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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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# Mesozoic Mollusca from Australia and New Guinea

BY

S. K. SKWARKO

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COMMONWEALTH OF AUSTRALIA

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# MESOZOIC MOLLUSCA FROM AUSTRALIA AND NEW GUINEA

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LOWER CRETACEOUS MOLLUSCA OF THE GREAT ARTESIAN BASIN TYPE IN THE GIBSON DESERT, CENTRAL WESTERN AUSTRALIA

2

MESOZOIC FOSSILS FROM EASTERN NEW GUINEA

(a) First Upper Triassic and ?Lower Jurassic Marine Mollusca from New Guinea

(b) Lower Cretaceous Mollusca from the Sampa Beds near Wau, New Guinea

BULLETIN No. 75

# Lower Cretaceous Mollusca of the Great Artesian Basin Type in the Gibson Desert, Central Western Australia

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## SUMMARY

Twenty-eight different fossils are present in collections recently made in the Gibson Desert of Western Australia, but because of their poor preservation only sixteen are described. Most species described are pelecypods, but they include one gastropod, one ammonite, some worm trails, and a problematicum. Only one new species has been formally named, *Syncyclonema gibsonia* sp. nov.

The fauna is not a new one; it closely resembles the molluscan faunas previously described from eastern and southern Australia in sediments deposited in Aptian (Lower Cretaceous) time in the shallow sea of the Great Artesian Basin. Its presence in central Western Australia is proof of marine sedimentation in that part of Australia in the Aptian, and implies an active migratory route along a direct marine connexion with the Great Artesian Basin of the eastern part of Australia. This route may have led through the Officer Basin or through the Eucla Basin, though the latest, and as yet unscrutinized, evidence suggests a migratory route between the north-eastern part of the Canning Basin and the south-western part of the Mullaman area of sedimentation. The Gibson Desert sea was also connected with the Dampier Peninsula in northern Western Australia.

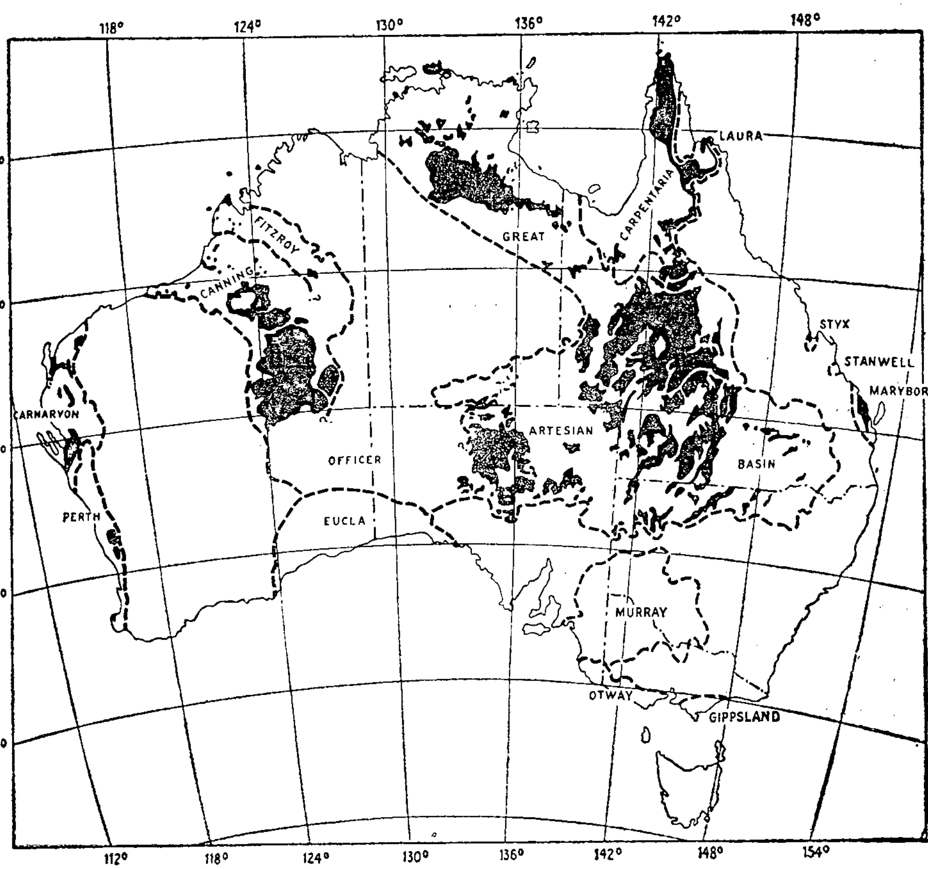


**Fig. 1. Distribution of Cretaceous sediments in Australia and boundaries of sedimentary areas and basins which enclose them.**

## INTRODUCTION

SEDIMENTS of Cretaceous age cover very large areas of the Australian continent (Fig. 1). They occur in a number of basins and areas of sedimentation, the largest of which is the Great Artesian Basin (Fig. 3, p. 11). The shallow sea of the Great Artesian Basin covered, in Lower Cretaceous time, most of inland Queensland, northern New South Wales, and north-eastern South Australia. In addition it was shown to have extended into at least two areas in the Northern Territory (Sullivan & Öpik, 1951; Skwarko, 1966a). In this Bulletin evidence of the existence of a shallow Aptian sea in central Western Australia communicating with the Great Artesian Basin is put forward.

Studies of the distribution of fossils in the better known Aptian and Albian sediments of the Great Artesian Basins have shown the striking persistence of individual species of molluscs over considerable distances within the Basin. This persistence contrasts sharply with faunas in sediments which have accumulated along the peripheries of this continent in Neocomian time. The better known Neocomian assemblages, such as those of the Nanutarra Formation in the north-western Carnarvon Basin (Cox, 1961), Mullaman Beds in the north of the Northern Territory (Skwarko, 1966a), Dampier Peninsula in Western Australia (Brunnschweiler, 1960), and Stanwell in eastern Queensland (Whitehouse, 1946; Skwarko, 1966b), have practically no similarities at specific level, though their assemblages are of a kind, and they are all of Neocomian age. Further studies of the remaining peripheral areas of Neocomian sedimentation may add to this list.

