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MILNE BAY, PAPUA - GEOLOGICAL RECONNAISSANCE

by

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SUMMARY

Scattered geological observations were made in the area south of Milne Bay in eastern Papua. The predominant rocks are the Lower Miocene Dawa Dawa Beds which consist of altered basic volcanics and minor chert and limestone. These are intruded by syenite and overlain, in places, by Pleistocene? agglomerate and tuff. Peridotite and gabbro occur at several localities.

The presence of syenite is remarkable as one of the few known instances of alkali-rich rock in Papua-New Guinea; most igneous activity in the region is calc-alkaline.

Up to 20,000 ounces of gold and 220 ounces of platinum have been won from the Milne Bay goldfield, mainly from alluvial workings. Three small reef mines were operating in the 1930's and at one of these there is some copper mineralization.

INTRODUCTION

This report records scattered geological observations in the area south of Milne Bay in eastern Papua. Most of the field data were collected by Davies during helicopter gravity traverses on 5th and 6th March, 1967; a few notes from foot traverses by J.E. Thompson are included. Petrological notes are based on thin sections of 27 rock specimens collected and examined by Davies. Microfossil identifications are by D.J. Belford (1959, and in preparation). Information on the Milne Bay goldfield is taken from Nye & Fisher (1954), Thompson (1962), and Thompson & Fisher (1965).

Geological observations during the helicopter gravity survey were mostly limited to brief landings in creek beds. Only in Gabahusuhusu Creek was a walking traverse undertaken. Some localities of particular interest (e.g. the stream draining north from Oura Oura) were not visited because high and overhanging trees made landing impossible.

J.E. Thompson visited the area in 1952. He walked from Mullins Harbour to Milne Bay via the Oura Oura mine, then returned to the south coast via the Dawa Dawa and Gara Rivers. Information from this and other traverses in eastern Papua is not generally available except as brief notes on a map held at BMR Canberra (reference C55/A/4).

Maps and airphotos

The area is covered by the Military One-mile Sheets of Sagarai River, Milne Bay, Baxter Harbour, and Guaugurina Bay. Airphotos of Sagarai River and Milne Bay sheets are available from Division of National Mapping and airphotos of the southern part of the area may soon be available from RAAF. Division of National Mapping is preparing 1:50,000 planimetric maps. The map accompanying this report is based on the Samarai (SC 56-9) 1:250,000 sheet, prepared by U.S. Army Map Service and distributed by National Mapping.

Access

Access to the Milne Bay area is by regular air service from Port Moresby to Gurney. The main settlements are at Alotau (previously Cameron),

the new district headquarters, and Samarai which is an international sea port. Alotau is ten miles by road from Gurney. Samarai can only be reached by boat but a small airstrip may soon be constructed on the mainland nearby.

GEOLOGY

The main rock unit is the Lower Miocene Dawa Dawa Beds which consists of altered basic volcanics and minor chert and limestone. This is intruded by syenite and overlain, in places, by agglomerate and tuff. Peridotite and gabbro occur at scattered localities.

DAWA DAWA BEDS (new name)

The Dawa Dawa Beds are named from the Dawa Dawa River which flows north-east into Milne Bay at 150°30'E. The Beds are predominantly altered basic volcanics with minor (less than five percent) chert and limestone. The volcanic rock types are basalt and dolerite with varying degrees of jointing; calcite, quartz, and feldspar veining; and alteration (uralitization, chloritization, and, less commonly, epidotization). Few primary textures were preserved in outcrops seen by the writer except for some autobrecciation; Thompson (pers. comm.) saw pillow textures near the mouth of the Dawa Dawa River.

The Dawa Dawa Beds are Lower Miocene (Tertiary "e" and "f" stage). Belford (1959, and in preparation) has found diagnostic foraminifera in thirteen specimens collected by Thompson and Davies. These include Lepidocyclina, Miogypsina, Operculina, Amphistegina, Carpenteria, Spiroclypeus, Heterostegina, and Eulepidina. The fossils are in limestone which is, in places, interbedded with thin chert beds.

The dolerite and basalt which make up most of the Dawa Dawa Beds consist typically of labradorite or bytownite plagioclase laths and clinopyroxene. Two specimens include some orthopyroxene (1301, 1339) and one of these also includes iddingsite after olivine (1339). Others include a green-brown amphibole which appears to be secondary (1305, 1316); in 1305 it is

probably a metasomatic effect of syenite intrusion. The most common alteration is chloritization; epidote was noticed in only one of the fourteen thin sections. Specimen 1336 shows a red (haematitic?) alteration and calcite veining and 1331 is veined by quartz and calcite. Textures of the dolerite and basalt are ophitic and commonly microporphyritic with phenocrysts of between one and five mm. maximum dimension.

