

Appendix to NANKYOKUKI, the Report of the Japanese Antarctic Expedition, 1910-12

The Japanese Antarctic Expedition, led by Lieutenant Nobu SHIRASE, left Japan for Antarctica on board the *Kainan-maru* on November 29, 1910. In the first Antarctic summer the *Kainan-maru* did not succeed in penetrating the pack-ice into Ross Sea and turned north from 74°16'S on March 12, 1911. After six months, camping in Sydney, the *Kainan-maru* went again southwards and reached the Bay of Whales, where she encountered the *Fram*. A sledge journey toward south was carried out on Ross Ice Shelf, and on January 28, 1912, the sledge party attained to 80°05'S and 156°37'W and turned back, while the *Kainan-maru* made a survey of King Edward VII Land during the same period. After picking up the sledge party, the *Kainan-maru* returned to Japan on June 19, 1912.

This expedition was the first Japanese challenge to Antarctica and no expedition was undertaken until the recent time. The report of the Japanese Antarctic Expedition, 1910-12, titled NANKYOKUKI, was published on December 15, 1913. In this book, the operation of the expedition was reported in detail. Scientific results of the expedition, explanation of equipments, record of the navigation in the Antarctic Sea and others were compiled in the appendix to NANKYOKUKI. But this book was written in Japanese and does not seem to have been widely distributed abroad. Fortunately the appendix to NANKYOKUKI has been translated in English by Dr. Seiya UEDA, Earthquake Research Institute, University of Tokyo. Upon publishing this, the report of this former Japanese Antarctic Expedition will be printed in English serially in the future issues of the ANTARCTIC RECORD.

It is a regret that photographs in the original report could not be reproduced owing to their unclearness. (*Editor*)

CHAPTER I REPORT ON THE INVESTIGATIONS OF SPECIMENS COLLECTED IN THE ANTARCTIC REGION

Animals and Plants Collected by the Japanese Expedition

The only botanical specimen collected by the Japanese Expedition in the polar region was a small brown piece of a kind of seaweed. Although it is hardly possible to define its exact genus, for it is only a few inches long, part of the original which is presumably several feet long, it appears to belong to the genus *Sargassum*, the family *Fucaceae* *Phaeophyceae*.

As for animals, we collected the furs of seas [*Stenorhincus leptonyx* (DE BLAINVILLE) = *Ogmorhinus leptonyx*], birds, fishes, shrimps

and crabs. In the following, descriptions of these specimens will be given.

Birds Collected in the Antarctic Region

The birds collected amount to eleven species, of these all but two from Australia are sea-birds, mostly belonging to the *Tubinares* genus. Those which belong to the *Tubinares* genus are the following five species, whose peculiarities are: 1) their nostrils, which are not simple holes as those of common birds but penetrate into the small pipes longitudinally fixed to the root of the beaks; 2) their long and powerful wings, suited for distant flight; 3) their well developed webs.

1) A species of albatross [*Diomedea melanophrys* (BOIE.)], similar to the albatross of our country (Japan). The body is large, its length being about 2 feet 7 or 8 inches. The length of the wings is over 1.1 feet (when folded). The body is almost entirely white, with black stripes before and behind the eyes. The back and the wings are black-brown, and the part of the back between the wings is yellow. The tail is gray, only the stems of the feathers are white. The beaks are also large, being about 4.5 inches long. They are yellow-white in color, the top somewhat darker. The legs are yellow. This species is found predominantly on the Antarctic Ocean, but sometimes they are found as far north as in the northern Atlantic. Usually they live on the ocean, great number of them gather together on islands during the breeding season and live in cone-shaped nests. One bird lays only one egg.

2) A species of petrel [*Oymodroma melanogaster* (GOULD)]. Although this species is similar to that of the petrels in our country, it is different from the latter in the following points: the scales of the front-side of the legs are in a single line (those of the petrels in our country are in several lines forming a network-figure) and the nails are extremely flat (those of the petrels in our country are slender and hooked).