Recent geological expeditions into central Western Australia have brought back fossils which after even a preliminary examination were found to resemble forms recorded from the Great Artesian Basin in eastern Australia (Singleton, 1961; Skwarko, 1962). Closer scrutiny confirmed the similarity and substantiated suspicion that during at least one phase of its existence, the shallow but extensive Aptian sea covered a greater area of this continent than was hitherto suspected, and extended well into Western Australia.

### ACKNOWLEDGEMENTS

I wish to thank the Frome Broken Hill Pty Ltd and also the Hunt Oil Co. Ltd, for submitting their material from the Gibson Desert for study.

## PREVIOUS WORK

THE first Cretaceous fossils from central Western Australia were collected by R. B. Leslie of Frome-Broken Hill Pty Ltd. They were collected from eight places in the Lake Carnegie area (see Fig. 2) and represent four stratigraphical-lithological units not formally named (Leslie, 1961). They were submitted for dating to Dr O. P. Singleton, University of Melbourne, who drew attention to close faunal similarities with some Lower Cretaceous sediments of eastern Australia, and correlated them with the Roma Formation of the Great Artesian Basin (Singleton, 1961). His determinations are as follows (see also Fig. 2).

'Collection 13A in fine ferruginous mudstone and siltstone; large indeterminate heterodont lamellibranch.

*Age:* Indeterminate.

'Collection 40 in quartzite:
*?Pseudavicula* sp.
cf. *Macrocallista? plana* (Moore)
Indeterminate heterodont lamellibranch
Silicified wood

*Age:* probably Lower Cretaceous—Aptian.

'Collection 21B in slightly ferruginous sandstone:
Thin burrows of two types

*Age:* Indeterminate.

'Collections 12D, 19, 21A, 22, 46 in siltstone . . .:

| | 12D | 19 | 21A | 22 | 46 |
|---|---|---|---|---|---|
| *Nucula* sp. aff. *N. gigantea* Etheridge Jnr | | x | x | x | |
| *Nuculana* sp. .. .. .. | | x | x | | |
| *Maccoyella* sp. cf. *M. corbiensis* (Moore) | | x | | | |
| *Maccoyella* sp. .. .. .. | x | | | | |
| *Pseudavicula anomala* (Moore) .. | | x | x | | x |
| *Syncyclonema* sp. .. .. .. | | x | | x | |
| cf. *Camptonectes* sp. .. .. .. | | | x | | |
| cf. *Entolium* sp. .. .. .. | | x | x | | |
| *Mytilus inflatus* Moore .. .. | x | x | | | |
| cf. *Cyrenites meeki* (Eth. F.) .. .. | | | x | | |
| cf. *Astarte* sp. .. .. .. | | | x | | |
| cf. *Cardium* sp. .. .. .. | | | x | | |
| cf. *Gari elliptica* Whitehouse .. .. | | x | | | |
| cf. *Tatella* sp. .. .. .. | x | x | x | x | |
| *Corbula* sp... .. .. .. | | | x | | |
| *Panope* sp. 1 .. .. .. | | x | | x | |
| *Panope* sp. 2 .. .. .. | | | | x | |
| *Aconeceras* sp. .. .. .. | | | | | x |
| Crustacean fragment .. .. | | x | | | |

*Age:* Aptian; to be correlated with the Roma Formation of the Great Artesian Basin and, by inference, with the Windalia Siltstone of the North-West Basin. . . . Of particular interest is the correlation with Roma faunas, which implies the existence of free communication between this part of Western Australia and Eastern Australia.'

In 1960 A. T. Wells of the Bureau of Mineral Resources made a small collection near Mount Samuel, near where the previous collections had been obtained (see Fig. 2). The following genera and species were identified (Skwarko, 1962):

*Maccoyella* sp. cf. *M. barklyi* (Moore, 1870
*Maccoyella reflecta* (Moore, 1870)
*'Macrocallista' plana* (Moore, 1870)
*Modiolus tatei* (Etheridge Jnr, 1902)
*Malletia* sp. cf. *M. elongata* (Etheridge Snr, 1872)
*?Fissilunula clarkei* (Moore, 1870)
*?Natica variabilis* (Moore, 1870)

These were correlated with the Roma Formation fauna of Queensland and dated as Aptian, and it was pointed out that during Lower Cretaceous time the Great Artesian Basin extended into central Western Australia and suitable conditions existed for pelecypods to migrate westwards along the coast (Skwarko, 1962). I suggested that a direct sea communication existed between the Gibson Desert and the Dampier Peninsula, and that the only likely connexion between central Western Australia and eastern Australia was either through the southern portion of the Northern Territory (Amadeus Basin) or farther south through the Eucla or Officer Basins. These conclusions were reached independently of Singleton's results.

Further collections were also made by Wells in 1962 during a helicopter traverse. On this occasion fossils were collected from seven sites scattered between Mount Charles and Alfred and Marie Ranges (see Fig. 2) and their sources were undifferentiated Cretaceous sediments (including Kidson Beds) and Bejah Beds (Wells, 1963). The distribution of fossils in localities which were dated as definitely Aptian was as follows (Skwarko, 1963):

| | B4 | B5 | Be6 | Be7 | W3 | W4 | W5 |
|---|---|---|---|---|---|---|---|
| *Nucula?* sp. .. .. .. .. | | | | | | | x |
| Nuculoid gen. et sp. indet. .. .. | | | x | | | | |
| '*Malletia*' *elongata* (Etheridge Snr, 1872) .. | x | | | | x | | |
| '*Glycymeris*' cf. *sulcata* Eth. Snr, 1872 .. | x | x | | | | | |
| *Pseudavicula anomala* (Moore, 1870) .. | x | x | | | | | x |
| *?Pecten* sp. nov. .. .. .. | | | | | | x | |
| *Camptonectes* sp. indet. .. .. .. | | x | | | | | x |
| *Syncyclonema?* sp. indet. .. .. | | x | | | | x | |
| *?Mytilus inflatus* Moore, 1870 .. .. | | | x | | | | |
| '*Macrocallista*' *plana* (Moore, 1870) .. | | | | x | | | |
| *?Palaeomoera mariaeburiensis* (Etheridge Snr, 1872) .. .. .. .. | | | x | | | | |
| *Natica* (*L.*) *variabilis* (Moore, 1870) .. | | | | x | | | |

These determinations supported the earlier conclusions, and Kidson and Bejah Beds were correlated with the Roma Formation of the Great Artesian Basin.

