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NARRATIVE

THE ANARE 1963 EXPEDITION TO HEARD ISLAND

by

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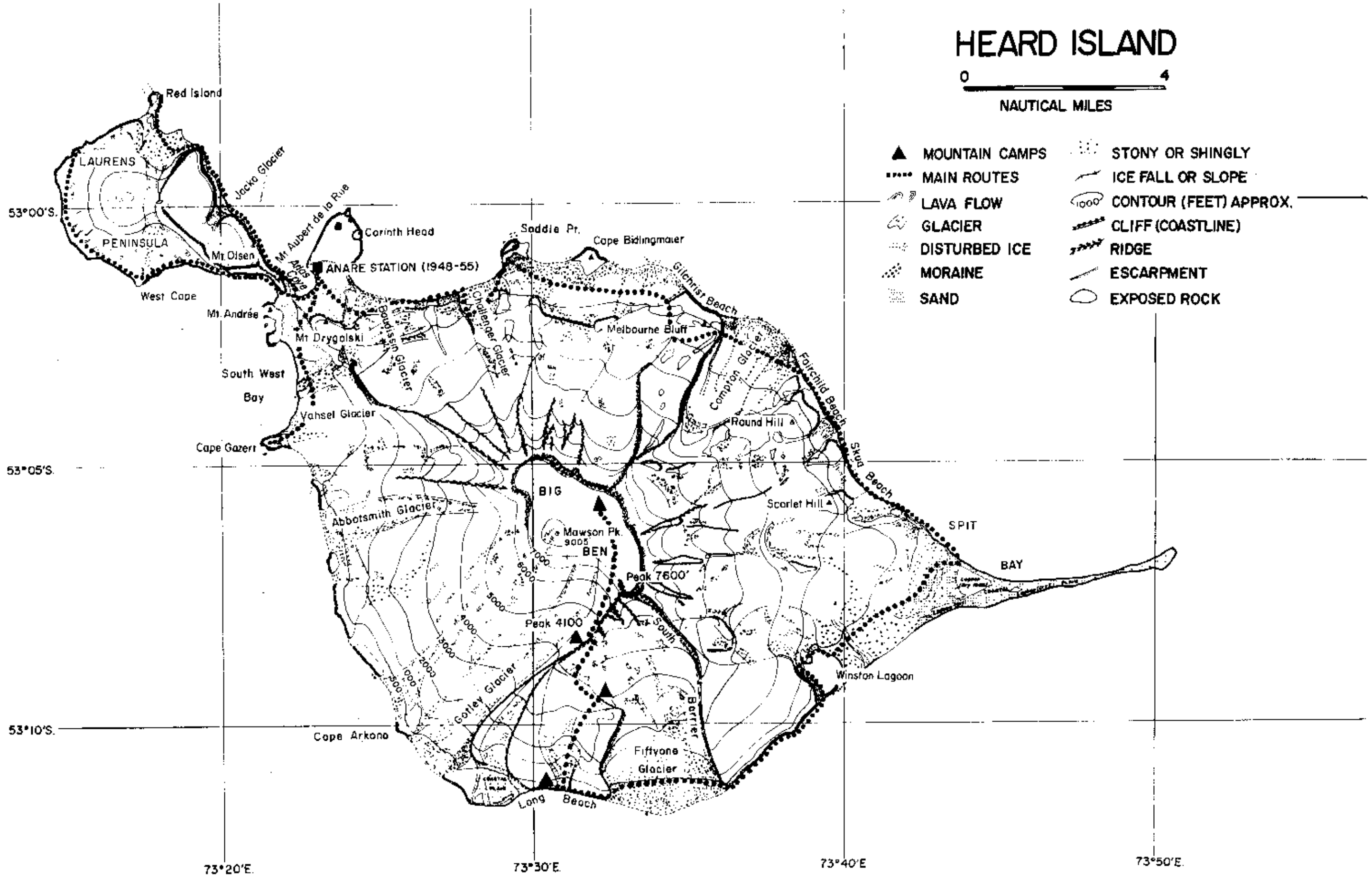

HEARD ISLAND
0
4
NAUTICAL MILES
MOUNTAIN CAMPS
MAIN ROUTES
LAVA FLOW
GLACIER
DISTURBED ICE
MORAINE
SAND
STONY OR SHINGLY
ICE FALL OR SLOPE
CONTOUR (FEET) APPROX.
CLIFF (COASTLINE)
RIDGE
ESCARPMENT
EXPOSED ROCK
Red Island
LAURENS
PENINSULA
Jacka Glacier
Mt Aubert de la Rue
Corinth Head
Mt Olsen
Atlas Cove
ANARE STATION (1948-55)
West Cape
Mt Andrée
Mt Drygalski
Baudissin Glacier
Challenger Glacier
Saddle Pt.
Cape Bidlingmaier
Gilchrist Beach
Melbourne Bluff
Compton Glacier
Fairchild Beach
Skua Beach
Round Hill
South West
Bay
Vahsel Glacier
Cape Gazert
BIG
BEN
Mawson Pk.
9005
Scarlet Hill
SPIT
BAY
Abbotsmith Glacier
Peak 7600'
Peak 4100
South
Barrier
Gotley Glacier
Winston Lagoon
Fiftyone
Glacier
Cape Arkona
Long
Beach
53°00'S.
53°05'S.
53°10'S.
73°20'E.
73°30'E.
73°40'E.
73°50'E.

THE ANARE 1963 EXPEDITION TO HEARD ISLAND

by

G. M. BUDD*

[*Manuscript received July 23, 1964.*]

INTRODUCTION

Heard Island, which in many ways resembles the arctic island of Jan Mayen, lies in the Southern Ocean in latitude 53°S and longitude 73°E, some 290 miles south-east of Kerguelen and 900 miles north of the Antarctic Continent[1, 2] (Fig. 1). It is roughly 27 miles in length and 13 miles in width (see attached map). The main part of the island is

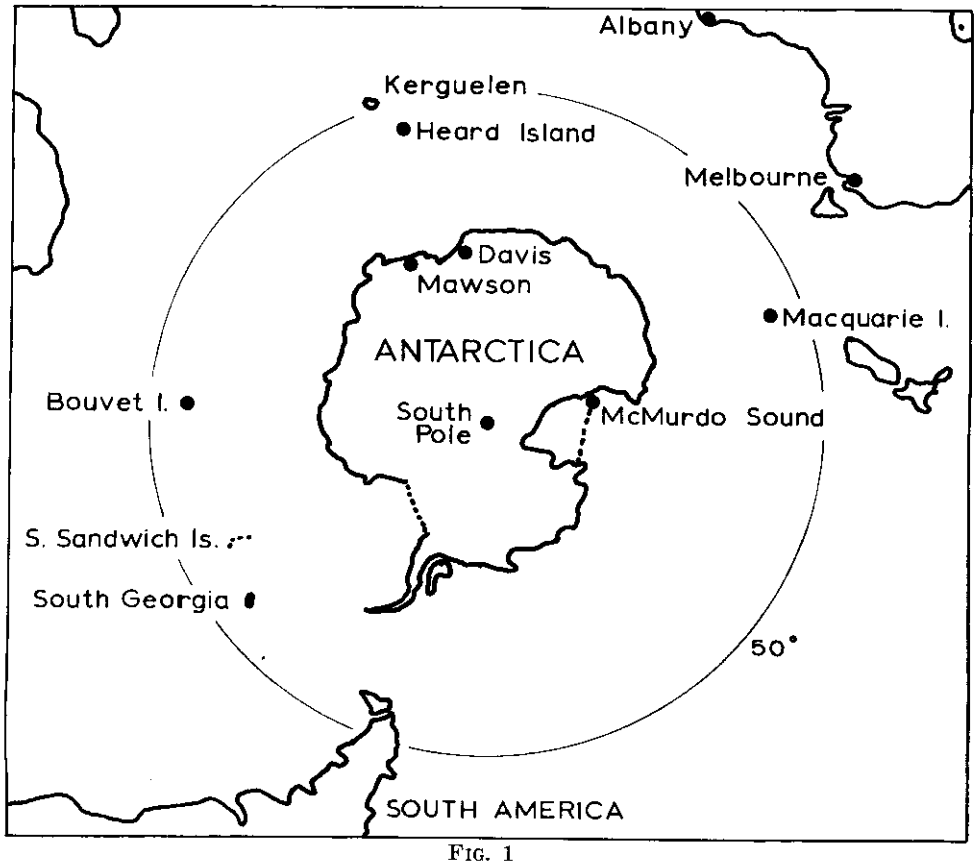


FIG. 1
Antarctica and the Southern Ocean.

* School of Public Health and Tropical Medicine, University of Sydney. Leader of the Australian National Antarctic Research Expeditions to Heard Island, 1954-55 and 1963.

circular in shape and consists of a massive volcanic cone known as Big Ben. The extinct crater of this volcano, breached on the western side, is filled with snow and ice and forms a plateau lying between 7,000 and 8,000 feet, from which the more recent cone of Mawson Peak rises to a height of 9,000 feet (Fig. 2). Vapour is continually emitted from the

ANARE photo 611 P. Swan

FIG. 2

Big Ben from the south-east in December 1947. The orientation cross on the left-hand border lies over the '51 glacier. Above and to the right of the cross are Peak 4100 and the pass leading to the west. To the right of the pass the western ridge of South Barrier rises to Peak 7600, where it merges with the rim of the old crater of Big Ben. The crater rim encloses the summit plateau, from which the cone of Mawson Peak rises to a height of 9,000 feet. The eastern ridge of South Barrier runs diagonally from the crater rim to the left-hand border of the picture, on the near side of the '51 glacier.

summit, and occasionally from several other vents at lower altitudes. As a result of its altitude and its position within the zone of antarctic surface waters, approximately 90% of the island is glaciated, more than half of its coastline consisting of ice cliffs 50 to 100 feet in height and washed

by the sea. The climate is cold, windy and cloudy, with a mean annual temperature of 33°F and a windspeed of 15 knots. Gales are frequent. The annual average for duration of sunshine is 1.7 hours per day, and rain or snow falls on 300 days of the year.[2] There are no safe anchorages; Atlas Cove, the best of them, is usable about half the time, and is swept by williwaws in which gusts between 60 and 100 knots are common. Vegetation in the ice-free areas consists mainly of azorella (*Azorella selago* Hook f.) tussock grass (*Poa cookii* Hook f.) and mosses; there are no trees or shrubs. Many seals, penguins and other birds breed on the island.

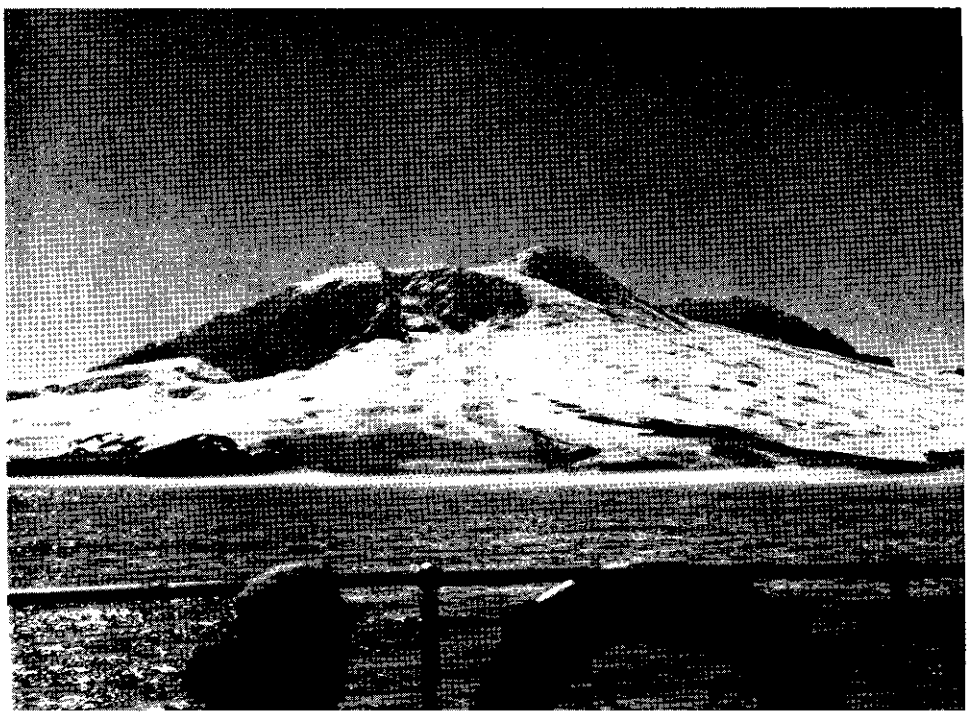
The history of the island has been described by Roberts.[3] It was discovered in 1833, and the first landing was made in 1855. Intensive sealing operations were carried on after 1855, but within 20 years the seal population had been almost exterminated and operations then ceased. A further period of sealing, of unknown duration, began in 1907,[3] and sealing was observed [2, 4, 5] in 1929. Scientific observations were made during brief visits by Nares's *Challenger* expedition in 1874, Drygalski's *Gauss* expedition in 1902, and Mawson's BANZAR Expedition* in 1929; the French geologist Aubert de la Rue also visited the island in 1929, in the whaler *Kildalkey*. In December 1947 a scientific station was established by the Australian National Antarctic Research Expeditions (ANARE) at Atlas Cove, at the north-west end of the island, and was continually occupied until March 1955, when the station was closed down. Since that time several visits, of a few hours' duration, have been paid to the Heard Island station by ANARE ships returning from the relief of Mawson and Davis.

Travel on Heard Island is difficult, owing to heavy crevassing of the glaciers that have to be crossed and the prevailing bad weather and poor visibility. On most days there is a layer of cloud at 1,500 feet which impedes travel above that height. The use of small boats as an alternative means of travel is extremely hazardous owing to the heavy surf and changeable weather. A complete overland circuit of the island has been made only twice, despite several attempts to do so, the main obstacles being the exceptionally difficult Abbotsmith and Gotley glaciers on the west coast, and the rocky uplands of South Barrier. Long Beach, lying on the south coast between South Barrier and the Gotley glacier, was visited only in the course of the two circuit trips; and Spit Bay, at the eastern end of the island, was visited only six times in the seven years of ANARE occupation. In 1952 two men lost their lives while trying to reach Saddle Point, on the route between Atlas Cove and Spit Bay.

A number of attempts were made to climb Big Ben from the ANARE station at Atlas Cove between 1947 and 1955 (Fig. 3). All made use of the same route—a rising traverse of the Abbotsmith glacier. The glacier

* British, Australian and New Zealand Antarctic Research Expedition.

is some 2 miles wide and very badly crevassed, so that movement in the prevailing blizzards, heavy snowfalls and freezing mist is both difficult and slow. The most successful attempt was that by Béchervaise, Elliott and Shaw in November 1953; they attained a height of approximately 5,000 feet in an attempt lasting 17 days, for over half of which time they were confined to the tent by blizzard.[6]



ANARE photo 233 A. Campbell-Drury

FIG. 3

Big Ben from the west in February 1949, showing the two main routes of ascent. The 1963 route from Long Beach crosses the pass beside Peak 4100 (on the far right) and ascends on the near side of the South Barrier ridge and Peak 7600, which are visible to the right of Mawson Peak (centre). The route from Atlas Cove, which was used in all previous attempts, traverses from the far left of the photograph and rises diagonally across the Abbotsmith glacier, visible immediately left of centre.

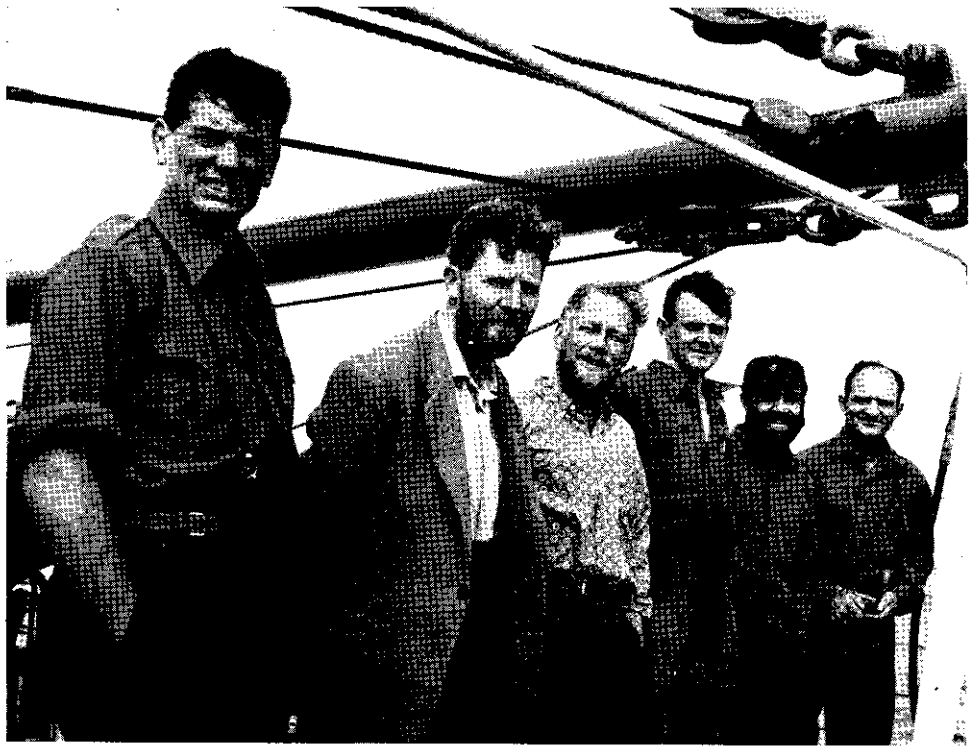
1963 EXPEDITION PLANS

In 1963 ANARE undertook a short summer expedition to Heard Island. Six men were to be landed on the island during the annual relief voyage to Mawson and Davis, and re-embarked on the return voyage some 6-8 weeks later. In this time they were to attempt the ascent of Mawson Peak, as one part of a broad scientific programme. The work planned included studies of the geology, vulcanology and glaciology of

Big Ben, the geological and biological survey of unexplored areas on South Barrier and elsewhere, and a biological and glaciological survey of as much of the island as possible in order to assess changes occurring in the eight years since the ANARE station was closed down. In addition, physiological experiments were to be conducted to determine whether the expedition members acclimatized to the cold, detailed ornithological studies and bird-banding were to be carried out, and regular synoptic meteorological observations were to be made at Atlas Cove for comparison with previous records at that site and with simultaneous observations at other parts of the island. Collections were to be made from bird, seal and plant material, from pumice on the beaches and at different levels on the island, and from rocks for studies of palaeomagnetism and for age determination.

