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VOLUME I

NARRATIVE

The Vestfold Hills

by

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THE VESTFOLD HILLS

HISTORY

Princess Elizabeth Land was discovered and named by Sir Douglas Mawson's BANZAR Expeditions of 1929-31. During the second voyage, on February 9, 1931, Mawson (Mawson, 1931) made a flight with pilot Stuart Campbell in a small Gypsy Moth seaplane from the ship " Discovery ", which was then in the position of 66° 35′ S. latitude, 75° 57′ E. longitude. From a height of about 6,000 feet he could see, to the south, a very broad line of sunlight, reflection from what appeared to be a land ice-cap, extending roughly from south to south-east. Near the horizon, to the south-east, an extensive area of grounded ice-bergs was a notable feature. On the south-south-westerly horizon two black rock peaks were visible. In the south-west the land ice was a bright white line suggesting the face of an ice-shelf.

Captain Klarius Mikkelsen (Mikkelsen, 1935), master of the Norwegian ship " Thorshavn ", first sighted and named the Vestfold Hills on February 20, 1935, when leading an expedition for Lars Christensen. He landed with his wife and seven men in a small bay between two high promontories on the northern part of this ice-free coast. The land was undulating and rose steeply to a height of about 125 metres. On the rocks there was a large Adélie penguin rookery, with half-grown chicks. Other rookeries stretched away as far as could be seen, some of them quite large, and the ground was more than a metre thick in yellow guano. No vegetation was seen. Between the two promontories a little valley led to a lake, 30-35 metres above sea level, from which a stream ran down to the sea. The sea, the stream and the whole coast were free from snow.

Later, Captain Mikkelsen sailed his ship down to the southern end of Prydz Bay, describing the eastern coast of the bay and naming Mt. Caroline Mikkelsen, the most southerly point observed.

The region was next visited in 1937 by Lars Christensen himself, with his wife, in the same ship, " Thorshavn " (Christensen, 1938). On 25th January they discovered and named the Four Ladies Bank (after the four ladies on board the vessel). In the afternoon the " Thorshavn " met up with the second ship of the expedition, the " Firern ", which was engaged in surveying the Ingrid Christensen coast and carried an aeroplane.

On 27th January the aircraft, carrying Wideröe and Romnaes, made two flights and succeeded in taking oblique photographs of the whole Ingrid Christensen coast. On the basis of these photographs, H. E. Hansen (1946) produced maps of this region whose detail is excellent, even though lack of ground control has led to errors in both latitude and longitude of up to 11 miles.

The U.S. antarctic explorer, Lincoln Ellsworth, in the ship " Wyatt Earp ", sailed along this coast in January, 1939. He was accompanied by the Australian, Sir Hubert Wilkins, and several landings were made between 3rd January and 11th January on the Svenner Islands, the Rauer Islands and the Vestfold Hills. On 11th January, Ellsworth made a flight, piloted by J. H. Lymburner, which proceeded due south as far as 72° latitude. He says (Ellsworth, 1939) : " Once clear of the barrier, I was prepared to see a rugged topography with great mountain ranges to the south. But I was surprised and impressed by the vast wind-riffled desert of unblemished white that greeted my eyes. South, east, and west it stretched to the cloudless blue horizon."

Early in 1947 the Western Group of the U.S. Naval Antarctic Expedition (" Operation Highjump "), commanded by Captain Charles A. Bond in the seaplane tender U.S.S. " Currituck ", lay outside the pack-ice more than 150 miles off the Ingrid Christensen coast. From there, aircraft, fitted with trimetrogon cameras, made photographic flights over Princess Elizabeth Land, those on 13th and 27th February being made by Pilot Reinbolt and that on 1st March by Pilot Rodgers (Byrd, 1947; Dyer, 1957; Roscoe, 1952).

No expedition visited the area again until March, 1954, when the writer, leading an ANAR Expedition, landed at Vestfold Hills. A further landing was made by the ANARE in January, 1955, and the Australian station at Davis was established in January, 1957.

The only other recorded visit is that by members of the U.S.S.R. Antarctic Expedition, who landed at Vestfold Hills on 12th January, 1956.

NARRATIVE OF ANARE VISIT, 1954

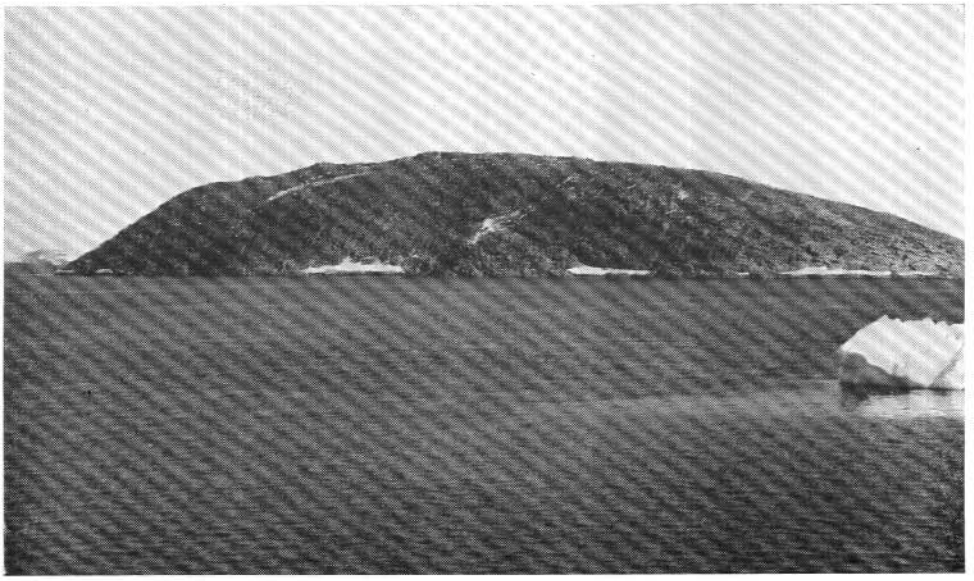
In 1954 I led an expedition to Antarctica in the ship " Kista Dan " (Captain H. C. Petersen) and established a new ANARE station named " Mawson " on the coast of MacRobertson Land (Law, 1954). A wintering party of ten men was left at Mawson under the command of Robert Dovers, and the " Kista Dan " departed on 23rd February to carry out coastal exploration to the east. We called first at Scullin Monolith on 25th February and then turned north.

The outer edge of the pack-ice was reached at 1800 hours[1] on Friday, 26th February, at approximately the position 66° 10′ S., 69° 15′ E. The ship continued eastward all Saturday, following the northern limit of the pack-ice, and on Sunday turned south and pushed through the ice deep into Prydz Bay. On Monday, 1st March, at 1325 hours, we suffered an early disappointment when old, heavy floes cemented together with rapidly-thickening young ice forced the ship to turn about at approximately 68° 29′ S., 75° 55′ E., but, some miles to the north of this position,

[1] All times mentioned in this report are G.M.T. + 5 hours.

we discovered a promising weakness in the pack and pushed through to a lead which took us directly into open water along the coast off the Vestfold Hills.

From the sea these appeared as a series of rounded dome-shaped hills and red-brown cliffs against the background of the creamy antarctic ice plateau, with numerous small irregular glacier bergs and a few tabular bergs strung out in line between us and the land. None of the hills was very high and none showed features distinctive enough to be marked above others at a distance of ten miles. Heights seemed in accord with those on Hansen's Norwegian chart, namely 70-150 metres.



Magnetic Island. [A.N.A.R.E. photo by Phillip Law.

We ran in past Plough Island in deep water until close to an outlying island, which I later named Magnetic Island, where a narrow passage between a rocky island and a grounded iceberg showed a minimum depth of 11 metres before levelling off inside to 18 metres. Here the ship anchored at 2040 hours on Monday, 1st March, but the rocky bottom proved a poor holding ground, so each night, after the first, the Captain took the "Kista Dan" about three miles out to beyond the nearest line of grounded bergs and each day returned to the anchorage close to Magnetic Island.

Unfortunately, a north-east gale of force 8-9 (Beaufort) arose early on 2nd March and prevented any landing that day, and this was followed by heavy falls of snow that evening and throughout Wednesday. As our landings were all subsequent to the snowfalls, we were not able to see as much of the rock and detail as we would have done had

we arrived a day or two earlier. Certainly, the view of the Vestfold Hills, coated with thick snow as we left on Thursday, 4th March, was vastly different from the bright colouring of the bare rock as we approached on the Monday.

On Wednesday, 3rd March, at 0945 hours, a party set out in the ship's motor-boat comprising Richard Thompson, Dr. Arthur Gwynn, Peter Shaw, Jim Brooks, Fred Elliott, a Danish A.B. (John Hansen) and myself. The air temperature was 27° F., the sky was overcast, and there was little wind. Landing at Magnetic Island through heavy brash ice, we put ashore Brooks and Elliott with instruments for magnetic observations, then pushed on in the boat towards the mainland. The

Proceeding towards mainland by motor-boat for first landing, 1954.
[A.N.A.R.E. photo by Phillip Law.

water was calm, with much new pancake ice, and the sludge formed by newly-fallen snow lying unmelted in the sea appeared strangely green, like scum on a pond. This was due to some form of microscopic alga which we found had stained quite green the larger pieces of pancake ice (i.e., anything more than about two days old).

We passed between a number of islands, all low and of roche moutonnée type, with shores easy of access, and saw occasional bergy bits grounded in the channels we traversed. Neglecting the sprinkling of snow from the previous day's storm, the islands were all ice-free except for occasional snowdrifts, which occurred on their south-western sides, and for remnants of fast-ice which clung to the rocks along their shores in sheltered coves.

Upon reaching the mainland we first essayed to land on a gently-sloping rocky beach, but the water was too shallow for the motor-boat, so we moved a short distance to the north, where a stretch of fast ice three to four inches thick joined the mainland to an island not far offshore. The rather fragile ice bore our weight safely and we walked ashore over it, leaving Hansen behind in charge of the motor-boat.

Landing on the mainland at Vestfold Hills, 1954. From left to right: Dr. Arthur Gwynn, Peter Shaw and Richard Thompson. Able Seaman Hansen is in the motor-boat.

[A.N.A.R.E. photo by Phillip Law.

The shore here consisted of rocks and boulders covered with ice from frozen spray and freshly-fallen snow. In front of us stretched an almost semi-circular plain that appeared to be a ground moraine which at one time had been washed flat by the sea. The saucer-like rim of this plain comprised low rocky hills which swung to meet the coast north and south of where we stood, then continued along to form the shoreline for as far as we could see. These hills were obviously moraines and several samples of rock were collected from them.

We built a small cairn of boulders, placed under it a glass jar containing a short note of our landing, and raised the Australian flag. Then, as the sky was lowering and further snowstorms threatened to reduce visibility, we picked up our rock samples, looked briefly for botanical and zoological specimens, and returned to the motor-boat.

Several small points here are worthy of mention. In the shallow water near the shore the gently-shelving bottom could be seen to consist of rock and sand, the former being covered with short, green, grass-like seaweed. Scattered on the sand a number of clam-like shells glinted and Dr. Gwynn obtained specimens from the nearby beach. They have since been identified as *Laternula elliptica* King and Brod., a clam common to Antarctica. No lichens or mosses were seen ashore; however the snow cover made any thorough search in the time available impossible. There was plenty of sandy soil between and under the rocks which we raised to build the cairn. No penguins were seen on this trip to the mainland, but four or five Weddell seals were lying on the new ice not far from where we landed.

Raising the Australian flag, Vestfold Hills, 3rd March, 1954. From left to right: Peter Shaw, Phillip Law, Dr. Arthur Gwynn.
[A.N.A.R.E. photo by R. Thompson.

As we returned to the " Kista Dan " we called at Magnetic Island and put ashore Gwynn and Shaw to collect biological and geological specimens. The base rock of Magnetic Island was found to be a granitic gneiss, finer grained than that from Mawson, and the ridge of the island was plentifully scattered with erratics. Those examined were all highly metamorphosed and included schists with extensive veins of quartz and inclusions of garnet. A small dolerite dyke, about

18 inches wide, ran along the crest of the island ridge; it was raised above the surrounding rock, giving it the appearance of a broken-down stone wall. There were at least four other similar dykes on the island, one crossing the others at an angle of about 30°. At the north-eastern end of the island was an accumulation of assorted boulders which might deserve the status of "moraine". Samples of rock were collected from the island. Around its shores, at indentations in the coast, there were accumulations of ice, most of it being in the form of heavy broken ice cakes, 18 to 30 inches thick, grounded on boulders under the water.

There was some seaweed around the shore at Magnetic Island. This was generally small, with flat, dark-maroon and yellow fronds. A slimy green alga covered the rocks at tide level. On the two occasions that the anchor was weighed near Magnetic Island in 18 metres of water, kelp was brought up with the anchor. Only four seals were seen from the island.

Many of the islands around Plough Island showed extensive light pinkish-brown patches when viewed from the sea. These patches mark the sites of rookeries of Adélie penguins, although few were to be seen when the coast was scrutinized through binoculars. This paucity of the birds was explained by an examination of Magnetic Island, which disclosed that the population of the rookeries there was at a very low level. All the latest season's chicks had left and the only remaining birds were two or three hundred moulting adults. It seems probable that these were non-breeding birds and that the bulk of the population was away feeding up for the moult, as happens with most species of penguin after the departure of the chicks. Captain Mikkelsen's remark about penguin guano "a metre thick" appears to have been an exaggeration, but there were plentiful guano accumulations up to twelve inches deep.