The body is thin and small, being a little more than 7 inches. The wing is comparatively long, amounting 6 inches. The body is mostly black-brown, the head being darker and the root of the wings being lighter. The loin is snow-white and the central part of the abdomen is brown. The beaks and the legs are black.

This species is widely distributed on the Antarctic Ocean and found as north as in the Bengal Bay and near the tropic in the Atlantic Ocean.

3) Snow-bird [*Pagodroma niven* (GMELIN)]. This species resembles the petrel of our

country more than the previous one, but the colour of its plumage is completely different. As its name indicates, the whole body is snow-white and only the beaks and legs are coloured, the former being black and the latter yellow. Its form is like the previous one but its size is larger, although it varies considerably. The larger ones are 1.4 feet in body-length and 9 inches in wing-length, while the smaller ones are 1.1 feet in body-length and 8 inches in wing-length.

This species is commonly found in the Antarctic Ocean, especially in the frozen area. None have been found in the northern hemisphere. It is reported that this species was collected in the Louis-Philip Land, Victoria Land and Falkland by expedition boats such as the "Rattlesnake" and the "Challenger".

4) Shearwater [*Thalassoeca antarctica* (GMELIN)]. This species is more or less akin to the shearwater of our country. The size is also about that of the shearwater, the body-length being 1.4 feet and the wing-length being 1 foot. The beaks are comparatively long, amounting to 1.4 inches. The back is brown, the wing mostly white, the rim of the wing brown, tail coverts and the tail white. The tip of the tail is tinged brown. The under side is also brown at the head and neck but is white elsewhere. The beaks are black and the legs are yellow. The distribution of this species is limited to the Antarctic Ocean.

5) A species of fulmar [*Daption capensis* (L.)]. Though this species appears to belong to the sea-gull family, it actually belongs to the petrel genus, the beaks having the pipe-shaped nostrils. This species is distinguished from the ordinary petrel by the peculiar grooves inside the beaks, shaped like the teeth of a comb.

The head is black, and the plumage of the rest of the back is black at the tip and white at the root. There are white spots in the central

part of the wings and the remex is coloured black and white. The under side is purely white below the breast, with indistinctly black feathers at the breast. The tail is white with a brown tip, and the beaks and legs are both black. The body is about 1.3 feet long, the wing is 8.5 inches long. This species is widely distributed in the South Seas, the northern limit being Ceylon.

6) There are two species of penguin in the collection of the expedition; one is the Emperor Penguin, *Aptenodytes forsteri* (GRAY), the largest of the penguins, and the other is the far smaller *Pygosceles adeliae* (HOMB. & JAGG.). The penguins are peculiar to the Antarctic Ocean and are not found in any other part of the world. Its body-form is extremely unusual, with many peculiarities. As the body is heavy and large, and the legs are at the end of the body as is commonly known, it stands erect and walks on land much like human beings, instead of keeping the body horizontally as do the other birds. The wing is as small and flat as the fins of fish, and the remex is so degenerated that is hardly recognizable. The function of the wings is, in fact, similar to that of the fins of fish. Thus, the legs of the penguin act merely as a rudder, whereas the legs of other water-birds perform the function of fins.

The plumage of penguin, being different from that of the other birds, is short and fine, and grows close to the body. It grows thick all over the body, much like the scales of fish. They molt once a year, in the autumn. When it molts, again different from the other birds, the feather of the body falls out in a mass. Since it is a kind of bird of the intensely cold region, the subcutaneous fat layer is remarkably thick, and the temperature of the body is sometimes over 100°F. In the breeding season, numberless penguins gather together on the rocks and islands, and make exceedingly crude nests on

a flat land in a cave by grass blades, gravels, dead leaves and etc. One penguin lays two white or green-tinged white eggs.

The food of the penguin consists mainly of the Crustaceans, the Cephalopodas, other Molluscas and fishes. It consumes a few vegetables and swallows a lot of small pebbles.