Personnel

The six-man expedition was divided into two teams—the mountain party and the Atlas Cove party (Fig. 4).



ANARE photo. 11916A

FIG. 4

The members of the 1963 expedition on *Nella Dan* during the return voyage. From left to right: W. M. M. Deacock, M. C. Downes, N. T. Lied, G. M. Budd, A. R. Gilchrist, P. J. Stephenson.

The mountain party was to be landed at Long Beach, from which point its members would attempt to climb Big Ben, and afterwards try to travel around the island to Atlas Cove, via South Barrier and Spit Bay. The party consisted of Dr. P. J. Stephenson* (geology and glaciology), Mr. W. M. M. Deacock (botany and photography), and myself (leader; physiology and biology). A depot of stores was to be landed at Spit Bay to facilitate this work.

The Atlas Cove party was to re-occupy the ANARE station at Atlas Cove, and from this base to carry out scientific work at the north-western end of the island. In addition they were to maintain radio contact with the mountain party and with the expedition ship during its antarctic voyage, and if necessary travel to Long Beach to assist the mountain party. The members of this party were Mr. N. T. Lied† (meteorology, glaciology and radio), Mr. M. C. Downes‡ (biology), and Dr. A. R. Gilchrist (medical officer; biology).

Both parties were to be re-embarked from Atlas Cove, the most reliable embarkation point on the island, if all went well. If the mountain party proved unable to reach Atlas Cove, as seemed quite likely, the Atlas Cove party was to advise the ship of its whereabouts.

Equipment of mountain party

Our intention was to spend several days doing scientific work on the summit plateau of Big Ben, between 7,000 and 8,000 feet. The equipment for this work included a set of snow-sampling tubes for drilling to a depth of 25 feet in order to obtain cores and temperature profiles, thermometers for measuring ice temperature and the temperature inside the summit fumaroles of Mawson Peak, and a shovel for pit studies. The work would require reasonable weather, so to allow a margin for bad weather the plateau camp was to be stocked with food and fuel for 12 days on full rations, those used being the standard ANARE sledging rations. Our small "Béche" tent, of ventile cloth, weighed 25 pounds. The equipment for meteorological and physiological observations, and for survey work, added more weight.

Meteorological records indicated that in February the air temperature at 9,000 feet could range from —7°F to above freezing point, hence it was necessary to carry waterproof suits as well as windproofs. Luckily we were able to obtain vapour-barrier boots, which saved our having to duplicate such heavy items as footwear— and probably saved us from frostbitten feet, in the events that followed. No information was available concerning snow conditions above 2,000 feet in February, but heavy

* University College of Townsville, Queensland.
† Commonwealth Bureau of Meteorology, Melbourne.
‡ Fisheries and Wildlife Department, Melbourne.

snowfalls seemed likely above 4,000 feet, and so we took snowshoes in addition to crampons and ice axes. Marker poles, to facilitate travel in poor visibility, consisted of fibreglass wands 4 feet in length, with strips of orange-red fluorescent cloth attached to one end.

In order to avoid the difficult situation that would arise if the ship returned and nobody knew the mountain party's whereabouts, a radio was considered necessary, although as a compromise it was not taken above 4,000 feet on the mountain. The set used weighed some 10 pounds, and had a transmitter output of 300 milliwatts on a frequency of 2.7 megacycles; it was reputed to be robust and reliable, and had performed well in field trials in Australia. To transport the load of equipment and stores, and to serve as an ambulance in case of injury, a sledge was taken; and because we expected to encounter deep snow it was an aluminium Akja (boat-type) one rather than a Nansen (ski-type) sledge. It was evident that a few sections of the route on the mountain, and much of our route elsewhere, would be unsuitable for sledging, so rucksacks of large capacity were also necessary.

All this added up to a sizeable load for three men to shift to the plateau, 7,500 feet in vertical height and a horizontal distance of 8 miles from the beach.

Route on Big Ben

Our route was divided into two stages by a short steep pass between 3,000 and 4,000 feet, some 4 miles from the beach. The first stage led up over vegetation and loose rock to about 1,000 feet, then over steep ice beside scree slopes and moraine to 2,500 feet, and finally traversed a moderately steep and exceptionally windy ice slope among crevasses to the foot of the pass at about 3,000 feet. From the top (and western side) of the pass, at 4,000 feet, the route ran another 4 miles straight up a glacier alongside the rock wall of South Barrier and Peak 7600, to the plateau at 7,500 feet, from which another mile and a rise of 1,500 feet led up the final cone to the summit. We intended to camp just above the pass with 24 days' stores, and there await an opportunity to lift all our gear and the 12 days' stores to the plateau.

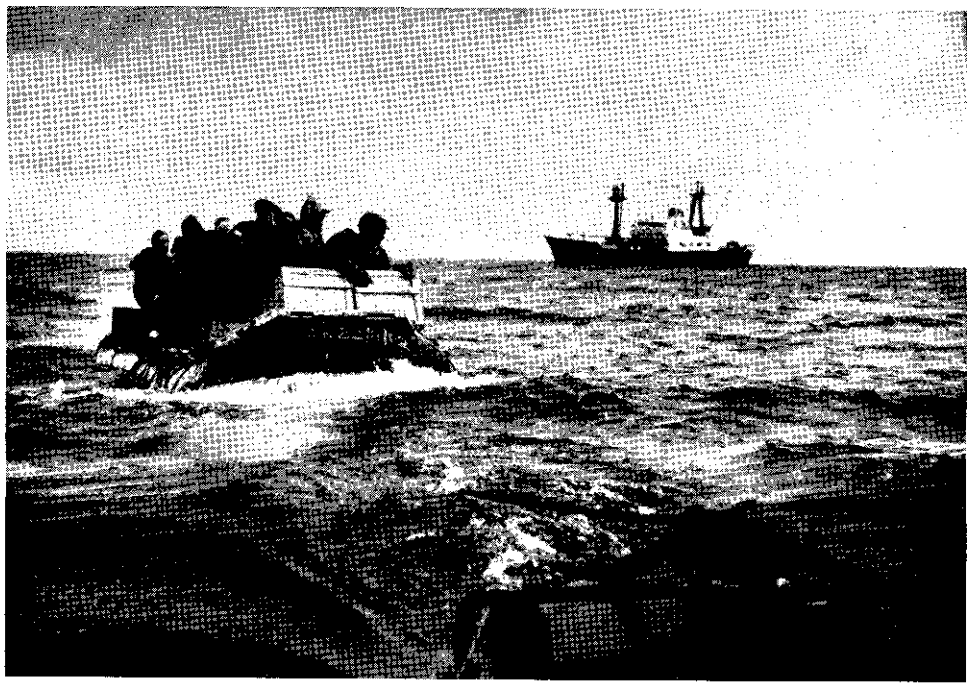
All of this route except the first 2,000 feet lay over unexplored ground, and the map of this part of the island was sketchy and in several places quite inaccurate. However, I had briefly inspected it during the circuit of the island in 1954, and we had at our disposal the excellent ANARE photographs taken from the air and the sea in 1947 and 1949. Two good features of the route were apparent from these photographs: the climb commenced immediately behind the boat landing beach, and much of the route, being alongside rock that would be conspicuous in mist or blizzard, was suitable for travel in bad weather.

NARRATIVE OF THE 1963 EXPEDITION

Voyage and landings

The Heard Island expedition, in company with the Mawson and Davis expeditions, sailed from Melbourne on 9th January, 1963, in M.V. *Nella Dan* (Captain G. Bertelsen), under the leadership of Dr. P. G. Law. No helicopters were carried. A case of appendicitis developed, forcing the ship to put back to Albany in Western Australia and resulting in the loss of several days. The usual Southern Ocean headwinds and rough weather prevailed during the latter part of the 17-day voyage; for the last few hundred miles before arrival at Heard Island large quantities of floating pumice, which possibly had originated in submarine volcanic eruptions near the South Sandwich Islands,[7] were seen.

Nella Dan arrived at Heard Island on the afternoon of 26th January in a north-west gale. It seemed possible that conditions of wind and swell might be suitable for landing at Long Beach, on the lee side of the island, but half an hour before the ship was due to reach Long Beach the wind backed to south-west and freshened to 60 knots, so we went about and proceeded to Spit Bay in the hope of landing our depot there in the morning.



ANARE photo 12581 Phillip Law

FIG. 5

Ferrying men and stores ashore by pontoon at Atlas Cove on 28th January.

The morning of 27th January brought favourable although squally conditions, and we were about to launch the motor-boat and the inflatable rubber pontoon used for landing stores when a steady 30-knot north-west wind set in, with driving snow, a choppy sea and a heavily dumping surf inshore. These conditions offered little chance of getting the stores ashore dry, so we postponed the attempt on Spit Bay and returned to Long Beach.

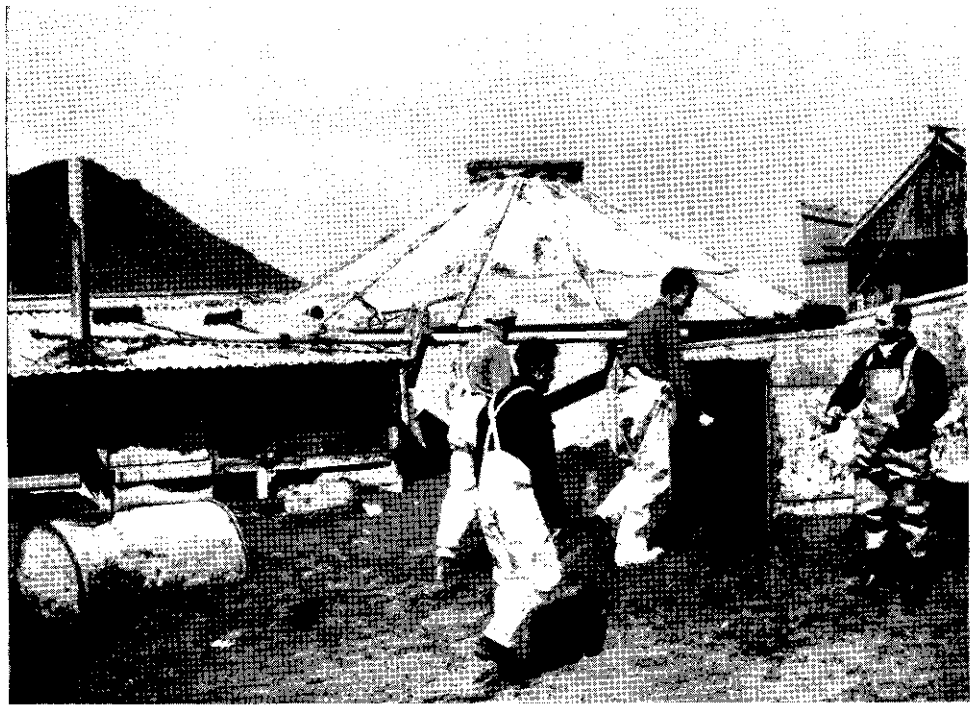
Arriving there several hours later, *Nella Dan* slowly approached to within 1 mile of the boat landing area at the eastern end of Long Beach, where there was much less surf than elsewhere on the beach. We were hoping to get into the lee of the land, but the wind remained over 40 knots, visibility was poor, and a big swell was surging far up the beach. In mid-afternoon the attempt was abandoned and we proceeded up the west coast—of which nothing could be seen from a few miles offshore—to Atlas Cove.

ANARE photo 12309 Phillip Law

FIG. 6

Unloading the pontoon at Atlas Cove. In the background is the Laurens Peninsula, with Mt. Olsen on the left and the Jacka Valley on the right.

Anchoring in Atlas Cove on the morning of 28th January, we spent the day, in squally weather, establishing the Atlas Cove party in the ANARE station (Figs. 5, 6, 7). The station was in a dilapidated condition: one hut had been blown onto its side, another had vanished, and elephant seals had forced their way into several others, rendering them



ANARE photo 12577 Phillip Law

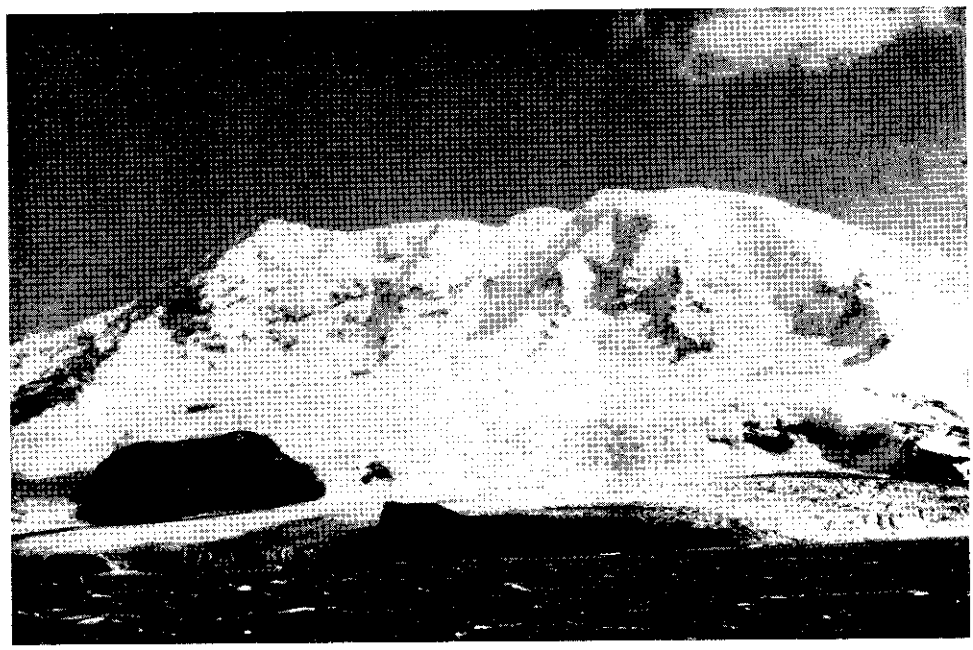
FIG. 7

Luncheon break during the establishment of the Atlas Cove party in the old ANARE station.

uninhabitable except in an emergency. A number of huts, however, were still in good condition, some of the water-tanks were full, and three of the radio masts were still standing. By the time *Nella Dan* sailed, at 4 p.m., the Atlas Cove party's stores had been placed under cover, the radio station had been set up, a 1,400-foot baseline had been accurately measured for the survey work, and geomagnetic observations had been made.

Soon after we left Atlas Cove the cloud lifted completely, giving us magnificent views of the mountain, and panoramic photographs controlled by compass bearings were made along the whole north coast of the island (Fig. 8). Collections were made of floating pumice. In the evening a motor-boat reconnaissance to within 100 yards of the beach at Spit Bay revealed a heavy surf and violent eddy winds coming from every direction, so the landing was again postponed.