The present study is based on all material listed above, as well as on additional collections made recently in the Gibson Desert area by the Hunt Oil Co. Ltd.

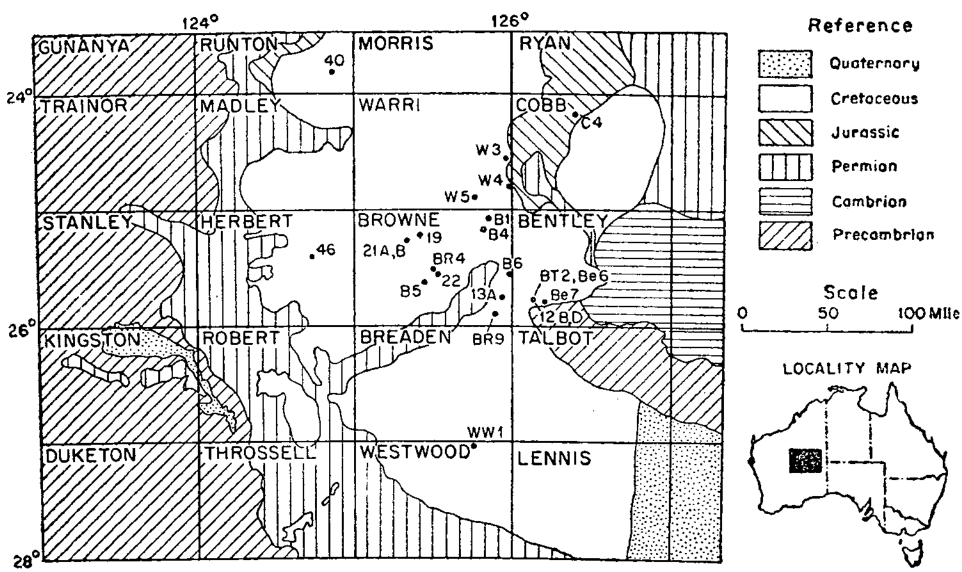

**Fig. 2. Fossil localities in Cretaceous strata in the Gibson Desert.**

# LIST OF FOSSIL LOCALITIES AND THEIR CONTENT

**Bearings cited in locality descriptions are from true north.**

### Bentley 1 : 250,000 Sheet

*Be6:* Mount Charles. Mount Charles is 1½ miles at 147° from National Mapping trig station, whose position is 25° 43′ 37″ S, 126° 10′ 32″ E. Bejah Beds. Aptian. Collected by A. T. Wells, June/July 1962.

*Eyrena* sp. cf. *E. linguloides* (Hudleston, 1884)
*?Palaeomoera mariaeburiensis* (Etheridge Snr, 1872)
*?Aphrodina? woodwardiana* Hudleston, 1884
Pelecypods indet.

*Be7:* 6.7 miles at 153° from Mount Charles. ?Kidson Beds. Aptian. Collected by A. T. Wells, June/July 1962.

*Tancredia plana* Moore, 1870
*Euspira reflecta* (Moore, 1870)

*BT2:* Mount Charles Gravity Station 4-2804. 25° 44′ 48″ S, 126° 11′ 28″ E. Aptian. Collected by Hunt Oil Co., April/May 1963.

*'Pseudavicula anomala'* (Moore, 1870)

***12B:*** Mount Charles. ?Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960
Worm borings

***12D:*** Mount Charles. Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960

*?Yoldia freytagi* Ludbrook, 1966
*Maccoyella* sp. cf. *M. reflecta* (Moore, 1870)
*'Pseudavicula anomala'* (Moore, 1870)
*Eyrena* sp. cf. *E. linguloides* (Hudleston, 1884)
*Tatella?* sp.
*?Palaeomoera mariaeburiensis* (Etheridge Snr, 1872)
*?Aphrodina? woodwardiana* Hudleston, 1884
Pelecypod fragments indet.
Crustacean remains
*Chondrites?* sp.

### Browne 1 : 250,000 Sheet

*B1:* 16.7 miles at 70° from Lake Gruszka. Position of Lake Gruszka is 25° 19′ S, 125° 34′ E. ?Kidson Beds. ?Aptian. Collected by A. T. Wells, June/July 1962.
Worm borings

*B4:* 7.3 miles at 355° from Lake Gruszka. Bejah Beds. Aptian. Collected by A. T. Wells, June/July 1962.

*?Yoldia freytagi* Ludbrook, 1966
Nuculoid A. fragment
*'Pseudavicula anomala'* (Moore, 1870)
*Pseudavicula* sp.
*Panopea* sp. nov?
Small pelecypods indet.
Small gastropod? indet.

*B5:* 9.4 miles at 199° from Mount Beadell. Position of Mount Beadell is 25° 32′ 44″ S., 125° 16′ 38″ E. Bejah Beds. Aptian. Collected by A. T. Wells, June/July 1962.

*Nucula* sp. cf. *N. etheridgei* Ludbrook, 1966
*'Pseudavicula anomala'* (Moore, 1870)
*Syncyclonema gibsonia* sp. nov.
*Panopea* sp. nov?
Small pelecypod indet.