The Emperor Penguin inhabits Victoria Land and the wide area adjacent to it. Its body is more than 4 feet in body-length and weighs as much as 60~80 lbs. The back is dark gray, the head, the jaw, and the throat are black, and the breast and trunk are white. On both sides of the head, there are beautiful ellipsoidal yellow spots. The Adélie Penguin is far smaller in size: its colour is more or less like the Emperor Penguin, but it has no spots on the head. Its tail is exceedingly long. Its favorite habitats are the small ice crusts near the Antarctic.

7) A species of booby gannet [*Sula serrator* (a species of *Steganspodes*). This bird has great beaks with saw-like teeth-limbus, hairless from the lower beak to the throat. The body is white, the back, the face and the neck being slightly yellow-brown, and the remex of the wings are black. The body, the wing, and the beak are 3 feet, 1.5 feet, and 3 inches respectively. This species is distributed in Australian and New Zealand waters. As this species was not captured in the polar region, its photograph has been omitted from this report.

8) A species of jaeger [*Megalestris macrorhinus* (SAUNDERS) (a species of sea-gulls)]. This species, though belonging to the family of sea-gulls, is distinguished from the ordinary sea-gull by its cere at the root of the beak, which is like that found in the hawk and eagle. The whole body is brown, lighter on the under side than the back, and the neck and the breast are tinged slightly yellow. The wing and the tail are darker, and there are clear white spots near the center of the wings. The body, the wing, and the beaks

are 2.7 feet, 1.3 feet, and 2 inches long, respectively.

This species, discovered by Mr. McCORMIC of the "Erebus" in 1841, is also found exclusively in the Antarctic Ocean.

Fishes Collected in the Antarctic Region

A fish captured by the Expedition Party at 164.5°W and 78.5°S in the Bay of Whales, January 1, 1912, has a scientific name of *Pleurogrmma antarcticum* (BOULENGER) and is customarily considered as belonging to the family of Leptoscops, to which the Japanese Parapecis also belongs. The species was first reported by the British ichthyologist BRANGE in 1902 in his study on the fishes captured by the British expedition boat, the "Southern-cross", in 1898-9. Several specimens of this kind collected at that time at 78°35'S are famous as the fish specimens captured at the farthest south than any captured before. The specimens at that time were reported to be about 165 mm long, but the specimen collected by this expedition was 170 mm long. The tail was destroyed for the most part and its form could not be ascertained. For the tail, therefore, we referred to Dr. BRANGE's figure in making our figure. It has two dorsal fins; the first one has 7 thorns and the second has 36 fin-rays. The anal fin has 37 fin-rays, the pectoral fin 19 fin-rays, and the ventral fin has 6 fin-rays. The number of scales is 53 along the lateral line and 14 along the transverse line.

Shrimps Collected in the Antarctic Region

A species of *Euphausia*. The total number of specimens collected are 18, and they have been preserved in alcohol. In most of them the major part of the first and the second tentacles are broken. Hence, none of the specimens possesses the spines. 8 of them lost the eyes, some lost most of the ambulatory legs, and some have broken dorsal carapace. Although the identification is difficult, owing to the poor state of preservation, it can be judged that they belong to the

Euphausia species from the nearly perfect uniformity of the structure of every pair of ambulatory legs. We referred to the report of "On the Euphausiaca Collected by the Challenger" by Dr. SAAS in trying to identify the species within the *Euphausia* species. The protruding outer tip of the scales of the second tentacle resembles that of *Euphausia antarctica*, but they are different in that the uropods are a little shorter than the telson, and in that its outer part is slightly longer than the inner one. A pair of small spines, more or less conspicuous, at the lower margin of the dorsal carapace are very similar to those of *Euphausia murrayi*. It was, however, unfortunately impossible to ascertain if its first tentacle coincides with that of *Euphausia murrayi*. The form of cephalic appendages well resembles that of *E. antarctica*, but we have no means of comparing it with that of *E. murrayi* for neither a description nor an illustration is available. In view of the above considerations it would be better not to classify the present specimens with respect to their species. Our specimens are all female, of which the largest one is nearly 5 cm long.