There were many dead chicks in the Adélie rookeries. Because of the climate, dead birds decompose very slowly and here, as at islands near Mawson, the bodies of chicks which have died for a number of years past litter the ground, it being difficult to differentiate between any older than about two years. These bodies, in places, lie on top of each other to a depth of two or three feet and probably provided the basis for Mikkelsen's statement.

Skuas were numerous and several fledgling chicks were found on the island, fully feathered and able to fly but still being fed by their parents. From the ship's anchorage a steady stream of silver-grey fulmars was observed, all heading south-west or west, giving the impression that they were on their way to a breeding area beyond the Sorsdal Glacier. Quite a few cape pigeons were seen and also several giant petrels (dark phase), indicating that these species may also breed in this area. Wilson's storm petrels were also observed, including one over the mainland, and it is probable that they nest here in considerable

numbers, as the moraine hills are eminently suitable for that purpose. Few snow petrels were seen, but one was found resting under some rocks on Magnetic Island and another took shelter on the deck of the ship. Observations at Mawson have indicated that they come to their nests mainly in the late evening or at night, and it is probable, therefore, that these birds also nest in this region in spite of the meagre occurrences noted. Antarctic petrels (as at Mawson and Scullin Monolith) were not seen.

One emperor penguin was seen standing on an icefloe near our anchorage on the first night, but otherwise the only ones seen were a few in the packice as we sailed south down Prydz Bay. However, after leaving Vestfold Hills, as we pushed through the packice off the King Leopold and Queen Astrid Coast, we passed more than one hundred of these birds in four hours.

The lines of icebergs offshore are worthy of note. The first line, about one mile off the outlying islands, contained some hundreds of small, irregular, grounded glacier bergs, and it swept parallel with the coast from the Sorsdal Glacier Tongue north-east to beyond the northerly commencement of the Vestfold Hills, swinging away further out to sea in the latter stages. Beyond this line, about five miles offshore, was another line of grounded glacier bergs, including a few tabular bergs of medium size. Both lines of bergs showed a minimum density, amounting practically to breaks in the lines, opposite Plough Island and this was the reason for our approach at this section of the Vestfold Hills. Only a few bergs were drifting. Five bottle-green bergs were seen locally and two others thirty miles out in the packice as we approached.

The tidal range at Magnetic Island (which is one of the outermost islands) appeared to be in the region of four feet during the three days we were there (the moon was in its first quarter). There was, however, evidence that high tide is, at times, up to two feet higher than that observed during our stay.

Magnetic observations were taken by Brooks at the point shown on the enclosed sketch map. The observations comprised a full half-set of determinations of the components H, V, and D, taken on Wednesday, 3rd March, and the value of D was checked again on Thursday. The determined declination was 70° 10′ W. From values at Heard Island (50° 20′ W.) and at Mawson (58° W.) it was expected that the figure here would be about 64°. There would thus appear to be a local magnetic anomaly, but this will require subsequent confirmation. Apart from this, it is apparent that isogonal lines on navigation charts of this region of the Southern Ocean will need to be considerably displaced from the positions at present shown.

On Thursday, 4th March, the sun shone for the first time since our arrival and permitted Brooks to carry out his astronomical observations. The Expedition's Auster aircraft, mounted on floats and piloted by Flight-Lieutenant Douglas Leckie, carried out a short flight. By 1300 hours all our work had been completed and at 1325 the "Kista Dan" set sail for Heard Island. A strong N.E. wind arose as we left and blotted out the sun with cloud. By 1700 hours the wind was blowing at force 8 and the ship was proceeding, with difficulty, at four knots in open sea.

By 2000 hours the wind had risen to hurricane force and the ship hove to in the inky blackness, pitching violently in giant waves. About midnight the captain could no longer hold the unballasted empty ship into the wind and she broached and swung broadside to the wind. Lying over on her side the ship drifted before the storm in a S.W. direction across Prydz Bay. The aircraft mounted on the boat deck aft broke from its moorings, which were unable to stand the combined force of the heavy rolling and the strong wind, and leaned drunkenly in a litter of wreckage over the starboard rail. At 0300 hours the second mate cut the remaining guy ropes and allowed it to drop overboard to prevent damage to the lifeboats.

From 3 a.m. until dawn was a nightmare. The ship would heel over through an angle of 40°, 50°, 60°, and remain shuddering for twenty seconds while those on board wondered whether she would recover or capsize. Then again, she would be flattened over under the onslaught of wind and waves. On a number of occasions, rolls dipped my cabin window on the boat deck beneath the green seas.

On the bridge, Captain Petersen peered into the welter of spume and spray to try to distinguish between the white danger of a bergy-bit and the white crest of a breaker. At one terrifying time a bergy bit the size of a two-storied house dipped and plunged wildly in the spindrift and surf 30 yards to port while the captain tried, crab-fashion, to back and charge out of danger. On another occasion the ship was lifted high on the crest of a wave and dashed down broadside on a small floating lump of ice some twenty feet in diameter with a force that shattered it into fragments and shook the ship from stem to stern.

Shortly after dawn we drifted into an area of brash ice—pack ice pulverised to the consistency of concrete by the action of the waves—and the weight of ice smoothed out the breaking crests of the seas while having no influence on the height of the giant swells.

The ocean looked like a snow-covered undulating landscape in which hills and valleys alternately changed places, with the ship now on a high ridge, now in a valley. The lifeboats began to work loose and gangs of sailors worked hazardously on deck to prevent them from sharing the fate of the aircraft.

At 1400 hours there was no moderation and the ship wallowed helplessly in the brash, crabbing around the larger pieces of ice and bumping alarmingly against the smaller pieces. The ship's radio was out of commission and the decks and rigging were sheathed in ice.

Night fell and the wind moderated to between 50 and 60 m.p.h. The brash ice was saving us from the punishment of breaking waves in the open sea and sailors spent the night trying to free frozen water-pipes to enable sea water to be pumped as ballast into empty tanks. Towards morning the captain was able to snatch some sleep, wrapped in a blanket on the settee of the chartroom.

On Saturday, 6th March, at 1315 hours, conditions had moderated sufficiently for us to head slowly northwards through driving, frozen mist, but at 1515 bad visibility forced us to stop. At 0415 on Sunday, 7th, we proceeded again and at 0715 broke through an ice edge trending N.E.-S.W., to reach open water between this and the coast to the east. I saw a bergy-bit 40 feet high, with pieces of ice-floe six feet in diameter and two feet thick, cast up on its top by the waves. We made slow progress all day Sunday, but in the afternoon the weather worsened. Overnight the wind blew at 50 knots and conditions were again unpleasant, with the ship pitching uncomfortably.

We continued all Monday to run N.N.E. to N.E., parallel with the coast, through brash ice and newly-freezing pancake ice until at 1615 we could see to starboard the West Ice Shelf. To our disappointment, the heavy line of packice and brash on our port side swung around parallel with the coast and the growing calmness of the sea indicated heavy ice between us and the open ocean to the north. At 1700 the captain turned north and began to push through the pack. By 1945 the ice was jammed tight and we could proceed no further.

On Thursday, 9th, the captain started the ship about 0420 hours and retraced his steps south and east, but at 0700 the wind was blowing very hard again and visibility had decreased because of frozen mist, so we were again brought to a halt. We began to hope that the gale, blowing from the east at 70 knots, would loosen the pack to our west. In the meantime, jammed fairly tight in packice, we were in no danger, except that of being frozen in for the winter.

On Wednesday the wind dropped and at 0445 hours the captain started up and pushed into an open lead through heavy floes. Undoubtedly, the storm of the previous day had loosened the ice, for we found a succession of reasonable leads and by noon were through the worst of the ice. Open sea was reached at 1615 hours and a course was set for Heard Island.

NARRATIVE OF ANARE VISIT, 1955

The 1955 relief expedition to Mawson (Law, 1956) sailed from Melbourne in the "Kista Dan" on 7th January for Heard Island. The master of the ship was again Captain H. C. Petersen. Following the captain's advice, I had decided to carry out coastal exploration in the Prydz Bay region before relieving the Mawson Station, because the fully loaded ship was more stable in high winds and more efficient in breaking ice. Accordingly, on 25th January, at 2110 hours, we sailed from Heard Island S.S.E. across the BANZARE Bank, where soundings were taken by echo sounder.

On Saturday, 29th January, the sea was calm and the weather grey and misty. A number of icebergs was visible, the swell soughing into their eroded sides and erupting over them in cascades of spray. Many bergy-bits floated happily by, dipping and gyrating and twinkling against the sombre surface of the sky.

The first antarctic petrels showed up at about 0800 hours, indicating that the ice-edge could not be far distant, and one sooty albatross still followed in the wake of the ship. A flock of about fifty antarctic petrels, roosting on an iceberg, took off and circled us as we passed. At 0930 we logged our first silver-grey petrel and the first snow petrel was seen at 1145 hours.

At 1040 hours we met the northern edge of the packice, in the position 66° 03′ S., 77° 24′ E. It extended westward to starboard, but there was open water to port so we changed course to the east and attempted to skirt the pack. At 1345 the captain went to the crow's nest and began to con the ship through the ice, which could no longer be avoided. It was open pack, with a lot of brash and a few heavy floes, some more than 15 feet thick.

We ran onto the Four Ladies Bank shortly after lunch and sailed through a great collection of icebergs grounded in the shallow water. Soundings were again recorded and the echo sounder was kept working continuously from this point onwards. Crabeater seals and Adélie penguins were numerous on the ice-floes and occasionally we saw emperor penguins. The weather continued fine—dull-grey, with some light snow, broken at times with weak sunshine and practically no wind.

The captain maintained a general southerly course, weaving in and out between large floes and icebergs, but pressing on most of the time at half to three-quarter speed. By 1730 hours the pack had closed up to about 5/8 cover and our speed was reduced.

All the afternoon we had sailed over the Four Ladies Bank, which at its shallowest point registered only 120 metres. From the crow's nest at one stage the captain could see a circle of icebergs marking the periphery of an area upon which it was too shallow for bergs to ground.

By 2030 hours we were in almost open water and thereafter steamed full speed ahead. Our progress had been better than I had optimistically hoped. An hour later some more ice appeared and when, at 2230, it began to thicken up we stopped for the night. Our position was 67° 25′ S., 78° 28′ E.

Sunday, 30th January, dawned a magnificent day—sunny, cloudless and calm. I was awakened at 0450 by the engines, but found we were not making much progress. It took us half an hour to push out of the thick ice, but thereafter the going was easier and at 0530 we ran into clear water and sailed at full speed for the Vestfold Hills.

We found the hills almost bare of snow and obtained some fine photographs as we sailed in through lines of grounded icebergs whose blue sides glinted dazzlingly in the early sun. I was astounded at the numbers of Adélie penguins on the numerous off-lying islands. We were a month earlier than in 1954, when most of the birds had left. Also, the previous year, a recent snowfall had covered the brown guano patches of the rookeries.

One outlying island (Lucas Island) was literally smothered in penguins and several other islands were heavily populated. However, it was difficult to understand why some islands possessed rookeries while others of similar type and position were bare. No doubt some become ice-free earlier than others.

We decided to approach, as in the previous year, at Magnetic Island, but it was difficult to recognise this island and Captain Petersen's first guess turned out to be wrong. From that point, however, Magnetic Island could be seen and the captain began to edge the ship cautiously across to it at dead slow speed through water only 5 to 10 metres deeper than the echo sounder. At 1140 hours there was a lurching jar and the ship bucked violently as she ran up onto a pinnacle of rock.

To be aground on a rock, 3,500 miles from home, in waters whose tidal movements are unknown, is not a pleasant situation. The engines were set full speed astern, then ahead, and various combinations of rudder and propeller speed were tried, but the only result was to cause the ship to swivel a little on the pinnacle. Half an hour later, however, probably due to a rise in the tide, the " Kista Dan " floated free, none the worse for the mishap.

We then retraced our path and made a wide circuit to approach Magnetic Island from the same side as the previous year. At 1356 the ship anchored in 18 metres of water just north-east of the island.

Remembering the delay occasioned in 1954 by the snow storm, I was eager to waste as little as possible of the glorious weather. For two days we had been preparing for our landing and all was ready for action immediately the anchor dropped. Thompson and the Second

Mate set off in the ship's motor-boat and at 1530 hours landed four men on Magnetic Island. A second trip took five others ashore. Lacey proceeded to take astronomical observations from the highest point on the island, Lodwick commenced geomagnetic and gravity measurements with the assistance of Parsons, and Oldham organised the others in observing the flora and fauna and collecting geological specimens. Thompson took a series of panoramic photos with bearings from Lacey's astrofix position.

In the meantime two DUKWS took eleven men to the mainland. The party comprised Bechervaise, Shaw, Elliott, Crohn, Ward, Hall, Bathurst, Power, Lowe, Hungerford and myself. The DUKWS drove in for two miles past numerous islands through calm water and we searched the shore for the cairn we had erected the previous year, but without success. (Next day, on our way back to the ship, we saw it.) We landed at a point to the north of it after pushing aside a number of light ice-floes. The second DUKW bogged at the water's edge and had to be winched out by the one already ashore.

From the beach we drove up over the crest of a rise, skirted some extensive snowdrifts on our left, and ran inland for nearly a mile over earth, rock and some snow to a valley where a blue, ice-free lake nestled in the chocolate-coloured terrain. Here we encountered rough moraine and a field of boulders through which we had difficulty in choosing a route. The second DUKW again bogged and was winched out.

