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PRELIMINARY REPORT ON GEOLOGICAL WORK DURING THE RELIEF VOYAGE OF THE M.S. "MAGGA DAN", JANUARY - MARCH, 1961.

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SUMMARY

An account is given of geological work done at Chick and Henry Islands on the Sabrina Coast and the Wilson Hills in Oates Land. Chick Island is a porphyritic charnockitic granite and Henry Island a porphyritic biotite granite. The rocks at all places examined in the Wilson Hills and the nearby Aviation Islands are migmatites, consisting of an irregular network of granite veins through banded feldspar-biotite gneiss; a few pegmatites are present. Small-scale folding can be seen at many places.

INTRODUCTION

The M.S. "Magga Dan", during its voyage early in 1960 to relieve the stations of the Australian National Antarctic Research Expeditions, carried a geologist and surveyor to survey parts of the Antarctic coastline. Although a certain amount of work was done on this voyage (McLeod, 1960), one of the main areas of interest, the Wilson Hills in Oates Land, could not be visited.

In 1961, the "Magga Dan" again carried a geologist and surveyor and in addition a geophysicist, as supernumeraries. Two Bell 47G-2 helicopters, larger than the Hillers used the previous year, were taken for transport. A de Havilland Beaver was again used for trimetrogon aerial photography. This year the exploratory work was to be concentrated in the Wilson Hills area of Oates Land. (See map at back).

Although the ship attained a position off the Oates Land coast from which rock exposures over a large area could be reached by helicopter, unfortunately the weather for almost the whole time spent there was too bad for flying, and sea-ice conditions were such that a longer stay in the area was inadvisable. The coast could not be reached by boat because of a fringe of pack-ice. Consequently only a small proportion of the work possible was actually achieved before the ship was obliged to leave the area.

NARRATIVE.

The M.S. "Magga Dan" (Captain W. Pedersen) sailed from Perth on 22nd January, 1961, and after a voyage slowed by strong headwinds, tied up alongside the M.S. "Thala Dan" in Mawson Harbour on 8th February.

At Mawson, the results of the 1960 geological work were discussed by R. A.Ruker, D. S. Trail and myself. Proposals (especially the transport aspect) for spring and summer field work in the southern Prince Charles Mountains were discussed at a conference of relevant members of the old and new parties and the Director and Assistant Director of the Antarctic Division. Trail and I made an aerial reconnaissance (using the Beaver) of the Framnes Mountains and the coastline for 60 miles west of Mawson. I also had discussions with the glaciologist (R.W.L. Wyers) of the 1961 party.

After completion of relief operations the "Magga Dan" sailed on 11th February for Chick Island, approaching to within 70 miles of Wilkes to enable the Beaver to transfer some equipment from the ship to the station. Early on the morning of the 18th the ship entered very heavy pack ice with new ice between the floes, about 70 miles north of Chick Island, and on the morning of the 20th, after steaming through several miles of new ice a couple of inches thick, tied up to the edge of fast ice 6 miles north of Chick Island.

Both Chick Island and the Henry Islands (several miles to the west) were examined early in 1960 (McLeod, 1960) but I re-examined both while the weather station was being constructed and also assisted the surveyor with his work.

On 22nd February a small unreported islet was seen during a photographic flight, situated approximately at 66°40'S, 122°16'E, with another islet 5 miles to the south, and a possible third 10 miles to the west. It was planned to visit these before the ship sailed, but fog and the general whiteout prevailing made conditions too dangerous for flying. The "Magga Dan" sailed at 0800 hrs. on 23rd, and cleared the pack on the evening of 25th February. En route to Oates Land, a couple of hours were spent at the French station, Dumont D'Urville, on 28th February.

Oates Land was approached along 160° east longitude, and at daylight on 4th March, the Wilson Hills could be seen about 50 miles to the south. That afternoon, while the ship was still 30 miles from the coast, the pack-ice closed in and stopped progress.

Next morning the helicopters landed the geophysicist and me on "Peak 1" * (Fig. 1). While we were ashore the pack opened and the ship moved closer to the coast. The weather that afternoon and the next two days was too poor for flying but on 6th March a party was landed by launch on the westernmost of the Aviation Islands, and I also examined the other islands of the group.

