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RECORDS:

1967/73

LOWER WATUT RIVER, NEW GUINEA - RECONNAISSANCE GEOLOGY.

by

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SUMMARY

The Tertiary and Mesozoic rocks of the lower Watut River were examined during a brief visit in September, 1966.

The river, in its lower reaches, flows along a syncline of little indurated conglomerate and minor sandstone, here named the Babwaf Conglomerate. The Conglomerate appears to overlie unconformably the Langimar Beds (Lower to Middle Miocene volcanic conglomerate and limestone), which occupy most of the area covered by the geological map. The Babwaf Conglomerate is therefore regarded as Upper Miocene or Pliocene, and a correlative of the Aseki Conglomerate found to the south.

The rocks to the east are highly indurated and in places slightly metamorphosed shale, greywacke and some boulder conglomerate, which are regarded as Cretaceous.

INTRODUCTION

In September 1966, in company with R.R. Harding, I visited the lower reaches of the Watut River. The main purpose of the journey was to evaluate the use of jet-boats in the Markham River and its southern tributaries, but some geological observations were made during the trip and are recorded here.

The Watut River drains the Wau-Bulolo Goldfield, and flows north-westwards through a deep gorge before reaching a wide, swampy flood-plain across which it meanders for about 40 miles before joining the Markham River west of Lae.

PREVIOUS WORK

Fisher (1935) was the first geologist in the area. He crossed the southern part of the map area (Fig. 1), and named the rocks there the Langimar Series.

MacKay (1955) was the only other geologist to visit the area before 1966. He traversed most of the Watut River in the map area, and showed that the river flowed through Tertiary rocks over most of its lower reaches, but described them merely as 'sedimentary rocks'.

GEOLOGY

The gorge of the Watut River cuts across a horst of highly indurated sediments of Upper Cretaceous and possibly Lower Tertiary age, which was uplifted during the Pliocene to form a barrier now breached by the Watut River. These sediments have been intruded by batholiths of granodiorite called the Morobe Granodiorite, and are recrystallised in places, but in the Lower Watut area they are merely highly indurated. These indurated sediments and probably also the Granodiorite are overlain unconformably by the Langimar Beds (Smit, 1967) which are Lower Miocene (Tertiary f_{1-2} Stage), and cover most of the area shown in the geological map (Fig. 1).

In its lower reaches the Watut River flows through a thick sequence of conglomerate and other shallow-water sediments, which have been folded into a complex tight syncline. These beds have been called the Babwaf Conglomerate: they appear to overlie the Langimar Beds, and are therefore probably Upper Miocene or Pliocene in age.

? Cretaceous Rocks

The rocks east of the Lower Watut River are highly indurated shale, greywacke, and some conglomerate of probable Cretaceous age.

Rocks seen on the present reconnaissance were mostly very highly indurated shale and fine-grained greywacke which are generally slightly recrystallised, and have a rudimentary schistosity. The rocks are mostly dark grey to light grey; they are massive and highly jointed, and only rarely was bedding seen.

A highly indurated conglomerate was seen as large boulders in all the eastern tributaries of the Watut River, but was not seen in outcrop. It is dark grey or green, and consists of well-rounded pebbles and cobbles of gabbro and dolerite, and some indurated greywacke and other sedimentary rocks. A pebble of pyroxenite was also noted.

The rocks contain abundant pyrite, either as scattered grains or as very thin joint fillings. Veins of quartz and pyrite up to a few inches thick are common, and there are also small dykes of propylitised microdiorite almost certainly belonging to the Morobe Granodiorite.

Cretaceous fossils have been found at Snake River, 14 miles to the east, and it is believed that most of the rocks in the lower Watut area are of a similar age. However, apart from the high degree of induration, the conglomerate is very similar to the Langimar Beds, and it is possible that there are Lower Tertiary rocks in the region which have been more highly altered in a zone of intense deformation east of the lower Watut River.

Langimar Beds

The Langimar Beds were named Langimar Series by Fisher (1944), and were later mapped in more detail to the south of the present map area by Smit (1967).

The rocks are mostly volcanic pebble and cobble conglomerate consisting of basic and andesitic components in a tuffaceous sandstone matrix. Large limestone lenses are common. Basalt lava flows and basaltic and andesitic agglomerate, called the Yacobei Volcanics, were mapped to the south by Smit.

The Langimar Beds were not seen in situ during the present survey, but they can be seen plainly on the airphotographs to the east of the Lower Watut River. The streams draining this area contain boulders which are almost entirely limestone and basic volcanics, derived from the Langimar Beds. Fisher (1944) mapped the Langimar Beds in the lower reaches of the Langimar River, and it has been possible to confidently extrapolate to the east and west by photo-interpretation, as shown of figure 1.

The Langimar Beds are Lower to Middle Miocene in age (Tertiary f_{1-2} stage and probably f_3 stage, and pebbles of limestone collected during the present survey from the streams draining the area west of Tsili Tsili, contain foraminifera which are either Tertiary f_{1-2} stage or f_3 stage (D.J. Belford pers. comm.).