We had just negotiated the worst section of boulders and were heading up a slope above the lake when the leading DUKW bogged in deep, heavy, yellow-black mud. The second DUKW winched it out, but bogged down in doing so. When both had been hauled free we decided to camp.

When the two tents were pitched and our equipment was unloaded, I sent the two DUKWs back to the smooth, safe slope leading to the beach so that in the event of a heavy snowfall there would be no difficulty in their returning to the water.

While the rest of the party prepared dinner three of us reconnoitred the immediate vicinity. We visited two lakes and an inlet of the sea, took many photos, walked about eight miles and were away three hours. On our return we ate dinner, then cleared up while the others made a similar circuit. Finally, we all retired at 2330, four in one tent, two in the other, three in the first DUKW and two in the second.

We rose at 0300 on Monday, 31st January, and, while breakfast was being prepared, I climbed a small hill above the camp and took a panoramic series of photographs.

After breakfast we broke up into three parties. The first party, led by Bechervaise, set out at 0630 hours and was followed soon after by my party. Three men remained behind in the camp.

Breakfast, 31st January, 1955.
[A.N.A.R.E. photo by George Lowe.

We headed south-east towards Ellis Fjord. The scenery was magnificent and the day again fine, though overcast. The air temperature was 26° F. at noon and the sun shone after 1100 hours. We overtook the first party while their geologist, Crohn, was collecting specimens and then proceeded together.

There was much to interest us and we noted several lakes not marked on the map. At one of these, larger than the rest (Lake Stinear), we again separated, Bechervaise's party proceeding south-east and mine heading south. When Bechervaise reached Ellis Fjord he followed it inland while I took my party along it towards the sea. The entrance to Ellis Fjord was almost blocked by a tongue of moraine and through a narrow gap a heavy tide-race flowed. We photographed the entrance then turned back for the camp. On the way back we encountered an extensive plain of moraine rubble and boulders some five miles in extent across which we trudged heavily in bored silence. At 1630 we reached the camp to find that the men there had pulled down the tents and packed the DUKWs ready to depart.

Bechervaise and his party came in at 1830, having done a wide circuit inland of about 20 miles. My party had covered about 15 miles and, between us, we had investigated most of the Broad Peninsula. We set out immediately for the ship and arrived back without incident at 1930 hours.

ANARE men at Lake Stinear, Vestfold Hills, January, 1955.
[A.N.A.R.E. photo by Phillip Law.

That day, while we were working ashore, the men on the ship had not been idle. Thompson took four men ashore to Magnetic Island at 0700 hours. He returned to the ship and made five attempts to land men on some other islets but without success. The tide was out, there was a fresh N.E. wind, and the motor-boat and the men were doused and iced up by the spray from the choppy sea. They finally joined the others on Magnetic Island and assisted with a census count of the penguins while the scientists completed their astrofix and magnetic observations. All finally returned to the ship for dinner at 1800 hours.

After dinner, at a meeting of all the men, we discussed the results of the day's investigations and then retired, very weary, at 2330.

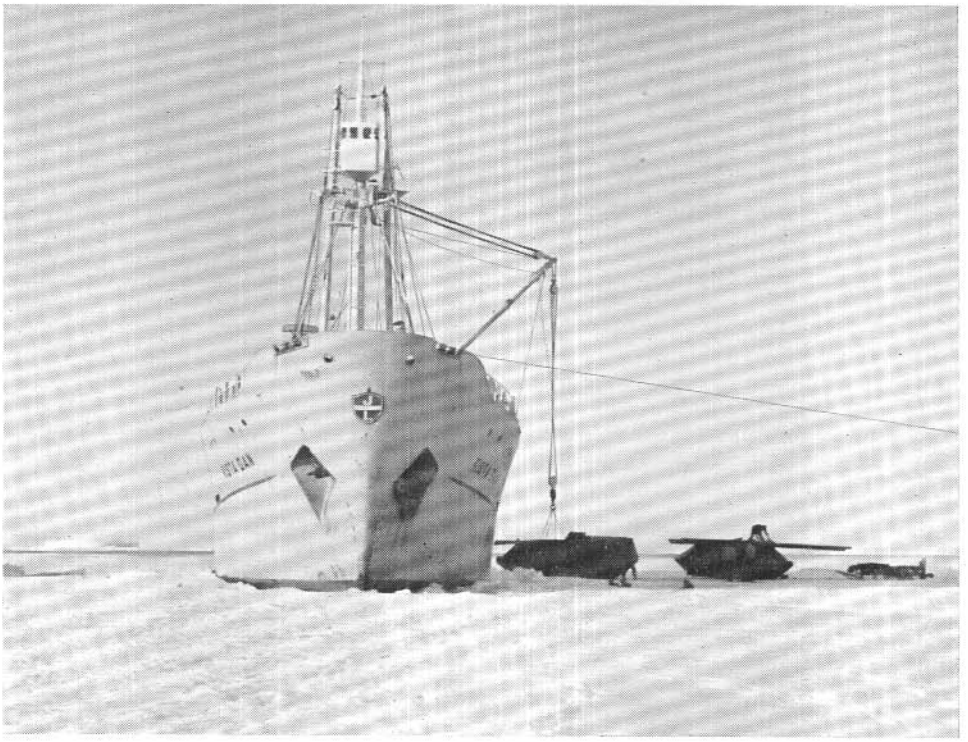
Next day, Tuesday, 1st February, at 0415 hours, the "Kista Dan" sailed from her anchorage near Magnetic Island and headed south. I

wanted, if possible, to land and make observations at the Larsemann Hills and again further south.

We met fast-ice north of the Larsemann Hills at 1015 hours. It was about five feet thick—blue, glassy and hard. It had no appreciable amount of rotten ice on the under side and the captain found it was too hard for the " Kista Dan " to break.

The men thronged the rails of the deck, enthralled by the scenery. To the east lay the chocolate-coloured, bare, rock hills behind which rose the ice of the antarctic plateau, while to the west were the icebergs of Prydz Bay with the Amery Ice Shelf beyond. To the south were many more icebergs and then the peak of Mt. Caroline Mikkelsen. Cementing the whole lot together was the ice—the fast-ice of Prydz Bay or the plateau ice of the Continent.

We decided to try a lead which the captain could see to the east in the hope of approaching closer to the Larsemann Hills. The ship sailed around to it and followed it as far as possible, but at 1330 hours we were forced to stop.



Hoisting out vehicles near Larsemann Hills, 1st February, 1955.

[A.N.A.R.E. photo by Phillip Law.

As there appeared no hope of taking the ship closer to the shore, I decided to try a dash with the weasels across the fast ice to the Larsemann Hills twelve miles away. After lunch we hoisted out a weasel, a caravan and a dog sledge, while Elliott and Shaw collected all the equipment needed for a nine-man party from the mobile field store kept in the 'tween-decks of the "Kista Dan".

As I did not trust the fast-ice, I planned to have the weasel tow the caravan and dog sledge to the Larsemann Hills and leave them there with my nine-man party. Gowlett and Power would then drive the weasel back to the ship and await a radio call from us next day before coming to pick us up. In this way the weasel would be on the ice for the shortest possible time. If the fast-ice were to break up I considered that the ship (or a DUKW) could push through to reach us and if we were forced to leave equipment behind we would lose only a caravan and a sledge.

The preparations went very smoothly and we got away at 1730 in bright warm sunshine, running on two inches of fine powder snow lying on top of the blue fast-ice. In the first quarter-mile we ran over two weak spots in the ice and nearly stranded the weasel. Bechervaise and I then

Weasel party proceeding over fast ice towards Larsemann Hills.
[A.N.A.R.E. photo by Phillip Law.

tried walking ahead and probing down with ice spears, but it was difficult to tell the condition of the ice by this method, so finally we just rode on the weasel and directed driver Gowlett purely from the appearance of the surface. When it looked suspicious we jumped down and probed. Half a mile from the ship we sank dangerously in three places, but the weasel pulled through, leaving pools of salt water.

Two miles from the ship we met a crack two feet wide, in which sea water lay nine inches from the top. The men suggested that we use our bridging timbers to cross it, but I felt that it might widen and leave us stranded, so I took the weasel south along the crack for about half a mile to where it narrowed to a mere line in the ice. There would have been no difficulty crossing here, but there were half a dozen cracks converging at this spot from nearby icebergs and the whole area looked weak, with seals lying around beside their breathing holes. Altogether, I did not fancy the place as an important point on our return journey, so I surveyed the stretch of fast-ice which lay between us and the Larsemann Hills by using binoculars from the top of the weasel. Blue water fringed the island which was our objective and all the others (except two small ones 15-20 miles away) had suspicious-looking cracks lying across the ice which separated them from us.

Much to the disappointment of us all, I decided to call off the trip and return to the ship.

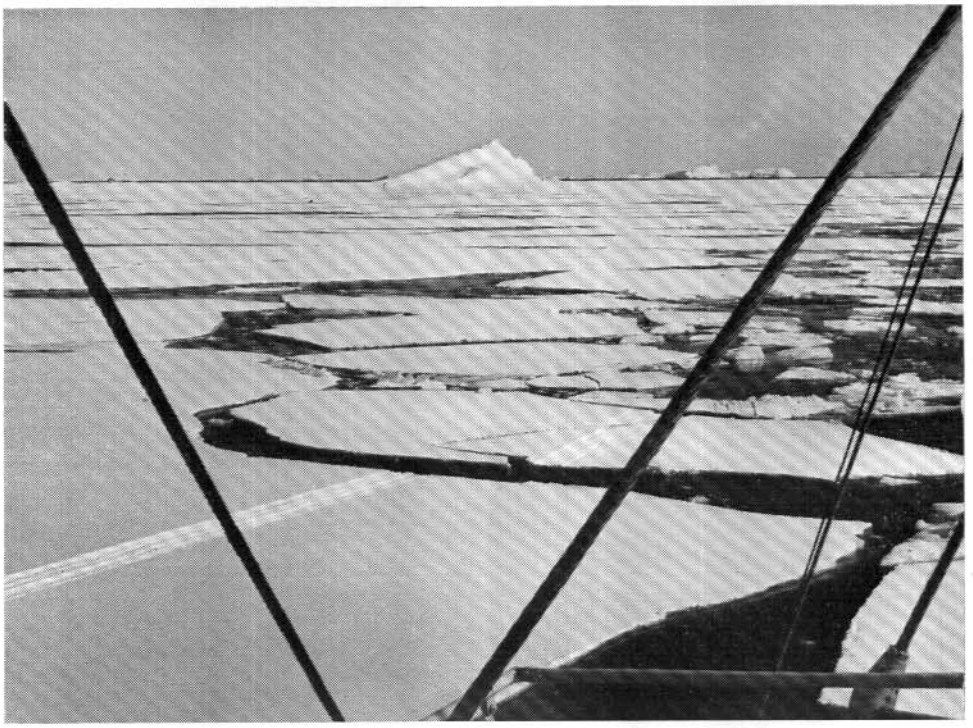
We arrived back about 2000 hours and nearly lost the weasel thirty yards from the ship, where it broke through and left a hole nearly eight feet long in the ice, but somehow kept going and pulled out of it. Immediately we loaded all our equipment and vehicles back onto the "Kista Dan".

Some of the men walked across to a large iceberg two miles away to obtain photographs. Others found a Ross seal in ice hummocks near the ship and arrangements were made for it to be shot and collected after dinner.

Sitting in my cabin, I looked idly out and saw a number of new cracks in the fast-ice around the ship. I went on deck and met Bechervaise, who had just returned from the iceberg. He said that the cracks were opening up. And so they were—rapidly. I was concerned about the other men at the iceberg, but they arrived back shortly afterwards.

Suddenly, then, the whole of the ice within some miles of the ship broke up. In less than twenty minutes the broken floes were floating out to sea, separated by wide lanes of water. It was disturbing to see some of these floes, bearing the track marks made by our weasels a short time before, drifting around in the open water.

The day was still perfect and there was no wind. Just after the break-up, I saw several large swells move past the ship and sweep on under the ice. They did not recur. Several of these earlier would have been sufficient to break the fast-ice, but the reason for them was obscure. Perhaps they represented the surge from a distant iceberg which had cracked in half or turned over. Such occurrences are more common on hot, sunny days when the solar radiation causes unequal heating and expansion on different parts of the berg.