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* Reference numbers are given to peaks only for the convenience of this report and have no official significance.

By the afternoon of 7th March, it was apparent that the weather was not going to improve, and as new sea-ice was forming, the ship began to work north through the pack. Progress was stopped early next morning about 25 miles from the coast by pack under pressure.

That afternoon the weather improved enough for a return by helicopter to the mainland, where parts of two mountains ("Peak 2" and "Peak 3") were examined. The pressure on the pack eased that evening and the ship worked eastwards to a broad lead which led to the open sea.

Macquarie Island was reached early on 12th March. The island was then bathed in sunshine but by mid-morning cloud had come down on the plateau and the wind increased, and for the rest of our stay there flying was not possible. The "Magga Dan" after unloading cargo, sailed the next afternoon and reached Melbourne on the morning of 19th March.

GEOLOGICAL WORK.

Chick Island.

This island was visited in 1960. On the present visit, attention was concentrated on the inclusions. The rock is a dark coarse-grained charnockitic granite containing rare garnet and biotite. A faint foliation strikes east-west and the dip ranges from 80° to the south to vertical. Inclusions are fairly common; the most numerous are fine-grained granulitic aggregates of feldspar and pyroxene; other common types contain pink feldspar, quartz, and either hornblende or biotite, with pegmatoidal, granitic or aplitic textures; others resemble the charnockitic granite in mineral content but have a finer grain-size.

A specimen of the granite was also collected for age determination.

Henry Islands.

These islands were also examined in 1960. They consist of pinkish-grey porphyritic biotite granite with a poorly defined foliation striking east-west and dipping vertically. Small, fine-grained biotite-rich inclusions are common. Long, straight feldspar veins up to 6 inches wide, run through the rock. Ice-polished surfaces are common.

A specimen of the granite and of an inclusion were also collected for age determination.

Aviation Islands.

This small group of islets consists of fine- to medium-grained banded feldspar-biotite gneiss invaded by numerous irregular veins of medium-grained equi-granular biotite granodiorite. The veins are sharp-edged and commonly transgress the banding of the gneiss. Irregular masses and thin veins of feldspar are common, and pegmatite veins occur in many places. Ptygmatic veins are a feature of many parts of the rock.

The rocks of the eastern-most island of the group consist almost entirely of a foliated coarse-grained porphyritic garnetiferous biotite granodiorite, cut by thin diorite dykes and a vein of limonitic quartz. Banded feldspar-biotite gneiss is restricted to a zone 50 feet thick.

The gneisses are tightly folded in many places, but the general strike on all the islets of the group is about south-east, and dips are steep to the north-east.

Wilson Hills - "Peak 1".

This is made up of banded feldspar-biotite gneiss which is cut both concordantly and discordantly by numerous quartz-feldspar -biotite veins, garnetiferous in places. The texture of these veins varies greatly; some are equigranular, others porphyritic; the grain-size ranges from fine to coarse; biotite may be very common or almost absent.

These granite veins and the gneiss are cut discordantly by several straight parallel-sided dykes of massive medium-grained biotite granite. One of these is in turn intruded by a thin aplite dyke. Copper staining was seen in the gneiss in two places.

The gneiss is tightly folded in places but has a general strike to the south-east and dip of 80° to the south.

Wilson Hills - "Peak 2".

The rock here is mainly garnetiferous granite gneiss, containing remnants of banded garnetiferous feldspar-biotite gneiss. Most of these remnants are invaded by granite veins and masses of quartz and feldspar. These rocks are cut by thin, zoned pegmatite veins and long, thin feldspar veins.

The gneiss is commonly strongly plicated and is folded in places, but the general strike appears to be about east-south-east, and the dip north at 20° to 60°.

The granite gneiss and feldspar-biotite gneiss are intruded by a dyke of medium-grained diorite and a dyke of vesicular basalt.

Wilson Hills - "Peak 3".

This is composed of granite gneiss and feldspar-biotite gneiss like the rocks on Peak 2, but here the feldspar-biotite gneiss is greatly predominant over the granite gneiss. A few veins of aplite and feldspar were seen. The gneiss is folded into fairly tight folds several feet across, and with axial planes striking east-south-east and dipping south at 60° to 80°.