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TABLE 1. DISTRIBUTION OF CRETACEOUS FOSSILS IN THE GIBSON DESERT LOCALITIES

| Genera and Species | Be6 | Be7 | BT2 | 12B | 12D | B1 | B4 | B5 | B6 | BR4 | 22 | 13A | 19 | 21A | 46 | W3 | W4 | W5 | WW1 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Nucula* sp. cf. *N. etheridgei* Ludbrook, 1966 | | | | | | | | x | | | x | | | | | | | | | |
| Nuculoid A. fragment | | | | | | | x | | | | | | | | | | | x | | |
| *Yoldia freytagi* Ludbrook, 1966 | | | | | ? | | ? | | x | | x | | | | | | | | | |
| *Maccoyella* sp. aff. *M. corbiensis* (Moore, 1870) | | | | | | | | | | | | | x | | | | | | | |
| *Maccoyella* sp. cf. *M. reflecta* (Moore, 1870) | | | | | x | | | | x | | | | | | | | | | | |
| *Maccoyella* sp. | | | | | | | | | | | | | x | | | | | | | |
| '*Pseudavicula anomala*' (Moore, 1870) | | | x | | x | | x | x | | | | | x | x | x | x | | x | | x |
| *Pseudavicula* sp. | | | | | | | x | | | | | | x | | | | | | | |
| *Syncyclonema gibsonia* sp. nov. | | | | | | | | x | | | | | cf. | x | | | ? | | | |
| *Syncyclonema* sp. | | | | | | | | | | | x | | x | | | x | | x | | |
| Pectinids indet. | | | | | | | | | | | x | | | x | | | x | | | |
| *Eyrena primulafontensis* (Etheridge Jnr, 1902) | | | | | | | | | x | | | | | | | | | | | |
| *Eyrena?* sp. | | | | | | | | | | | | | x | | | | | | | |
| *Eyrena* sp. cf. *E. linguloides* (Hudleston, 1884) | x | | | | x | | | | | | | | x | | | | | | | |
| *Fissilunula clarkei* (Moore, 1870) | | | | | | | | | ? | | | | | | | | | | x | |
| *Tatella?* sp. | | | | | x | | | | | | x | x | | x | | | | | | |
| *Astarte?* sp. | | | | | | | | | | | | | | x | | x | | x | | |
| *Tancredia plana* Moore, 1870 | | x | | | | | | | | | | | | | | | | | | x |
| *Panopea* sp. nov? | | | | | | | x | x | | x | x | | x | | | | | | | |
| *Panopea* sp. indet. | | | | | | | | | | | x | | | | | | | | | |
| *?Palaeomoera? mariaeburiensis* (Etheridge, Snr, 1872) | x | | | | x | | | | | | | | | | | | | | | |
| *Aphrodina? woodwardiana* Hudleston, 1884 | x | | | | x | | | | | | | | | | | | | | | |
| Pelecypoda indet. | x | | | | x | | x | x | | x | x | x | x | x | | x | | x | | x |
| *Euspira reflecta* (Moore, 1870) | | x | | | | | | | x | | | | | | | | | | | |
| *Sanmartinoceras?* sp. | | | | | | | | | | | | | | | x | | | | | |
| *Dentalium* sp. | | | | | | | | | | | x | | | | | | | | | |
| *Chondrites* sp. | | | | | ? | ? | | | | | ? | | ? | | | | | | | |
| Crustacean fragments | | | | | x | | | | | | | | | | | | | | | |
| Worm borings | | | | x | | | | | | | | | | | | | | | | |

*B6:* Mount Samuel. 25° 45′ 55″ S., 125° 55′ 43″ E. Bejah Beds. Aptian. Collected by A. T. Wells, September 1960.

*Yoldia freytagi* Ludbrook, 1966
*Maccoyella* sp. cf. *M. reflecta* (Moore, 1870)
*Eyrena primulafontensis* (Etheridge Jnr, 1902)
?*Fissilunula clarkei* (Moore, 1870)
*Euspira reflecta* (Moore, 1870)

*BR4:* Mount Beadell. Gravity Station 2-4320. 25° 32′ 15″ S., 125° 16′ 30″ E. Aptian. Collected by Hunt Oil Co., April/May 1963.

*Panopea* sp. nov?
Bivalve indet.

*BR9:* 9 miles at 242° from Mount Samuel. 25° 49′ 37″ S., 125° 47′ 58″ E. ?Permian. Collected by Hunt Oil Co., April/May 1963.

Organic trails

*22:* Mount Beadell. Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960.

*Nucula* sp. cf. *N. etheridgei* Ludbrook, 1966
*Yoldia freytagi* Ludbrook, 1966
Pectinid A (strongly ribbed)
*Syncyclonema* sp.
*Tatella?* sp.
*Panopea* sp. nov.
*Panopea* sp. indet.
Small pelecypod indet.
*Dentalium* sp.
*Chondrites?* sp.

*13A:* Mount Samuel. ?Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960.

*Tatella?* sp.
Large pelecypod fragment indet.

*19:* Mount Everard. Mount Everard's position is 25° 10′ 40″ S., 125° 03′ 45″ E. Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960.

*Maccoyella* sp. aff. *M. corbiensis* (Moore, 1870)
*Maccoyella* sp.
'*Pseudavicula anomala*' (Moore, 1870)
*Pseudavicula* sp.
*Syncyclonema* sp. cf. *S. gibsonia* sp. nov.
*Syncyclonema* sp.
*Eyrena* sp. cf. *E. linguloides* (Hudleston, 1884)
*Panopea* sp. nov?
Pelecypod fragments indet.
*Chondrites?* sp.

*21A:* 8 miles at 227° from Mount Everard. Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960.

?*Pecten* sp.
'*Pseudavicula anomala*' (Moore, 1870)
*Syncyclonema gibsonia* sp. nov.
*Mytilus?* sp.
*Tatella?* sp.
*Astarte?* sp.
Small and large pelecypod fragments indet.

*21B:* 8 miles at 227° from Mount Everard. ?Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960.

Organic remains indet.