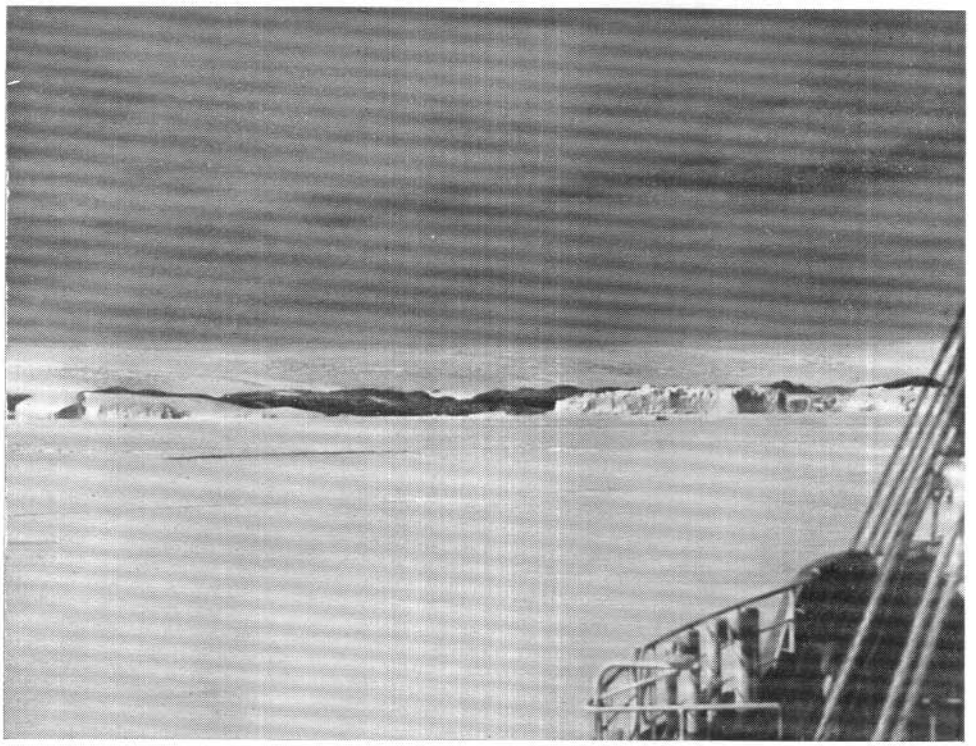


Fast ice breaking up. The tracks of the weasel party can be clearly seen.
[A.N.A.R.E. photo by Phillip Law.

On Wednesday, 2nd February, I awoke to find that we had drifted overnight in the direction of Sandefjord Bay. At 0700 the captain started the engines and began to work the ship through the broken ice past our broken weasel tracks towards Larsemann Hills. Our idea was to push through to the remaining unbroken fast ice and to secure the ship to it. We could then obtain a fairly accurate ship position by sun shots and, by taking radar distances to the shore, fix the positions of several prominent features along the coast in relation to that of the ship. However, we were unable to proceed far before again being stopped by ice.

The Captain and First Mate, also Lacey and Bechervaise, set up survey instruments on the fast ice beside the ship and took a series of sun observations between 1030 and 1500 hours. I took a series of panoramic

photos of the Larsemann Hills from the ship in specific directions between 90° and 195°, but it was not possible to relate the image on the radar screen accurately enough to the visible features along the coast.



Telephoto of Larsemann Hills.
[A.N.A.R.E. photo by Phillip Law.

At 1615 we sailed for Sandefjord Bay. We pushed through the broken fast ice again into open water and at 2000 hours reached fast ice just to the east of the tip of a protruding Glacier Tongue. To the south could be seen brown rock outcrops behind massed icebergs, while close by, to the W.S.W., was the seventy-foot ice wall of the Glacier Tongue. The Captain wedged the ship's bow into the fast ice and ran out ice anchors to hold her.

I examined the situation from the crow's nest and decided to attempt to reach one of the islands of the Bolingen group to the south by hand-hauling a sledge with a party of six men. I was not prepared to risk a weasel again on fast ice at this time of the year. However, I considered a light, mobile sledge party would have a reasonably safe chance of reaching its objective. Should the ice break up it must float out to the north where, weather permitting, the ship could pick up the men. If the weather turned bad I reckoned we could

climb up onto the Glacier Tongue, walk to its tip and wait for conditions which would permit the ship to send a boat alongside. We could then clamber down a rope to it.

Having decided on this course of action I chose Bechervaise, Shaw, Crohn, Ward and Lacey as members of the party and they set to work preparing the sledge, while Thompson and I took skis and set off at 2110 to reconnoitre the fast ice and the Glacier Tongue.

We were away until 2315 and covered about five miles. The surface was fine powder snow and the skis ran easily. The sea ice seemed good—there were a few cracks but it was not as bad as that at our last stop and I considered it to be as stable as fast ice at this time of the year can be. We climbed up onto the Glacier Tongue and found the surface good with occasional small crevasses from a few inches to two feet wide. The bridges supported skis adequately but on foot we broke through.

While we were skiing a large iceberg moved down from the north-east, swung around just a few cables north of the ship, and passed on beyond the tip of the Glacier Tongue. Two smaller bergs later followed the big one. They were travelling at about three knots. It was reassuring to know that the icebergs followed a current which swirled off the submerged sides of the Glacier Tongue and carried them safely out of the way of the "Kista Dan".

Whether due to the iceberg movements, or some swell. or the weakening of the ice by the ship's charging to wedge its bows, I do not know, but when Thompson and I returned we found that the ice near the ship and for about a mile south had broken up. The ship moved in to tie up to the firm ice.

Next morning, Thursday, 3rd, I was awakened by Shaw who told me that the barometer was dropping, there was a N.E. wind, heavy black clouds were coming up from the north and north-east, and the situation reminded him of last year just before the hurricane at Vestfold Hills. I consulted the Captain and asked did he wish to head for the open bay or for an anchorage at Vestfold Hills, but he said that if there was to be a blow he would prefer to stay where he was.

The blow did not eventuate and the day smoothed out into one of snow showers, bad visibility and a 20-knot wind. The men spent the morning fitting ski bindings to their boots and instructing those who had never been on skis. Some of the men had trouble with bindings because their boots stood too high for the toe-irons.

Delays in general packing and adjustments to skis delayed our departure and I decided to have supper before leaving. We finally got away at 1730 hours in bad visibility and snow showers.

The sledge, packed with more than 800 pounds of gear, was very heavy to pull and did not run easily on the rather wet, new snow. I set a course along the side of the Glacier Tongue, but the first few miles were painfully slow as someone always seemed to be stopping—to adjust a binding, to alter the set of a hauling harness, or to replace a ski skin which had come off.

The sledge party prepares to set out for Lichen Island.
[A.N.A.R.E. photo by Phillip Law.

The wind was behind us, which helped considerably. Snow was falling, but not thickly, and, although everything was grey and dim, the visibility gradually improved. As each distinctive feature loomed up ahead we would note its bearing and sledge for it. Upon arrival, we would read the distance travelled from the sledge wheel and take a back bearing on the feature we had left behind.

The first phase ended when we reached a point where great bergs in tumbled profusion had piled up against the edge of the tongue. Peter Shaw and I went ahead on skis to see if we could find a way to push through between the bergs. Recently we had gained the impression that we were climbing, and I was hoping that this might be so and that we would find ourselves in semi-permanent bay ice, 30 to 50

feet thick. It was disappointing, therefore, to discover swell cracks around the icebergs and newly-frozen black ice, some of which was quite slushy and salty. Obviously we were still at sea level. Altogether, I did not feel very happy about the condition of the ice and prayed that no storm and swell would arise to sweep it out to sea.

Shaw and I found a confused jumble of hummocks and snowdrifts, tilted icebergs, and piles of broken ice, pressure ridges and weak black ice. At some time an easterly storm had apparently forced numerous icebergs hard up against the immovable Glacier Tongue, where they had been tilted, broken and wedged in fantastic style. The region provided incredible evidence of the titanic forces of Nature and we could not help imagining the plight of a ship or a ground party caught in such an upheaval. Altogether, it was an impassable place. Our heavy sledge was as much as we could pull and even small ridges taxed our strength. Whenever the sledge stopped we had to count and jerk in unison to start again, often jerking eight or ten times before it would budge.

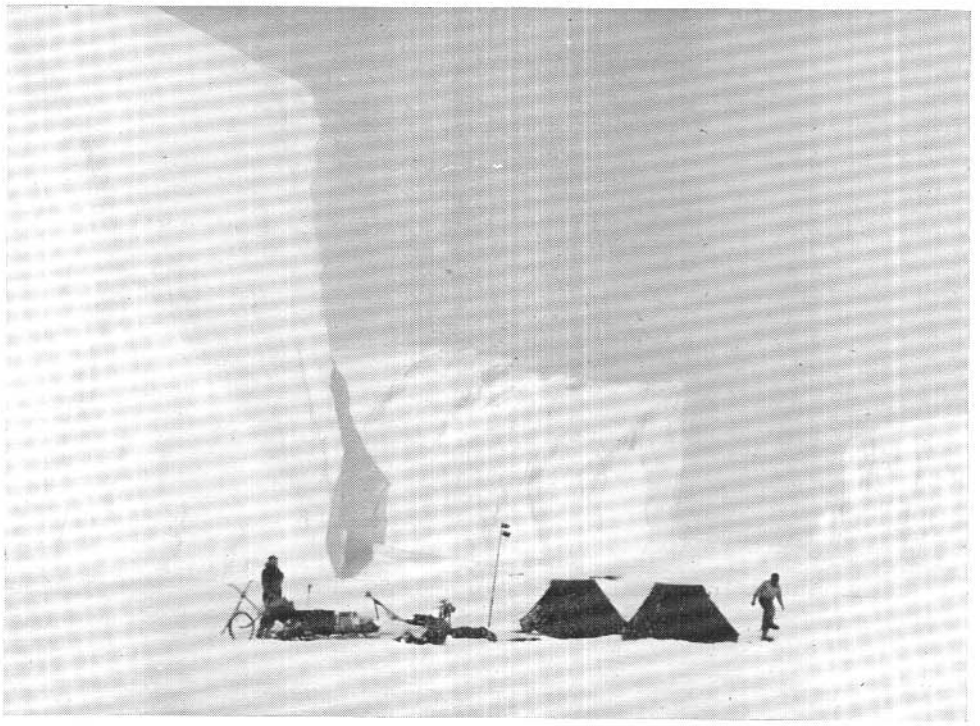
From here on I chose my route carefully, trending in the general direction of the islands to the south, but choosing open areas of reasonable smoothness, preferably between distinctive icebergs which would act as markers for us. These I drew in my notebook. Where any doubt as to a turn could possibly occur we put in a red flag on a numbered bamboo marker. A large accumulation of bergs now lay on our right as we moved out from the Glacier Tongue, although there were still other icebergs on the left. At the 4.6 mile mark we headed for a gap in the bergs, but when we arrived there the gap was impassable and led through to a jumble of other icebergs. Here we contacted the ship weakly by walkie-talkie for the first and last time on the way out. The men were all very tired as I set course for another gap—a most distinctive one between two bergs—and prayed that it would not be choked up by piled ice, or unsafe because of ice cracks. The intervening terrain consisted of very bad ice—cracked, newly-frozen, moving up and down with the swell, and generally unsubstantial. As we neared the gap, Shaw suggested that we stop and cook a meal, as we had been going hard since 5.30 p.m. and it was then nearly 2 a.m.. During these eight hours our only sustenance had been some lemon drink and hot chocolate. Stops had been limited in time because after the sweat of the hauling, one tended to get very cold after more than a few minutes delay. I was very glad I had ordered supper before leaving the ship.

The trouble with cooking a meal was that it involved putting up a tent, for it was too cold to stop for long without shelter. The visibility was now poor, although it looked much better than it was because of the reflected light from the snow. For instance, I wanted to take a photo

and found my meter did not register any light at all, yet to our eyes the scene was quite plain and bright. However, it was difficult to see things at a distance and to assess the relief of the surface over which we were travelling.

Bechervaise started to rig our tent and Shaw and I ski-ed around to investigate the gap. The path through the gap proved better than an alternative one behind the berg to the east, although the black ice comprising the gap was cracked and water appeared in a number of places. Through the gap we could see a black, rocky, ice-free island which we assumed was the outlying island called Lorten on the Hansen map. This boosted our morale, for it was five miles closer than any of the others and just as good for our purpose. (The islet proved later to be one not marked on any map.)

When I was chopping ice from an iceberg for water for our tea, it appeared to heave up out of the tide-crack and subside again, but this was an illusion caused by the sea-ice heaving in the swell.

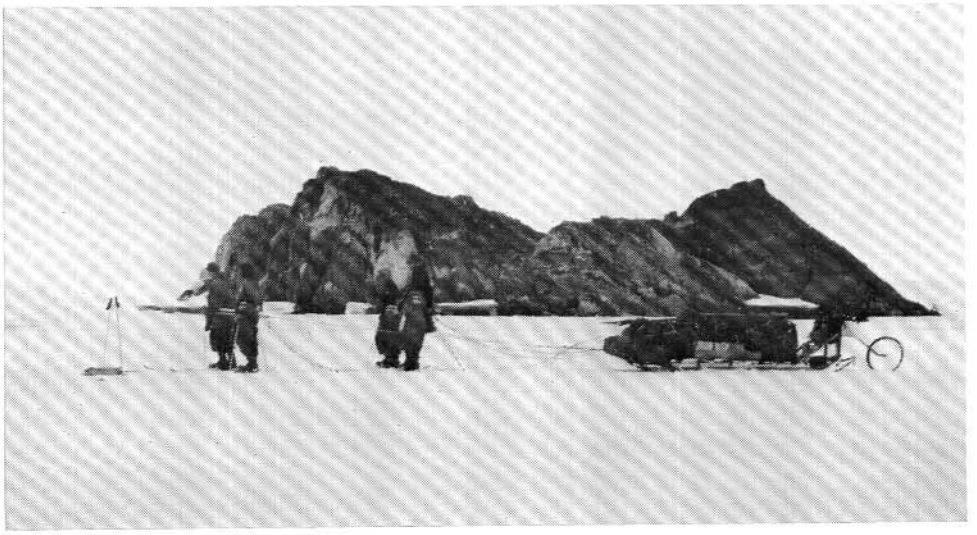


Sledge journey to Lichen Island, February, 1955. The camp on sea-ice at the Gap.
[A.N.A.R.E. photo by Phillip Law.

