scott's second expedition in the 1911-1912 summer. It has been described by Levick, who was surgeon to the Northern Party, in his book on penguins. The U.S.S. *Glacier* spent two days at Terra Nova Bay in December, 1958, and several helicopter flights were made, but the rookery was not observed. High-level oblique aerial photographs of the district have been examined by the writer, but the rookery could not be located on them.

Wood Bay and Mt. Melbourne: Borchgrevink early in 1900 found an Adelie Penguin rookery towards or at the head of Wood Bay, on a beach similar to that at Cape Adare, but apparently no-one has since been sufficiently far into Wood Bay to re-observe it. The writer has observed on a U.S. Navy aerial photograph, that a light-coloured area, similar to guano staining, is visible near sea-level on the northern slopes of Mt. Melbourne on the southern side of Wood Bay. If a rookery exists there, it is possibly not the one recorded by Borchgrevink. In an earlier note (*Notornis* VIII, No. 5, July 1959, pp. 127-132) it was suggested that there may also be an Emperor Penguin rookery on the bay ice of Wood Bay.

Possession Islands: The Possession Islands are a cluster of 9 small islands and stacks which are erosional remnants of a large volcano, lying off the northern entrance to Moubray Bay and Hallett Station. They are clearly visible at times from the Station, and on the north-west and largest island (Possession Island, *sensu strictu*) Sir James Clark Ross in 1841 discovered an Adelie Penguin rookery, which apparently spreads well inland to a height of 300ft. and is very large. Access to the rookery is from a long boulder beach on the south-west coast of the island. The colony has been visited since then by Borchgrevink in 1900 and by Austin.

Cape Adare: This large rookery is on a large triangular boulder beach, similar to those at Cape Hallett, Beaufort Island and Franklin Island. It is a very large rookery, comparable in size with the main rookery of Cape Adare. Borchgrevink and the Northern Party of Scott's second expedition both built huts on the beach, and both published maps and photographs of the beach and rookery. It was also described by Levick in his book on penguins. In recent seasons Sladen was landed there early in 1959. It is possible that there are other undiscovered rookeries in the Cape Adare district, near the head

of Robertson Bay. It seems, that except possibly at Cape Adare, none of the rookeries in the Ross Sea region occupy all the bare-rock space available for colonisation.

Balleny Islands: Commander Price Lewis, Jnr., captain of the U.S.S. *Staten Island,* has informed me verbally that he spent some days cruising in the vicinity of the Balleny Islands in January, 1959, while *en route* to Wilkes Station, and that a large number of Adelie Penguin rookeries were discovered there during helicopter reconnaissance flights in company with Dr. W. Sladen. Chin-strap Penguins *(Pygoscelis antarctica)* were observed, this being the first record of their occurrence in the Ross Sea sector of the Antarctic.

ACKNOWLEDGEMENTS

Most of the field work was made possible by sea and air transport generously provided by the U.S. Navy and the United States Antarctic Program scientists in the best spirit of international co-operation and assistance. Captain E. S. McDonald, Captain J. Cadwalader and Commander Price Lewis took a special interest in the geological and surveying work from which these notes on penguins are a by-product. Thanks are also extended to many Antarctic biologists for discussions about wild-life matters, and for a free exchange of views and information, particularly Drs. W. Sladen and R. Goldsmith, and Messrs. G. Caughley, J. Dearborn, H. Dewitt and R. Penney.