HERBERT 1 : 250,000 SHEET

*46:* Mount William Lambert. Position of Mount William Lambert is 25° 24′ 05″ S., 124° 05′ 16″ E. (National Mapping Trig Station). Aptian. Collected by Frome-Broken Hill Pty Ltd, May/October 1960.

*'Pseudavicula anomala'* (Moore, 1870)
*Sanmartinoceras?* sp.

WARRI 1 : 250,000 SHEET

*W3:* 10 miles at 56° from centre of Lake Blair. Position of Lake Blair is 24° 43′ S., 125° 25′ E.. ?Kidson Beds. Aptian. Collected by A. T. Wells, June/July 1962.

*'Pseudavicula anomala'* (Moore, 1870)
*Syncyclonema* sp.
*Astarte?* sp.
Small Nuculoid A frag.
Pelecypod frag. indet.

*W4:* 16.4 miles at 98° from Lake Blair. Bejah Beds. Aptian. Collected by A. T. Wells. June/July 1962.

Small Pelecypoda indet.

*W5:* 1.5 miles at 62° from Mount Cox. Approximate position of Mount Cox is 24° 47′ S., 125° 53′ E. Bejah Beds. Aptian. Collected by A. T. Wells, June/July 1962.

*'Pseudavicula anomala'* (Moore, 1870)
*Syncyclonema* sp.
*Astarte?* sp.
Pelecypod fragments indet.

WESTWOOD 1 : 250,000 SHEET

*WW1:* Gravity Station 5A-567. 27° 03′ 00″ S., 125° 57′ 32″ E. Aptian. Collected by Hunt Oil Co., October/November 1964.

*Fissilunula clarkei* (Moore, 1870)

COBB 1 : 250,000 SHEET

*C4:* Ryan Buttes. 15.2 miles at 100° from the northern end of Lake Cobb. Position of Lake Cobb is 24° 12′ S., 126° 15′ E. ?Jurassic. Collected by A. T. Wells, June/July 1962.

*Chondrites?* sp.

RUNTON 1 : 250,000 SHEET

*40:* 11 miles at 130° from Bejah Hill. Aptian. Collected by Frome-Broken Hill Pty Ltd, May/November 1960.

*'Pseudavicula anomala'* (Moore, 1870)
*Tancredia plana* (Moore, 1870)
Pelecypoda indet.

## AGE OF THE GIBSON DESERT COLLECTIONS

The following fossils identified from the Gibson Desert collections are regarded as of value in dating:

*Nucula* sp. cf. *N. etheridgei* Ludbrook, 1966.
*Yoldia freytagi* Ludbrook, 1966.
*Maccoyella sp.* aff. *M. corbiensis* (Moore, 1870).
*Maccoyella* sp. cf. *M. reflecta* (Moore, 1870).
*'Pseudavicula anomala'* (Moore, 1870).
*Eyrena primulafontensis* (Etheridge Jnr, 1902).
*Eyrena* sp. cf. *E. linguloides* (Moore, 1870).
*Fissilunula clarkei* (Moore, 1870).
*Tancredia plana* Moore, 1870.
*?Aphrodina? woodwardiana* (Hudleston, 1884).
*Euspira reflecta* (Moore, 1870).
*Sanmartinoceras?* sp.

The time ranges of the Australian Cretaceous genera and species are known through the work of Dickins (1960), from short unpublished reports of J. T. Woods and R. A. Day, from the recent monograph of Ludbrook (1966), and from some earlier work of Whitehouse (1928). From these it would seem that *M. corbiensis, M. reflecta, P. anomala, E. linguloides, F. clarkei, A. woodwardiana, T. plana,* and *P. mariaeburiensis* are indisputably Aptian forms. *Sanmartinoceras* occurs in Australia also only in Aptian sediments (R. O. Brunnschweiler, pers. comm.).

Ludbrook (1966) stated that the stratigraphic range of *N. etheridgei* and *E. primulafontensis* is limited to the Albian, but Dickins (1960, p. 20) reports *'Mytilus'* sp. cf. *M. primulafontensis* in association with such Aptian forms as *F. clarkei* and *Cyrenopsis* sp. cf. *C. opallites* (Etheridge Jnr, 1902) at Buckingham Downs, Queensland; while in the Gibson Desert the association of *E. primulafontensis* is clearly with pelecypods of Aptian age (see lists of determinations for localities Be6, 12D, and 19, p. 6, 8). Similarly, at locality B5, *N. etheridgei* occurs in association with *P. anomala*—an Aptian form.

Of the remaining fossils listed above, *Y. freytagi* and *E. reflecta* occur both in Aptian and Albian (Ludbrook, op. cit.).

It would seem, therefore, that the fossil evidence overwhelmingly points to an Aptian age of the Gibson Desert Cretaceous collections, and this is the age assigned to them in this Bulletin.

## PALAEOGEOGRAPHICAL IMPLICATIONS

The probable extent to which the continent of Australia was inundated during the Aptian time is shown in Figure 3. The greatest single body of water was that of the Great Artesian Basin, which occupied a large portion of Northern Territory, Queensland, northern New South Wales, and South Australia. Sediments laid down in the Great Artesian Basin are mostly fossiliferous and outcrops are prolific. The geographical persistence of individual species throughout the basin is striking, and the examination of fossil evidence has enabled the extent of this primarily inland sea to be traced. To the north, the Great Artesian Basin continues into the Carpentaria Basin, and into the Mullaman sediments to the north-west in the Northern Territory. It may have connected directly with the Murray Basin to the south, and through the Murray Basin with the Otway Basin. In the Otway Basin, however, Aptian sediments are chiefly non-marine. The discovery of a marine macrofaunal assemblage with definite Great Artesian Basin characters in the central portion of Western Australia is evidence that in Aptian time there existed in that part of the continent a large body of water which was also in communication with the Great Artesian Basin to the east. An attempt has been made to determine the location of this connecting route, which allowed molluscs to migrate.