It was 0400 hours before we got to bed. We slept until 0800 on Friday, 4th February, then breakfasted, took photos of the unrealistically beautiful camp and got under way again at 1130 hours, heading straight

for the small islet. We negotiated the gap all right, but I could imagine it to be a burnt bridge should heavy swell or wind break up its weak coating of black cracked ice. The memory of this gap remained a worry to niggle at my mind for the next 34 hours. (I meant to mention that at various times the previous evening we had heard a great crashing noise, somewhat like the sound of an express train rushing through a station, caused by ice crashing down from icebergs. After a hot day it is dangerous to go too close to them. We saw two which had recently suffered from such falls—the whole of one face to a depth of several feet, had flaked off like shale and lay in a pile of litter at the base of the berg.)

As we approached the islet I could see what looked like black water at the base and ice some feet higher up on the rock. In dismay I realised that we might have had to exert all this effort only to find ourselves prevented from landing by a narrow open belt of water around the rock. We pushed on, making very good pace compared with the previous day, past silent groups of emperor penguins clustered together motionless on the snow (like prospective passengers waiting for a bus), past numerous Weddell seals basking on the sea ice, over crunching névé, powder snow and ice hummocks, until at last we stood a quarter of a mile from the island and saw that it was almost surrounded by black ice. Five feet above the ice, clinging to the rock and projecting as a shelf, was a ledge of ice marking the upper limit of the tidal rise, and beneath this ridge was open water.



Sledge party arrives at Lichen Island.

[A.N.A.R.E. photo by Phillip Law.

Leaving the sledge where we were, we hurriedly ate the lunch we had prepared that morning—four biscuits each with butter and marmite, one orange, some chocolate and hot cocoa from a thermos—and pushed over to the island on skis. We found it most interesting, with a wealth of lichens, great expanses of moss, interesting rocks, and excellent viewpoints from which to survey our surroundings. Crohn collected and examined rocks; Lacey set up his theodolite and waited for a sun shot; I took panoramic photos and Bechervaise collected flora; Jack Ward built a ground cairn. We noted a swell at the tide crack of about five to eight inches.

We returned to the sledge about 1800 hours, had a successful radio schedule with the ship, pitched camp on the highest surface I could find, and cooked dinner. Again I was not happy about the site. I did not wish to camp on the island in case the black ice melted or broke up and left us sitting there stranded and waiting for the next freeze. On the other hand there were no heavy floes anywhere handy which we could camp on—the best I could find was a spot, about three feet higher than the uniform sea ice surface, which apparently was a pressure ridge covered with snow. The snow had firnified, giving under us twelve to eighteen inches of granular ice (like loose gravel, each piece a small glassy nodule of ice). This overlaid the usual sea ice, which did not appear to be more than one foot above the water and which probably extended from three to five feet beneath. I had looked around for an iceberg, with a slope against one face, up which we could scramble to pitch our tents on top, but nothing suitable existed. We had to make do with what we had.

The evening meal was pemmican "hooch" (a stew of pemmican, potato powder, onion powder, oatmeal), one biscuit each, coffee and chocolate. I then sat and wrote by the light of an electric lamp and later Bechervaise came in and we smoked a cigar. There was a radio schedule at 2200 at which we arranged a listening schedule for 0600 next morning and an operating schedule for 0900 hours. Thompson sent us a warning message that there was a five-feet swell at the ship which had broken up the ice for some distance along our track. We went to bed shortly after 1100 hours in what looked like "set fair" weather.

I was worried about several things. First, a hurricane would set this area into a heaving, gigantic cauldron in which icebergs would roll and grind to slush all the surrounding pack that was not broken up by wind and swell. In such a case our only safety would lie on the island. Secondly, I was concerned that our way of return might be blocked at the two weak points—the Gap and the rotten mile the other side of it. A ten-foot lane of water at the gap could prevent our escape and force us to search the iceberg maze for another route under conditions where time might be paramount.

Thirdly, I was concerned (but less so) as to what we would do if wide lanes of open water within three miles of the ship prevented our reaching the ship and the heavy floes prevented the ship from reaching us. This would be less serious, as we would simply have to wait for a re-freeze, or a close-up or a break-out.

With these thoughts in mind I went to sleep.

At 0300 hours on Saturday I was awakened by wind flapping the sides of the tent. When I went out I found it was snowing and blowing fairly hard from the north-east. I thought: "So this is what broke up the ice last night at the ship".

After consultation, we decided that we could not risk remaining where we were in a storm and that we would be safer on the islet. Accordingly we worked fast, without breakfasting, and by 0430 hours were ready to move. We hauled the sledge cautiously over the weak black ice to the open water at the foot of the tide crack ice-fringe on the island. There we unpacked and passed the equipment up onto the rock. While doing so I broke through the ice into the sea and was thoroughly soaked.

The camp on Lichen Island.
[A.N.A.R.E. photo by Phillip Law.

We pitched our two tents on a flat snow slope between the two main humps of the islet and were fully established by 0600 hours.

After breakfast we proceeded with our work. Lacey took sun shots between 1030 and 1230 hours, Crohn collected geological samples, Bechervaise collected lichens, I took photographs and Shaw and Ward built a cairn and kept radio schedules with the ship. I wrote a note which we placed in a rum bottle and set beneath the rocks of the cairn and, shortly after noon, clouds obscured the sun. We were lucky to get the noon shot we required for the fix.

I decided to name the island "Lichen Island", because of the rich profusion of coloured lichens growing there.

Looking south from Lichen Island.

[A.N.A.R.E. photo by Phillip Law.

The expected storm did not develop and the afternoon turned out fine, though overcast. The ship advised by radio that the breakout of ice was continuing and that it would move in closer to us. We had a solid meal at 1400 hours and at 1730 set out on the return trip. The temperature had risen and the snow had begun to thaw.

We made fast time to the gap and found to our relief that it had deteriorated only slightly since our previous passage. We negotiated the weak ice safely and then were heartened to see the "Kista Dan" dead ahead on the horizon. She had moved in four miles from her previous position through the broken fast ice.

The return journey—men on skis hauling the sledge approaching the Gap. Man on right uses a walkie-talkie radio to contact the ship. The sledge wheel measures the distance travelled.

[A.N.A.R.E. photo by Phillip Law.

The hauling became harder as the evening wore on and the snow became drier. However, the new position of the ship meant that we could abandon our old track, with its mile of rotten ice and its confusing maze of bergs, and head directly north for the ship. Behind us blazed a glorious sunset.

Over the last three miles to the "Kista Dan" the ice deteriorated. First we met small crevices, then wider ones, and finally cracks two to six feet wide which opened and closed with the swell. By waiting our chance we succeeded in hauling the sledge straight across most of them, but finally a large crack ten feet wide forced us to detour almost half a mile. Thereafter we zig-zagged, choosing our path as shrewdly as possible to avoid the open stretches of water, hauling across the

narrow cracks and detouring around the wider ones. We were literally floe-hopping over the final stages and were greatly assisted by Captain Petersen, who wedged the bows of the "Kista Dan" hard against a very large floe and pushed at full speed ahead to force this floe against those behind it and thus prevent their drifting apart.

We reached a floe near the ship at 2245 but had to wait until 2315 before the ship could manoeuvre alongside to pick us up. Good weather and good visibility had simplified what otherwise could have proved a difficult predicament.

On Sunday, 6th February, the ship started at 0625 hours to push out of the ice towards Sandefjord Bay. This took much longer than we had expected and we did not reach the open water near the Glacier Tongue until 1300. Sailing around its snout we found that packice stretched across the lower extremity of Prydz Bay and that the entrance to Sandefjord Bay was as narrow as five or six times the height of the ice cliffs of the Glacier Tongue. The whole area beyond this narrow entrance was cluttered up with icebergs and packice and appeared quite inaccessible for a ship. From what I had seen on the eastern side of the tongue I guessed that Sandefjord Bay would prove impassable also for a party on foot.

The second mate and Lacey commenced a careful plot of the ship's course and the position of the Amery Ice Shelf in relation to it, while Elliott drew a series of sketches of the radar screen at regular intervals. I was kept busy at the echo sounder.

That evening we passed through pancake ice for the first time and at 2247 we hove to for the night. On Monday, 7th February, we ran into fairly heavy packice at 800 hours as we rounded the point of the Amery Ice Shelf into the Mackenzie Sea, but by 1000 hours we had broken through into open water against the Shelf and with the sun shining brightly and in an air temperature of 19° F. we proceeeded with an excellent plot of the coastline. At the south-western corner of the Mackenzie Sea the flat top of the ice shelf began to rise to the west, indicating that here was the join of the plateau ice and the ice shelf.

We were able to follow the coast north until 1700 hours, when we were forced out to the east by the heavy pack and icebergs about 30 miles south of Cape Darnley. This possibly represented the southern limit of the Fram Bank. By midnight we had skirted the Fram Bank and were proceeding westwards towards Mawson. On Tuesday, at 1650 hours, we met loose pack which thickened up with numerous heavy old floes until we stopped for the night at 2153. Starting at 0600 hours next morning, we passed into open water at 0800 and pushed on speedily to reach Mawson at noon on Wednesday, 9th February.

We stayed for 21 days. During this period 400 tons of cargo were unloaded and nine new huts were erected. Mawson Station thus became firmly established as a permanent geophysical observatory for work in cartography, meteorology, geomagnetism, cosmic rays, seismology, gravity, geology, aurora, glaciology and biology. A party of 15 men, led by John Bechervaise, was put ashore to replace the 1954 party of 10 men, led by Robert Dovers.

At 1415 hours on Tuesday, 1st March, the " Kista Dan " sailed for Heard Island, Iles de Kerguelen and Melbourne. We met brash and consolidated pancake ice for the first twenty miles or so, but reached the open ocean at 2050 hours without having seen any of the heavy old season's floes which we had sailed through three weeks earlier.

We arrived at Heard Island at 1600 hours on Saturday, 5th March, and remained until Wednesday, 9th March, when, at 1430 hours, this station was finally closed down. The huts were sealed and stocks of food and fuel, in addition to diesel generators and radio sets, were stored with appropriate instructions to provide succour for any persons cast in distress upon this lonely island.

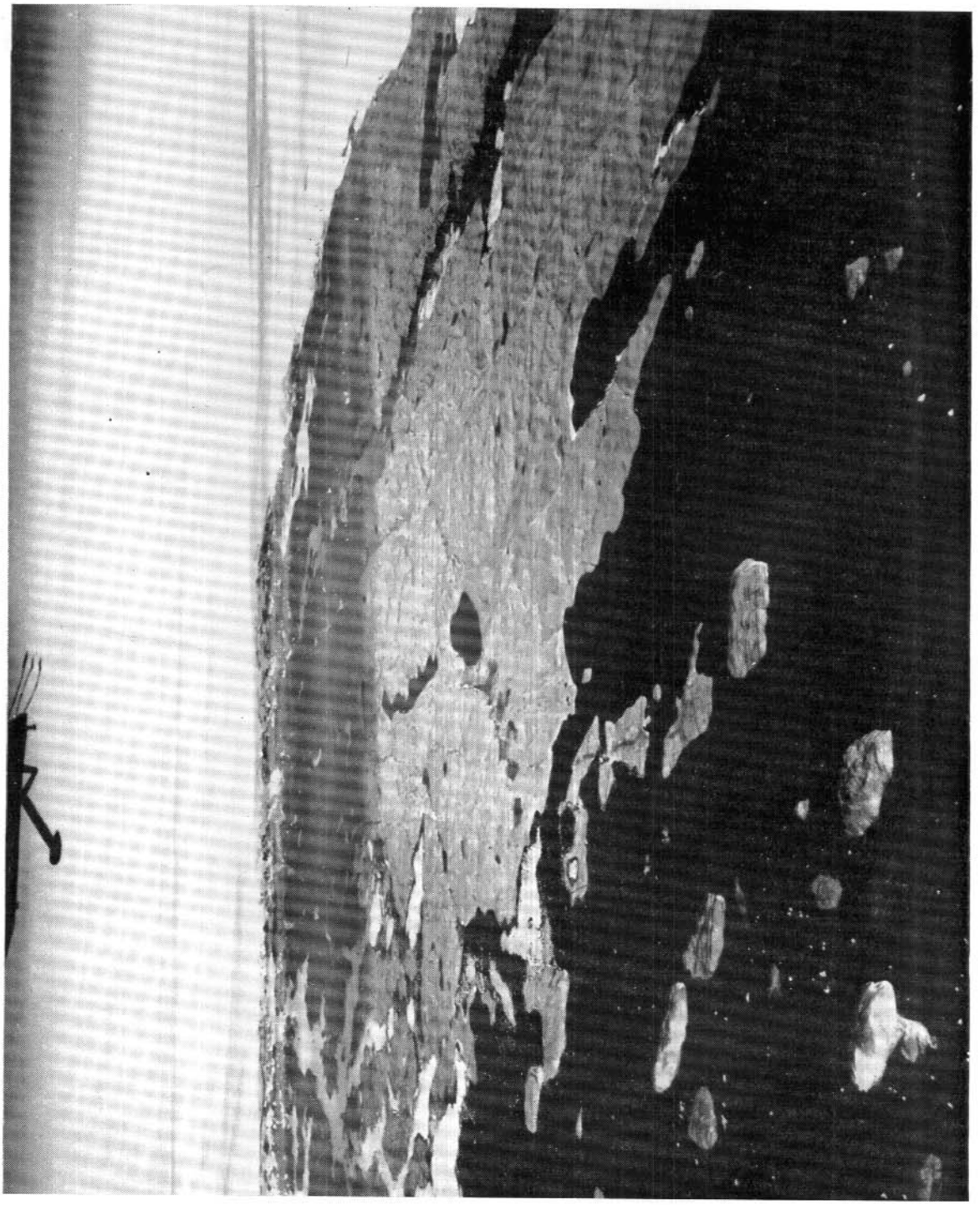
After a courtesy call at the French Station at Iles de Kerguelen and an uneventful journey to Australia, the " Kista Dan " anchored at No. 2 North Wharf, Melbourne, at 0800 hours on Wednesday, 23rd March.