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KEAS AT ARTHURS PASS

By J. R. JACKSON

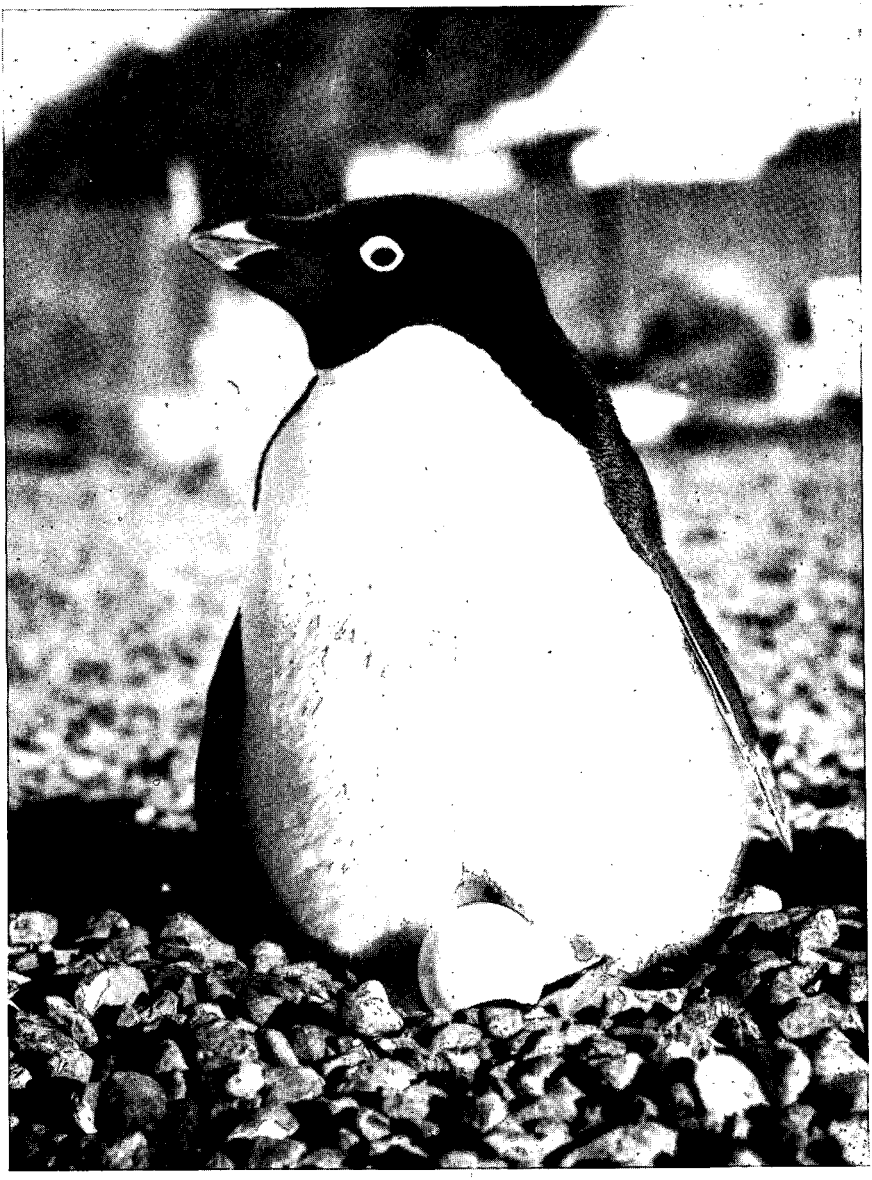
INTRODUCTION

In the years 1956 and 1957, 213 Keas *(Nestor notabilis)* were banded in Arthurs Pass National Park. There were 224 recoveries of 115 different birds, 94 recaptured and 130 by sight. For a sight record the band number was read either with the naked eye or through binoculars*. Where relevant I have included observations made in 1958, 1959 and 1960. The field work was done during 5 days in 1956 and 53 in 1957 well distributed through the year as the first line Table 3 shows.

The area studied is east of the alpine divide in Canterbury (see map). Up to 4500ft. is a forest of mountain beech *(Nothofagus cliffortioides)* and above is alpine tussock grassland and rock to the permanent snowfields above 6500ft. The highest peak is Mt. Rolleston (7453ft.) and all the dividing ridges rise to about 6000ft.

Previously I spent 7 years on the West Coast, where the Keas' range is in a different environment, in the Westland forest, a mixed forest with totara *(Podocarpus hallii),* miro *(Podocarpus ferrugineus),* rata *(Metrosideros lucida)* and *Dracophyllum traversii,* important trees for the kea. The Westland forest is found over Arthurs Pass in the Otira Valley.

