Geological Observations in the Wisselmeer Region, New Guinea

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Geological Observations in the Wisselmeer Region, New Guinea

by **Arnold Heim**, Zürich

With 2 figures

When working in the Molucca Islands in summer 1939 on behalf of the Netherlands Koloniale Petroleum Mij. (Standard of New York), the writer was kindly granted with a four weeks vacation. His aim was to meet the newly discovered mountain Papuas of the Wisselmeren in Dutch New Guinea. No geological observations having been known so far of that region, the following notes, though fragmentary, may be welcome for science.

The writer enjoyed the excellent companionship of captain C. A. MONSTED of Dobo on the Aru Islands, who brought him in one of his cutters in three days therefrom towards NE to the mouth of the Uta river (Fig. 1).

To Dr. H. E. THALMANN, now professor of Micro-Paleontology at Stanford University, California, are thanked the studies on the foraminifera collection.

The adjoining section in WNW projection, Fig. 2, gives an approximate idea only. The difficulty derives from the fact that the course of the river is oblique to the strike of the folds, and from the deviations of E-W in the direction of the local folding. For better understanding, the topography would have to be surveyed first in this mountainous forest country so difficult of access.

Observations along the route

Rowing up the Oeta river against strong current, after having crossed the alluvial plain, the first foot hills are encountered about 2 km north of the mouth of the Amerei side river, i. e. about 22 km in a straight line NNE from the coast.

The first outcrop on the left bank is a coarse sandstone alternating with clay marl and dipping 45° to SSW (3). The shales contain well preserved leaves, few bivalves and fragments of coal. The facies is coastal. The current of the river was too strong to make observations on folding. The outcrops are interrupted by the flat region of Camp Orawja (police station and starting place for the climbing) made of a subrecent river conglomerate (5).

The trail along the river then leads over a field of limestone broken to blocks which overlie clay-marl of 10° southern dip. They contain corals and *Fasciolites*. Underneath rises more rapidly a thick series of limestone which forms the first higher mountains. It contains Echinoderm fragments and *Operculina*. The base, at Biwak 4, is made of steeply dipping limestone alternating with marl and sandstone. This series seems to form the apex of an anticline, supposed to be made of Paleocene sediments. The limestone which follows is full of well preserved *Laca-*

zina. The usual facies of hard chalk rock passes to green and pink limestone with Echinoderm fragments.

On the two very steep ridges south of Biwak 7, the limestone series dips 60–70° to N–25°–E and may be over 1000 meters thick. It is mainly made of hard chalk rock, but contains also greenish to pink limestone with Echinoderms. In places it abounds of *Lacazina*, *Nummoloculina*, *Triloculina* and *Quinqueloculina*.