GENERAL NOTES ON THE VESTFOLD HILLS

Geography

The region called the Vestfold Hills comprises an area of about 200 square miles of ice-free mainland rock, with numerous off-lying islands, on the coast of Princess Elizabeth Land. It lies between the latitudes 68° 25′ S. and 68° 40′ S., and is bounded by longitudes 77° 50′ E. and 78° 35′ E. The mainland portion is deeply dissected by extensive fjords and is dotted with numerous lakes. The hills and islands rise to a maximum altitude of about 500 feet but are mostly between 100 and 300 feet in height.

At some stage—probably in the late pleistocene era—the antarctic continental ice-sheet receded and exposed this area of rock, leaving much glacial debris as evidence that it once completely covered the region. Since then, frequent strong winds have tended to keep much of the exposed area free of snow, while the high absorption of solar heat by the dark rock in summer serves to melt off any drifts which form and to thaw out the lakes. In this and other respects the region is very similar to the Bunger Hills in Queen Mary Land (Avsyuk, Markov and Shumsky, 1956).



Vestfold Hills from the air. [A.N.A.R.E. photo.

The general appearance of the Vestfold Hills is shown in the aerial photograph. In summer, with its rich chocolate-coloured rock and blue-green lakes, with its sapphire fjords leading to the open sea and the myriad icebergs offshore, and with the creamy white slopes of the Antarctic Plateau vanishing into the distance behind, the Vestfold Hills present an attractive picture. Nevertheless, it is a remarkably sterile region. A few lichens and mosses grow on the rocks and some algae occur in the lakes, but the general impression is that of a desert.

The amount of glacial debris decreases as one proceeds from the coast towards the continental ice-sheet. The country rock of the coastal hills is in places completely covered by moraine rubble and no bedrock is visible in the valleys, but inland the hills are bare of erratics. A large portion of the coastal region of Broad Peninsula consists of an extensive plain of moraine boulders, rubble and sand. On this plain was found one very large cottage-sized black erratic boulder.

Soil is plentiful. The yellow-black mud in which the DUKWs bogged near Camp Lake was many feet deep; there was soil between the rocks of the moraine plains and sand between the erratics everywhere else.

In every depression there are tarns or lakes. Most of these are salty or brackish and the degree of salinity in general decreases with the height of the lake above sea level, so that the small pools on the tops of the hills are quite fresh. Some of the large lakes are below sea level and are saltier than the sea. Most of the lakes are undrained. I am of the opinion that the salt is derived from the sea spray which is whipped up during violent storms and carried across the rocks by the wind, for the rocks are not of the type from which salt in any quantity can be leached.

On many of the rocks at low and medium altitudes were white incrustations of salt, obviously evaporated residues from salt water. Such residues were common around the leeward (western) shores of the larger lakes, demonstrating the effect of strong winds in transporting salt from shore lakes to the rocks. No doubt a similar process on a larger scale takes place when gales sweep the fjords and open sea. Melt water during the summer thaw would then wash the salt down into the lakes. The higher lakes are less salty because the drainage areas from which they derive sustenance are smaller and because less salt is carried to the higher altitudes.

One large lake showed terraced sand and pebble beaches at one end. On these beaches the pebbles were sorted in size, the largest being at the western end of the beaches furthest from the water and the smallest nearest the water. This is probably the result of sorting by the vigorous wave action caused by strong winds.

The high, fresh lakes were partly or completely covered with ice, but all lower, larger, more saline lakes were ice-free. On our 1955 visit we found the temperature of the water in the larger lakes within a few feet of the water's edge to be 39°-40° F. In contrast, we noted that most fjords were frozen over solidly except for the first 3-5 miles near their mouths. Apparently solar heat is able to thaw the rock-enclosed lakes earlier than the sea ice of the deep fjords. It would appear, too, that lakes in hollows, surrounded by high cliffs of dark rock, receive much re-radiated solar heat from the cliffs.

Broad glacial valleys, roughly parallel with the fjords, lead into the larger lakes, and smaller valleys often lead down steeply from the hills in directions at right angles to this. In some cases hanging valleys indicate glacial action of a much earlier period. Glacial polishing is common on the rocks.

Off-lying islands offer fine examples of roches moutonnées, their axes lying in a N.E.-S.W. direction and their highest points being at their south-western ends.

Island of Vestfold Hills exhibiting typical roche moutonnée form.
[A.N.A.R.E. photo.

Frost sorting of pebbles was noted in areas where winter drifts had been lying. In some sheltered places permafrost remained a few inches beneath the surface of the ground. An unusual feature observed

was one we named "Steam-roller Flats". Where snow drifts had lain during winter but had melted each summer, the pebbles had been crushed down and orientated so that all their flat faces were upwards and they constituted a paved surface as flat as though rolled by a heavy steam-roller. On one terrace, situated near the crest of a rise overlooking the sea, no large boulders existed (although there were many all around the terrace) and the small stones of the terrace showed this steam-roller effect. Sorting and pressing by the action of seasonal snow drifts was apparently responsible.

Wind erosion was severe and interesting examples of cellular deflation were common. Exfoliation of large areas of country rock on the summits of hills was also observed.

The absorption of solar radiation by the rock and its re-radiation over an area of 200 square miles has a remarkably ameliorating effect upon the general climate of the region. In addition, as points on the shore of Broad Peninsula are twelve miles from the mainland ice-cap, it is rare for a katabatic wind to persist over the distance. Although Vestfold Hills is further south than Mawson, its coastal climate is warmer and calmer. A vast difference is noted immediately one moves down the coast close to the ice-cliffs south of Rauer Islands, where cold katabatic winds sweep off the ice-cap and make conditions unpleasant for most of the time.

The dolerite dykes which stripe the country rock with broad black bands are a prominent characteristic of the Vestfold Hills. They do not occur in the Rauer Islands or the Larsemann Hills further south.

Meteorology

Now that the meteorological station Davis has been established at Vestfold Hills, a full account of its prevailing weather conditions will soon be available. However, at this stage, only some general remarks derived from a few observations made during the three ANARE visits to the area can be made.

During our 1954 visit the barometer rose to an unusual height (1005 millibar, the highest recorded south of 52° lat. during this voyage) and we experienced our strongest winds and heaviest snow. High winds, always N.E., were usually accompanied by falling pressure, although the total drop in pressure was small. In fine weather the winds appeared to be light and variable. As already mentioned, snow drifts showed wind scours and cornices indicative of superimposed S.E. winds.

During the approach to the coast on 1st March, in fine weather, the wind was a very slight westerly up to about eight miles from land and thereafter a light south-easterly. The region where the change occurred was the boundary between the off-shore new ice and the open lead along

the coast, suggesting that the orographic easterly winds, presumably prevailing during the preceding weeks of fine weather, kept the water immediately offshore free from ice.

In 1955 we found snow drifts to be very rare. A small one we found on the way to Ellis Fjord extended under the surrounding moraine debris as a sort of "permafrost", indicating an almost permanent drift in this sheltered place. On the walk back to the camp we passed over large drifts on the seaward side of the first row of coastal hills. Above the camp, and between it and the coast (along our DUKW route), there were also large drifts. Apart from these, and a large one on the S.W. corner of an island north of our route to the shore, we saw no other drifts.

Apparently, just before our arrival, there had been a snow-storm, for fine powder snow lay in windblown, remnant streaks an inch or two deep behind the boulders and appeared to be not more than two or three days old. It is this thin sprinkling of powder snow that appears in the photographs.

Meteorological observations were taken on the "Kista Dan" at 3-hourly intervals while the ship was at anchor in March, 1954:—

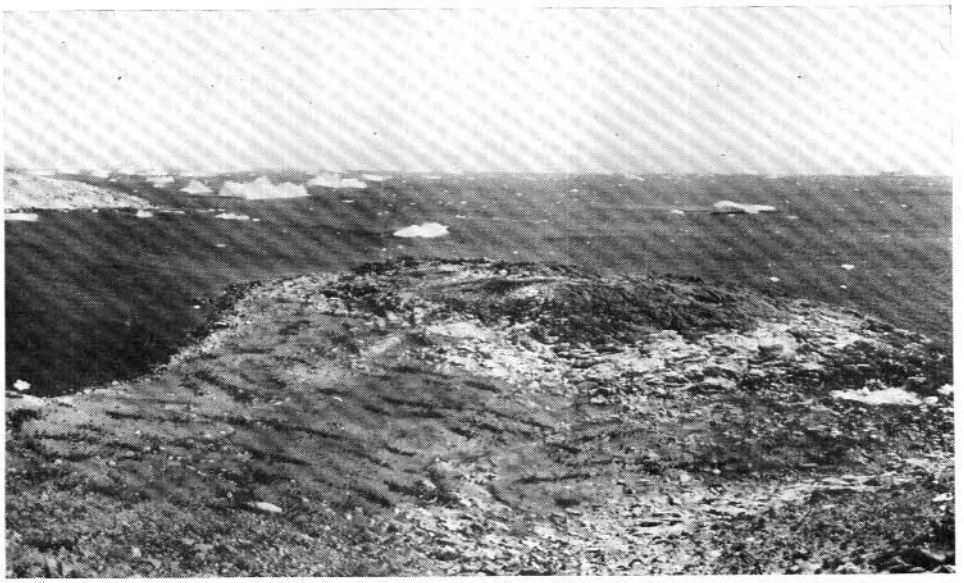
Position of Ship	Date	Time (G.M.T.)	Pressure (° F.). MBS	Pressure (° F.). MSL	Temp. (° F.).	Wind Direction (Degrees)	Wind Speed (Knots)	Sea Temp. (° F.)
67° 57′ S., 75° 35′ E.	Mar. 1	0000	991.0	13.2		250	18	29.0
68° 10′ S., 76° 00′ E.		0600	992.1	16.8		220	13	....
68° 25′ S., 76° 42′ E.		1200	994.0	16.8		250	8	28.8
68° 33′ S., 77° 54′ E.		1800	994.6	19.8		160	2	29.0
68° 33′ S., 77° 54′ E.	Mar. 2	0000	993.2	21.0		040	25	29.3
68° 33′ S., 77° 54′ E.		0600	993.9	23.0		060	40	29.1
68° 33′ S., 77° 54′ E.		1200	989.4	25.2		090	27	29.0
68° 33′ S., 77° 54′ E.		1800	989.1	24.2		110	75	29.0
68° 33′ S., 77° 54′ E.	Mar. 3	0000	989.2	25.0		240	12	28.8
68° 33′ S., 77° 54′ E.		0600	994.8	27.2		090	3	28.9
68° 33′ S., 77° 54′ E.		1200	999.5	22.1		250	15	29.2
68° 33′ S., 77° 54′ E.		1800	100.9	16.0		210	5	29.0

At Lichen Island, in February, 1955, the following air temperatures were recorded (unshielded spirit thermometer, ventilated by whirling).—

	Time (G.M.T.).	Approximate Location.	Temp. (° F.).
Feb. 3	1730	At ship	28
	2200	Beside glacier tongue	25
Feb. 4	1800	At Lichen tide crack	28
	2200	At Camp II	22
	2300	At Camp II	19
Feb. 5	0330	At Camp II	25
	0830	At Lichen cairn	24
	1230	At Lichen cairn	33
	1600	At Lichen tide crack	34

Biology [1]

There are two large Adélie penguin rookeries on Magnetic Island. The main rookery lies on a small isthmus connecting the main body of the island to a small promontory on the western side; the second rookery occupies a good portion of the north-west slope of the island and is much more scattered than the first.



Isthmus rookery on Magnetic Island.
[A.N.A.R.E. photo by R. Thompson.

The main rookery covers about two acres and, at the time of our 1955 visit, a rough count showed it contained 3,000 chicks. Within the rookery there was only one adult to every 10 or 20 chicks. Other small groups of chicks were gathered at spots not far from the rookery, but these were excluded from the count.

There were estimated to be nearly 2,000 chicks in the second (hillside) rookery and large bare spaces in this rookery, littered with guano and dead chicks, suggest that it formerly supported a much larger population.

About 2,000 adults were counted on the island, most of these being non-breeding birds occupying areas separated from the rookeries. Most of the parent birds were obviously away at sea and numbers of adults were constantly coming and going from the shore.

On the basis of the above figures the total population of Magnetic Island would be at least 13,000 Adélies.

[1] Based upon observations by A. M. Gwynn, H. Oldham, N. Parsons, R. Thompson, and J. Bechervaise, in addition to those of the writer.

The majority of the chicks in 1955 were completely grey, about one-quarter beginning to turn white at the throat and not more than one in ten to turn white on the breast. This was in marked contrast to our 1954 visit when, at the beginning of March, all birds except the non-breeding adults had left.