At daybreak on 29th January the ship was in a steady 60-knot wind blowing from the west, and clouds were pouring over the mountain-top from the south-west. Within half a mile of the shore, however, there was much less wind and a calmer sea. When the ship had moved into this



ANARE photo 12590 G. M. Budd

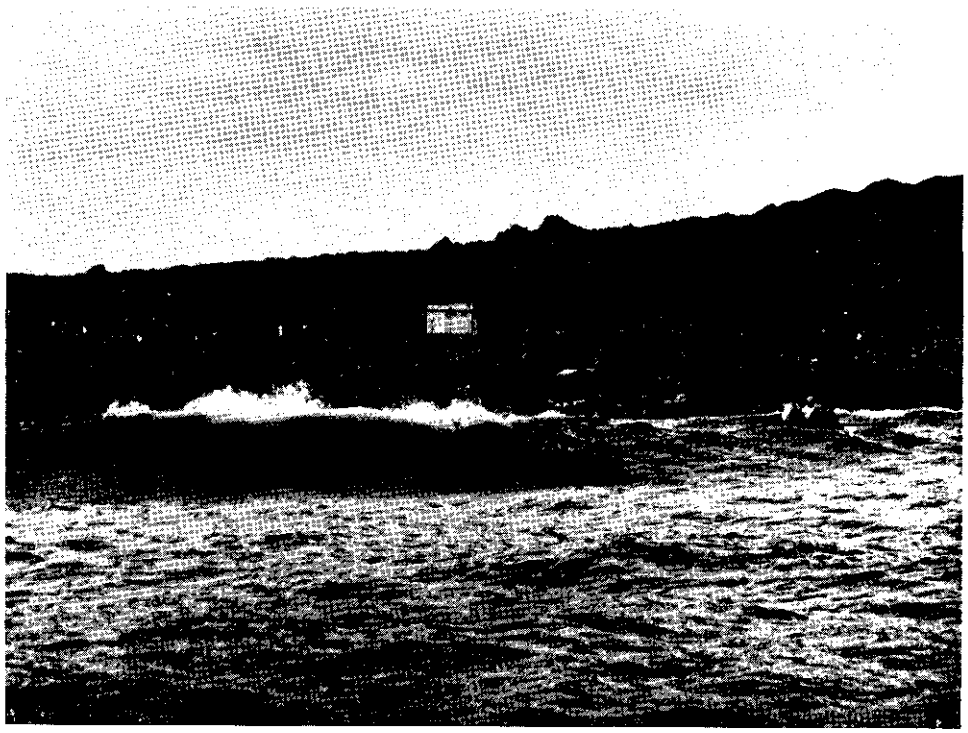
FIG. 8

The north face of Big Ben. Mawson Peak is just visible beyond the central couloir. Beneath it is Cape Bidlingmaier, with Melbourne Bluff on the left.

calmer zone the motor-boat and dinghy were launched and proceeded inshore, while a few hundred yards to seaward of *Nella Dan* the sea continued to foam in the wind streaming around the coast.

The motor-boat remained just outside the breakers while the dinghy, loaded with stores, was rowed in backwards, its bow attached to a long grassline paid out by the crew of the motor-boat. The waves surging up the steep beach of large boulders made the dinghy hard to control, but the stores were landed without incident and the dinghy was hauled out to the motor-boat for another load.

On the next landing the dinghy was swamped (Fig. 9), but eventually the stores were safely ashore and we returned to the motor-boat. It was a longer ride this time, for the waves were now much bigger and were breaking further offshore, and after transferring to the motor-boat we had a rough trip back to the ship in a 50-knot wind and a confused and breaking sea—evidently the " weather stream " had swung inshore. The sea temperature was 36°F and the air temperature 38°F. We changed into dry clothes and had breakfast, well pleased to have the Spit Bay depot in place at last. Now all that remained to be done was to get ashore at Long Beach.



ANARE photo 11590 Phillip Law

FIG. 9

Landing the depot at Spit Bay on 29th January. In the centre is the ANARE hut. On the right is the dinghy, about to be swamped.

We sailed from Spit Bay at 10 a.m. in a north-west wind with its typical low cloud and poor visibility. After rounding the Spit we had light and variable airs until we came out of the lee of South Barrier—and then we had a 60-knot wind from the south-west. The visibility improved as we approached Long Beach, and further series of panoramic photographs were taken. Despite the wind and the heavy surf on most of Long Beach, the sea near the boat landing area appeared to be fairly calm, but the wind made it impossible to launch the pontoon. We returned to the Spit and then ran slowly westwards on fixed courses $1\frac{1}{2}$ miles offshore, taking soundings, sketching the radar screen at regular intervals, and photographing the coast whenever the squally weather permitted. The coastline from the Spit to Long Beach was surveyed in this manner, and some marked differences from the existing map were noted.

At 4 a.m. on 30th January the wind was still 50 knots, but by 7 a.m. it had dropped to 30 knots and Dr. Law decided to attempt a landing. All the stores and 11 men were transported on the rubber pontoon to just

outside the breaker-line, where a buoy was anchored. Three men rowed a long grassline ashore in the dinghy and fastened it around rocks behind the sandy beach, and the men on the pontoon then hauled it ashore along the line. The stores were unloaded and carried across a glacier torrent to a suitable camp site on the moraine 50 yards from the beach. Farewells were said and the pontoon was hauled out through the surf, but two men were washed overboard, one of them being left on the beach.

When the pontoon was safely at the buoy again, the dinghy was sent back for him. It capsized in the surf but the two men in it landed safely, and soon all three had returned to the pontoon. The buoy was picked up, the pontoon and dinghy were towed back to the ship by the motor-boat, and shortly afterwards *Nella Dan* was disappearing in the south. Stephenson, Deacock and I walked up to our dump of stores and began clearing a tent site.

The attempt on Big Ben

It was just after midday and the wind had dropped. Shreds of cloud drifted about the crags and the icefall above us. The opportunity was too good to be wasted, so instead of pitching the tent we set off on a reconnaissance. We intended climbing only to about 1,000 feet, but in the continuing fine weather the allure of unexplored country, and the pleasure of climbing on ice and snow again after so long at sea, proved too much for us. Each crest revealed an even more interesting one beyond, the knowledge that we might never again have such good weather countered our increasing fatigue, and five hours later we were looking down on the western slopes of Big Ben from the top of the pass at 4,000 feet. The weather was extraordinarily warm, and a great waterfall was pouring down the western face of Peak 7600. We arrived back at Long Beach eight hours after leaving it, tired but well pleased with our first day's work, having proved almost half of the route and inspected at close range much of the remainder.

During the next three days we relayed loads up the mountain, making meteorological and physiological observations every three hours, and on the evening of 2nd February moved the tent to 2,300 feet. After our sheltered and comfortable camp at Long Beach (Fig. 10), this cold and very windy camp on an ice slope overlooking the '51 glacier came as a rude shock. Most of the time a hard gale was blowing, with intermittent heavy drift and thick mist, and temperatures around 25°F, but on a couple of occasions we had fine views of the high peaks above with the cloud pouring over them (Fig. 11). Our sledge proved unsuitable on the steep slopes of ice and hard snow, and was left at 2,300 feet for later use on South Barrier. The snowshoes remained at Long Beach. On 3rd and 4th February we relayed loads across the long traverse among crevasses from the end of the moraine at 2,500 feet (Fig. 12) to the foot of the pass beside Peak 4100, frequently being blown over by the violent eddy gusts coming from the ridge upwind of us.

ANARE photo 12592 P. J. Stephenson

FIG. 10
Camp at Long Beach on 31st January, looking east. In the middle distance is the sandy boat-landing beach, and in the background is the '51 glacier.

ANARE photo 11942B W. M. M. Deacock

FIG. 11
Camp at 2,300 feet on 3rd February. In the right background are Peak 4100, the pass, and Peak 7600, with drift snow and clouds blowing over them.

ANARE photo 12596 P. J. Stephenson

FIG. 12

Strong wind at the stores dump on the moraine at 2,500 feet, on 3rd February. In the background is Peak 7600, half obscured by cloud and drifting snow.

By the evening of 4th February all the scientific equipment, with food and fuel for 14 days, was above the pass, and another eight days' supplies were in a dump just below it. Very weary from the long day's work, we camped at 8 p.m. on a platform we had made in the steep ice slope some 50 feet below the top of the pass. We thought that this site would be sheltered by the rock wall of Peak 4100 to windward, but we were badly mistaken. We had hardly entered the tent when the wind increased and changed its quarter, so that we were exposed to both the wind funnelling down the pass and the destructive eddy gusts from Peak 4100. The temperature rose above freezing, the ice pitons securing the tent guys would not hold, and sudden gusts of great violence flogged the slack tent from all points of the compass.

It seemed unlikely that the tent fabric would stand up to very many hours of this treatment, so after a quick meal we collapsed the tent, weighted it down with rocks and pieces of ice, and fought our way up the slope to the top of the pass. Mawson Peak was clear in the moonlight, and the great wind roared down the pass from a sky of tranquil stars and a few wisps of cloud. The moon hanging low over the summit plateau lit the snow slopes and the floor of cloud over the sea; a few rays of the aurora moved slowly in the south. We passed the night digging a snow cave in the wall of a deep windscoop on the western side of Peak 4100.

By the time it was almost completed, at dawn, the wind had moderated and we were able to move the tent to a snow slope nearby where there was much less wind. The anemometer showed only 20 knots at the new camp site at 8 a.m., but at the top of the pass, some 40 yards away, it showed a steady 45 knots, with gusts of much greater force. This was after the wind had moderated. At Atlas Cove, we later found, there had been only a light breeze of 5-10 knots all night. Such local variations were to be expected, in view of our height and the funnelling effect of the pass, the only break in a rock wall running across the wind from 7,600 feet almost to sea level. Nevertheless it was clear that the pass would be a formidable place in a really strong blow.

ANARE photo 11978B W. M. M. Deacock

FIG. 13

Camp above the pass, at 4,000 feet, on 6th February. The dark area to the left of the figures is part of the windscoop; beyond it are the pass and Peak 7600. Clothing and sleeping mats are spread on the tent to dry.

After a day and a half of mist and rain, the weather cleared at midday on 6th February (Figs. 13 and 14), and we reconnoitred the route to 6,000 feet, where we laid a depot of eight days' food. The crevasse bridges

ANARE photo 11978A W. M. M. Deacock

FIG. 14

Adjusting ropes at the 4,000-foot camp on 6th February. Just visible between Mawson Peak and the smooth ice above the figures is the heavily-crevassed Gotley glacier. The snow cave was dug in the part of the windscoop which is visible just above the tent on the right.

and the snow surface proved to be firm and the route excellent, leading straight upwards at an easy angle, midway between the shattered ice of the Gotley glacier and the rock wall of South Barrier. We stayed at the depot for half an hour, enjoying the view (Fig. 15). Shadows of the higher clouds drifted across the sea of cloud below. White vapour tinged with brown billowed from the summit of Mawson Peak, and the wind streaming around the mountain formed delicate veils and traceries of cloud that swept over and past us, one after the other in a repeated pattern, in the clear blue sky (Fig. 16).

ANARE photo 11975B — W. M. M. Deacock

FIG. 15

Looking back down the route from 6,000 feet on 6th February. The windscoop and the tent are just visible on the right of the pass, through which can be seen the moraine at 2,500 feet.

ANARE photo 12263 — G. M. Budd

FIG. 16

Wave clouds on 6th February, from 6,000 feet.

The weather was still fine on 7th February, and we moved up from the pass at 8 a.m. carrying all the scientific and camping gear, 12 days' fuel, and 4 days' food—about 80 pounds a man. At the 6,000-foot depot, rather than add the other eight days' food—about 60 pounds—to this load we enlarged the snow cairn, marked it with three fluorescent flags on fibreglass poles, and fixed its position by compass bearings. The wind-swept nature of the ridge on which it was situated seemed to be further security against the depot being snowed under. Since we intended to flag the route higher up, we thought it would be a simple matter to bring up the extra food if we needed it; but it seemed possible that we might manage to climb the mountain and finish all our work on the summit plateau before we had used the four days' food we already had. Our experience in the nine days we had been on the island had seemed to support the notion, held by previous ANARE parties, that the thick weather characteristic of the island below the 5,000-foot level might not prevail on the upper part of the mountain.

While we had lunch at the 6,000-foot depot the weather was fine right down to sea level, and we looked down the long snow slopes to the glowing green vegetation of Long Beach and the ice-locked headlands of the west coast. A line of brash ice drifted away to the west from the face of the Gotley glacier, a surprising observation in view of the strong easterly current we had experienced in landing. A coastal shelf extending about a mile offshore, discoloured by thaw water near the land, showed green against the blue deep water beyond, its edge curving around Long Beach from the '51 glacier to Cape Arkona. Little vapour was visible from the summit, in marked contrast to the activity of the previous day.

Above the depot we continued up the sharp crest of a long snow-drift, which fortunately served also to bridge a large ice chasm running westwards from South Barrier at about the 7,000-foot level. Beyond this chasm we climbed on a windless slope of firm snow with many bridged crevasses and some avalanche debris, sweating heavily in the hot sun shining through the cloud which had now enveloped us, until quite suddenly we emerged into a hard freezing wind and saw that we were on the summit plateau of Big Ben. Brief clearings in the mist gave us glimpses of the upper snowfield of the Gotley glacier below us, rising gently to the west with its crevasses becoming fewer, and across it to the bergschrund and the girdle crevasses of the summit cone, 200 yards away. The long ridge of Peak 7600, behind us, swept round to the north as the rim of the crater, its sheer cliffs plastered with fantastic bulges and flutings of honeycombed ice. From the crest on which we were standing, myriad small blades of ice pointed upwind.

Hoar-frost was forming on our clothing and hair and our sweat-sodden clothing was rapidly chilling in the cold wind, so we moved a short

distance onto the Gotley snowfield, marking our route with fluorescent flags in the thick mist, and pitched the tent, at a height of 7,500 feet, at 4 p.m. The idea of attempting the summit at once, which we had considered earlier, was now abandoned. We were tired from the 3,500-foot climb with the loads, particularly Stephenson, who had broken one of his crampons the previous day and so could not maintain an even rhythm in climbing; the summit slopes, although not particularly difficult, did not look negligible; and the weather was rapidly worsening. We lay on our sleeping bags and drank tea to the accompaniment of the rising moan of wind, the rattle of snow against the tent, and a shadow of accumulating drift creeping up the walls.

Early the following morning we caught a glimpse of the lower slopes of Mawson Peak, and ate breakfast in hopes of attempting the summit at once. During breakfast, however, the barometer fell rapidly, and when we went outside at 8 a.m. snow was falling and drifting in a strong north-west wind, visibility was 20 yards in the freezing mist, and the temperature was 16°F. We spent the day in the tent, which by evening was half buried in snow.

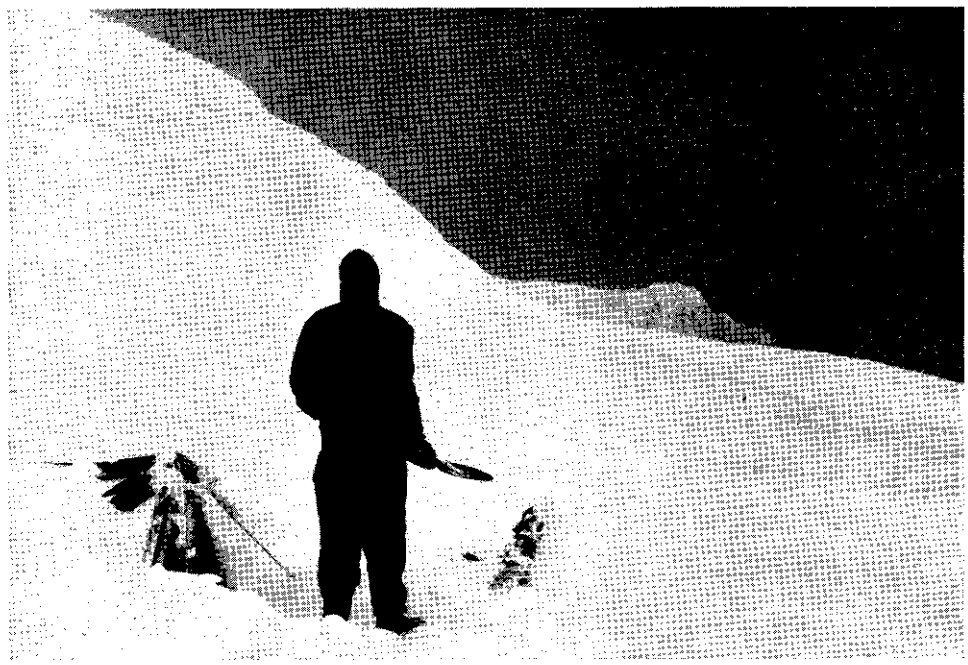
ANARE photo 12589 P. J. Stephenson

FIG. 17

The summit plateau of Big Ben, looking north-west, on 10th February. The tent entrance is being dug out.

On 9th February the weather was worse. Visibility was only 10 yards in the mist and the dense drifting snow, and a hard south-west gale was blowing, with frequent showers of sago snow. Although the outside temperature was 10°F, inside it was warm and dark from the insulation of the snow which now almost covered the tent. An attempt to clear away some of the snow was defeated by the drift, which immediately refilled the hole we had dug. Sleeping bags and clothing were becoming damp from the snow melting around the tent, but we lay there comfortably enough, talking, reading, and eating sparingly. We were now on half rations, for we realised that our optimistic conclusions about the summit weather had been premature: this was the typical Big Ben weather, which in 1953 had immobilised Béchervaise's party at 4,500 feet for 10 days.

During the morning of 10th February the weather moderated a little, and we emerged from the tent to find ourselves in a clear layer between the upper and lower cloud, with Mawson Peak looking like a small hillock in the deceptive light of the whiteout (Figs. 17, 18, and 19). The temperature was 9°F and the wind only about 20 knots, with moderate drift, but we were evidently in the lee of the summit cone for the moment, for heavier drift was streaming across the plateau a few hundred yards to the west.