Babwaf Conglomerate

Babwaf Conglomerate is the name proposed for a thick conglomerate confined to the lower Watut River area.

Rock Type:	Pebble and cobble conglomerate, with some coarse-grained sandstone, and siltstone.
Distribution:	Confined to a narrow trough in the lowermost reaches of the Langimar River and the Watut River.
Derivation of Name:	From Babwaf Village which is situated at the mouth of the Watut Gorge.
Type Area:	The lower Watut River. The type section is in the lowermost part of the Watut Gorge, between the Langimar River and Babwaf Village.
Stratigraphic Relationships:	The Conglomerate appears to overlie the Langimar Beds, but as the contact is poorly exposed, it was not possible to prove this. It is probably a correlative of the Aseki Conglomerate mapped to the south by Smit (1967).
Thickness:	At least 4000 feet thickness is preserved at the type section, but the section is incomplete.

Age: There is no direct evidence of age of the formation, but it is probably younger than the Langimar Beds and therefore probably Upper Miocene or Pliocene.

Detailed Description:

The Babwaf Conglomerate is composed almost entirely of pebble and cobble conglomerate and subordinate coarse-grained, micaceous sandstone.

The conglomerate is massive, and the only bedding seen was defined by thick lenses of sandstone. The conglomerate consists of well-rounded and well-sorted pebbles or cobbles of indurated greywacke and siltstone, quartz, and some basalt, in a matrix of corase-grained micaceous quartz sandstone or fine conglomerate, both of which are also well sorted. In contrast to the conglomerate in the ?Cretaceous rocks to the east, the Babwaf Conglomerate is not well indurated, and in fact is almost friable in places.

In the type section the beds become finer-grained towards the east, and at their eastern extremity they are predominantly massive green micaceous sandstone and siltstone containing lenses of pebble conglomerate. No cross-bedding or graded bedding was seen, so it is not known which way the beds face.

However, the structure to the south-west indicates that the type section is overturned, in which case the formation is coarser-grained toward the top.

The Babwaf Conglomerate is very similar to the Aseki Conglomerate mapped by Smit (1967) about 20 miles to the south, and it is probably a correlative of that formation. The Aseki Conglomerate is regarded as Upper Miocene.

STRUCTURE

Little is known of the structure of the Cretaceous rocks: bedding is rarely seen, and no idea of the type of folding was obtained. Some are schistose, and the schistosity strikes at about 350°, and dips steeply east and west. The folding of these rocks probably took place in lower Tertiary time.

The Langimar Beds are a competent unit folded very broadly into synclines and anticlines with limbs rarely dipping more steeply than 10°. The unit reacted to stress mainly by faulting, and it is disrupted by several large north-north-easterly-trending faults.

The broad physiographic features of the region had been blocked out by movement on these faults by late Tertiary times. Two north-north-easterly-trending horsts were formed, separated by a graben, along which the Watut River flows in its lower reaches. The easternmost horst formed a barrier which dammed the Watut River to form a lake in which the Otibanda Lake Beds were laid down in Upper Pliocene times.

The Babwaf Conglomerate is found only in the graben, where it is folded into a fairly tight syncline, broken by several faults. It seems likely that the Conglomerate was laid down in the graben at much the same time as the Otibanda Lake Beds, and it may never have been distributed more widely than its present outcrop.

The structure shown in Figure 1 has been traced from the air-photographs, and it can be seen that the conglomerate is folded into a simple syncline which appears to be closed on its south-western end.

In most places the dip of the beds can be seen plainly on the air-photographs, and the eastern limb of the syncline appears to change from a northwesterly dip to a south-easterly dip along strike northwards in the lower Langimar River. Thus it appears that the eastern limb is overturned along most of its length, but unfortunately there were no features in the rocks examined to show which way the beds are facing.

RELATIONSHIPS: TERTIARY ROCKS AND MOROBE GRANODIORITE

Since the commencement of a program of isotopic age determination of New Guinea igneous rocks, the relationships between the Tertiary rocks and the Morobe Granodiorite has assumed considerable importance.

Fisher (1935) found granodiorite which he regarded as Morobe Granodiorite, in the middle reaches of the Langimar River, overlain unconformably by the Langimar Beds. MacKay (1955) shows a body of granodiorite 6 to 8 miles downstream, but does not show the outcrop mapped by Fisher. Thus there are possibly two separate bodies of granodiorite exposed, but they may belong, not to Morobe Granodiorite, but to the older Mount Victor Granodiorite exposed about 40 miles to the north-west.

It is hoped during the forthcoming field season, to sample these granodiorite bodies, and also the granodiorite boulders within the Langimar Beds, to determine their age.