According to the report of the "Challenger", *E. antarctica* were collected at a point 65°49'S and 79°49'E (Station No. 153), and its larva at points not far from there (Stations Nos. 152 and 156). Therefore, Mr. SAAS, supposing it to be peculiar to the Antarctic region, named it *antarctica*. As *E. murrayi* was sampled in the Antarctic Ocean (Station No. 154) and off the coast of Kerguelen, it may be noticed that both of these species are inhabitants of the southern hemisphere.

The genus *Euphausia* belongs to the family Euphausiaca of the order Euphausiacea. Euphausiacea was first defined by Mr. BOAS in 1883. Before this time it had been classified as Schixopoda with Mysidacea, as was the case in the report of the "Challenger"

by Mr. SAAS. This species, except *Ben-
theuphausia*, all emit light, as is well known. This species is an oceanic crustacean, found as surface plankton, although it is also found in deep waters.

Crab Collected in the Antarctic Region

A species of crab (*Sesarma sp.*). Only one specimen, of which only the fifth leg remains on the left side, was collected. The third leg of the right side is now being reconstructed. Although it is hard to identify it because of the defects in the antennae, cephalic appendages, and carapace in the posterior region. That hairs in line were found in the merus and ischium of the third maxilliped shows that it is a species of the *Sesarma* species. The specimen is female, with the dorsal carapace, of which diameters are 14 mm and 12 mm.

Geology and Petrology

As for the geology of Antarctica, only very little is known today. This is partly because the expeditions that have gone to there have not yet covered all the coastal areas and mainly because of the very scarce outcrop of rocks: the rocks are mostly permanently covered by snow and ice. In the following, an outline summary of what is known at present of the geology of Antarctica will be given, referring to the various records of the expeditions so far made. The regions comparatively well studied are the Graham Land region facing South America and the Ross Sea region facing New Zealand.

The Andes Range of South America stretches to South Georgia via Staten Island, Burdwood Bank, and Shag Rocks, and then, turning southeast, reaches South Sandwich Islands via Clerke Rocks and Traverse Island. From South Sandwich Islands, it proceeds to west-west-south and, through South Orkney Islands, Clarence-Elephant Islands, and South Shetland, reaches the Dirk-Gerritz Archipelago, which is located at the northern end of

Antarctica. This mountain-chain forms an arc whose direction is quite similar to the Antilles between the South and North American continents. Besides the above mentioned mountain-chain, there is another mountain-chain which connects Antarctica with another continent: namely the one lying between New Zealand and the Ross Sea region. This mountain-chain enters Antarctica via Auckland Island, Campbell Island, and Balleny Islands. This stretches far into the heartland of Antarctica through the Admiralty Range and the Prince Albert Range and includes volcanoes such as the Erebus and the Terror. Although it is a problem of much interest, it is difficult, today, to give a definite answer to the interesting problem of whether the above described two mountain-chains are inter-connected or not. It has been, on the other hand, pointed out by Dr. GOURDON that the young volcanoes consisting of andesites and basalts in Graham Land and Shetland are an extension of the Andes in South America, and that it is an easy task to ascertain a close relationship between Antarctica and South America from petrological evidence. As for the relation between New Zealand and the Ross Sea region, however, reliable evidence has not been obtained to conclude that the young volcanic belt, running roughly south-north through the Erebus, the Terror, the Islands of Possession, Coulman, Franklin, and Beaufort erupted at the same age as the volcanic belt of andesites and basalts in New Zealand.

A brief comparison of the petrography of the Graham Land region and the Ross Sea region will be described below. In Graham Land, gneiss and granite resembling the latter constitute the basic element. In South Shetland, crystalline schist and quartzite are also found. These old gneiss and mica-schist, with interbedded cherty rocks, also crop out at 66°40'S and 89°30'E, indicating its Archeozoic age. Among the old igneous rocks, quartz