ANARE photo 12591 P. J. Stephenson

FIG. 18

View south-east to Peak 7600 on 10th February. Rime coats the tent guys and the half-buried equipment.

ANARE photo 12588 P. J. Stephenson

FIG. 19

Digging out equipment on 10th February. Beyond the figures, to the south-west, are crevasses and the summit cone, the edge of which is visible in the top right-hand corner.

We dug out our equipment and roped up, intending to reconnoitre the western part of the plateau and from there to attempt the summit; but by 11 a.m., when we were ready to start, we were once more in cloud and drifting snow and could see only 30 yards. In the whiteout there was no perception of distance or surface conditions, which increased the threat from concealed crevasses. Nothing of the tent was visible

above the snow except the entrance and part of the ridge pole, which did not make a very conspicuous landmark and was liable to be drifted over at any time, so we laid out a line of marker flags at right angles to our intended course to help us find the tent on our return. This left us with only one or two flags to mark our route, almost a mile in length, to and from the invisible summit.

It was clear that under these conditions there was a serious risk of getting lost. Even if we managed to avoid falling over the 3,000-foot cliffs of the north face, which lay a hundred yards behind the tent, we doubted the adequacy of our equipment for an emergency bivouac on the plateau. Our windproof clothing in particular, which I had found excellent on the Antarctic Continent, rapidly smothered in snow and became wet, while the water proof clothing we carried as an alternative caused condensation and also allowed drift snow to penetrate. We therefore decided to postpone the western reconnaissance, and instead to descend over our flagged route to the 6,000-foot depot and bring up our reserve of eight day's food. Once this was accomplished we should have ample time to await more reasonable conditions for attempting the summit and carrying out our scientific programme.

Even this modest objective was to prove beyond us. We could not find the flags marking the route, and before we had gone a hundred yards we came to a large crevasse we had not seen before. Deacock thought we were too far to the right, Stephenson too far to the left. In searching for a recognisable landmark, we stumbled across a little loop of fibreglass projecting from the snow, and realised why we could not find our route-marking flags. The freezing mist had heavily coated the flag and its pole with ice, the wind had bent it double, and the drifting snow had then buried it. Our vision was obscured by the sticky drift adhering to our goggles, and the drift was rapidly obliterating our footprints in the ankle-deep powder snow. It seemed to be the wrong day for travelling anywhere, so we returned to the tent and began building an igloo, which would provide more comfortable quarters than the cramped, dark and wet tent.

This too was a failure. The snow was unsuitable, the ground sloping, and the size of the igloo over-ambitious, no doubt in reaction against conditions in the tent—but the thing that made us retreat to the tent before the igloo was half-built was the light. With goggles on, we could see nothing because of the drift, but without them—as we belatedly realised after $3\frac{1}{2}$ hours of squinting against the glare of the whiteout—there was a grave risk of snowblindness. We therefore limited ourselves to digging a pit against the back wall of the tent and roofing it with thin slabs of snow, to improve light and ventilation, and then crawled back into the

tent, quite blind for the first few minutes after the glare outside. The outside temperature had risen to 31°F and our clothing was wet. We cooked our supper cautiously, for primus fumes had been troublesome during breakfast, and our marked weakness and breathlessness during the first 10 minutes outside in the morning had shown us to have a mild dose of carbon monoxide poisoning. The consequences of a severe attack, or of snowblindness, in the present state of the tent and shortage of rations did not require much thought. We drank our thin pemmican soup, hoping that our eyes were smarting merely because of the wind and drift, and reflected that it had not been a very successful day.

During the evening wet sago snow fell, burying the tent entrance and accumulating on the part of the roof that remained above the snow. Unlike the snow already around the tent, it showed little tendency to consolidate when compressed from inside, so that the loose and heavy grains stretched the fabric more and more tightly. With our exit blocked, we viewed this with some apprehension, but luckily the ventile material proved equal to the strain.

Next morning, 11th February, relieved to find our eyes still normal, we cut a tunnel out and found that the temperature was 11°F once more and the surface, after the thaw the previous night, was now hard and slippery ice. It was still windy, with gusts up to 40 knots, but the drift was less dense and did not stick to our goggles, and the cloud was only intermittent. The day looked promising. Patches of sunshine chased each other down the slopes of Mawson Peak, clouds tore across the plateau rim, and frequently we saw windows of blue sky with small white clouds.

We dug our equipment out of the hard ice, roped up, and waited for the next clearing in the mist. It never came, and the visibility remained limited to 20 yards for the rest of the day. My wet gloves froze solid, then split. Once again we decided against attempting the summit, and set off for the 6,000-foot depot. About 100 feet below the rim of the plateau we turned back. Our navigation in the dense cloud was unreliable, we were very cold, and we realised that we had forgotten to bring our bivouac gear. Two hours after setting out we arrived back at the tent, very pleased to see again the few pieces of equipment that marked its position.

We spent the next three hours making tunnels, roofed with slabs of snow, at each end of the tent, to give us more living space and ventilation. Despite the temperature of 9°F, our clothing was sodden when we had finished, so after mopping up the pools of water on the tent floor we sat around, wet and chilly, drying our windproofs on our bodies so that they would not freeze when next we went outside. The tent was now completely buried, but through the snow we could feel, as well as hear, the recurrent thunder of the wind, like express trains passing.

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tent, quite blind for the first few minutes after the glare outside. The outside temperature had risen to 31°F and our clothing was wet. We cooked our supper cautiously, for primus fumes had been troublesome during breakfast, and our marked weakness and breathlessness during the first 10 minutes outside in the morning had shown us to have a mild dose of carbon monoxide poisoning. The consequences of a severe attack, or of snowblindness, in the present state of the tent and shortage of rations did not require much thought. We drank our thin pemmican soup, hoping that our eyes were smarting merely because of the wind and drift, and reflected that it had not been a very successful day.

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On the morning of 12th February it was still blowing hard, with visibility 20 yards in the dense cloud and drifting snow, but the temperature had risen to 21°F. We set out from the tent determined to bring up the reserve rations, steering by compass and building snow cairns every rope's length to guide us back to the tent on our return. In the whiteout the strips of orange fluorescent material we attached to the cairns shone like lamps, but we realised it would not be long before they were iced over. Despite the need for speed, our progress was dismayingly slow, for building the cairns proved to be quite exhausting; either we had absorbed further carbon monoxide while cooking in the buried tent, or else the reduced rations had been insufficient to cover our activities of the past four days. Our route was hesitant, but by chance we found one of the marker poles we had left on the ascent, and gradually felt our way down into the windless area. Here we had occasional patches of visibility, with glimpses of an angry sky and sea. After crossing the ice chasm we came onto the long snowdrift with the sharp crest, and moved down it at a better pace. The north-west gale thundered like heavy surf on the ridge of South Barrier above us, and the eddy wind reflected from the Barrier cliffs swept our snow ridge with dense drift and hard salvos of ice fragments. Leaning back against the wind, we moved down the ridge until we crossed a few crevasses and realised that we had overshot the depot's position. It was a hard struggle to return 100 yards uphill against the wind, and when we reached the place indicated by our compass bearings there was no sign of the depot.

It was now 3 p.m., and after a quick and much-needed lunch we began systematic probing. Under the drift snow was a layer of hard ice, very like the new surface formed above our tent by the thaw on 10th February. We probed down through this ice for the length of our ice-axes, digging holes whenever we thought we had found something, but after an hour of probing back and forth across the slope, above and below the position fixed by the compass, we had to accept the fact that we had lost our depot.

Shouting to make ourselves heard above the roar of the wind, we quickly agreed what had to be done. Nothing would be achieved by returning to the plateau without rations, and the obvious course seemed to be to continue the descent to 4,000 feet and spend the night in our snow cave above the pass. The emergency equipment in our packs—down suits, two days' rations, and solid fuel sufficient for two warm meals—promised a comfortable bivouac, and at daybreak we would descend the pass, collect the eight days' food and fuel from the dump immediately below it, and return to the plateau with adequate reserves to continue the siege of Mawson Peak.

Cloud and heavy drift closed in again as we descended, but as we approached the pass the temperature rose, the snow turned to rain, and through the pass we saw the far cliffs of South Barrier lit with

watery sunlight, and a bright rainbow hanging over them. Tremendous gusts exploded against the cliffs beside the pass, flinging rocks and lumps of snow high into the air. The entrance to the snow cave, running horizontally in from the steep face of the windscoop, was filled with snow, but otherwise there had been no accumulation in the past week.

Inside the cave, we spread ropes and wet windproofs on the floor of the sleeping platform, changed into our dry down clothing, and lay there with our feet in our packs. Unfortunately it was not a very good cave, owing to layers of hard ice which had impeded our digging, and in our tired state we made the mistake of thinking it would do for one night. There was just enough room for us to lie squeezed tightly side by side, and not quite enough headroom to sit up straight; in the thawing temperature the roof dripped continually. My waterproof oversuit had been left at the plateau camp, and although we spread the remaining suits over us it was not long before we were soaked to the skin. The effect of an excellent but small hot meal, cooked by Deacock in a butter tin resting on pitons piled up on the shovel blade, did not last long, and we spent an uncomfortable and sleepless night.

At first light on 13th February we ate a lukewarm breakfast and prepared to move. The cave entrance had again filled with snow and we had no idea what the weather was like, but on cutting a new entrance, through the roof, we found that it was blowing a 50-knot blizzard from the south-west, with heavy drift and a temperature of 26°F. A short reconnaissance to assess conditions in the pass showed that the weather there was much worse. Against gusts of well over 100 knots we had difficulty in getting back to the cave, and in the short time we were outside our clothing and gloves froze hard and a few fingers were frostbitten.

We sealed the hole in the cave roof and settled down to await better weather. The cave temperature was 33°F, and we tried various means of getting warm, without success. Exercising was too difficult in the cramped conditions and seemed to produce no more heat than did our continual involuntary shuddering. Huddling tightly together, like the emperor penguins, served only to squash the man in the middle and send us into fits of laughter. We wrung the water from our clothes but they were soon sodden again. We were saving the little fuel that remained, for a hot brew when the time came to leave the cave. Meanwhile we chewed pieces of pemmican, raw bacon, and greasy chocolate; without fuel there was no water to drink. No sound from outside penetrated into the cave, and periodically we re-opened the hole in the roof to inspect the weather. During the afternoon the wind moderated a little, but the drift became even heavier, and another night in the cave seemed inevitable. By now it was clear that in this weather we could not attempt the long climb back to the colder conditions of the plateau in wet clothing; henceforth our problem was to descend safely to Long Beach in hopes of

returning later, and we realised that if the bad weather continued much longer we should find ourselves in a serious predicament.

Such a predicament arrived sooner than we had expected. On attempting to re-open the roof hole at 8 p.m., to inspect the weather and improve the ventilation in the cave, we discovered that we were deeply snowed in. When we finally succeeded in tunnelling up to the surface we found that within a few hours 5 feet of packed drift snow had accumulated above us. It had also formed a new cornice on the windscoop, thus burying our old entrance tunnel as well. The level was still rising and the drift was already filling the trench we had just dug at the tunnel entrance and running down into the cave. Darkness was falling, and we had only three alternatives, none of them encouraging. We could retire to the cave and seal up the entrance, but the snow was accumulating so rapidly that it was probable we would be unable to dig our way out again, and so be buried alive. To attempt the descent of 4,000 feet to Long Beach, 4 miles away, in blizzard and darkness appeared hopeless. Our only chance seemed to be to try and keep the cave entrance clear for the eight hours until daylight came at 4 a.m., despite the inevitable deterioration this would cause in our physical condition.

We shovelled in shifts, half-hourly at first but steadily becoming shorter as cold and exhaustion gained on us. The river of drift snow pouring past the man shovelling silted up the entrance as fast as he dug. Periodically he would bite accumulations of ice off the shovel handle, to clear it and to allay his thirst. At the end of his shift he would slide down into the cave, confused and incoherent, to remove his frozen gloves and try to rewarm his hands. There was a growing mound of snow beneath the entrance and the cave was now little more than a slot where the two men off shift sprawled amongst the equipment, shuddering with cold. In the pitch darkness items of clothing such as gloves, essential to our survival, kept getting lost, and had to be found and identified by touch with hands that were rapidly losing all sensation. Knowing that we should need the energy, we forced down mouthfuls of solid pemmican, and compulsively swallowed the ice we scraped off our gloves with our teeth. In the general chaos there was no chance of using the fuel we had been saving for a final brew.

Around midnight, Stephenson and I located and counted into the three packs the various items of equipment scattered about the cave, for we knew we were losing the battle against the rising flood of snow. Our chances of negotiating the descent safely were seriously prejudiced by the loss of all our ice axes, which had been left outside the cave and were now deeply buried. We packed our three pairs of crampons, for we hoped that the snow would have covered the ice slopes below us and made their use unnecessary; we could not put them on in the cave because of the lack of space and the risk of spiking each other in the darkness, and to do so outside seemed impossible.

The struggle against the snow ended around 2 a.m., when it became clear that we must abandon the cave immediately or be buried alive. With difficulty we passed the packs and climbing gear up the long tunnel in the snow, and despite the gravity of the new situation it was a great relief when the last man was hauled out. There was enough light—presumably from the sky above the blizzard—to let us dimly see a yard or two, and by it we untangled the climbing rope and tied on. We slid down into the windscoop and moved across to the top of the pass. I led out into the pass, but after only a few paces lost my footing and slid off down the slope on my back, to be firmly held by Deacock on the rope. The pass was still bare ice and we would have to put on our crampons after all.

I swung sideways on the rope until I was on a snowdrift beside the rocks and could then relieve the strain on Deacock. I could not get back to the others up the ice slope, nor could I climb back over the rocks beside the pass, for they were coated with ice and my gloves were frozen into immovable claws from holding the shovel during the final digging shift. My spare gloves had been lost in the snow cave. Deacock looped a pair of crampons over the rope and shook them down to me, and I began trying to strap them onto my boots. This proved to be very difficult as my bare hands kept freezing, the wind kept pushing me off balance on the sloping ground, and my frozen jacket bulged outwards as I stooped and obstructed what little vision I had in the dim light and drifting snow. Gradually, however, it was accomplished, and when Deacock and Stephenson arrived, about 20 minutes later, only one buckle remained to be secured. Working in woollen gloves, they soon finished the job for me, and at last we were ready to travel.

I led down the pass as fast as I could walk, with Deacock second on the rope and Stephenson, at the rear, guarding against a fall with our only belay weapon—the shovel. Staying close to the right-hand side of the pass, where the rock wall 10 yards away could be sensed as a slightly darker area in the blizzard, we avoided getting lost but had to cross many wide crevasses, which fortunately all had secure snow bridges. Stephenson had lent me his windproof gloves, but as we descended I realised that my fingers had frozen again, and at the bottom of the pass we stopped to rewarm them. Deacock fed us boiled sweets while Stephenson held my hands against his abdomen. After 10 minutes there were some symptoms of thawing, and we thrust the hands down onto my own abdomen—a surprisingly difficult operation, with 10 numb and stiff fingers snagging on various layers of clothing—and set off on the long traverse through the crevasses.

Stephenson was now leading and Deacock belaying with the shovel, while I stumped along last, feet braced wide apart against the wind, with my hands inside my trousers. Dawn came and its grey light allowed us to distinguish between solid ice and the insecurely-bridged crevasses

running parallel to our course. The drift was still heavy, and our vision was further reduced by the icicles which kept forming on our eyelashes, so that we lost the way and climbed too high, although still heading in the general direction of Long Beach. The traverse was as windy as ever, and several times one or the other of us was blown off his feet, or fell when a crampon came loose. Whenever this happened it was dismaying to note how difficult it was to find the strength to stand up again. During one of these halts, while Stephenson secured a loose crampon for me, Deacock separated my woollen mitts from the outers to which they were frozen (breaking a tooth in the process), then split them with his knife to allow my stiff hands to fit into them.

We had been on the traverse for two or three hours when we became aware that we were going downhill, and a moment later there was a temporary lull in the drift and we saw rocks ahead. Beyond them we saw the moraine, leading downwards over safe ice to Long Beach, and knew at last that we would reach it.

At 2,300 feet we stopped and retrieved from the sledge we had abandoned there its waterproof cover and some rope. They were frozen to the rocks and with no ice axes it took a long time to free them. As we descended further we hoped to emerge into milder weather, but the only improvement was a lessening in the drift. Apart from a momentary glimpse of sunshine and blue sky, soon gone, the scene remained as grim as ever, with drifting snow and fast-moving clouds above, heavy surf below, the gale continuing, and ice and snow plastered on the rocks almost down to sea level. We stumbled down over the final rocks, slipping and sliding, with many falls and frequent long rests, and at last over the soft green azorella and onto the black sand of the beach, where the penguins and seals, unconcernedly going about their business, seemed to accept us back into the world of living things.