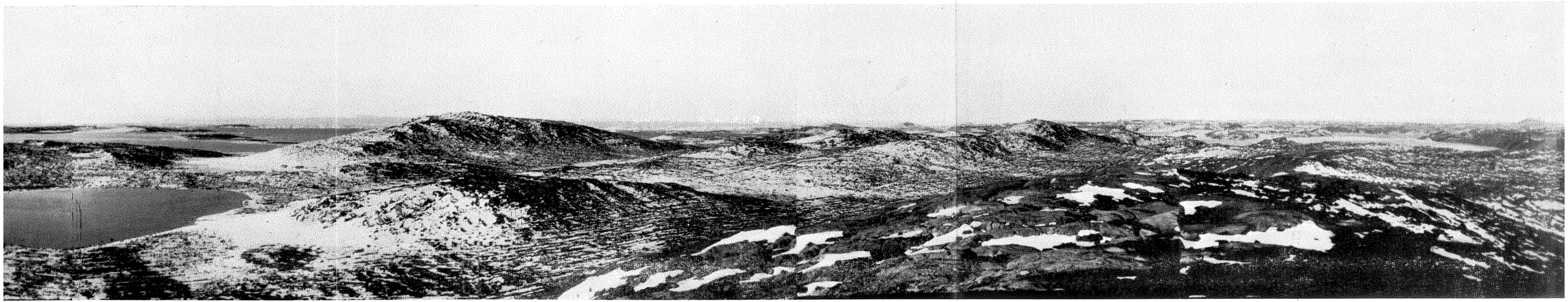
Numbers of dead chicks were seen and the accumulated dehydrated corpses were in places several feet deep. Guano from several inches to a foot in depth was common. The spectacle of chicks chasing adult birds and cheeping for food was commonly seen, but seldom did the adults disgorge any food to them. Many of the immature birds appeared undersized and undernourished, and would probably not survive. The mortality amongst the young birds must be very high. Food seen to be regurgitated by adults consisted of pink or bleached shrimps, $\frac{1}{4}$ to one inch long.

A leopard seal was seen to catch and play with a penguin, then skin it by tossing it in the air and beating it on the surface of the water (behaviour commonly reported by ANARE men at Heard Island).

Lucas Island was densely covered with penguin rookeries, as also were several of the smaller islands. The rookeries appear as light-brown patches on the darker rock from a distance. Not all accessible and apparently suitable islands possessed rookeries and there appeared to be none at all on the mainland which we examined (no doubt because the sea-ice there breaks out later than that around the islands). Lone adults and a fair number of chicks were seen at various times wandering aimlessly over the mainland rock, sometimes miles inland.

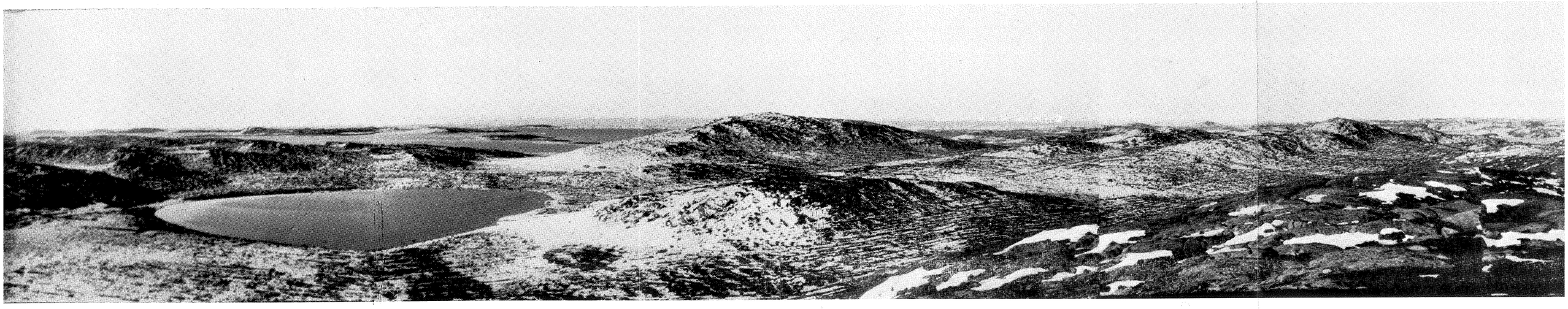
Other birds seen in 1955 at Magnetic Island were two to three dozen McCormack skuas around the rookeries, and a dozen skua chicks (almost fully fledged) at scattered places. Giant petrels (dark phase) were occasionally seen flying by. A few snow petrels were seen and two nests were found, one containing a small chick. Many Wilson's storm petrels were flying about the island slopes and one nest was found. These birds were numerous also on the mainland, where Bechervaise found four nests containing chicks and other evidence that the coastal moraine hills were a breeding place for many of these birds. Two colonies of cape pigeons, each of two or three dozen nests, were estab lished on the east and south-east faces of Magnetic Island. The nests each contained one chick.

Far more seals were seen in 1955 than in 1954. During our voyage by DUKW to the shore, and also later in Ellis Fjord, we saw Weddell seals floating on ice floes. Dead juvenile seals, mummified by dehydration, were observed at various places on the shores of large, highly-saline lakes miles inland. One immature bull elephant seal was seen ashore on Magnetic Island.



Panorama of Vestfold Hills taken from near Camp Lake.

[A.N.A.R.E. photo by Phillip Law.



Panorama of Vestfold Hills taken from near Camp Lake.

As lichens are numerous at Lichen Island and on Magnetic Island, it came as a surprise to us to find how scarce they were on the mainland of Vestfold Hills. The first was found by Bechervaise on the hill east of Camp Lake, where our parties met early in our 1955 walk. My party found none during our walk around the coastal region, but Bechervaise's group entered a region quite rich in lichens when they turned east along the frozen stretches of Ellis Fjord, about six miles inland from the open sea. They collected six species. Later they found rich lichens and one species of moss on a small hill just north of the eastern end of Ellis Fjord. There were no mosses or lichens in the region around Camp Lake which we walked over on our first night ashore.

I would be tempted to suggest that the absence of lichens on the mainland coastal region is due to the salt spray, but this does not accord with the fact that lichens were common on Magnetic Island, unless the stimulus of penguin guano on the island overcomes the adverse effect of the salt.

On the shores of the fjords were found clam shells (*Laternula elliptica*), starfish, sea urchins and worms, and a pale mauve, ribbed jellyfish about eight inches in diameter. Long ribbons of kelp, some green grass-like seaweed, and green algal slime were also observed.

Geomagnetism and Gravity

The following magnetic and gravity observations were obtained at the Absolute Station on Magnetic Island in 1954 and 1955:—

Observer: J. A. Brooks.
Date: 3rd March, 1954.
Observed Magnetic Values:

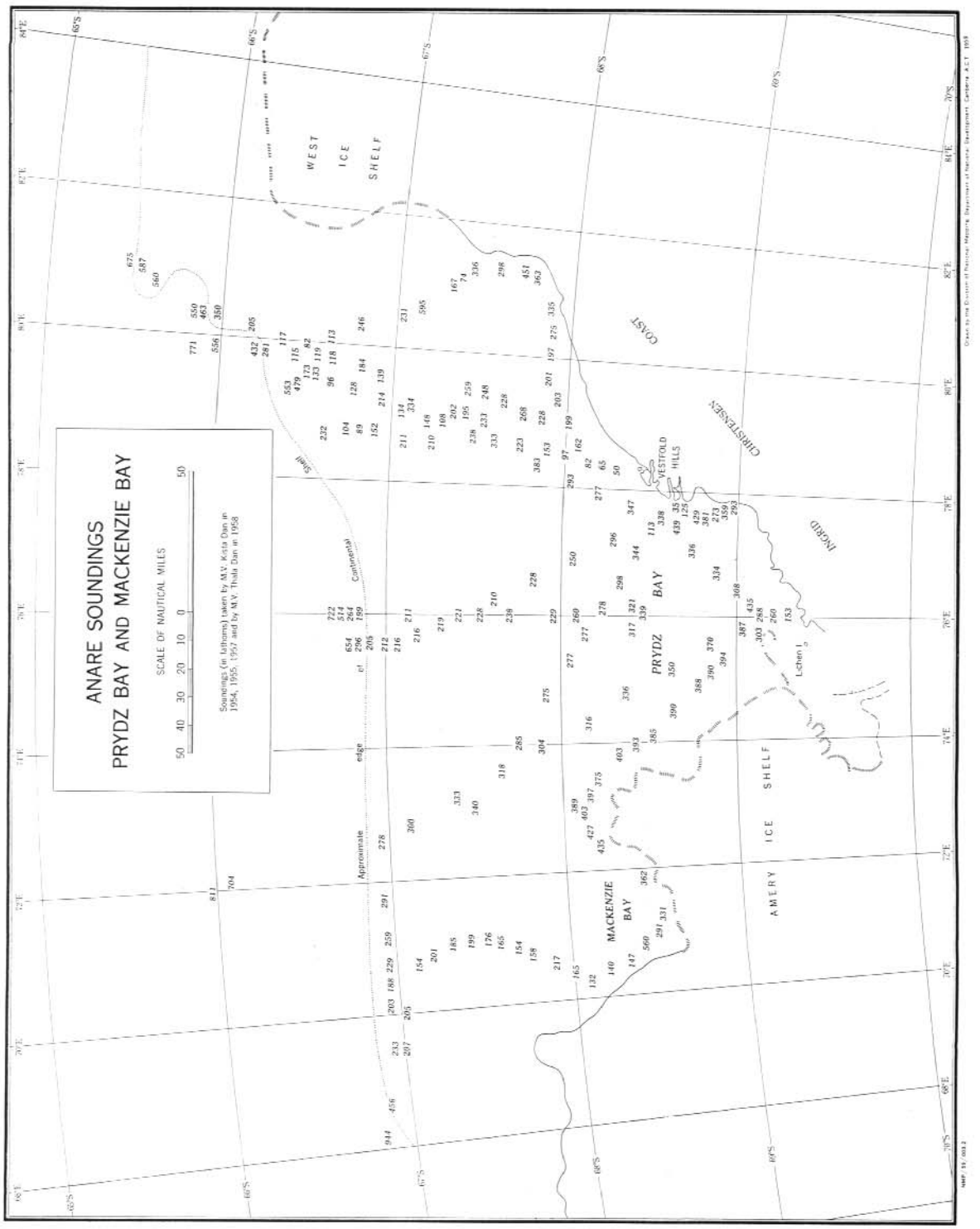
Horizontal Intensity: 15,600 gamma.
Vertical Intensity: 56,270 gamma.
Declination: 70° 16.1′ West.

Observer: W. H. Oldham, assisted by K. B. Lodwick.
Date: 31st January, 1955.
Observed Gravity Value: 982,572 mgal.
Observed Magnetic Values:

Horizontal Intensity: 15,634 gamma.
Vertical Intensity: 56,256 gamma.
Declination: 70° 18.4′ West.

Soundings

Soundings in fathoms on the Vestfold Hills coast taken on the "Kista Dan" and "Thala Dan" from 1954-1958 are shown in the accompanying chart.


ANARE SOUNDINGS
PRYDZ BAY AND MACKENZIE BAY
SCALE OF NAUTICAL MILES
50 40 30 20 10 0 50
Soundings (in fathoms) taken by M.V. Kista Dan in 1954, 1955, 1957 and by M.V. Thala Dan in 1958
WEST ICE SHELF
COAST
CHRISTENSEN
INGRID
VESTFOLD HILLS
PRYDZ BAY
MACKENZIE BAY
AMERY ICE SHELF
L. Chen
Approximate edge of Continental Shelf

Geology [1]

The area shows relief of the order of 400 feet with numerous isolated hummocky hills, somewhat modified in shape by joint and shear directions of the country rock. The major valleys trend in a roughly east-west direction, parallel to the predominant strike of the rock foliation, and are filled to various depths by glacial drift and moraine. In the central coastal portion of the area, moraines also form low hills and no country rock at all is exposed in this vicinity. Elsewhere, only scattered erratics occur on the upper portions of the hills and few of these show significant facetting or striations. Lakes and fjord-like inlets are very prominent features of the landscape, but there are no defined stream channels and most of the lakes do not appear to have any surface outlets.

The country rock consists largely of medium-grained charnockite gneisses, which sometimes show banding, due to the segregation of ferromagnesian minerals. The dominant strike of both foliation and banding is 90°, with vertical to steep northerly dips, but deviations in strike of up to 45° are not uncommon. No significant lineation is present. Extensive zones of slight shearing, sometimes up to a hundred feet in width, cut this foliation at various angles, with a slight preference for trends close to 360°.

Numerous narrow seams of bluish and glassy quartz are present, generally sub-parallel to the foliation, as well as occasional larger lenticular or irregular bodies of granite pegmatite, charnockite pegmatite, quartz-garnet rock and quartz-epidote rock. Segregations of almost pure epidote or almost pure pyroxene are sometimes present, and may be up to two or three feet in diameter.

Bodies of biotite granulite and pyroxene granulite occur at several points, and the largest of them attains a diameter of at least half a mile. Their relations to the gneisses are not known.

Basic dykes are very numerous, ranging up to about 30 feet in width, and can occasionally be traced for distances of at least one mile. They include fine-grained dolerites, basalts, and lamprophyres. The dominant strike directions are between 340° and 20°, with a minor set approximately at right angles to this and occasional dykes oblique to both these directions. Dips are generally within 20° of vertical. The dykes typically cut across shear structures in the country rock, but some of the dykes themselves are faulted and show slight local shearing. On the other hand, they do not contain any quartz veins or other indications of younger magmatic activity. No petrological or structural differences could be detected between the various sets of dykes of different strikes, and no consistent age relationships exist at intersections.

[1] Prepared by P. W. Crohn.