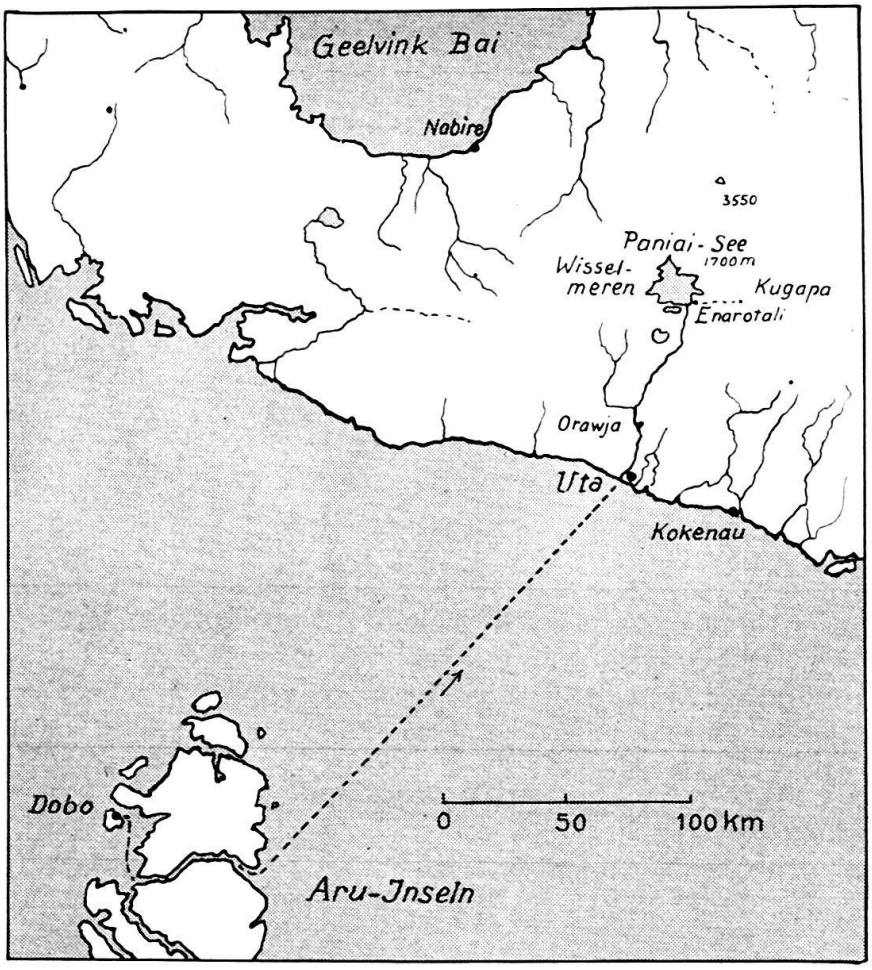

Fig. 1. Location of Wisselmeeren in New Guinea.

Biwak 7 is in a narrow synclinal gap. Towards Biwak 10, greenish to gray sandstone is exposed (Palaeocene?). At Biwak 12, 1000 meters above the sea, the dip is vertical with an ENE strike. Some blocks were found full of a small *Operculina*, 3–4 mm in diameter.

The structure is obscure. The marly sandstone 2–3 km NE of Biwak 12 dips regionally 35° to NE, while the great limestone which overlies it on the north side of the river forms a long high mountain with gentle northern dip. After Biwak 16 (limestone with large *Lacazina*) the trail rises to an undulated peneplain of about 1600 meters above the sea, where a coarse conglomerate forms the surface. Excepting rare weathered diorite, the pebbles are quartzite and white quartz. Their provenance must be far to the north.

Clear structures appear again north of the Kapauku village Jaba, where the *Lacazina*-limestone is cut out in the shape of an anticlinal valley of ENE strike.

The last step to the great Paniai Lake, travelled with a row boat on the river, shows steeply dipping narrow anticlines of the limestone series described before. The regional strike is east as measured on vertical strata, though locally ESE. At the lake shore the vertical bedding rapidly begins to lean over towards north, apparently forming the limb of an anticline which passes over the lake. The little peninsula north of the "Veldpolitie" camp Enarotali is made of sandstone dipping 40° NE and may belong to the Paleogene basal formation.

Having had no proper row boat at our disposition, no further trips could be made on the lake. On a foot excursion to the Djonggunu village Kugapa, about 12 km straight east of Enarotali, this sandstone and marl formation, of anticlinal position, was followed along the south side of the Weatu Valley. This is a peaty swamp plain located in a wide syncline (Fig. 2).

The upper huts of Kugapa stand upon the horizontal part of the syncline made of massive limestone, weathered to phantastic pinnacles. The rock, about 50 meters thick is sprinkled throughout with *Lacazina* (c). The basal part contains in additon *Fasciolites Wichmanni* RUTT. of over 20 mm in length (b). On the top, directly behind the chief's huts, is a small exposure, about 4 meters thick, of limestone full of giant *Lepidocyclina (Eulepidina) dilatata* (MICH.) with diameters up to 50 mm (d).

Stratigraphic Review

As indicated in Fig. 2, the following main divisions were distinguished:

1. Greenish marl and sandstone, probably of Paleocene age, 500 + ? m.

2. Great series dominated by limestone, of 1000 meters ore more, with subordinate marly layers. The most common type is a chalky precipitate, but also coral limestone occurs. A pink layer of about 20 meters in the middle part is full of Echinoderm fragments. Certain layers of the chalky to dense limestone abound in small and large Foraminifera, of which the most frequent one is *Lacazina*, an Eocene genus in the Dutch East Indies. Professor H. E. THALMANN has recognized in the samples:

Lacazina wichmanni SCHLUMB., very abundant, between 3½ and 7 mm (very rarely 10 mm) long, with a diameter of 1 to 3½ mm. *Fasciolites wichmanni* (RUTT.), rare, but with large specimens up to 22½ mm long and 4½ mm in diameter.