The bivouac at Long Beach

Deacock had gone on ahead and Stephenson was in sight on the hill behind me. I splashed across the glacier stream and very slowly, with several pauses, climbed the final 50 yards to our dump on the moraine. Deacock had not been idle: standing on a ration box were three open cans of pineapple, pears and fruit salad—untouched. It was $7\frac{1}{2}$ hours since we had left the snow cave.

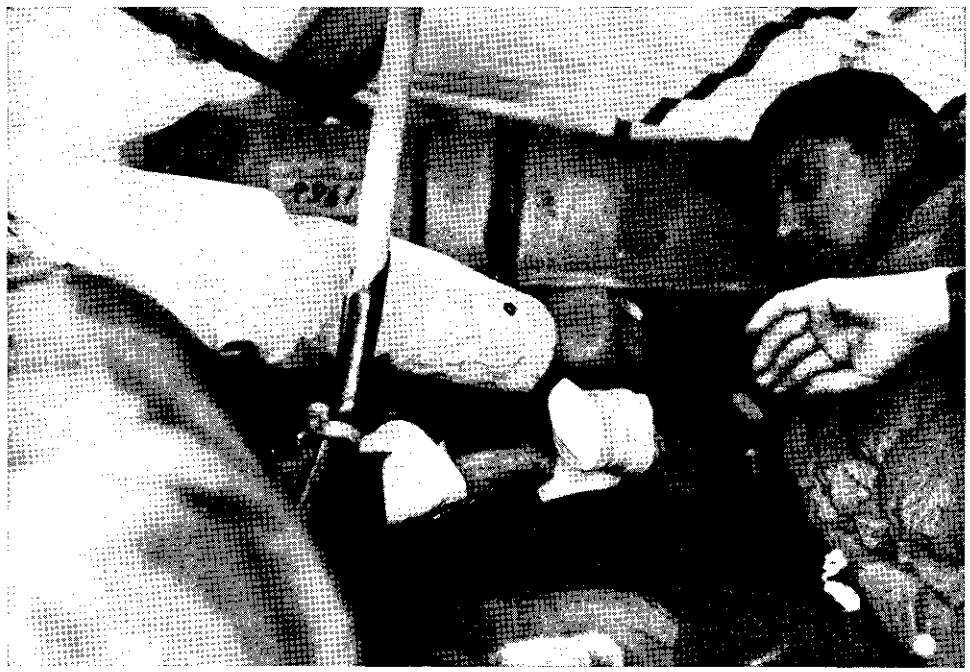
Our troubles were by no means over. Our survival was now assured by the milder temperatures at sea level—several degrees above freezing point—and the presence in our dump of ample food, fuel, and a primus stove, but our tent, our sleeping bags, and all our camping and personal gear had been lost on the summit plateau. Frequent squalls of rain and snow swept the beach, we were still wet through, and the reaction from the strain of the past 50 hours was bound to come soon. We set

to work to build a shelter from the materials on hand. After a few attempts at carrying rocks I realised that I was only jeopardising any chance I might have of saving my frostbitten hands, without being of much help to Deacock and Stephenson, so I lay on the azorella in a slightly sheltered area until they called me to come inside.

ANARE photo 5/612 P. J. Stephenson

FIG. 20
"The Wallow" at Long Beach, on 16th February.

The shelter they had built was rather like a child's "cubby-house" (Fig. 20). Three walls were of ration boxes, fuel drums and rocks, the chinks between being packed with moss and azorella. The roof consisted of the sledge cover and another piece of waterproof material, anchored by a network of ropes tied to rocks. Supporting the centre of the roof was a bamboo pole Stephenson had found on the beach, propped up by our life-saving snow shovel. The fourth wall, and the final part of the roof, consisted of our packs, into which we put our feet. It was not quite wide enough to accommodate three pack frames side-by-side, so one man had to lie on the ground instead of on a frame. Headroom was such that when a man raised himself on his elbow, as in cooking, his other shoulder pressed against the roof (Fig. 21). Our standard of living in the five days we spent in this dwelling seemed to have so much in common with that of the moulting elephant seal that we later christened it "The Wallow".



ANARE photo 12593 P. J. Stephenson

FIG. 21

Interior of the wallow, on 16th February. Deacock is bandaging Budd's hands.

On this first day, however, our shelter promised rest, food, and the chance to dry our clothing near the primus. I gratefully crawled inside and lay there, out of the wind at last, with my swollen hands throbbing painfully and the numb fingers beginning to stick together with exuded serum. It was some time before the others entered and they frequently had to go out again because the roof kept blowing off in the squalls. But at last the primus was alight, and soon we were eating hot food.

After our meal, Deacock boiled some water in an empty fruit can and aseptically cleaned and bandaged my hands. Then we pumped up the primus, in hopes of drying the down suits which had to serve as sleeping bags, but they were still wet when we fell asleep. During the night Stephenson and Deacock were disturbed many times by squalls which called for maintenance of our flimsy shelter, and towards dawn we all awoke, stiff with cold, each oppressed by the same nightmare of being buried in snow. We made a hot drink to warm us a little and dispel the threat, reassuring ourselves that it was only rain we could hear rattling on the roof.

The day after our return to Long Beach—15th February—was mainly given over to sleeping, eating, and improving our shelter, for we were still very tired and still shivering. Our wet clothing took a long time

to dry, partly because of the roof's habit of collecting large pools of water and then suddenly emptying them over us. On 16th February we felt stronger and spent more time outside, and Deacock changed the dressing on my hands. The complete numbness of all 10 fingers had led me to expect severe damage, so it was a pleasant surprise to find there was still circulation in them. The left hand required care, to avoid infection in the blisters on two fingers, but I was able to begin using the right hand the next day, even though all fingers remained stiff and swollen for many days, and completely numb (yet exquisitely sensitive to cold) for the next six weeks. This improvement was welcomed by my companions, who had had to attend to all my needs whilst my hands were out of action.

The next two days were mainly spent in doing scientific work around the Long Beach area and getting fit again. Stephenson geologised, pointing out to us pillow lavas and other interesting evidence of the island's history, while Deacock and I made notes on the wildlife. We measured a baseline as part of a topographical and glaciological survey Stephenson had begun during the ascent of the mountain, and took panoramic photographs of the glaciers for comparison with panoramas I had taken from the same viewpoints in 1954. The weather stayed squally at Long Beach, while above us the mountain remained hidden in the continuing gale and new snow lay on the rocks above 500 feet. Observations of the surf at the place where we had landed showed it to have been a fortunate choice. Out of a total of eight days of observation between 30th January and 19th February, a pontoon landing would have been possible on seven, and on three days there was a flat calm—even though there was generally strong wind on the mountain and heavy surf elsewhere on Long Beach.

One of our most urgent needs at this time was to make contact with the Atlas Cove party. We had occasionally heard their twice-daily radio transmissions during the ascent to 4,000 feet (where we left the radio and later retrieved it on the descent), but apparently they could not hear us, owing to a fault in our transmitter of which we were unaware. This contingency had been allowed for in our planning, but we knew that they, and others, must be feeling anxious about our safety, and that before long they would be setting out to search for us. In an effort to improve reception, Stephenson laid out a ground aerial. At first the only result was a song from " West Side Story ", but on the evening of 17th February we heard Lied's transmission from Atlas Cove quite clearly. We learned that the following morning he was going to transmit from some high ground almost in line of sight of the bluff overlooking the Gotley glacier, a mile or two west of our camp, and so we decided to climb this bluff to ensure good conditions and try to get a message to him.

We stayed awake until midnight, considering several possible lines of action, and drafting carefully-worded messages for Lied and for

Dr. Law in *Nella Dan* off the coast of Antarctica. Next morning we left early and took up our position on the most exposed ridge of the Long Beach area after a brisk pre-breakfast walk against a rainy 40-knot headwind. The radio remained silent. We returned to the wallow, feeling that our most cynical opinions about radios had been confirmed, and spent the rest of the morning making pancakes and discussing our next move.

There seemed little point in remaining at Long Beach. Without sleeping bags and camping gear we were limited to work near sea level, and even that was inefficient. Life in the wallow, especially for Stephenson and Deacock, who were doing all the work of cooking and maintenance, was extremely irritating. My hands being now unlikely to come to harm from travelling, it was clear that we should try to reach Atlas Cove, to relieve anxiety and to re-equip for a return to Long Beach and possibly up the mountain.

Whether we should succeed in reaching Atlas Cove, however, was by no means certain. Our inspection from the ship had shown us that the glaciers had changed considerably since 1954, and no long journeys had previously been attempted at this time of the year, when the snow bridges normally used for crossing the innumerable crevasses would have melted. Not having any ice axes was a severe handicap, one of our crampons was broken, the party was weakened by my almost-useless hands, and the effects of any delays or mishaps would be aggravated by our lack of a tent and sleeping bags. These considerations prompted us to avoid the direct route up the west coast, where there was a risk of being immobilised above snowline by bad weather, and instead to travel via Spit Bay and Saddle Point, where there were huts that could be reached, with luck, in a long day's march. Even if ice conditions prevented us from reaching Atlas Cove, it seemed possible that we might make radio contact on the north coast.

We spent the afternoon of 18th February sorting out loads and making other preparations, in hopes that the following evening might see us in the comparative luxury of the old packing case which was the Spit Bay hut.

The coastal journeys

Early on 19th February we left Long Beach and after an easy crossing of the '51 glacier (Fig. 22) travelled beneath the massive sea cliffs of South Barrier to Winston Lagoon, where we lunched in a pleasant grassy valley. On one side of us was a huge rookery of macaroni and rockhopper penguins, covering the hillside as high as 1,000 feet above the sea; on the other side was Winston Lagoon and the glacier at its head, the main obstacle of our 10-mile walk to Spit Bay. Travelling conditions so far had been quite good, even though the high tide had forced us onto the

ANARE photo 12266 W. M. M. Dencock

FIG. 22

Crossing the '51 glacier on 19th February. Beyond the icefall is the eastern ridge of South Barrier.

screes behind the beaches, and we had paused several times while Stephenson geologised on the screes and rock faces. Although we had left Long Beach in squally weather, and had been buffeted by violent winds from the mountain in the groove between the '51 glacier and the western cliffs of South Barrier, under the sea cliffs it had been sunny and relatively calm, and so the way ahead after lunch was made all the more forbidding by the contrast. We crossed the ridge bordering the sunny valley where we had rested on grass, and found ourselves on a slope of bare scree running inland beside the lagoon to the glacier, whose crevasses and icefalls were almost hidden in the mist and snow sweeping down across it from the mountain.

Remembering the difficulty that M. W. Henderson, J. E. Walsh and I had had in crossing this glacier in 1954, I was rather apprehensive about our chances of crossing it now with no climbing equipment except a bamboo pole, a small shovel, two and a half pairs of crampons and a length of rappel line. But we soon saw that the glacier had retreated several hundred yards since 1954, giving us much easier travelling and also an interesting contribution to the scientific results of the expedition. In 1954 we had toiled over interminable ice-cored moraines separated from

the beach by a 30-foot ice cliff, but now the ice moraines had vanished, and we walked along the beach as far as the snout of the glacier. A lateral stream gave use a convenient way onto the glacier, and soon we were in a region of seracs and tumbled heaps of fallen ice, wedged insecurely together and sometimes moving when trodden on, with great hollow caverns echoing beneath as we gingerly walked across (Fig. 23).

ANARE photo 12265 W. M. M. Deacock

FIG. 23

Stephenson—with bamboo pole—on the glacier above Winston Lagoon.

Within an hour, however, we were off the ice and walking along a sandy beach on which leopard seals were basking—an agreeable contrast to the maze of crevasses and seracs previously encountered in the same place; while above the beach, instead of the icefalls seen in 1954, there were now smooth rock terraces, rising one behind the other for many hundreds of feet, with waterfalls pouring down over them and rotting stagnant ice at their margins signifying the continuing decay of the glacier. We climbed the moraine on the eastern bank of Winston Lagoon, took a round of panoramic photographs from a vantage point near the place where photographs had been taken in 1954, and continued on our way, confident now that an hour or two of easy walking would bring us to the hut at Spit Bay.

We were soon disillusioned, for on this glacier, previously a smooth and uncrevassed sheet of ice, we spent hour after hour threading a way amongst crevasses and swift-flowing meltwater streams, constantly pushed about by the mountain wind and troubled by further breakages of crampons. Scarlet Hill, a few miles to the north-west, was continually obscured by drifting snow, but we had good visibility all the way to the hut, which we eventually reached just before dark after 12 hours of travel.

We remained at Spit Bay on 20th February to allow our sore feet to recover a little. The vapour-barrier boots had kept our feet warm in both the dry cold of the summit plateau and the wet cold at sea level, but they badly bruised our feet, especially when wearing crampons. The day at Spit Bay was a most refreshing interlude in our journey. We dried our clothing on the sun-warmed rocks in front of the hut, watching the cape pigeons swimming about in the calm sea and the gentoo penguins waddling to and fro, while a few miles away the squalls went past Scarlet Hill almost continually, whitening the sea a few hundred yards offshore. In the afternoon Stephenson visited the remains of the sealers' settlement on the south beach, while Deacock and I examined the extensive vegetated area between the north and south beaches. Our pleasure in the

ANARE photo 12598 G. M. Budd

FIG. 24
King penguin colony at Spit Bay on 20th February.

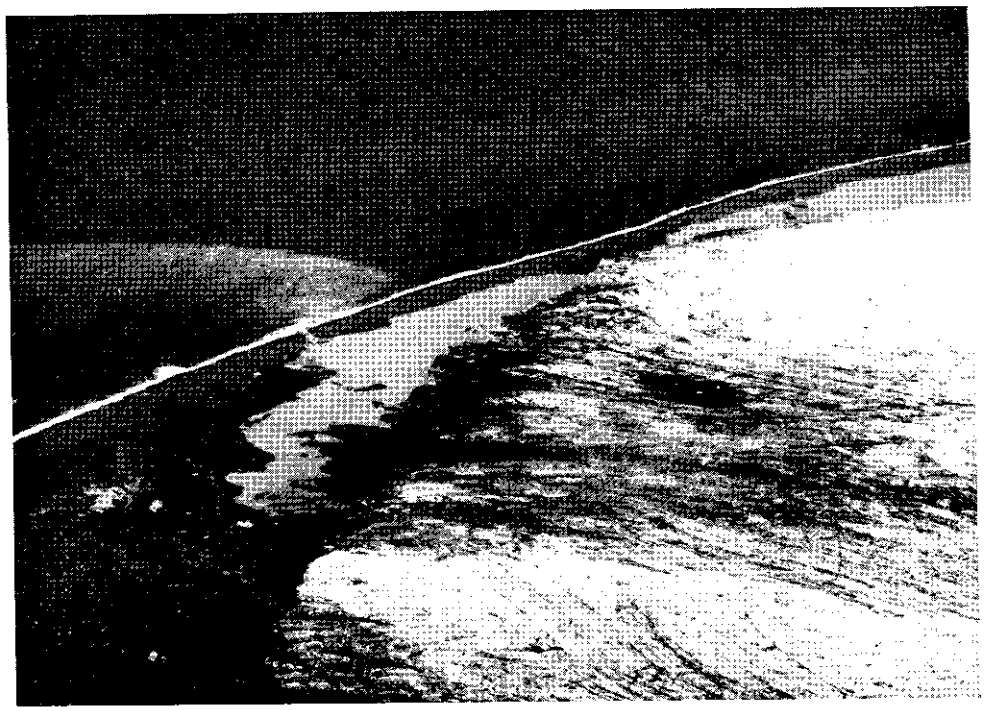
springy turf underfoot and the rich variety of the vegetation was heightened by the almost continual sunshine and the light breeze characteristic of this favoured corner of the island. We were returning to the hut when we noticed a patch of gold in the green grass, and on closer inspection found it to be a breeding colony of king penguins (Fig. 24). Shortly afterwards Stephenson returned with the news that he had found another colony of these handsome birds near the south beach. Between 1949 and 1955 king penguins (and also fur seals) had been only occasional visitors to Heard Island and did not breed there. Whether they had since begun breeding was an important question we had hoped to answer, so these discoveries, like the previous day's observations of the remarkable extent of glacial recession, gave us a welcome sense of achievement to set against the feelings of failure induced by our unceremonious dismissal from the mountain. We also counted more than a hundred fur seals on the hills behind the hut, which caused us to wonder whether they too might be breeding, although we found no proof of this at the time.

ANARE photo 616 P. Swan

FIG. 25

View south-east from an aircraft over the Compton glacier, in December 1947. Fairchild Beach and Round Hill are in the foreground, Skua Beach and Scarlet Hill in the middle distance, Spit Bay in the left background and Winston Lagoon on the far right. Note particularly the convex shadow cast on the sea by the terminal cliffs of the glacier immediately south-east of Round Hill.

Early on 21st February we set out on the 13-mile trip to Saddle Point. The first two glaciers, whose terminal ice cliffs had extended into the sea in 1954, no longer had to be crossed, as each had receded inland leaving a lagoon separated from the sea by a shingle beach (Figs. 25 and 26). The swift and deep streams draining these lagoons, which soaked



ANARE photo 12594 P. J. Stephenson

FIG. 26

View from Round Hill of the snout of the glacier immediately south-east of it, in March 1963. Compare with Fig. 25.