Wilson Hills - General.

In the area seen, the Wilson Hills consist largely of ridges striking about north-south. Evidence of faulting can be seen in the summits of these ridges near the coast and between the Pennell Glacier and the Tomlin Glacier. From the coast inland, at least three steps can be distinguished in the crests of many ridges at altitudes of approximately 500, 2000 and 3000 feet. The respective rises in the various ridges

Wilson Hills - General (continued):

are approximately collinear from one ridge to another, suggesting step faulting on lines parallel to the coast. (Fig. 1).

All the peaks seen from the air appeared to be composed of rocks similar to those seen on the ground. Examination of air photos supports this conclusion. No evidence was seen in this area of low-grade metamorphic rocks such as those described by Soloviev (1960), or of sediments of the Beacon Group, which occur at Horn Bluff and along the western edge of the Ross Sea.

CONCLUSIONS AND RECOMMENDATIONS.

It is again evident that the scope for exploratory geological work of this nature is greatly increased by the use of helicopters. The Bell 47G-2 machines were far superior in performance to the Hillers used in 1960. Larger aircraft would of course be an advantage in giving greater range and carrying capacity, but the Bell or a similar (but not smaller) machine can be regarded as adequate for work of this kind in the near-coastal regions.

The one serious drawback to these helicopters (and one applying to all aircraft to a degree depending on the size of the machine) is that they can operate only in moderately good weather. In this case the pilots set 30 knots as the maximum safe windspeed for operation. This was a reasonable limit but it was unfortunate that for most of our stay in the Wilson Hills area, windspeeds were above 35 knots. The whiteout conditions prevailing for most of the time also made flying dangerous. The only solution to these problems is to ensure that the time available is sufficient to wait out spells of bad weather.

The region between the area examined this year and the Ross Sea is one of the few regions of extensively exposed rock in Antarctica still to be explored. It is likely to prove of great geological interest in providing a link between the main shield area of the continent and the Antarctic Horst bordering the Ross Sea. At present the western edge of this horst is practically unknown. Rocks of the green-schist facies, known at few other places in Antarctica, are likely to occur. Also it is quite likely that representatives of the Upper Palaeozoic coal-bearing Beacon group may be found.

It is recommended that (provided helicopters are taken) a geologist accompany the next exploratory voyage into this area. The timetable for the voyage should be such that at least a week and preferably a fortnight can be spent actually in the area. Work should be concentrated east of the area visited this year, viz. east of longitude 159½°E. Large and extensive mountains were seen east of this line, and even if the whole fortnight were to be spent on actual work, this time would hardly be sufficient to make even a reconnaissance examination of all the exposed massifs between longitude 159½° and (say) longitude 167°E., (where the coastline is over 100 miles from the New Zealand base, Hallett).

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Soloviev, D. S., 1960 - The Lower Paleozoic slates of Oates Coast. In - Collection of Articles on Antarctic Geology (2), Scientific Investigation Institute of Arctic Geology, Vol. 113, pp. 147-158.