Flosculina cf. *globosa* (LEYM.), very rare;

Nummulites sp. of the *subbrongniarti-type*, very rare;

Operculina sp. cf. *O. complanata* (DEFR.), locally very abundant.

On polished surface, sections of *Sorites* sp., *Textularia* sp., *Quinqueloculina* sp., *Spiroloculina* sp. etc.

One piece of limestone collected from the region south of Biwak 7 is entirely made up of Miliolidae, namely: *Miliola (Pentellina)*, *Quinqueloculina*, *Trillina*, *Nummoloculina*, and shows furthermore: *Eorupertia*, *Haplophragmium* and *Bigenerina* species. This limestone in its facies strikingly resembles the Middle Cretaceous miliolid limestone (El Abra formation) in Eastern Mexico.

The age of the series containing the above mentioned faunal assemblages is Eocene, most probably Middle Eocene, if not even partly Lower Eocene. Of considerable younger age, namely Upper Oligocene (Chattian?), is the Eulepidina-rock at Kugapa with its many specimens of large, microspheric *Lepidocyclina (Eulepidina) dilatata* (MICH.), few *Spiroclypeus* sp., *Miogypsinids*, *Cristellaria* sp. etc. The rock specimens resemble very much those containing *Lepidocyclina (Eulepidina) gigas* CUSHM. and *L. (Nephrolepidina) undosa* CUSHMAN of the Oligocene Meson-formation of Eastern Mexico.