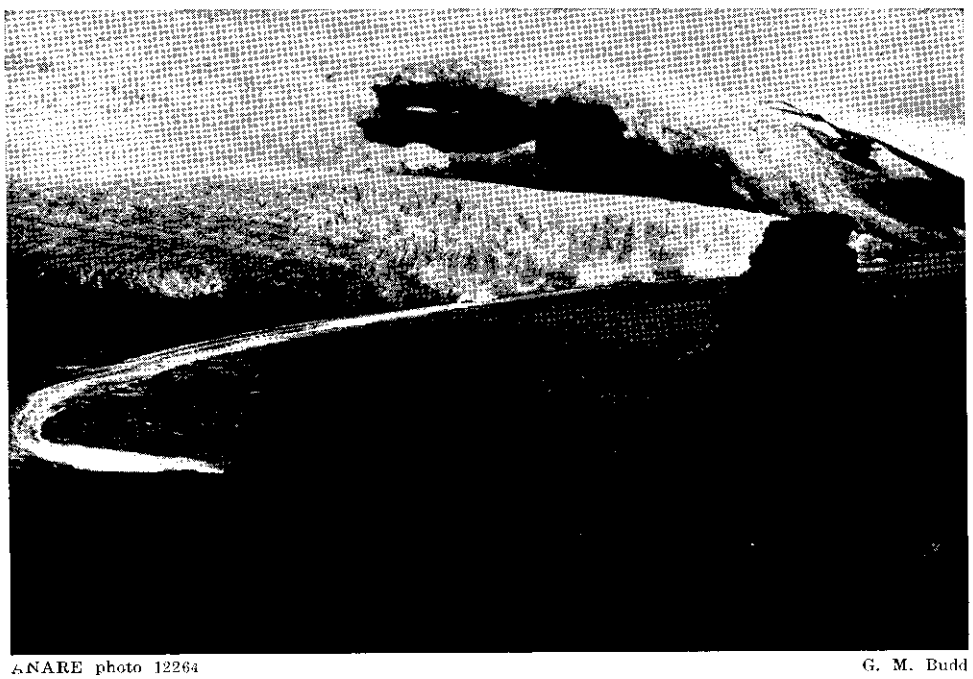
us to the waist in icy water, proved to be quite adequate substitutes for the vexations of glacier travel. Having enjoyed the novelty of walking from Spit Bay to the Compton glacier without setting foot on ice, we then found that the Compton had changed from the smooth ice sheet of 1954 to an extensively crevassed surface with many pressure ridges (Fig. 27). Beyond it the terrain forced us to climb high, on slopes of soft snow and against headwinds and drift. Looking back from this viewpoint, we saw that the face of the Compton glacier had receded and a line of shoal water extended across it from either side, suggesting an early stage in the formation of a beach like those we had crossed earlier in the day; its appearance contrasted strongly with the glacier tongue which in 1947 had extended out into the sea at this point.

ANARE photo 12597 P. J. Stephenson

FIG. 27
Crossing the Compton glacier on 21st February.

The glaciers between Gilchrist Beach and Saddle Point proved to be just as badly crevassed as they had been in 1954, and we were very weary when we reached Saddle Point, 10 hours out from Spit Bay, to find that the hut had been blown upside down. Atlas Cove and the Laurens Peninsula just across the bay were a cheering sight, and an hour later the hut was right way up once more, the holes in the roof were patched with boards, rocks and grass, and we were warm and comfortable inside. In the evening we received Lied's radio transmission strongly, and learned that within two days he and Downes were setting out to search for us, via the west coast. This promised to be a hazardous journey for a two-man party, and we hoped that we would reach Atlas Cove in time to forestall it.

The following morning we climbed the crater of Saddle Point for the radio schedule, but although in sight of the radio masts of the station across the water we could not make ourselves heard. We took another round of survey photographs, examined the local geology, found another incubating king penguin, and then set out on the final 5 miles of our journey. The pressure ice of the Challenger glacier (Fig. 28) extended further inland than it had previously, and we became involved with high and sharp ice ridges necessitating step-cutting and careful belaying,



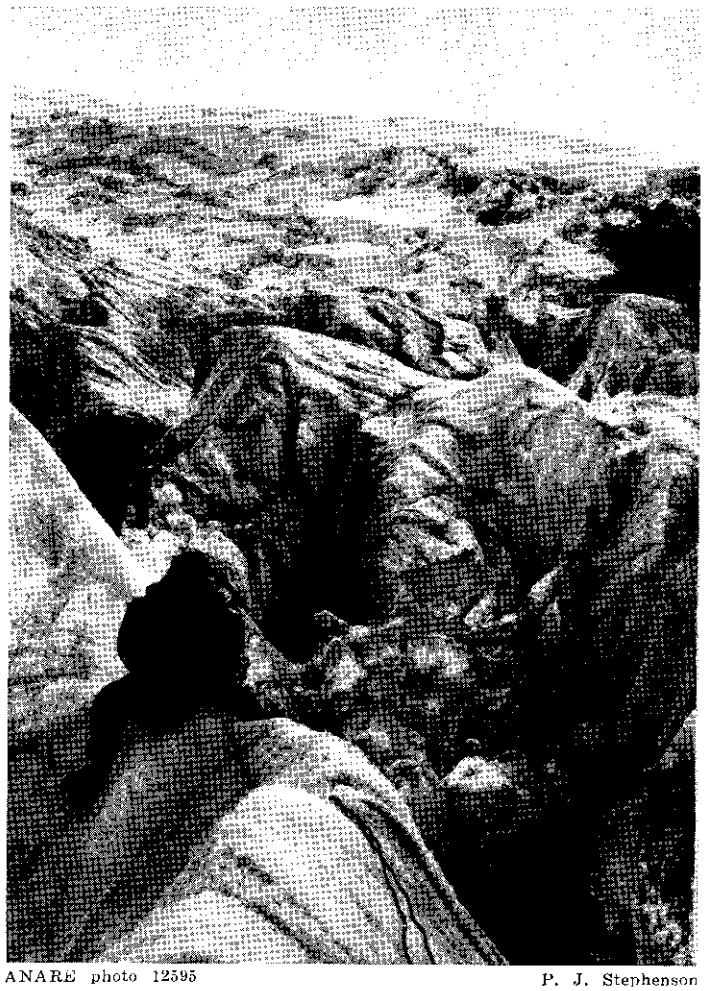
ANARE photo 12264 G. M. Budd

FIG. 28

Challenger glacier from the crater at Saddle Point, 22nd February. "Desperation Gully" runs along the foot of the rock cliffs immediately beyond the Challenger.

where the single ice axe from the Spit Bay depot proved invaluable but the lack of any others was keenly felt (Fig. 29). The only way off the Challenger lay along a scree slope traditionally known as Desperation Gully. The name is not inappropriate, for the gully is subject to ice avalanches at each end and stonefalls throughout its length. For an hour we traversed its steep and unstable slopes above the lateral crevasses of the Challenger, in strong gusty winds and snow showers, with the broken crampons continually coming off our boots.

The next glacier had retreated and now had only low terminal ice cliffs, but we traversed the broad beach beneath them with caution, recalling that Richard Hoseason had been caught by the surf and drowned here in 1952, his companion Alistair Forbes subsequently dying of exposure whilst trying to cross the Baudissin glacier. The Baudissin, the last glacier of our journey, was as heavily crevassed as it had been in 1954, but fortunately the route used in that year was still passable, and six hours after leaving Saddle Point we removed our crampons for the last time and walked across the mud flats to the station, to the great surprise and relief of the Atlas Cove party, who had heard nothing of us since we had landed 23 days previously. We received a splendid welcome, but the party to celebrate our return had to be postponed because we kept falling asleep.



ANARE photo 12595 P. J. Stephenson

FIG. 29

Belay *à cheval* on the Challenger glacier, 22nd February. Deacock (leading) has the only ice axe.

The Atlas Cove party, of which Lied was in charge, had accomplished a great deal of work in its three weeks on the island (see Appendix). Travelling in all weathers, they had established a camp at West Cape where Downes had lived alone to study the penguins, sheathbills and giant petrels, and they had also crossed the Vahsel glacier to Cape Gazert, where on 13th February they had weathered the same storm that had immobilised us in the snow cave. They had banded more than 1,000 giant petrels, and had recovered several banded 12 years earlier, obtaining valuable information on plumage changes. Gilchrist had visited the Jacka Valley and climbed high on Mt. Olsen to collect botanical specimens and pumice, while Lied had made three-hourly synoptic observations of the weather and transmitted them to Australia and the Ant-

arctic in regular radio schedules with Kerguelen, Mawson and *Nella Dan*. In their untiring efforts to establish radio contact with us they had travelled far from the station on many occasions, sometimes at night, to sit on hilltops for hours in wind and freezing rain. Like us, they had made many observations on clothing and thermal comfort as part of the physiology programme. They had also converted several huts of the derelict station into comfortable living quarters, which were greatly appreciated by the returning mountain party.

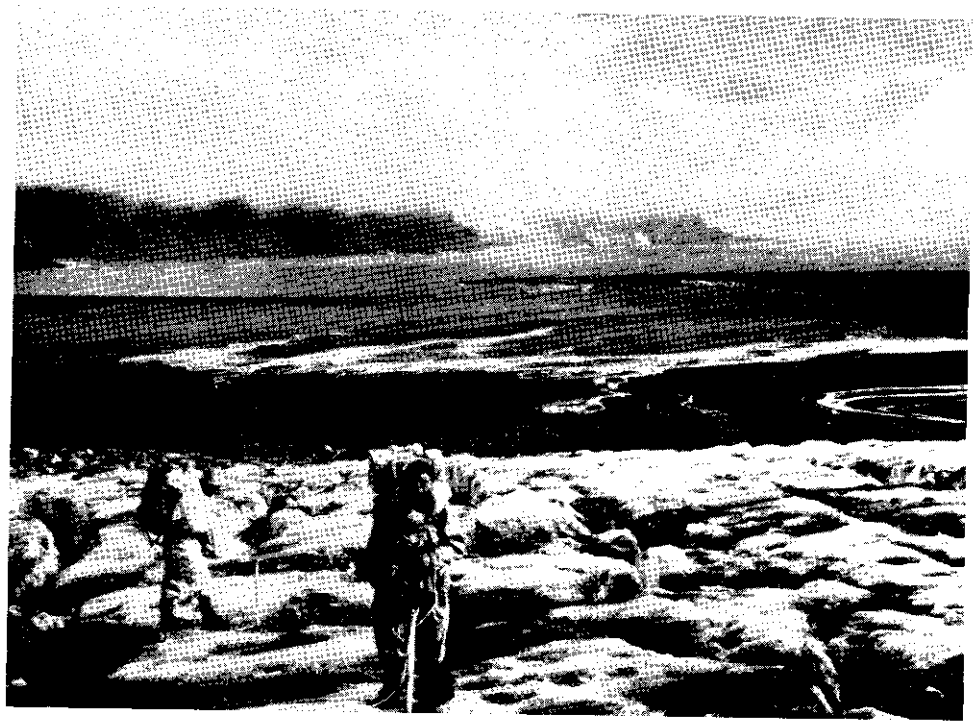
We had intended remaining at Atlas Cove for only a day or two before returning to Long Beach with fresh equipment, but this plan had to be modified when Deacock became ill as a result of eating old stores we had found at Saddle Point. Signs suggestive of appendicitis developed, and Gilchrist and I checked the surgical equipment left at the station in 1955—which proved to be still in good condition. Until Deacock's condition improved, a few days later, we could not split the party, in case an operation should be required. The six days on which we were all at Atlas Cove were put to good use. Stephenson and Lied completed the survey of the Atlas Cove area, using a Wild photo-theodolite, in the

ANARE photo 12599 G. M. Budd

FIG. 30

Fur seal family at Red Island on 25th February. Suckling occurred just after the photograph was taken.

first period of fine weather we had had since being forced down from the mountain. Downes, Gilchrist and I visited Red Island on 25th February, banding giant petrels, and obtaining evidence that fur seals were breeding on the island when we observed a pup suckling (Fig. 30). Downes collected specimens of birds and seals for later study, while Stephenson geologised over a wide area and collected rocks for palaeomagnetic studies and age determinations. A visiting emperor penguin was weighed, measured and photographed.



ANARE photo 12586 P. J. Stephenson

FIG. 31

Downes and Lied (left to right) on the Baudissin glacier on 28th February, *en route* to Spit Bay. In the background are Atlas Cove and the Laurens Peninsula, with Red Island on the far right; in the middle distance, in line with Red Island, is the ANARE Station.

On 28th February Stephenson, Lied and Downes set out for Long Beach via Spit Bay, carrying heavy packs with full camping equipment (Fig. 31). They camped the first night in wind and driving snow on the glacier near Melbourne Bluff, and next day made a geological and biological survey at Cape Bidlingmaier. Stephenson occupied a photo-survey station using the Leica camera and Smith-Guile "Panhead" attachment (which clamps to the head of an ice axe)[8] as he had done in previous survey stations outside the Atlas Cove area. They then set

out for Fairchild Beach, but while they were attempting to cross the Compton glacier in a heavy snowstorm late in the afternoon three of their crampons broke and they had to retreat to Gilchrist Beach, where it took them three hours to erect their tent in the wind. They succeeded in crossing the Compton the following day (2nd March), and continued on to Spit Bay, doing further survey work on the way. By now there was insufficient time for them to reach Long Beach and return before the expected date of the ship's arrival, so they remained at Spit Bay and worked in its neighbourhood, where Lied made three-hourly weather observations for comparison with simultaneous observations at Atlas Cove, and obtained photographs of the lee-wave cloud formations characteristic of the area.

At Atlas Cove, meanwhile, Gilchrist maintained the meteorological observations and radio schedules, while we hastened Deacock's convalescence with daily excursions to search for fur seals and king penguins, and to collect peat and other botanical specimens. Another incubating king penguin was found, at Vahsel moraine. On 5th March the three of us visited Jacka Valley to count and band the chicks of the blackbrowed albatross, thus completing the main Atlas Cove programme.

On 6th March, only two days before the ship was due, Deacock and I set out for Spit Bay to complete the census of fur seals and king penguins, leaving Gilchrist to pack his collections and maintain radio contact with the ship. The disadvantages of this course, although acceptable in the circumstances, were clearly recognised: we should have to travel regardless of the weather, and as a two-man party without tent or radio we were below the minimum strength advisable in such terrain. These disadvantages were emphasised in the first day's travel, when Deacock fell 20 feet into a crevasse, and again the next day when, travelling in bad weather, we were swept off our feet in a flooded glacial stream and almost carried out into the surf. We reached Spit Bay with our objectives accomplished except for the census at Skua Beach, which we had reached too late in the day, to learn that Downes had already made a census there, thus completing the survey of the island. In addition we had seen and photographed another suckling fur seal, at Fairchild Beach, and Stephenson and Downes had found a king penguin chick at Skua Beach.

Nella Dan arrived, a day later than expected, on 9th March. During re-embarkation a heavily dumping surf almost capsized the pontoon carrying men and scientific records to the ship, and Dr. Law was swept off into the water. Swimming strongly, he soon regained the pontoon and was hauled aboard, and a few minutes later we were safely beyond the breakers. After collecting Gilchrist and the scientific records from Atlas Cove, and sealing up the station huts, we sailed for Kerguelen. There, 24 hours after leaving Heard Island, all members of the expedition underwent a rigorous series of physiological tests over a period of 18 hours,

culminating in a two-hour exposure to a temperature of 39°F, dressed only in their underwear, in the ship's cold room. These experiments, which repeated an identical series done before leaving Melbourne, were in some ways the hardest part of the expedition, for we were all extremely tired after almost six weeks of constant work on the island, and my five companions might justifiably have considered themselves entitled to a rest. Instead, they underwent these unpleasant experiments with the same loyalty, fortitude and good humour that they had shown throughout the expedition, and it is a pleasure to acknowledge my appreciation and respect. I am also indebted to the many ANARE men, and the officers and crew of *Nella Dan,* who helped during the physiological experiments and the landing operations, and in particular to the Director of the Antarctic Division, Dr. P. G. Law, whose patience, experience, and personal leadership were in large measure responsible for our safe landings at the right places on Heard Island.

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Appendix

Narrative of the Atlas Cove Party

by

NILS LIED

A very depressing sight greeted us as we landed at Atlas Cove on 28th January, 1963. Time, wind, weather and elephant seals had wrought havoc throughout the station. Doors on most of the huts had been broken down by the seals, who subsequently had sheltered in the huts, with disastrous results. The crowning insult was the discovery that a venturesome seal had even tried the bath-tub. Fortunately one sleeping hut, the mess and kitchen, and a couple of store huts were in reasonable condition, and could be made liveable.

A concerted effort by all ANARE hands from the *Nella Dan* saw the Atlas Cove party established in the old ANARE station with all their stores and equipment by 4 p.m., 28th January, when the ship weighed anchor and sailed for Spit Bay and Long Beach. " Established " is hardly the word, except that we did have a fully operational base radio station and two mountain-pack radio sets, thanks to the efforts of the ANARE men.