The erratics and boulders of the moraine deposits generally belong to one or other of the rock types already described, the main exceptions being a few specimens of a contorted garnet schist and of a mica schist with porphyroblastic feldspars, neither of which corresponds to any rock type seen in situ in this area.

At Magnetic Island, about three miles offshore, observations by Lodwick, Oldham, Gwynn and Shaw indicate very similar conditions to those described above, and it appears likely that similar rock types also occupy the remaining unvisited portions of the Vestfold Hills area and the adjacent islands.

The only indications of economic mineralization seen in this area consisted of some specimens of glassy quartz containing traces of copper carbonate (malachite), and one specimen of felspathic gneiss containing chalcopyrite (copper iron sulphide). Both of these identifications are tentative, pending chemical tests, and none of the specimens was found in situ, although it is unlikely that any of them had been transported for any great distance.

No significant radio-active anomalies were encountered. Background counts were of the order of 80 to 120 counts per minute, and no consistent difference was apparent between rock types.

The following lichens and echinoderms were collected at Vestfold Hills and Larsemann Hills during ANARE visits:—

Lichens (identified by Professor C. W. Dodge, Washington University, St. Louis, Missouri):

Magnetic Island, Vestfold Hills (N. R. Parsons).

Sarcogyne angulosa.
Lecanora griseomarginata.
Gasparrinia Harrissoni.
Rinodina sordida.
Rinodina frigida.
Gasparrinia sp.

Lichen Island (J. M. Bechervaise):

Lecanora Mawsoni.
Lecanora McLeani.
Lecanora Johnstoni.
Protoblastenia citrina citrina.
Xanthoria Mawsoni.
Huea smaragdula.
Gasparrinio Harrissoni.
Rinodina frigida.
Pyrenodesmia Mawsoni.
Prasiola sp. (not a lichen, a green alga).

Echinoderms (identified by Dr. H. B. Fell, Victoria University, Coll., Wellington, N.Z.):

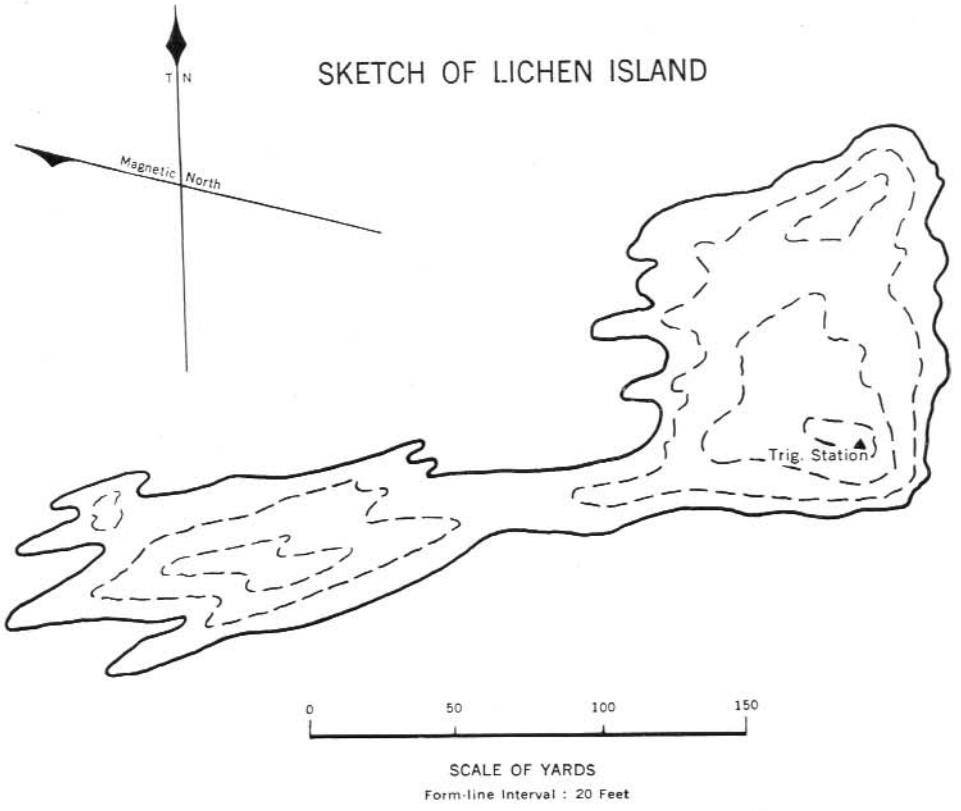
Echinoidea (sea-urchins): *Sterechinus neumayeri.*
Ophiuordea (brittle star): One specimen of the family, *Ophiolepidae,* seems to be a new species.

GENERAL NOTES ON LICHEN ISLAND

Geography

Situated at lat. 69° 20′ S., long. 75° 32′ E., Lichen Island may be considered a north-westerly outlier of the Bolingen Islands which lie off the coast of the Ingrid Christensen coast between the Larsemann Hills and Sandefjord Bay.

The island measures roughly 350 yards long and 150 yards wide, with a maximum elevation of about 60 feet. It is elongated in the direction E.W.E.-W.S.W. and is roughly dumbell-shaped, with knobby ends connected by a low saddle (see sketch).



Drawn by the Division of National Mapping, Department of National Development, from a sketch by P. W. Crohn.

At the time of our visit the island lay in the midst of an extensive area of fast ice, with a pronounced tide crack and an open water pool on its western side. A thick ledge of ice clung to the rocks a few feet above the water. On the fast ice at the far edge of this pool basked more than 50 Weddell seals. Some of the ice around the island was young (black) ice, indicating that a more extensive pool had shrunk in size owing to recent freezing. It is probable that late in February—but perhaps not every year—the island lies in open water. It is certain, however, that the period during which it can be approached in any year by ship or boat is extremely short. Some three miles to the north an arc of massed icebergs joined the Polar Record Glacier Tongue in the west to the fast ice tied to the Larsemann Hills in the east. To the west and south-west could be seen the ice front of the Glacier Tongue, while to the south the ice pattern was a confused jumble of tilted bergs, ice shelf and bay ice, graphically illustrating the effects of colossal pressure.

The low-lying central area of the island was covered by snow drifts, which also lay in sheltered cracks and crevices elsewhere; otherwise the rock was ice free. Runnels of melt water ran from the higher places, and scattered guano and feathers indicated that penguins customarily come ashore on this remote rocky area to moult. Green algae and a wealth of multi-coloured lichens grew profusely, the algae in the melt-water channels and the lichens over most of the rock. These and the contorted folds of the rock strata were the most striking features of the island.

Geology [1]

In contrast to the Vestfold Hills, this island is free from erratics and glacial drift. The country rock consists largely of medium-grained biotite para-gneisses, which locally grade into biotite hornfelses and are intruded by quartz feldspar ortho-gneissses with occasional clots of garnet. Garnet is also present in the para-gneisses near the ortho-gneiss contacts but, in contrast to the Vestfold Hills, there are only very minor amounts of pyroxene.

There is marked foliation in the para-gneisses, parallel to the original bedding, and this is intensely contorted into irregular folds of very variable amplitude. The fold axes, on the other hand, show remarkable parallelism with strikes of 225° to 255° and south-easterly pitches of 20° to 35°. There is also a marked lineation parallel to these fold areas, due to the presence of microfolds and of elongated clots of various mineral constituents. Both foliation and lineation are also present in the ortho-gneisses, although less pronounced, and are closely parallel

[1] Prepared by P. W. Crohn.

to those in the para-gneisses. The intrusions are generally elongated parallel to the direction of this lineation and their boundaries are also generally concordant to the foliation.

Occasional veins of glassy quartz with a thickness of two to three inches and a length of up to 20 feet were noted, but there is a complete absence of basic dykes.

APPENDIX: LIST OF ANARE PERSONNEL, 1954 AND 1955

1954 *Mainland Party*:—

P. G. Law
R. H. J. Thompson
Dr. A. M. Gwynn
P. J. R. Shaw

1954 *Magnetic Island Party*:—

F. W. Elliott
J. A. Brooks
M. W. Henderson
K. E. Dalziel
D. P. Sweetensen
Dr. A. Migot

1955 *Mainland Party*:—

P. G. Law
J. M. Bechervaise
J. L. Ward
P. W. Crohn
P. J. R. Shaw
T. A. G. Hungerford
G. Lowe
Lt. A. W. Hall
Lt. W. Bathurst
Cpl. C. Power

1955 *Lichen Island Party*:—

P. G. Law
J. M. Bechervaise
R. H. Lacey
J. L. Ward
P. J. R. Shaw
P. W. Crohn

1955 *Parties to Nearby Islands (including Magnetic Island)*:—

R. H. J. Thompson
R. H. Lacey
W. H. Oldham
E. L. Macklin
N. R. Parsons
L. N. Fox
F. A. van Hulssen
A. D. Riddell
R. G. McNair
A. S. Gowlett
Dr. R. W. Allison

ACKNOWLEDGMENTS

This account has been based upon observations made during the summer voyages of the "Kista Dan" in 1954 and 1955. The expedition men who took part in those voyages are listed above. All these men participated in the landings or in the work of preparing for them and many of them made observations which have been incorporated in this report.

In particular, I am indebted to Richard Thompson, my lieutenant on these voyages, for his very capable organisation of work on the ship and for supervision of all boat operations; to the leader of the 1955 Mawson party, John Bechervaise, for his skilled organisation of field equipment and his supervision of the work of the men of his party; to Peter Crohn for his geological reports on Vestfold Hills and Lichen Island; to Dr. Arthur Gwynn, Peter Shaw, Hugh Oldham and Neville Parsons, for ornithological observations and geological notes; to Jim Brooks, Keith Lodwick and Bob Lacey, for astrofix data and magnetic and gravity determinations; to Lieutenants Tony Hall and Bill Bathurst and their DUKW crews for landing operations in which their vehicles were used; to diesel mechanics Cpl. C. Power and Alan Gowlett, for operations involving weasels; to the Director, National Mapping Office (Mr. B. P. Lambert), for the preparation of track charts and maps; to the R.A.N. Hydrographer (Captain George Tancred, R.A.N.), for the reduction of the depth soundings taken on the voyage; to the Director of the Bureau of Mineral Resources, Geology and Geophysics (Mr. P. B. Nye), for the data on geology, magnetism and gravity collected by officers of his Bureau; to Professor C. W. Dodge, Washington University, Missouri, U.S.A., for the identification of lichens; to Dr. H. B. Fell, Victoria University College, Wellington, N.Z., for the identification of echinoderms. Finally, I am most grateful to the master of the "Kista Dan" (Captain H. C. Petersen), for his intrepid and capable handling of the ship and to the entire crew, for its friendly and competent co-operation, without which the data for this report could never have been obtained.

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VESTFOLD HILLS

AUSTRALIAN ANTARCTIC TERRITORY

Scale 1 : 100,000

Miles 1 0 1 2 3 4 5 Miles

Kilometres 1 0 1 2 3 4 5 6 7 8 Kilometres

Contour Interval : 25 metres

CONTROL : Astronomical Determination by A.N.A.R.E. 1957
COMPILATION : from Vertical Air-photos using slotted template assembly
PHOTOGRAPHY : by A.N.A.R.E. 1957-1958
PROJECTION : Polyconic
ELEVATIONS : Barometer heighting and parallax measurement (in metres)

LEGEND

Ice Free Coast	Land Contour 200
Indefinite Coast	Ice Contour 200
Limit of Ice Free Land	Depression Contour 0
Cliff and Ice Cliff	Astronomical Station ⊕
Edge of Continental Ice	Spot Height in Metres ·50

Produced for Antarctic Division, Department of External Affairs, by
Division of National Mapping, Department of National Development,
Canberra, A.C.T. September, 1958

77°50′ 78°00′ 78°10′ 78°20′ 78°30′

68°25′ 68°30′

Wyatt Earp Islands
Walkabout Rocks
Tryne Islands
TRYNE BAY
TRYNE SOUND
Barrier I
TRYNE FJORD
LONG PENINSULA
Pioneer Crossing
Tryne Crossing
Rundle Ridge
LONG FJORD
Lied Bluff
Lucas I
Plough Island
Magnetic Island
Turner I
Bluff I
Trigwell I
Flutter
Anchorage I
Lake I
WEDDELL ARM
Camp Lake
Lake Stincarp
Lake Dingle
Deep Lake
Davis ⊕ Station
Tarn
BROAD PENINSULA

Division of National Mapping, Department of National Development,
Canberra, A.C.T. September, 1958

LONG PENINSULA

BROAD PENINSULA

MULE PENINSULA

Lucas I

Plough Island

Magnetic Island

Turner I

Bluff I

Trigwell I

Lake I

Anchorage I

Flutter

Gardner I

Davis

Station

Tarn

Camp Lake

Lake Dingle

Lake Stinear

Deep Lake

Club L.

Lied Bluff

Tryne Crossing

Pioneer Crossing

Redgee Nick

Lookout Lake

The Lookout

Hawker I

Clear I

Mule I

WEDDELL ARM

HEIDEMANN BAY

LONG FJORD

ELLIS FJORD

CROOKED FJORD

CROOKED LAKE

SØRSDAL GLACIER

-68°30′

-68°35′

-68°40′

77°50′

78°00′

78°10′

78°20′

78°30′

LOCALITY PLAN

SCALE OF MILES
0 100 200

Mawson

Prydz Bay

VESTFOLD HILLS

MAC - ROBERTSON LAND

PRINCESS ELIZABETH LAND

NMP/58/084