In 1962, in an unpublished report, I postulated a marine continuity between the Gibson Desert sea and the Dampier Peninsula to the north. The evidence for this is the presence of fossils of the Great Artesian Basin type in both areas, and the postulate still holds. In addition I suggested that a direct marine and faunal

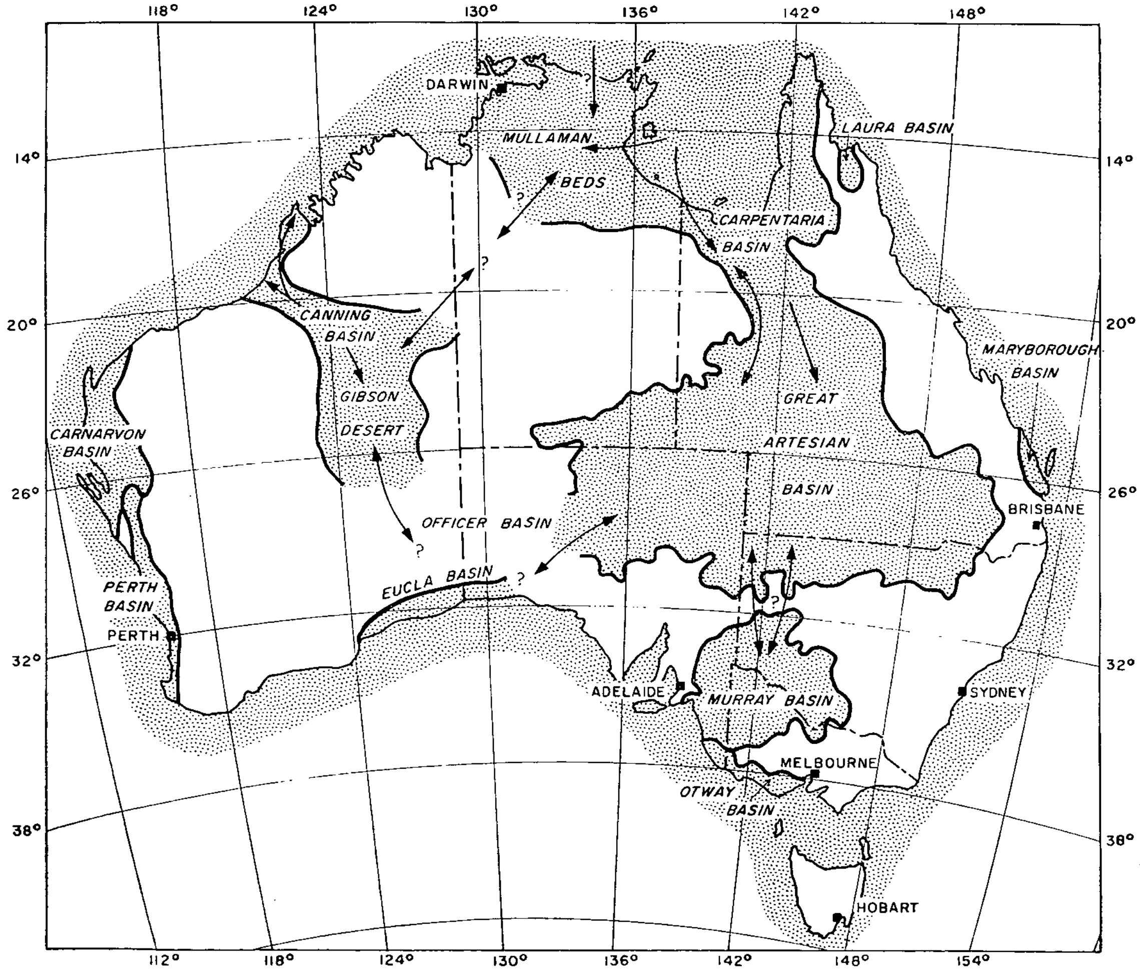


**Fig. 3. Australian palaeogeography during Aptian times.**

communication between the Gibson Desert sea and the shallow sea of the Great Artesian Basin existed in the Aptian times probably either through the Amadeus Basin or more probably through the Officer-Eucla Basins. Subsequent work has shown these conclusions to be premature.

Even now it is too early to arrive at definite conclusions regarding Aptian sea connexions in central Australia, as more field work is needed in critical and hitherto virtually unexplored parts of the continent. However, since 1962 more pertinent information has become available and its brief presentation here may be deemed advisable.

Field work carried out during 1963 discounted the possibility of an east-west connexion through the Amadeus Basin. The Cretaceous strata in the south-eastern corner of the Northern Territory wedge out to the west and finally disappear. The presence of Cretaceous strata in the Officer Basin has never been convincingly demonstrated.

There are only three published records known to me of the presence of marine Aptian sediments in the Eucla Basin. There is a mention of *Maccoyella corbiensis*—a Great Artesian Basin Aptian key fossil—from Loongana Bore (McWhae, Playford, Lindner, Glenister, & Balme, 1958, p. 118). This report is based on a much earlier one, which mentions the finding of a single shell reputedly similar to *M. corbiensis*. This specimen has been subsequently lost and no additional macrofossils of Aptian age have been found in the Eucla Basin—as far as I know—to the present day. The second report is by Ludbrook (1958, p. 111) who described cores from Madura No. 1 Bore drilled in 1903. The Aptian sediments in this bore occur at 1979-2079 feet (below 1839 feet, according to Ludbrook, 1960, p. 6), and consist of . . . 'carbonaceous sandstones with abundant arenaceous foraminifera typical of Lower Cretaceous (Aptian) sediments of the Roma Series in the Great Artesian Basin in South Australia. The whole of the Cretaceous sequence is paralic, all sediments being carbonaceous and mostly glauconitic.' The third report is from Harris & Ludbrook (1966), who in the description of Permian sediments in the Nullabor (Yangoonabie) No. 8 Bore state that . . . 'The Permian clay is overlain by . . . 142 feet of Aptian non-marine siltstone and sandstone, 210 feet of Aptian mudstone with foraminifera and radiolaria, 25 feet of interlaminated siltstone and sandstone with coarsely arenaceous foraminifera of presumed Aptian age, and 217 feet of feldspathic sandstone, grit, and silt of Lower Cretaceous (Neocomian to Aptian) age.'

