

A record of the genus *Lockhartia* (Foraminiferida) from Misool Archipelago, Irian Jaya

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The foraminiferal genus *Lockhartia* is recorded from the Misool Archipelago, Irian Jaya, considerably extending its

previously restricted occurrence in the western part of the Indo-Pacific region.

Occurrence and significance of fauna

In 1981, field geologists of the Irian Jaya Geological Mapping Project sent thin sections of rock samples to BMR for examination and age determination. Among them was one section of a foraminiferal-algal grainstone (sample 81UH57A), consider-

ably recrystallised and containing mainly miliolid foraminifera (Fig. 2.1). The sample came from a small island to the east of Sabennibnu Island (Fig. 1).

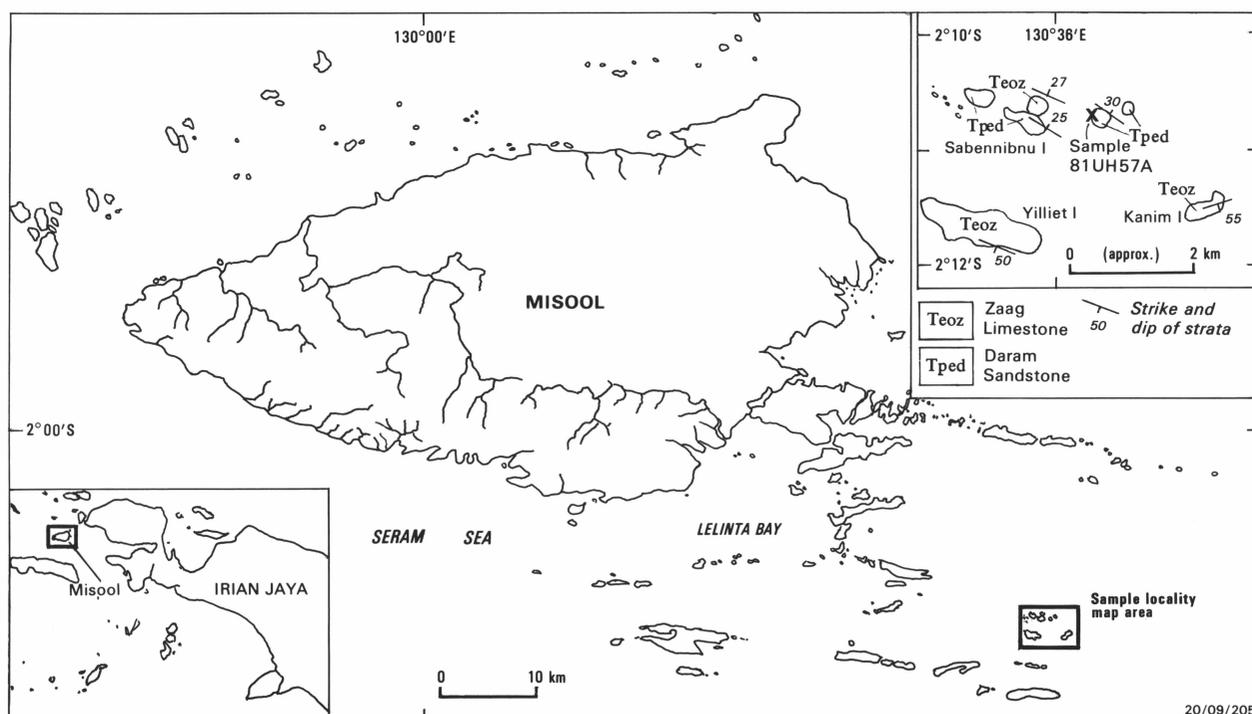


Figure 1. Location of palaeontological sample site, Misool Archipelago, and local geology around the sample-site area (after Pigram & others, 1982).

According to Pigram & others (1982) the Daram Sandstone crops out on Sabennibnu Island. The age of this unit is poorly controlled, and was thought to be confined to the Paleocene (Pigram & others, 1982). However, since the fauna that is the subject of this paper was examined, Rusmana & others (1989) have reinterpreted the age of the Daram Sandstone as Paleocene to Early Eocene, and that of the conformably overlying Zaag Limestone as Middle Eocene to Oligocene.