diorite and uralitic gabbro are found. In South Orkney Islands, the Ordovician age has been proved by the discovery of raptolite fossils accompanied by quartzite outcrop with *Radiolaria*. In Hope Bay, north-east of Graham Land, the fossils of *Sagenopteris*, *Thinfeldia*, *Cladophlebis*, *Pterophyllum* and *Otozamites* belonging to the Cycads and Conifers have been discovered. The strata yielding these plant fossils are, therefore, determined to be Jurassic in age. It is generally known that these fossils are found in Jurassic and Triassic of eastern Australia, India, South Africa, and Argentine. The existence of Jurassic has been made more reliable by the discovery of *Glossopteris* in Gondwana Land and *Phyllothea* in Falkland Islands. From these discoveries, the mild climate in Antarctica during the Jurassic period can be inferred. As for the Cretaceous fossils, numerous Ammonites have been collected in Snowhill Island, east of Graham Land. *Araucaria* and Beech, belonging to the Tertiary stratum, discovered in Seymour Island, indicate that the mild climate lasted through this period. In marine beds, probably of upper Oligocene or lower Miocene, the vertebrate of *Zeuglodon* and pieces of bones of five species of penguins were obtained. These would indicate that the penguins, peculiar to the Antarctica, have inhabited that region for a period of several hundred thousand years. In Cockburn Island, north of Seymour Island, a bed of conglomerate containing *Pecten* of the Pliocene age was found at 160 m above sea-level and was found to be identical with the Parana Bed in north Argentine and the Cape Fairweather Bed in south Patagonia. Younger volcanic rocks are seen at various places: andesite, its tuff and basalt in South Shetland, leucite basalt and its tuff in an old crater at 66°48'S and 89°30'E are the examples.

Now, let us examine the Ross Sea area. The basement is quite similar to that of the

Graham Land area. That is the Archeozoic rocks such as gneiss, granite and diorite similar to gneiss, and mica-schist, quartzite and crystalline limestone with condolite found there were similar to those of the latter. Camptonite, kersanite and banakite are also found. Over these basement rocks are found Beacon sandstones covering an extremely wide area. This Beacon sandstone layer was over 2,000 feet thick in parts. It extends over the area from Mt. Nansen, 75°S, up to 85°S, some 700 miles away. At 85°S, seven layers of limestone as thick as 3 to 7 feet, in which fossils of the trunks of *Pinus* exist, were found. This important thick bed belongs to upper Devonian or upper Carboniferous. A several hundred feet thick layer of limestone probably lower than the above mentioned ones, is exposed at Cape Royds. This includes a red-coloured layer and *Radiolaria*. A limestone layer was discovered between the Beacon sandstone at 77°S, 40 km south-east of Granite Harbour. The Mesozoic rocks such as were discovered in Graham Land have not been found in the Ross Sea area. Among the volcanic rocks and their tuffs, the following were found: dolerite, phonolite, trachyte, kentyte, hornblende basalt, olivine basaltic tuff. The order of eruption of lavas of the volcanic islands in the Ross Sea area seems to have been as follows: trachyte, kentyte and basalt. The volcanic chain runs approximately along the meridian passing through the volcanoes Erebus and Terror area the Islands of Beaufort, Franklin, Coulman and Possession. The most interesting fact in interpreting the relation between the young volcanic rocks and the old rocks is that the ancient sediment called Beacon sandstone bed, which is in contact with the volcanic line and which covers an area of several hundred miles, is a horizontal sedimentation nearly everywhere except where there have been particular local disturbances. This appears to indicate that the eruption of

the young volcanic line was caused not by any major geological agent, such as the crustal folding probably relevant to the formation of Antarctica, but through some minor fissures formed at the time of the formation of Ross Sea, which was probably due to a small depression. The rock samples collected by the SHIRASE party from King Edward VII Peninsula were all found attached to drift ice and, although their number amounts to some several tens, were found to belong to granite (mostly rich in hornblende, and some of them

have the fissile structure like gneiss) and to quartz-biotite diorite. Their petrography is identical with that of the rocks forming the basement of the west coast of Ross Sea. The fact that not even a single piece of younger sedimentary and volcanic rocks was found among the collection of the SHIRASE party may indicate that, although the basement consists of the same rocks in both South Victoria Land and King Edward VII Land, the volcanic line exists only in the former without having any influence on the latter.

(To be continued)