We immediately set about the task of renovating our future living quarters, while at the same time establishing the meteorological station and commencing the scientific programme. The meteorological station was fully operational by the afternoon of 29th January. Downes by then had completed his initial ornithological survey of the Corinth Head-Atlas Cove area, and Gilchrist had continued the war on elephant seals, dirt, sand and rust. Radio contact had been established with Kerguelen, Mawson and Davis, as well as the ship. We were delighted to learn on the 30th that the mountain party had landed at Long Beach with their stores intact in spite of the difficult conditions which had prevailed since our arrival at Heard Island.

From 30th January, three-hourly synoptic weather observations were taken regularly and transmitted to Kerguelen, the *Nella Dan,* or the Antarctic mainland stations, as conditions allowed.

By the end of the first week at Atlas Cove the living and sleeping quarters had been renovated, the stores unpacked, sorted and stacked, and, to our delight, we finally managed to resurrect the hut's AGA stove, which then provided the means of cooking our food, drying our clothes, and serving as a social " bottom-warming and discussion centre ".

We scoured the old station for " things to use ", and gradually came to light with extra fuel, clothes, crockery, cutlery, stationery and a great number of items which helped to make us more comfortable.

The feeling of living in an eerie ghost-town never left us. At night, rain, sleet and snow assailed the old huts, and the great winds of the Southern Ocean blasted the camp, shrieking and moaning through the steel radio masts and damaged huts, while the roar of fighting seals could be heard through the constant sound of the surf pounding the rocky shore.

Constantly we discussed the whereabouts of our three companions on the other side of the island, particularly after it became quite evident that radio contact with them would be a major problem.

After establishing ourselves in " opulent comfort ", and cleaning up the scientific programme close to camp, we started to extend our activities further afield. Due to our varied fields of enquiry we were rarely able to do so as a three-man party. Downes ranged extensively during his ornithological expeditions, Gilchrist similarly in his search for lichen and grasses and in his biological work. For my own glaciological work I often found it necessary to scramble over moraines and ice without the assistance of another man. We would always discuss our exact movements with each other in case of accidents.

During this early period I built survey cairns on all prominent features in the area, such as Corinth Head, Mt. Drygalski, Mt. Andrée and Mt. Aubert de la Rue, in preparation for the future glaciological and geographical survey.

Downes, on several occasions, went alone to West Cape on Laurens Peninsula carrying his " bird-observation-hide " and some provisions for a future stay in the area. Between trips he was kept busy preparing bird and seal specimens for further study in Australia.

To our delight the birds had seemingly forgotten the previous human occupation, and we were able to hand-feed both skua gulls and sheathbills (paddies). Our kitchen scraps were obviously a welcome change in diet.

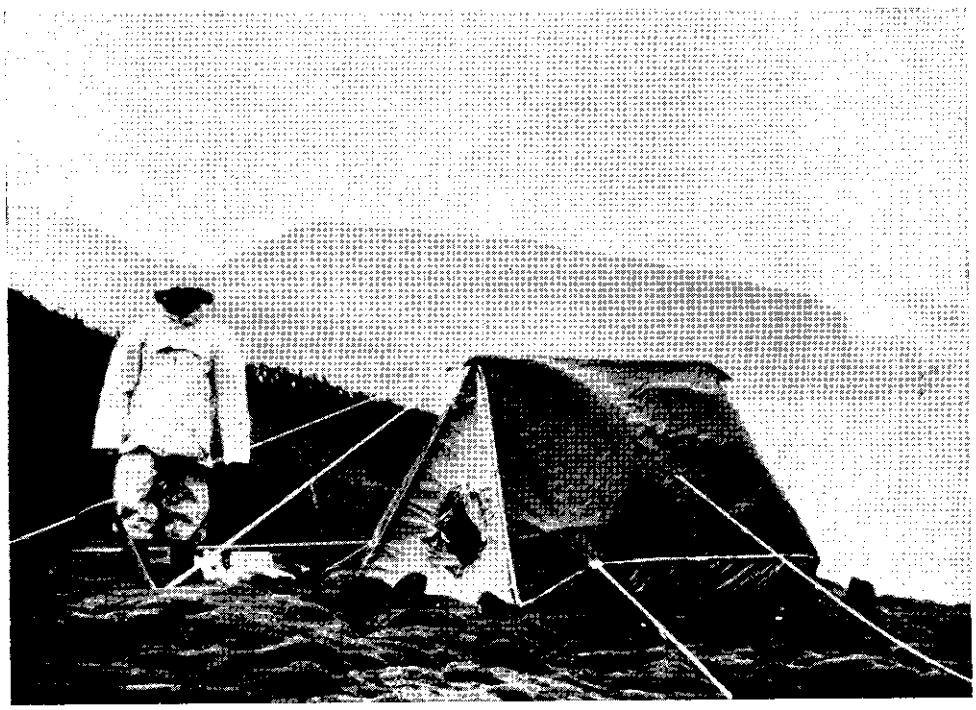
Fur seals were found to have re-established themselves on Heard Island, as indicated by the great increase in numbers and the many small pups observed.

Cape Gazert

It was decided that a visit to Cape Gazert on the west coast was desirable in order to band the giant petrel chicks in the rookeries there and to inspect the glaciers and moraines in that area. We also hoped to be

able to contact the mountain party on our field radio, as Cape Gazert is in line of sight with the South Barrier and Long Beach. No contact had been made since the ship's departure, so we could only make hopeful guesses as to the party's whereabouts.

For once we found it necessary to travel as a three-man unit, for we had to cross the wide Vahsel glacier, whose lower reaches had a reputation for bad crevassing. The weather was reasonable for Heard Island, with a 20-knot south-westerly wind and periods of light rain. We carried radio, provisions for one week, bird-banding equipment and meteorological instruments. The crossing of the Vahsel proved reasonably easy, except for the final difficult approach to Cape Gazert, and a camp, using our Béche tent, was established on level azorella below the peak of the Cape (Fig. 32).



ANARE photo 12585 A. R. Gilchrist

FIG. 32
Downes at the camp on Cape Gazert, 12th February.

The bird-banding programme started immediately on arrival, and by the evening of the following day, 12th February, we had banded the entire population of giant petrel chicks on the Cape, and also recovered two bands on adult birds, one of which had been put on by Downes 12 years earlier (Fig. 33).

ANARE photo 12584 A. R. Gilchrist

FIG. 33

Lied and Downes (left to right) banding a giant petrel chick at Gape Gazert on 12th February.

The barometer had taken a sudden plunge, and the weather had all the signs of an approaching hurricane. We spent the rest of the evening securing our tent with rocks and extra ropes, then crawled into our bags, hoping for the best.

The hurricane hit us late on 12th February, accompanied by snow, sleet and heavy rain. We could only remain in our bags and wait, eating sparingly, and economising on fuel. Attempts to contact the mountain party by radio failed—our only reward was a soaking.

This was the great blizzard which came close to bringing the mountain party to grief, and our thoughts were with them as the great wind shrieked across our small tent with gusts of more than 100 m.p.h.

As expected, a temporary lull in the weather occurred on 13th February and we decided to make a quick dash for Atlas Cove. If we could get across the Vahsel glacier we could make another camp on the other side of it, should the need arise.

Rarely has a camp been broken with such speed, and a party been packed up and on its way in such a short time. The weather was still foul, but we could at least stand up and travel against it. The last half-hour march into Atlas Cove was made in rapidly worsening weather, and by the time we gained shelter, the storm had regained all its former strength. Heavy sheets of sea spray were picked up by the wind at Atlas Roads and flung bodily through the station, giving us the sensation of standing in a needle-spray shower. However, we had managed to complete our various tasks and another 235 birds were adorned with rings. Our meteorological instruments showed that the barometer had plunged 40 millibars during the hurricane.

West Cape—Laurens Peninsula

In order to assist Downes in his biological programme it was decided to set him up with a complete camp near West Cape on the Laurens Peninsula. From this camp he would then be able to cover the entire south and west coast of the peninsula, which is a rich ground for ornithological research. On his previous trips to the area he had packed considerable quantities of stores and equipment, but insufficient to support him for the week he wished to spend there. On Saturday, 16th February, Downes and I left Atlas Cove for West Cape, packing approximately 140 pounds between us, including a field radio and the Béche tent.

The weather, true to Heard Island form, was foul, with a 30-knot westerly, showers of snow, hail and rain, and low scudding clouds. The route to West Cape lies along the beaches, through great heaps of fallen boulders, around vertical rock overhangs, and through guano-covered penguin rookeries. There is always the chance of rock falls from above, and the added danger of being swept off by the surf when dashing around the rock outcrops while the waves recede.

Pumice had been washed up along the entire coast after a distant underwater eruption, and the beach was completely covered, in some places to a depth of 2-3 feet (Fig. 34). The pumice offered very insecure and slippery walking ground, adding to our difficulties.

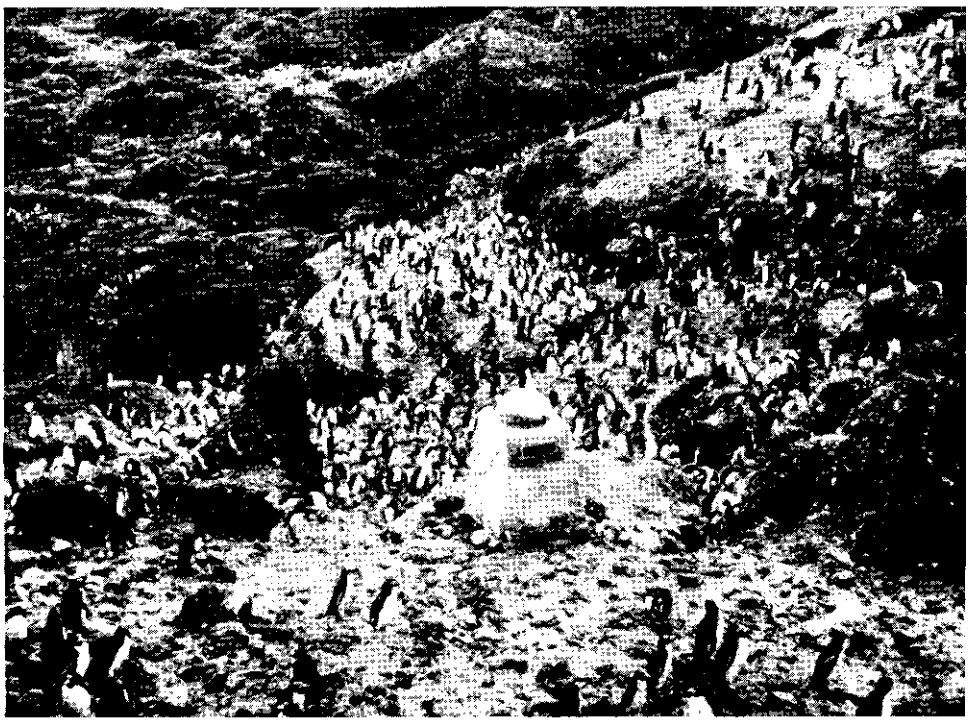
We reached Downes's depot at West Cape in the early afternoon. His camp was set up and radio skeds with base arranged. I then returned to Atlas Cove.

During his stay at West Cape, Downes reported by radio twice daily, and even received cables from his wife, re-transmitted on the field-set. This was rather an anxious period for his two companions, as the West Cape area consists mainly of broken lava outcrops, moraines and rubble, where it is extremely easy to sustain an injury (Fig. 35).

ANARE photo 11981/15 G. M. Budd

FIG. 34

Pumice on the beach at South-West Bay on 3rd March, with a leopard seal and a young fur seal.



ANARE photo 12583 M. C. Downes

FIG. 35

Downes's bird hide, in a macaroni penguin rookery at West Cape.

However, all went well and he subsequently banded some 1,250 giant petrel chicks, a truly incredible effort. An interesting discovery was a giant petrel, complete with banding ring, sitting on the same nest where Downes had banded it as a chick 12 years before.

Gilchrist and I returned to West Cape on 21st February to bring Downes and his equipment back to Atlas Cove. Each of us carried back packs weighing well over 60 pounds, although all the food was depoted at West Cape for future use. We discovered an albino macaroni penguin, a rare find indeed, and collections of algae and pumice were also made en route.

Plans for a search expedition

Since the departure of the ship we had been unable to contact the mountain party, and our anxiety for their safety and welfare increased day by day. We were particularly worried after the first great storm, which had immobilised us at Cape Gazert, and the subsequent passage of a number of severe depressions, accompanied by storm force winds and heavy precipitation.

On 17th February, I managed to contact the *Nella Dan* during particularly good radio conditions, and discuss our line of action with the Director. Plans for a search for the mountain party were discussed during further radio sessions over the next two days.

It was agreed that Downes and I should make up the search party, leaving Gilchrist at Atlas Cove to continue what part of the scientific programme he could manage, but mainly to keep radio contact, do the meteorological observations, and be on the spot in the event of the climbers' arrival at Atlas Cove.

Downes and I were to travel to Long Beach over the west coast glaciers. If there were no indications that the climbers had come down from the mountain and proceeded to Spit Bay, we were to climb as high as possible in an attempt to establish their fate. From Long Beach we were to proceed to Spit Bay, doing scientific work en route, and there await the ship's arrival.

The venture would be extremely hazardous with only a two-man party, but was our only course of action. We were both very fit, and experienced in glacier travel. We would travel as light as possible, largely live off the land, and use double nylon climbing ropes made up as rope-ladders, instead of the customary single line used for glacier crossings. This was to enable each of us to extricate himself unaided from a crevasse in case of a break-through.

Gilchrist was instructed in the management of our radio, and departure was set for 24th February.

Thirty-six hours before we were due to leave Atlas Cove the mountain party arrived—tired, frostbitten and hungry, with a minimum of gear.

The Atlas Cove men were extremely relieved to see them and treated them like visiting royalty. After a bath we shared our spare clothing, fed them, and established them in front of the stove, delighted at the sight of three scruffy mountaineers sitting round a baby's bath, of all things, soaking their sore feet, and nodding over cans of beer, replete with penguin steaks casseroled in claret.

Conclusion

The final stages of the expedition are covered in Dr. Budd's report. The trip to Spit Bay by Stephenson, Downes and myself proved to be both hazardous and strenuous, mainly because we carried approximately 200 pounds between us—mostly in foul weather. As we crossed the glaciers, scrambled over the moraines and struggled waist-deep through the fast-running, icy glacier streams, we could only admire the fortitude and endurance displayed by the mountain party in reaching Atlas Cove after their ordeal on Big Ben. Stephenson's performance after a strenuous period at Atlas Cove without a well-deserved rest was nothing short of incredible, and in fact the whole party had but the one over-riding thought—that of finishing our scientific programme.

Such is the weather at Heard Island that even in summer we had for the month of February 1963:

Hail on two days.
Snow on eight days.
Mist on nine days.
Dust storm on one day.
Fog on nine days.
Rain on 13 days.
Drizzle on six days.

To this we must add the almost constant gales, the crash of falling ice, and the roar of the Southern Ocean pounding the beaches, rocks and ice-cliffs.

In spite of the bleak aspect of this lonely speck in the Southern Ocean, its violent weather, and its dangerous terrain, we would all like to go back for another try. Somehow, we always do.

35′

40′

45′

50′

53°

33′
54′

73° 35′

37′
54′

Sail Rock
17

52° 55′

52° 55′

Shag Island
92

Drury Rock
37

SCALE 1:50,000

57′

33′

73° 35′

37′

57′

P.D.

Gilchrist Beach (sand, shingle and rocks)

15

200

261

BARRIER

GLACIER

Fairchild Be
(sand, shingle an

HEARD ISLAND
AUSTRALIAN TERRITORY

20′ 25′ 73° 30′

Red Island 94
Jungle
Sydney Cove
Macey Cone 124
233
340
The Sentinal 422
366
LAURENS PENINSULA
148
Mt Dixon 706 483 469 600
Anzac Peak 715
600 400 200
shingle
Jacka Glacier
226 220 Vanhöffen Bluff
537
alluvial flat
Hayter Peak 564
Gilchrist 515
374
Mt Olsen 636
192 volcanic ash
334 494 499
Aiguilles
150
P.D.
shingle
90 124
Mt Aubert de la Rue
ATLAS COVE
WEST BAY
sand
Mt Andrée 141
Cave Bay
Norwegian Rock P.D.
volcanic
sand
Rogers Head 145
balanced rock 95
crater 97
Corinth Head 180
2 ANARE STATION 1948-55
Mt Drygalski 210
234
Schmidt Glacier
SOUTH WEST
NORTH WEST
Erratic Point P.D.
CORINTHIAN BAY
Church Rock 16
124
BAUDISSIN GLACIER
207
Saddle Point 107
Mechanics Bay
Cape Bidlingmaier 120
Morgan Island P.D.
Black Roc
P.D.
76
CHALLENGER GLACIER
366
267
DOWNES GLACIER
Melbourne Bluff
386
396
351
384
672
567
912
200 400 600

15′

20′

Red Island
94

shingle

Sydney
Cove

Macey Cone
124

233

340
The Sentinel
422

Cape Cartwright

23

25

366

L A U R E N S

148

Mt Dixon
706

483

600

469

Anzac Peak
715

009

shingle

44

53°

45

400

200

P E N I N S U L A

Jacka Glacier

226

220

Vanhöffen Bluff

537

alluvial flat

Hayter
Peak
564

Mt Olsen
636

46

55

Gilchrist

515

374

494

334

192
volcanic ash

499

Aiguilles

shingle

150

P.D.