* Below "seen" indicates a sight record.



[Photo by A. J. Heine

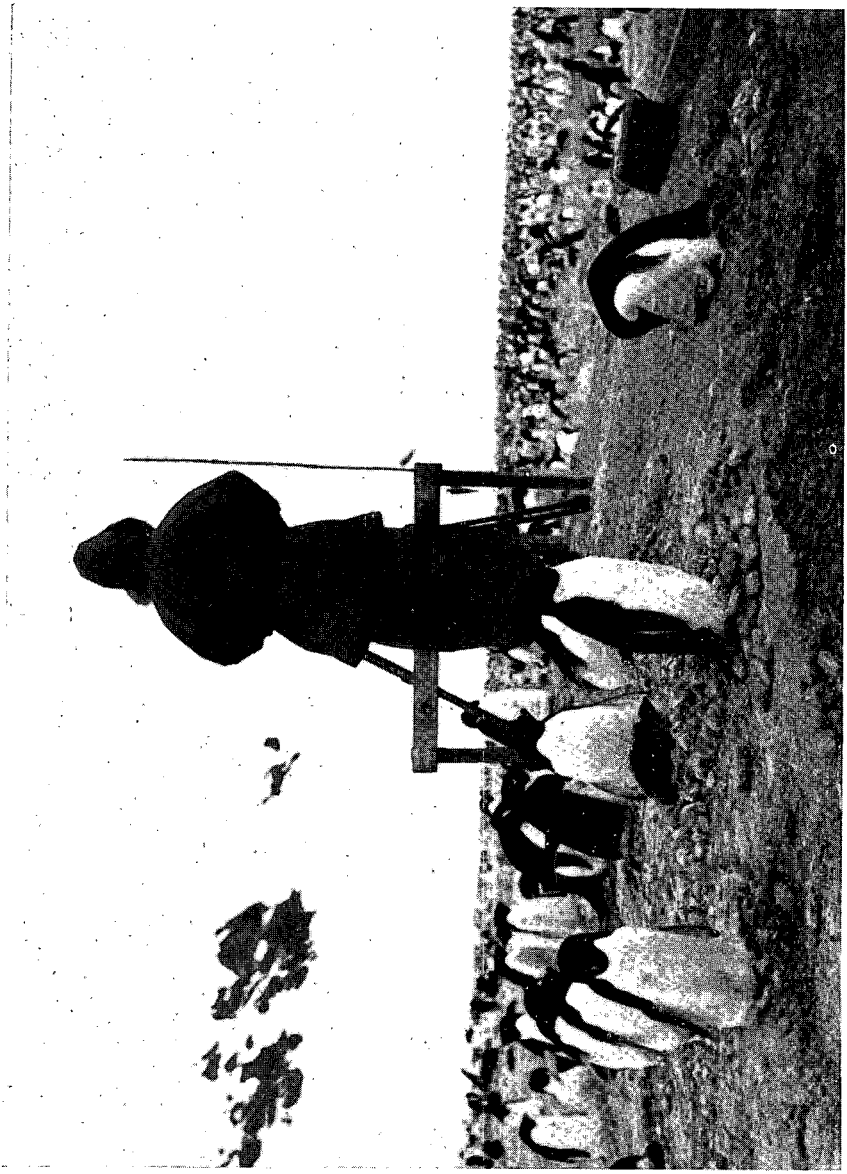
IX — Adelie Penguin **(Pygoscelis adeliae)** at Cape Hallett, Antarctica, mid-December, 1957.

[Photo by H. J. Harrington

X — Adelie Penguins at Cape Hallett showing nests of pebbles, chicks and the squabbling and peeking that keep the rookery continually in movement and noisy uproar.

[Photo by H. J. Harrington

XI — Adelie Penguins at Seabee Hook, Cape Hallett. Nests and young birds, a few weeks to two months old.



[Photo by A. J. Heine

XII — The rookery of Adelie Penguins at Cape Hallett with Brian Fitzgerald at work. N.Z. Geological Survey, Antarctic Expedition, 1957 - 1958.