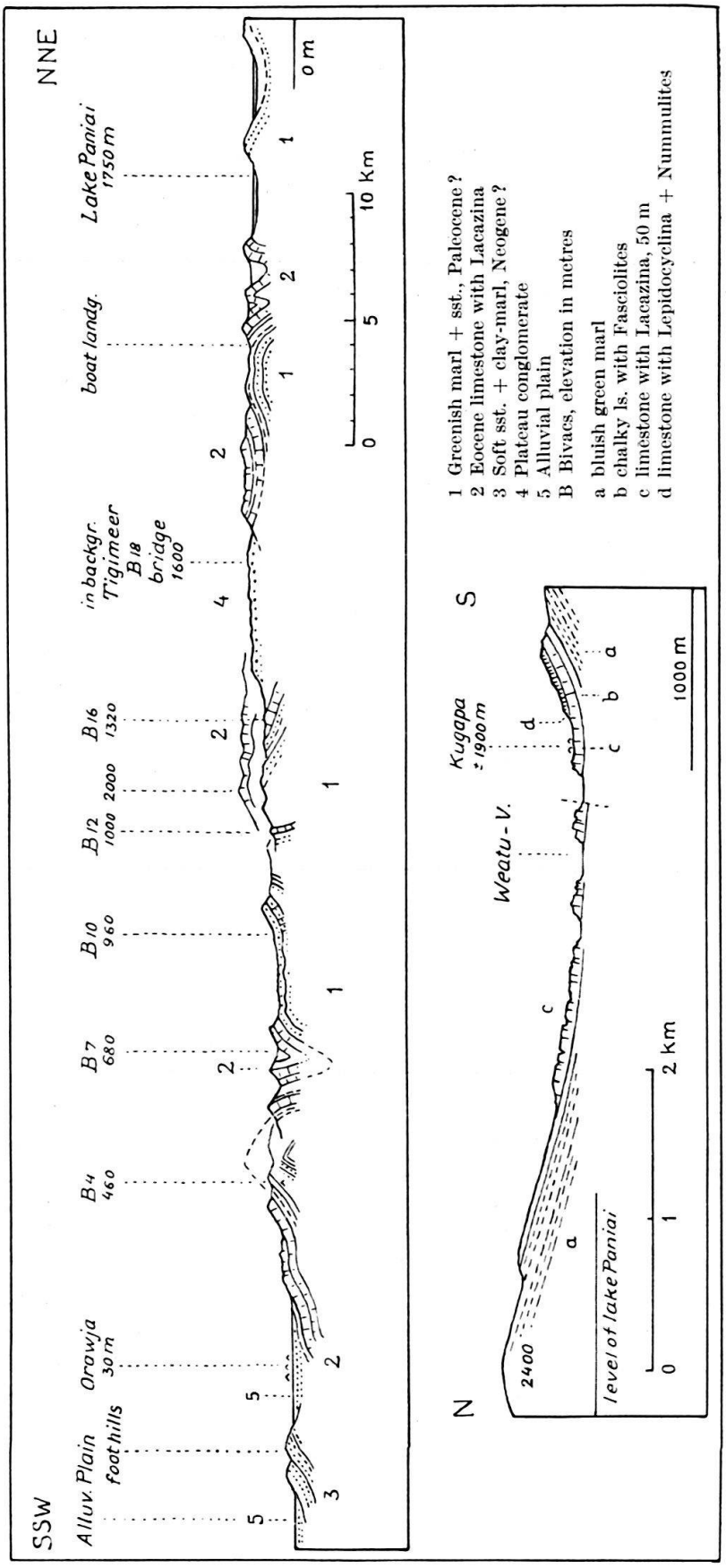

Fig. 2. Sketch-sections along the Uta (Oeta) River to Lake Paniai, and of Kugapa in Weatu Valley, Western New Guinea.

3. Sandstone and clay-marl of the foothills, with conglomerate, fragments of coal, leaf prints and Pelecypods, are probably of Neogene age. Thickness, some hundred meters at least.

4. Plateau conglomerate, mainly of quartzite pebbles, unconformable on the eroded folds and probably Pleistocene, post-tectogenetic.

Facies

The Eocene limestone series is lithologically characterized by chalky precipitate, palaeontologically by its abundance in certain layers of *Lacazina*. It extends from the main range with its culmination on Carstensz Peak towards west (Wisselmeer section, Etna Bay). The facies of Plattenkalk (supposed to be a deeper and colder marine deposit) was not encountered in the Wisselmeer district. Only on the SW side of Kamrau Bay, SW of the wide synclinal low land which extends to Babo, the Plattenkalk facies is typically represented and of great extension (Koemawa range–Fakfak). On Great Kai, which is the southern prolongation of the Koemawa range, both facies are represented, containing *Lacazina* as well as *Discocyclina*, as known already by VERBEEK and FR. WEBER (in UMBGROVE). The latter large foraminifera seem to exclude each other by preference, the tiny *Discocyclina* preferring somewhat colder water and more siliceous sedimentation, while *Lacazina* (together with the thick-shelled Miliolidae) grew in rising warm water during an abundance of lime precipitation.

Above the discontinuity which seems to mark the end of Eocene sedimentation, a new cycle begins with other large foraminifera. It is coastal on the Oeta river but represented farther west essentially by coral, algae and chalk rocks. This formation, at the village Kaimana on the southwestern border fold of the great ranges, contains besides corals and *Lithothamnium Spiroclypeus*, *Lepidocyclina (Nephrolepidina)*, *Miogypsina*, *Heterostegina*, *Operculina* and the smaller foraminifera like *Elphidium*, *Quinqueloculina*, *Textularia* and *Rotalia*. One sample also shows *Neoalveolina pygmaea* HANZ. in a matrix exceedingly rich in Miliolidae (after H. THALMANN).

Tectonic Review

In vain the writer hoped to traverse the Crystalline and the Mesozoic series discovered by DOZY on the south side of Carstensz Range. Mesozoic ammonites are said to be found in the region farther NE of lake Paniai, while the trail from one end to the other crosses folds of Tertiary rocks. It seems that the older formations (Jurassic and older) have disappeared from the surface by axial pitch towards the west.

Lake Paniai

In accordance to this tectonic depression, the great lake of 17 km width and a maximum depth of only 50 meters (after EECHOUD), is surrounded by mountains of only about 2500 meters on the northern part. The highest mountain over 3000 m is situated on the SW side of the lake and belongs to the steeply dipping folds of Eocene limestone traversed by the river near its origin. At the northwestern lobe of the lake, as seen from Enarotali, the land is so low that it appears that some 10–20 meters of tectonical uplift of the south shore would be sufficient to drain the lake towards north. Thus, as a whole, the lake is on the watershed of western New Guinea. The origin, as well as that of the smaller lakes to the south, is still an open problem. It may be in certain relations with the plateau conglomerate.