The sample contains several specimens of a species of the foraminiferal genus *Lockhartia*, and one small specimen of *Discocyclina* sp. with a heavy calcitic overgrowth, probably algal. Algae are also common, including numerous fragments of the species *Distichoplax biserialis* (Dietrich). Unfortunately no further material is available, and there is no possibility of collecting additional material at this time.

The species of *Lockhartia* in the Misool Archipelago is closest to the *L. haimiei* group of Smout (1954), although the umbilical plates are not distinct, possibly because of recrystallisation.

The specimens lack the labyrinthine umbilical area of the *L. diversa* group; the chambers are wedge-shaped in axial section, not semi-lunar as in the *L. tipperi* group. The *L. conditii* group has very large pillars, a feature not shared by the Misool specimens. The observed specimens are not referable to any described species. Figured specimens are deposited in the Commonwealth Palaeontological Collection, Canberra, Australia, under numbers 24927 to 24932.

The genus *Lockhartia* ranges from Late Paleocene to Middle Eocene (Adams, 1970), and *Distichoplax biserialis* occurs in the Late Paleocene and Early Eocene (see, for example, Keij, 1963). The sample therefore has a Late Paleocene to Early Eocene age. The fauna suggests a shallow-water back-reef or lagoonal deposit, and the preservation of some individual fossils indicates a period of abrasion and overgrowth by other marine organisms before lithification. This is the first record from Irian Jaya of carbonate sediments of this age. Earlier records of Late Paleocene deposits (Visser & Hermes, 1961) were based on planktonic deep-water faunas; beds of earliest Eocene age have not been identified definitely from Irian Jaya.

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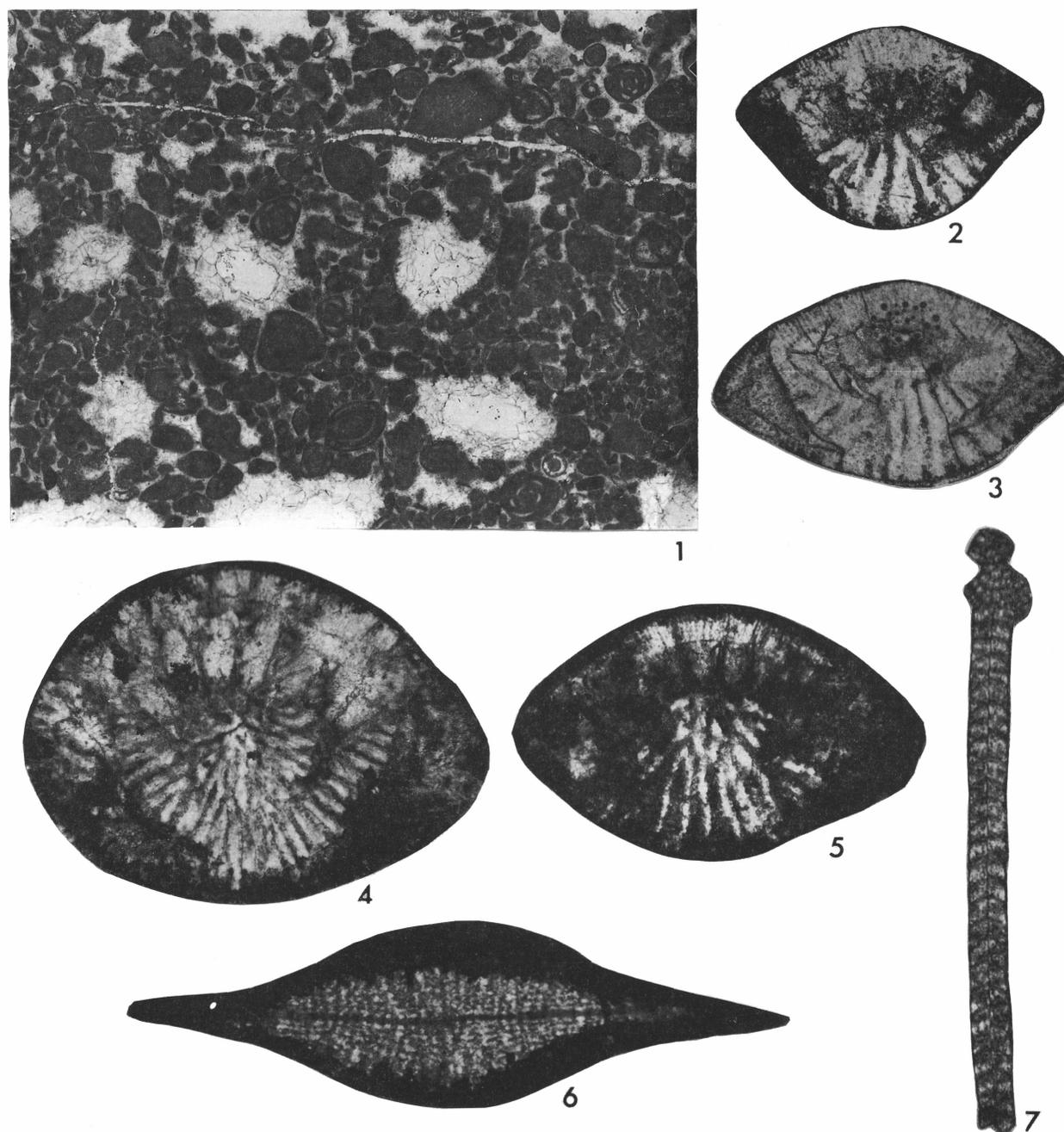