The salient features of the above quotations seem to be that: Aptian marine sediments are present in the Eucla Basin, that they are at least in part paralic with much carbonaceous matter and glauconite, and that although microfossils are prolific and diagnostic in most units there is a dearth if not complete absence of macrofossils. It would seem certain that the Lower Cretaceous sea which invaded large portions of eastern Australia flooded also at least the southern portion of the Eucla Basin. Current work on the Eucla Basin by Harris & Ludbrook is not yet available and until this is published it must be concluded that there is no evidence that Aptian molluscs have reached the Aptian sea which covered the Gibson Desert through the Eucla Basin.

Work on the Cretaceous sediments in the Northern Territory during the 1966 field season may in time provide critical evidence on the problem of faunal migration discussed above. Fossils collected in the Victoria River Downs, Delamere, and Daly Waters 1 : 250,000 Sheet areas are as yet not available for research, but even their cursory examination in the field revealed notable similarities with the Gibson Desert fauna on the one hand and the Great Artesian Basin Aptian assemblage on the other. It is hoped that with progressive systematic mapping in central western Northern Territory as well as with better knowledge of sediments in the Eucla Basin in the near future the intriguing problem of the occurrence of the Gibson Desert marine Aptian fossils will be solved.

# SYSTEMATIC DESCRIPTIONS

## Class PELECYPODA

### Family NUCULIDAE

### Genus NUCULA Lamarck, 1799

*Type species: Arca nucleus* Linn. 1767.

#### NUCULA sp. cf. N. ETHERIDGEI Ludbrook, 1966

(Pl. 3, figs 2, 3)

For ease of reference the synonymy list for *N. etheridgei* is presented below.

1872 *Nucula gigantea* Etheridge Snr, *Quart. J. geol. Soc. Lond.*, 28, 341, pl. 20, fig. 4; *non* Roemer, 1836.

1892 *Nucula gigantea* Etheridge Snr; Etheridge Jnr, in Jack & Etheridge, *The geology and palaeontology of Queensland and New Guinea,* 566, pl. 26, figs 6, 7.

1966 *Nucula etheridgei* Ludbrook, *Geol. Surv. S. Aust. Bull.* 40.*

*Material:* One almost complete and one posteriorly incomplete internal cast of the left valve; one incomplete external and one incomplete internal cast of the right valve.

*Description:* The shell is ovately oblong, large for the genus—just over 40 mm long and 27 mm high—equivalve, asymmetrical. It is produced posteriorly and well and regularly inflated.

The umbo is depressed, situated close to the anterior third of the shell.

The dorsal shell margin is almost straight just behind the umbo, but becomes gently convex towards the rear and close to the convex posterior margin. The ventral margin is broadly convex. The anterior cardinal margin is gently convex, while the anterior shell margin is sharply rounded.

The external surface of both valves is very faintly striated.

The hinge is narrowest directly beneath the umbo, increasing in breadth laterally. Its ventral margin is straight. There seem to be about thirteen teeth on the posterior portion of the hinge, but in front of the umbo the teeth were not preserved.

*Discussion:* The two internal casts of the right and the left valve on which the description of the species was based were described from Albian sediments of the Maryborough area, western Queensland (Etheridge, 1872). Subsequently, Etheridge (1892) described two additional right valve casts, one from Maryborough and the other from Port Curtis in Queensland. More recently Ludbrook (1966) described additional species from Nilpinna in Albian strata of South Australia. She found that the specific name *'gigantea'* was preoccupied and changed it to *'etheridgei'*. In their overall shape and those morphological features which are available for comparison, the Gibson Desert specimens agree closely with those from other parts of Australia, but our specimens are poorly preserved, and it is not possible to determine whether the chondrophore is present, or if the ventral edge is crenulated.

*Occurrence:* Localities 22 and B5.

* Page references not available.

## Family NUCULANIDAE

### Genus Yoldia Möller, 1842

*Type species: Yoldia arctica* Möller, 1842

#### Yoldia freytagi Ludbrook, 1966
(Pl. 1, figs 4, 5)

1902 *Malletia elongata* Etheridge Jnr, *Mem. Roy. Soc. S. Aust.*, 2 (1), pl. 3, figs 21, 22, 23 (non *Leda elongata* Etheridge).

1966 *Yoldia freytagi* Ludbrook, *Geol. Surv. S. Aust. Bull.* 40.

*Material:* Six variously incomplete internal casts of the left valve, one internal cast and one external mould of the right valve.

*Description:* The shell is up to 35 mm long and 18 mm high, not very strongly inflated, with a broad umbo situated in the anterior third of the shell.

The anterior cardinal margin is slightly convex, and the posterior cardinal margin weakly concave. The ventral shell margin is broadly arched; the junction of the posterior cardinal margin with the posterior shell margin is angular.

The surface of the bivalve is striated with faint concentric growth striae.

The hinge-plate is narrow. Its anterior portion is occupied by about fifteen teeth, and its posterior portion contains about twenty-eight teeth. The teeth are blade-like and triangular. They are directed towards the umbo.

*Discussion:* In spite of the rather poor preservation of the Gibson Desert specimens it is clear that in the number of teeth and in the overall shape they are closely similar to the recently described *Y. freytagi* from the Aptian and Albian strata of the Great Artesian Basin.

*Occurrence:* Localities 22, ?12D, ?B4, B6.

## Family AVICULOPECTINIDAE

### Subfamily OXYTOMINAE Ichikawa, 1958

### Genus Maccoyella Etheridge Jnr, 1892

*Type species: Avicula barklyi* Moore, 1870

#### Maccoyella sp. aff. M. corbiensis (Moore, 1870)
(Pl. 4, fig. 11)

An incomplete but large left valve from locality 19 belongs to the primarily Australian genus *Maccoyella.* Its overall shape and the type of ribbing have affinities with those of *M. corbiensis* from the Aptian strata of the Great Artesian Basin, but at this stage no more definite identification is possible.