ULTRAMAFIC ROCKS

A small body of dunite (1303) crops out in the lower part of Gabahusuhusu Creek. It consists of olivine grains up to 6 mm. across which are broken into 0.4 mm. pieces by serpentine veinlets; serpentine makes up 15 percent of the rock. The olivine is magnesian (2V near 90° indicates Fo_{70-100}). Chromite is accessory.

The dunite is veined by a biotite-feldspar pegmatite which may be related to the syenite (see later). The relationship between dunite and Dawa Dawa Beds is not known.

A dunite boulder (1311A) was found amongst basalt and gabbro boulders in a southern tributary of the Sagarai River (150°18'E). This specimen consists of olivine and 50 percent mesh-texture serpentine.

GABBRO

Gabbro intrudes altered volcanics at Oura Oura mine (Thompson & Fisher, 1965, p. 129) and is also found as boulders in Gabahusuhusu Creek and in a southern tributary of the Sagarai River (150°18'E).

Three specimens of gabbro examined in thin section consist mainly of labradorite and clinopyroxene. One specimen from the Sagarai tributary (1312) contains five percent biotite, presumably a metasomatic effect of unseen acid intrusion. The gabbro in Gabahusuhusa Creek is intruded by syenite and large (7 mm) metasomatic porphyroblasts of brown biotite have developed near the contact (1308).

SYENITE

Coarse-grained syenite and nepheline syenite intrude the Dawa Dawa Beds and gabbro in the Gabahusuhusu Creek area. No outcrop was seen but distribution of float indicates that the syenite is a small stock, less than three miles across. Large boulders of syenite were seen in Gabahusuhusu Creek and a few small boulders occur in the stream which drains south-east from near the head of Gabahusuhusu Creek. Porphyritic trachyte, probably a dyke rock, occurs as boulders in a creek five miles south-east of the Gabahusuhusu stock, and porphyritic andesite or trachyte boulders were found at the mouth of Ramaga River, ten miles to the east.

Three specimens of the coarse-grained syenite were examined in thin section; all contain albite, orthoclase, and aegirine-augite. In addition one (1317) contains nepheline? and cancrinite after nepheline, and another (1306) contains some hornblende. Typical accessories are sphene, apatite, and magnetite as grains up to 2 mm across. In 1317 the clinopyroxene is zoned with more sodic (greener) rims and in 1308 there is a gradational mixture of colourless augite and green aegirine-augite. The predominant feldspar in 1306 and 1308 is antiperthitic albite and in 1317 is orthoclase.

The porphyritic trachyte (1315) consists of phenocrysts of albite, orthoclase, and hornblende pseudomorphs in a fine-grained carbonatized matrix. The porphyritic andesite (1302) consists of phenocrysts of hornblende, altered plagioclase, and rare augite in a matrix of oligoclase-andesine, potash feldspar, and hornblende.

PLEISTOCENE? VOLCANICS

Gently folded Pleistocene or Pliocene basaltic agglomerate and tuff form islands off the south coast. The occurrence of tuff boulders in Gara River indicates that the same volcanics extend onto the mainland as patchy cover. Moderately lithified volcanic grit boulders in Debolina Creek may be part of the same unit; the grit contains Tertiary "e" stage fossils (1326)

but these appear to have been reworked.

Two basalt fragments (1333, 1334) from agglomerate on Badilabed-abeda Bonarua Island consist of phenocrysts of pale green augite and bytownite with magnetite grains in a fine matrix of plagioclase and pyroxene.

STRUCTURE

The north-westerly alignment of stream channels (see Plate 1) suggests a number of parallel lineaments, probably faults. The only field observation which supports this is the strong 300° jointing noted in dolerite at Gadogadoa Island (150°35'E).

REGIONAL SETTING AND GEOLOGICAL HISTORY

The Lower Miocene (Tertiary "e" and "f_{1-2}" stages) was a time of great and widespread basaltic volcanicity in Papua-New Guinea. In eastern Papua this took the form of extrusion of lavas onto a thin cover of limey and cherty sediments on the sea floor (the Dawa Dawa Beds). The presence of large foraminifera, corals and algae in the limey sediments, and the absence of terrigenous detritus indicate a shallow marine environment secluded from any eroding landmass. The volcanics are intruded by gabbro.

Syenite, some of it nepheline-bearing, intruded the volcanics as small stocks or dykes in Upper Miocene or Pliocene time. The syenite is remarkable as one of the few instances of alkali-rich rock in a province which is almost exclusively calc-alkaline. Rocks which may be similar have been found 70 miles to the north-west where "dyke swarms of undersaturated feldspathoid porphyries intrude a thick succession of submarine basalts" (Thompson & Fisher, 1965, p. 128).

Peridotite is older than the syenite but its relationship to the Dawa Dawa Beds is not known.