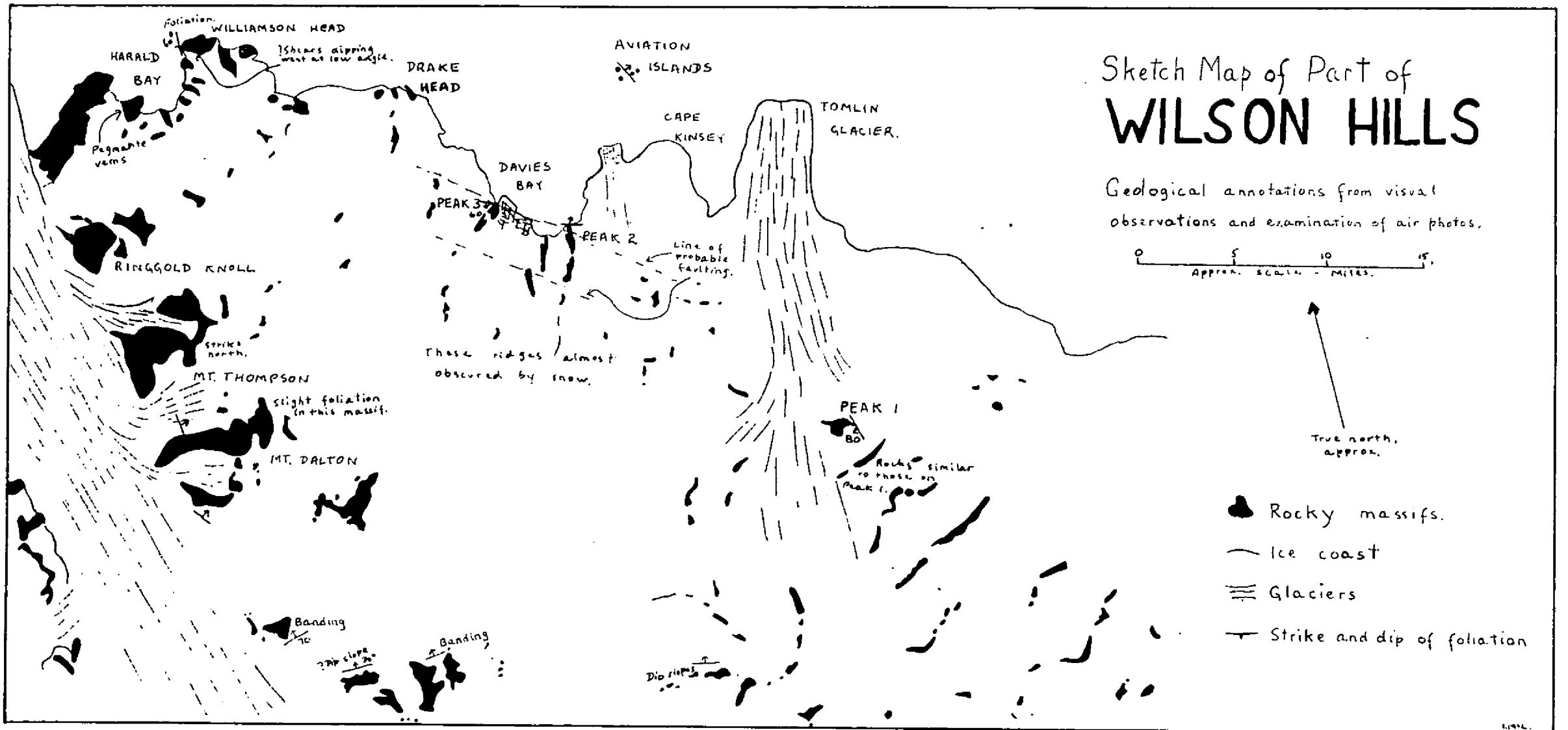
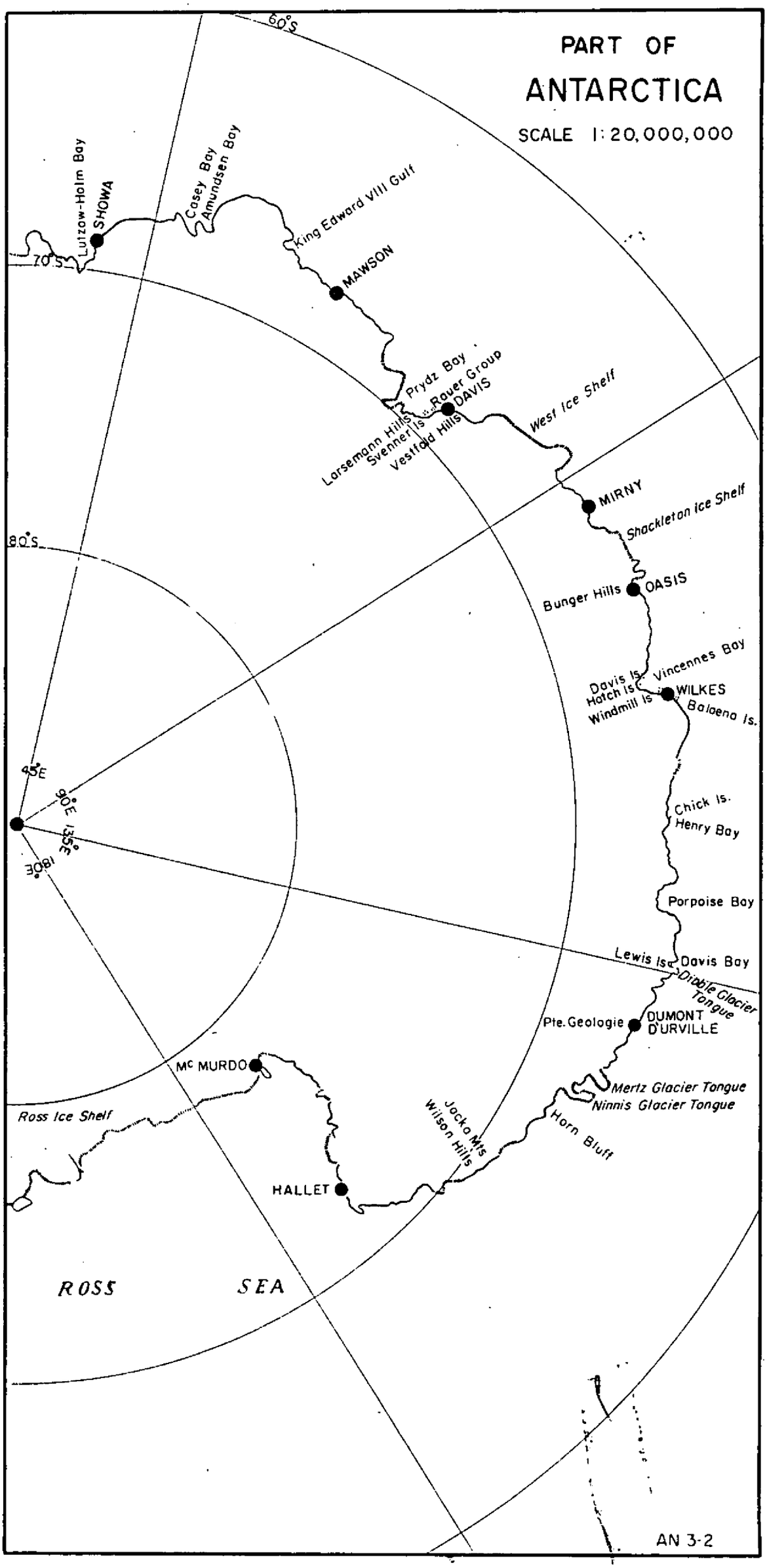