Figure 2. Fossil-bearing sample, and forms recovered from it.

1. General view of thin section of sample 81UH57A, showing recrystallisation and abundant miliolid foraminifera. 2-5. *Lockhartia* sp., CPC24927 to CPC24930. 2,3, vertical sections; 4,5, oblique tangential sections; all x60. 6. *Discocyclina* sp., CPC24931, uncentred vertical section, showing overgrowth, x55. 7. *Distichoplax biserialis*, CPC24932, x 60.

The main interest in this fauna is the occurrence of *Lockhartia* sp. Smout (1954) stated that this genus is known with certainty only from India, east Africa, Arabia, and Iraq; Adams (1970) recorded it only from the western part of the Indo-Pacific region. Rutten (1948) recorded *Lockhartia* (as redeposited specimens) from northern Borneo; after examining the material, however, Smout (1954) considered that these specimens were not *Lockhartia*, but possible poorly preserved forms of *Rotalia mexicana* Nuttall and of *Pellatispira*. Liechti & others (1960) recorded *Lockhartia* sp. from the Belaga Formation of central Sarawak, but did not present any figures. Belford (1974) recorded genus indet. cf. *Lockhartia* from the Nassau Range, Irian Jaya.

This record of the genus *Lockhartia* from the Misool Archipelago considerably extends the palaeogeographic distribution

of the genus, and indicates west-to-east migration from its presumed centre of origin in the western Indo-Pacific region.

Discussion

Lockhartia is known from neither the Mediterranean nor north Africa. Its absence from these regions could indicate one of two things: there was no connection between these regions and that containing the Ranikot faunas in Paleocene to Middle Eocene times, or conditions were not favourable for east-to-west migration. Davies (1940) considered that these regions were not connected in the Paleocene, but later (1949) postulated a connection between India and the Sahara (Africa) to account for the Palaeogene distribution of the group of cordate

operculines. On the basis of more recent palaeontological work, Adams (1967) noted that the two regions had faunal elements in common, and concluded that a connection had existed, probably via the Persian Gulf. In a later paper, Adams (1983, fig. 14.1) indicated that no physical barriers to faunal migration existed during the later part of the Paleocene; thus, unfavourable environments or unsuitable ocean currents might have accounted for the absence of *Lockhartia* to the west. However, Berggren & Hollister (1974) showed an east-to-west current in the Mediterranean in the Cretaceous–Tertiary. The absence of *Lockhartia* from the Mediterranean is at present unexplained; it may be more apparent than real, reflecting that limestones containing *Lockhartia* have been not yet fully investigated.

Adams (in discussion in Adams, 1967) noted that evidence for west-to-east migration of larger foraminifera is stronger than that for east-to-west migration; he also noted that evidence suggests that movement from Tethys to the Indo-Pacific was easier than movement in the reverse direction. The occurrence of the genus *Lockhartia* well to the east of the region where it may be presumed to have originated, and its absence from areas to the west, support these conclusions of Adams. It is to be expected that *Lockhartia* will in future be recognised in the area between Irian Jaya and the western Indo-Pacific.

Acknowledgements

I wish to thank Dr C.G. Adams for confirming the identification of the genus *Lockhartia* and for constructive discussion. Mr C.J. Pigram supplied locality details for the sample, which was collected by Mr Udi Hartono. Dr G.C.H. Chaproniere refereed the manuscript.

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