90

124

P.D.

P.D.

shingle

Mt Aubert de la Rue

W E S T

B A Y

sand

Mt Andrée
141

Cave
Bay

Norwegian Rock
P.D.

E.D.

S O U T H

W E S T

Erratic Po
P.D

5′

10′

BAY

VAHSEL GLACIER

sand and shingle

CORNICE

·771

Little
1480

Cape Gazert

△97

Pulpit Rock
55

P.D.

Walsh Bluff

sand

ABBOTSMITH GLACIER

Henderson Bluff

P.D.

200

400

600

800

1000

1200

1400

1600

1800

2000

LIED GLACIER

P.D.

P.D.

·219

Cape Arkona

GOTLEY GLA

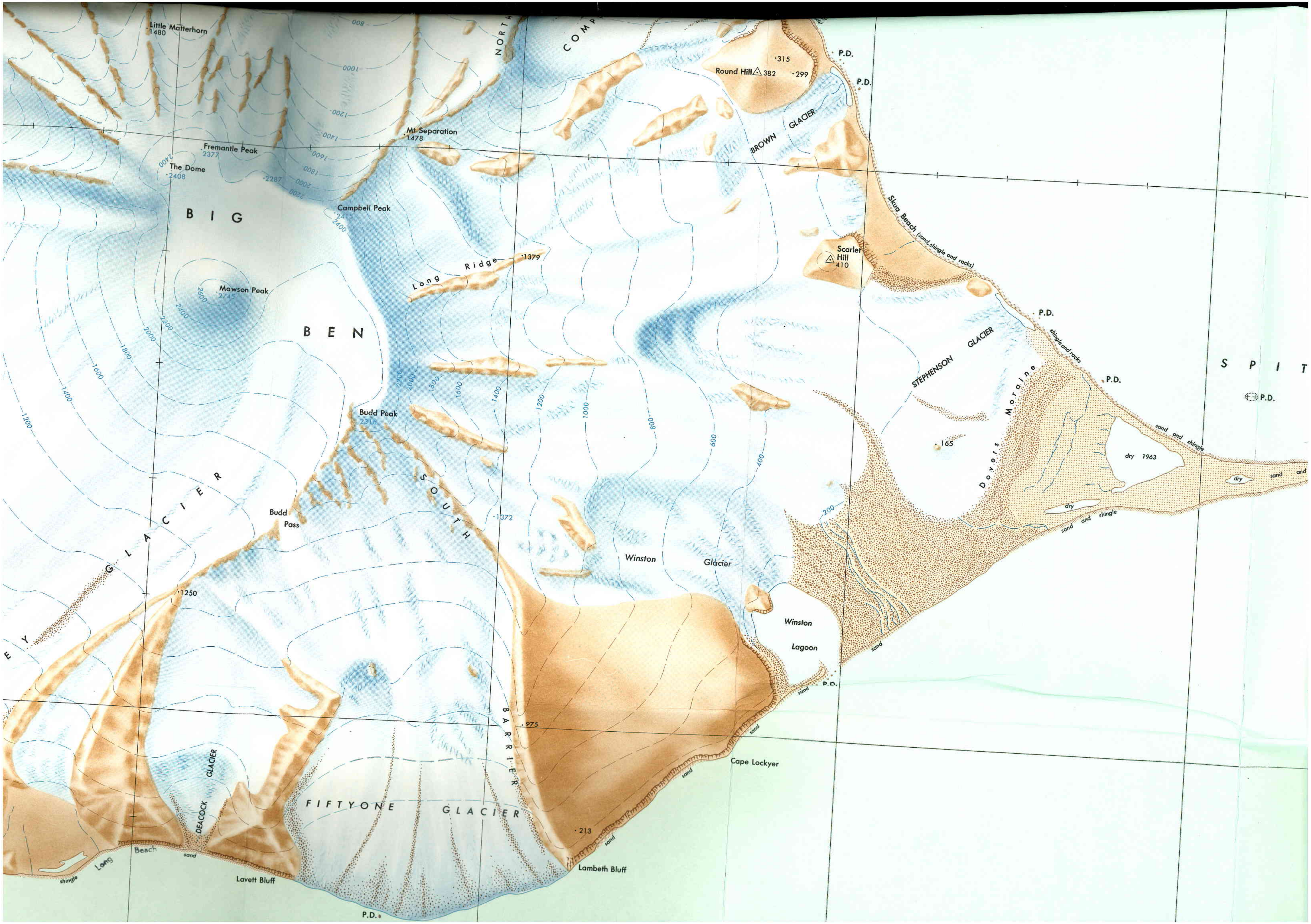
Wakefield Reef

·40

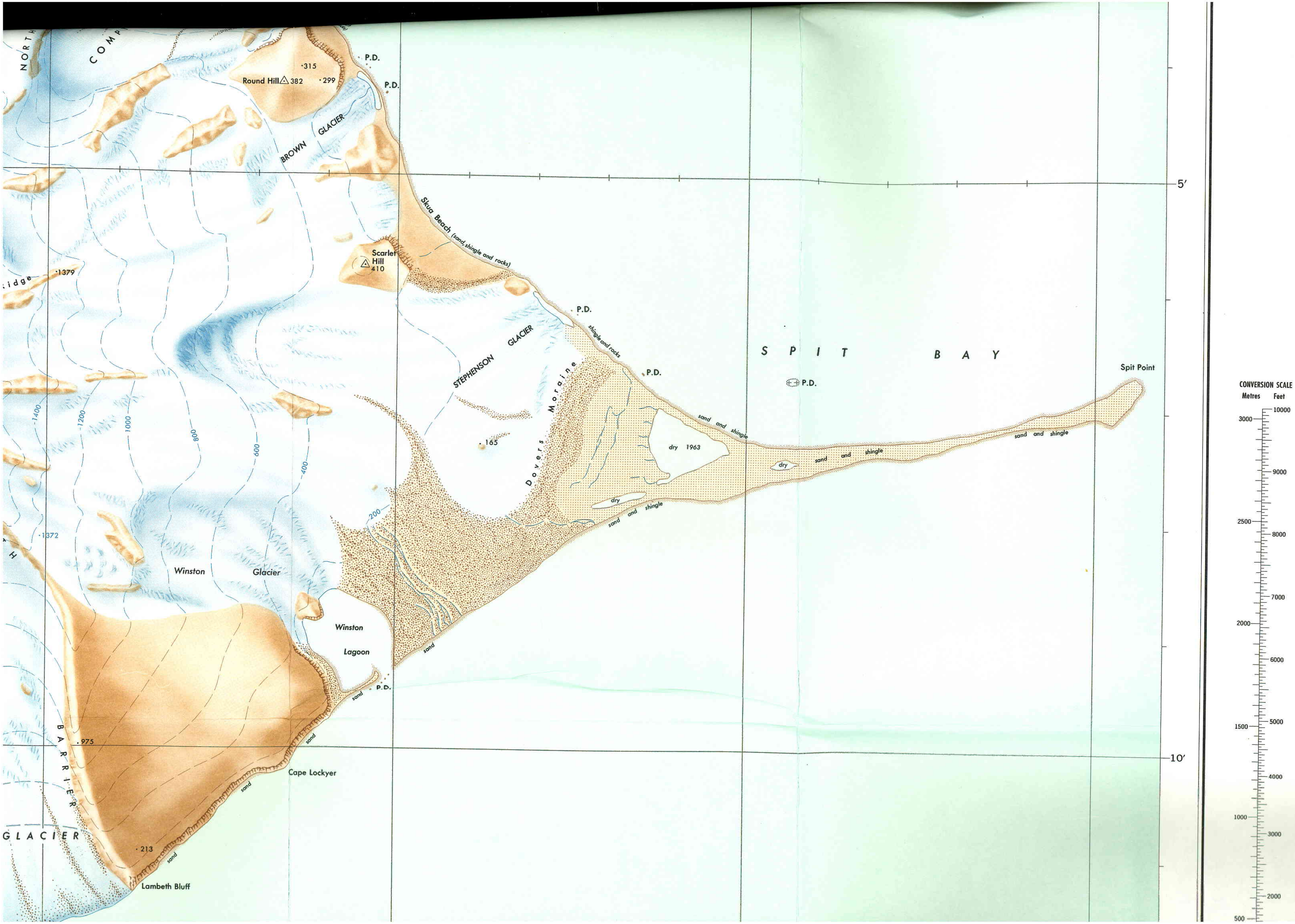
Cape Labuan

shingle

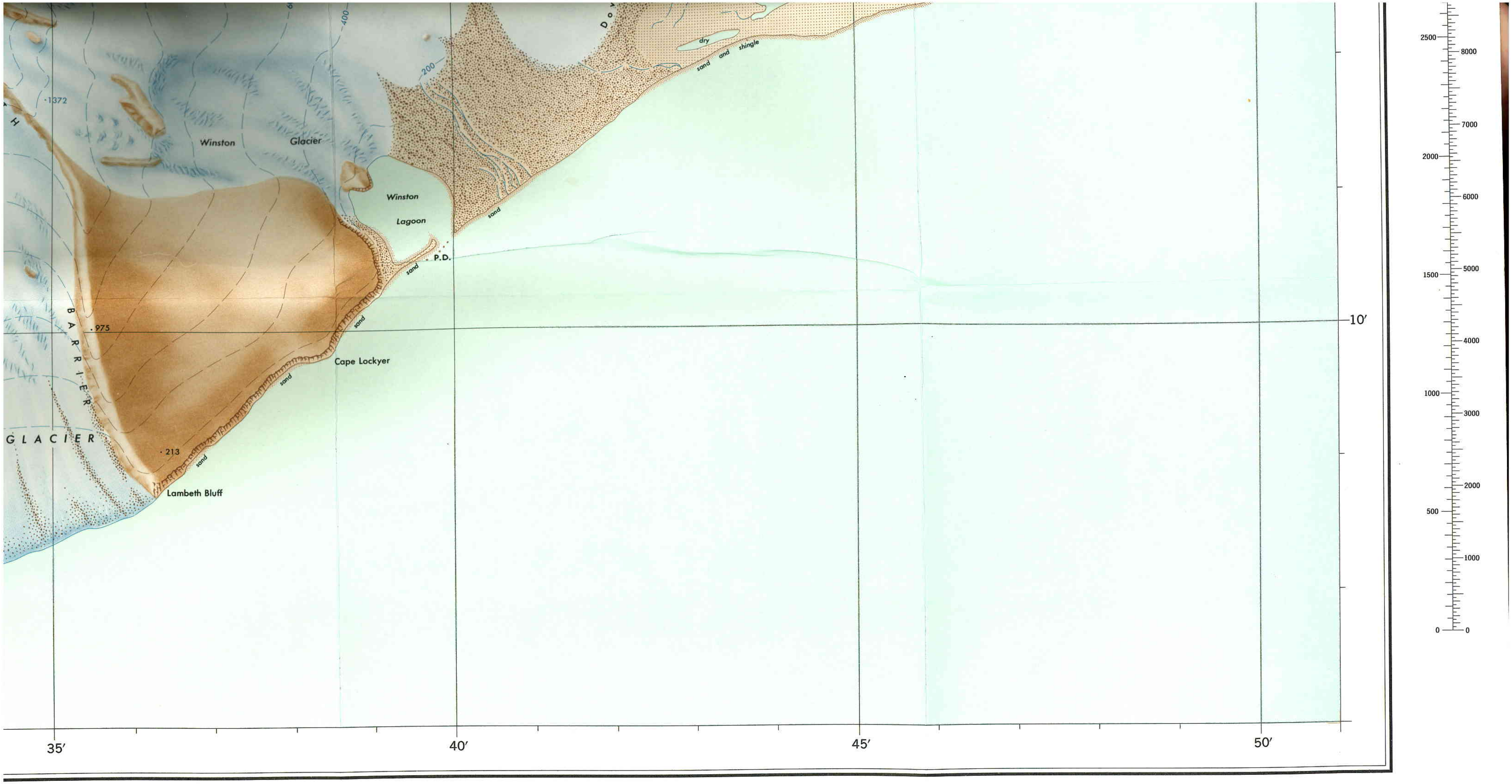
Long



Little Matterhorn
1480
Mt Separation
1478
Fremantle Peak
2377
The Dome
2408
2287
Campbell Peak
2415
B I G
B E N
Mawson Peak
2745
Long Ridge
1379
Budd Peak
2316
Budd Pass
1250
1372
Winston Glacier
Round Hill
382
315
299
P.D.
BROWN GLACIER
Skua Beach (sand, shingle and rocks)
Scarlet Hill
410
STEPHENSON GLACIER
shingle and rocks
Doyers Moraine
165
dry 1963
dry
sand and shingle
S P I T
Winston Lagoon
sand
Cape Lockyer
975
213
Lambeth Bluff
FIFTYONE GLACIER
DEACOCK GLACIER
SOUTH BARRIER
Lavett Bluff
Long Beach
shingle
G L A C I E R



NORTH
COMP
Round Hill 382
315
299
P.D.
P.D.
BROWN GLACIER
5′
Skua Beach (sand, shingle and rocks)
Scarlet Hill 410
1379
ridge
P.D.
shingle and rocks
STEPHENSON GLACIER
P.D.
S P I T B A Y
P.D.
Spit Point
Dovers Moraine
sand and shingle
dry 1963
165
dry
sand and shingle
sand and shingle
dry
sand and shingle
1400
1200
1000
800
600
400
200
1372
Winston Glacier
Winston Lagoon
sand
P.D.
sand
sand
975
BARRIER
Cape Lockyer
10′
sand
GLACIER
213
sand
Lambeth Bluff
CONVERSION SCALE
Metres
Feet
3000
2500
2000
1500
1000
500
10000
9000
8000
7000
6000
5000
4000
3000
2000



5 — 6 Statute Miles

7 — 8 Kilometres

4 — 5 Nautical Miles

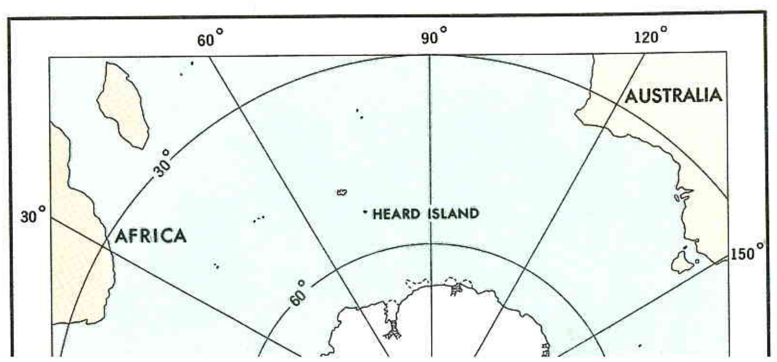
Beach

Coastal plain

International Spheroid

Universal Transverse Mercator Projection

Zone 43



Names have been approved by the Antarctic Names Committee of Australia.

Beaches vary in width from 10 to 50 metres.

Up to elevations of about 90 metres, Azorella, mosses and grasses grow on most ice-free rock areas.

1200
1000
800
600
400
200
LIED GLACIER
P.D.
P.D.
·219
Cape Arkona
GOTTLEY GLACIER
Budd Pass
SOUTH
·1250
DEACOCK GLACIER
FIFTYONE GLA
Wakefield Reef
Beach
sand
Long
shingle
·40
Cape Labuan
Lavett Bluff
P.D.
20′
25′
73° 30′

Magnetic Declination 1964
approximately 53°33′ West,
increasing 12′ annually.

·oduced by the Division of National
.apping, Department of National
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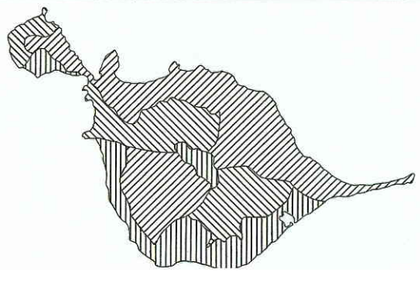
COMPILATION RELIABILITY DIAGRAM



SCALE 1:50,000

1 0 1 2 3 4

1 0 1 2 3 4 5 6 7

1 0 1 2 3 4

Heights in metres

Contour interval : 200 metres

LEGEND

Sunken rock
Limiting danger line
Ice coastline
Ice-free coastline

Ice cliff or escarpment
Rock cliff or escarpment
Melt stream and lagoon

Ice-free area
Crevasses

Be
Cc

10′

15′

20′

Wakefield Reef

NMP/64/38

Magnetic Declination 1964
approximately 53°33′ West,
increasing 12′ annually.

Produced by the Division of National Mapping, Department of National Development, Canberra, Australia.

Compiled from Australian National Antarctic Research Expedition survey 1948 and additional information obtained by ANARE to 1963.

COMPILATION RELIABILITY DIAGRA