Uplift of the sea-floor took place in Pliocene or Pleistocene time, before, during, and after deposition of Pleistocene? agglomerate and tuff. This movement may have been partly horizontal; it caused some shearing

and jointing (300°) of the older rocks, and tilting or folding of the agglomerate. It is interesting to speculate that this tectonic activity might be related to the resumption of ocean floor spreading at the Mid-Pacific Ridge at about 10 million years before present (Ewing & Ewing, 1967).

ECONOMIC GEOLOGY

The area south of Milne Bay is an alluvial gold and platinum field which has been mined intermittently since the turn of the century. Total production is of the order of 15,000 to 20,000 ounces gold and 220 ounces platinum. Records from the field are apparently incomplete; information quoted here is from Nye & Fisher (1954, pp. 7, 9, 14). First recorded gold production was 1,000 ounces in 1905-6, total production to June 1909 was 13,612 ounces, and to June 1926 was 14,230 ounces; it seems that this was all alluvial. In 1926 mining lapsed but recommenced in 1930 or 1931 with attempts at reef mining and applications for dredging leases. Three mines were operating on a small scale in 1938-9 and produced a total of 881 ounces in the year. The most successful was the Rough Ridge Mine which produced 771 ounces from 1301 tons of ore; other mines were the Juno and Jumbo and the Louise. The Louise mine was apparently located at Oura Oura (see Plate 1) but location of the other mines is not known.

Alluvial platinum was discovered in 1931 and production was at a peak from 1933 to 1935. Official records suggest that the platinum discovery was not a rich one; total production for Papua in the period 1933-41 was only 219 ounces and some of this probably came from the Yodda goldfield.

Thompson (1962, p. 32) records that gold and platinum were mined from gravels on the Sagarai River, Gabahusuhusu Creek, and Debolina Creek (platinum only). He suggests that the platinum has shed from small bodies of peridotite and, in the case of Debolina Creek, has been concentrated in the stream bed where moderately dipping Miocene sediments form natural riffles (Thompson & Fisher, 1965, p. 129). No peridotite boulders were found at the helicopter landing site in Debolina Creek.

The Oura Oura gold mineralization is in "pyritic shears and small quartz-pyrite lodes in olivine gabbro intruded by granodiorite" (syenite?) and there is some copper mineralization at the contact between gabbro and altered volcanics (Thompson & Fisher, 1965, p. 129).

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Plate 1

MILNE BAY, PAPUA
GEOLOGY

SCALE 0 5 10 MILES
0 8 16 KM
1:250,000

150°15' 150°30' 150°45'
10°15' 10°30' 10°45'

DOGURA A/S

P363 P362 limestone no diagnostic fossils

Tmv

GURNEY A/S
coconut plns

ALOTAU

P367

Gumini River

Qa

MILNE BAY

WAGAWAGA

Gabaghusuhusu Creek Au, Pt

1330-1 basalt boulders

gold lodes where granodiorite intrudes gabbro (J.E.T.)

also some copper mineralization

P377

800' OURA OURA Au

1303-8

pillow lava (J.E.T.)

Qa

Sagarai River

swamp

rubber plns

mangrove

MULLINS HARBOUR

1309-10

Au, Pt

S (some ga spur)

3300'

1316-20 rare syenite boulders

1301-2 basalt & porph. andesite boulders

basalt boulders

1321-4

Oraivepina C.

Dawa Dawa

1313-5 some porphyritic trachyte boulders

Ramaga R.

Qa

1311-2 some dunite + gabbro boulders

1325 1326-9

Debolina C.

Pt

P382

hot spring (J.E.T.)

Tmv

Qa

P385 P383

P400

Qpv

Tmv

1339 altered olivine dolerite

(J.E.T.) 30

OSAMARAI

altered basalt, agglomerate & lava

P388 P389

"mostly limey sediments" P 344

1332 some bedded tuff boulders

Guaugurina Bay

1340-1 dolerite Gadogadoa I.

Baxter Harbour

Tmv

1335-8 Oiama Aiama I. altered basalt + limestone

Suau I.

pyroclastics (J.E.T.)

15

Qpv

15

Badilabedabeda Bonarua I.

Qpv

basalt agglomerate with 5% tuff

30

1333-4

10

HLD 12.'67

T 30 dip of bedding
vertical jointing
lineament
P334 specimen locality J.E. Thompson
.1332 " " H.L. Davies (prefix 6552)
Tertiary e and f stage microfossil locality.
Au, Pt Gold, platinum

REFERENCE

Quaternary — Recent — Qa — Alluvium.
Pleistocene (or Pliocene) — Qpv — Basalt agglomerate and tuff, folded.
Tertiary — Post-"f" stage — S — Syenite, some with nepheline; some gabbro xenoliths.
Lower Miocene (T.e & f1-2) — Tmv — Dawa Dawa Beds:- basalt lavas with minor limestone and chert, some trachyte & andesite dykes, all moderately altered and jointed.
u — Ultramafic rocks dunite, probably associated with gabbro.

To accompany BMR Records 1967/53

C 56/A9/3