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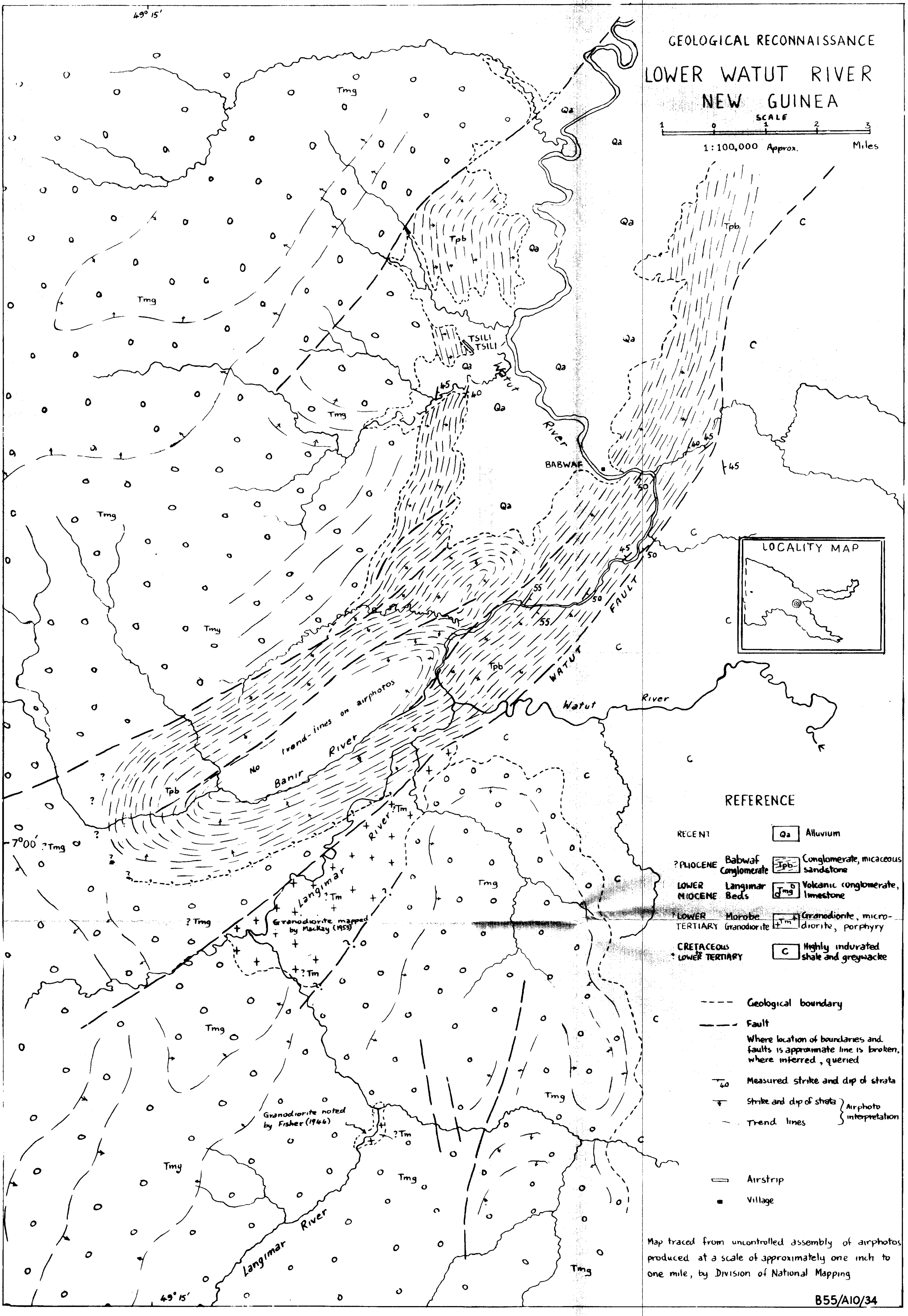
MACKAY, N.J., 1955 - Geological report on a reconnaissance of The Markham and Upper Ramu drainage systems. Bur. Min. Resour. Aust. Rec. 1955/25

SMIT, J.A.J., 1967 - The geology of the central part of the Wau 1:250,000 Sheet area. Bur. Min. Resour. Aust. Rec. (in prep)

FIGURE 1


GEOLOGICAL RECONNAISSANCE
LOWER WATUT RIVER
NEW GUINEA
SCALE
1 0 1 2 3
1:100,000 Approx.
Miles
49° 15′
7° 00′
Tmg
Tpb
Qa
C
Tm
TSILI TSILI
Watut River
BABWAF
WATUT FAULT
No trend-lines on airphotos
Banir River
Langimar River
Granodiorite mapped by MacKay (1955)
Granodiorite noted by Fisher (1944)
LOCALITY MAP
REFERENCE
RECENT
Qa
Alluvium
?PLIOCENE
Babwaf Conglomerate
Tpb
Conglomerate, micaceous sandstone
LOWER MIOCENE
Langimar Beds
Tmg
Volcanic conglomerate, limestone
?LOWER TERTIARY
Morobe Granodiorite
Tm
Granodiorite, microdiorite, porphyry
CRETACEOUS to LOWER TERTIARY
C
Highly indurated shale and greywacke
Geological boundary
Fault
Where location of boundaries and faults is approximate line is broken, where inferred, queried
Measured strike and dip of strata
Strike and dip of strata
Trend lines
Airphoto interpretation
Airstrip
Village
Map traced from uncontrolled assembly of airphotos produced at a scale of approximately one inch to one mile, by Division of National Mapping
B55/A10/34