Sketch Map of Part of
WILSON HILLS
Geological annotations from visual observations and examination of air photos.
0 5 10 15
Approx. scale - Miles.
True north, approx.
WILLIAMSON HEAD
foliation
HARALD BAY
Islands dipping west at low angle.
DRAKE HEAD
AVIATION ISLANDS
CAPE KINSEY
TOMLIN GLACIER.
Pegmatite veins
DAVIES BAY
PEAK 3
PEAK 2
Line of probable faulting.
RINGGOLD KNOLL
strike north.
These ridges almost obscured by snow.
MT. THOMPSON
slight foliation in this massif.
MT. DALTON
PEAK 1
80
Rocks similar to those on Peak 1.
Banding
70
?Dip steep
Banding
Dip slight
Rocky massifs.
Ice coast
Glaciers
Strike and dip of foliation

FIG 1.


PART OF
ANTARCTICA
SCALE 1:20,000,000
60°S
70°S
80°S
45°E
90°E
135°E
180°E
Lutzow-Holm Bay
SHOWA
Casey Bay
Amundsen Bay
King Edward VIII Gulf
MAWSON
Prydz Bay
Rauer Group
DAVIS
Larsemann Hills
Svenner Is
Vestfold Hills
West Ice Shelf
MIRNY
Shackleton Ice Shelf
Bunger Hills
OASIS
Davis Is
Hatch Is
Windmill Is
Vincennes Bay
WILKES
Balaena Is.
Chick Is.
Henry Bay
Porpoise Bay
Lewis Is
Davis Bay
Dibble Glacier Tongue
Pte. Geologie
DUMONT D'URVILLE
Mertz Glacier Tongue
Ninnis Glacier Tongue
Mc MURDO
Ross Ice Shelf
Jacka Mts
Wilson Hills
Horn Bluff
HALLET
ROSS SEA
AN 3-2