#### Maccoyella sp. cf. M. reflecta (Moore, 1870)
(Pl. 1, figs 6-8)

*Material:* One incomplete external and one incomplete internal impression of the left valve; two incomplete casts of the right valve.

*Description:* The shell is about 60 mm high and 70 mm long, inequivalve, asymmetrical, plano-convex, weakly inflated. The left valve is weakly inflated, with maximum tumidity in the umbonal region. Its umbo is short, obtuse, and not very prominent.

The posterior cardinal margin is straight and extends to the rear. It is longer than the anterior margin, which slopes downwards. The remainder of the shell's periphery is evenly circular.

The left valve is ribbed with over 40 radial costae, which are of two orders. The ribs diverge rapidly from the umbo, increasing slightly in thickness and relief. Interspaces which separate them are much wider than the ribs and concentrically striated with growth-lines and rugae. Dentition on the left valve consists of a smallish but prominent triangular cardinal process which is striated parallel to its periphery with growth-rugae.

The right valve is flat, and the flexure in its surface which is caused by the passages of the byssus is more prominent than on the left valve. The right valve has more than 60 ribs, far more than the left valve, and they have smaller relief. They are not as clearly divisible into the first and second orders and lack the incipient tubercles or barbs present on the ribs of the left valve.

*Remarks: M. reflecta* is one of the key fossils which characterize the Great Artesian Basin sediments of Aptian age.

*Occurrence:* Localities 12D, B6.

## Family AVICULOPECTINIDAE

### Genus PSEUDAVICULA Etheridge Jnr, 1892

*Type species: Lucina anomala* Moore, 1870.

### 'PSEUDAVICULA ANOMALA' (Moore, 1870)

(Pl. 2, figs 11-18)

1870 *Lucina anomala* Moore, *Quart. J. geol. Soc. Lond.*, 26, 251, pl. 14, fig. 4.

1966 *Pseudavicula anomala* (Moore), *Ludbrook, Geol. Surv. S. Aust. Bull.* 40. (for synonymy).

*Material:* Many internal and rather fewer external impressions of both valves.

*Description:* The shell is moderately large for the genus, up to 40 mm high and almost as wide, circular or vertically ovate, almost equivalve, auricular, asymmetrical. The shell is compressed, weakly inflated at about the centre, with tumidity decreasing towards the edges of the shell. The umbo is depressed, pointed, and somewhat obtuse. The postumbonal ridge is several times longer than the preumbonal ridge. The periphery of the shell is convex except for the posterocardinal margins, which are almost straight. The posterior auricle is large and prominent. The anterior ear was not observed.

The external shell sculpture consists of numerous fine radial primary and secondary riblets which are separated by flat interspaces twice as wide as the primary riblets. The concentric lineation is present but not conspicuous except for growth-rugae in mature specimens. Radial lineation may be absent from areas of the shell's surface, but this feature may be due to imperfect preservation.

The dentition is limited to a prominent hinge-plate. This plate is flat and lies in the commissural plane. It is best developed along the posterior portion of the cardinal margin; its greatest width is behind and near the umbo, from which it narrows forwards and backwards.

*Discussion:* The fact that representative species of *Pseudavicula* are subject to considerable intraspecific variation has been discussed in the past (Dickins, 1960). It may not come as a surprise, therefore, that whereas Ludbrook referred to *P. anomala* as an inequivalve shell, the specimens from the Gibson Desert are practically equivalve. The two-order ribbing is a rather unusual feature.

The consensus of opinion among Australian palaeontologists working on Cretaceous fossils is that *P. anomala* (Moore, 1870) and *P. australis* (Moore, 1870) represent the same species. Although this may well be the case it is worth while remembering that the form described by Moore as *P. australis* is gregarious, its tests occurring in great abundance as matte surfaces. *P. anomala,* on the other hand, is a solitary dweller. The Gibson Desert specimens occur singly, and nearest outcrops of Cretaceous strata which yielded the gregarious *Pseudavicula* are near the Rumbalara mine in south-eastern Northern Territory. The source rock near Rumbalara mine is similar to that of the Gibson Desert.

*Occurrence:* Localities BT2, 12D, B4, B5, 19, 21A, 46, W5, 40.

## Family PECTINIDAE

### Subfamily ENTOLINIINAE

### Genus SYNCYCLONEMA Meek, 1864

*Type species: Pecten rigidus* Hall & Meek.

#### SYNCYCLONEMA GIBSONIA sp. nov.

(Pl. 1, figs 1-3)

*Material:* Four valves.

*Holotype:* CPC 6925 (Pl. 1, fig. 1).

*Paratype:* CPC 6926 (Pl. 1, fig. 2).

*Diagnosis:* The shell is small for the genus, smooth and with a broad ridge marking its maximum inflation extending radially from the umbo to the ventral periphery of the shell.

*Comparison with other species:* The combination of the small shell size with the lack of ornament and the presence of a conspicuous broad ridge of maximum inflation distinguishes this species from the previously described forms.

*Description:* The shell is small, up to 18 mm high and 13 mm long, longitudinally oval, equilateral. The umbo is acute, pointed, and well defined with straight and prominent peripheries. The ventral shell margin is evenly rounded. The shell is poorly inflated except along its longitudinal axis, where a broad ridge marks the region of greatest tumidity.

The auricles are of normal size, a little less than 2 mm long and a full 3 mm high. Their extremities distal from the umbo are curved away from the commissure, but this may be due to preservation.

*Remarks:* Three out of four specimens which were examined are obviously diagonally distorted. This brings about changes in the overall shape of the shell, and results in excessive convexity of the median ridge.

*Occurrence:* Localities B5, cf. 19, 21A, ?W4.

## Family MYTILIDAE

### Genus EYRENA Ludbrook, 1966

*Type species: Modiola linguloides* Hudleston, 1884

### EYRENA PRIMULAFONTENSIS (Etheridge Jnr, 1902)

(Pl. 2, figs 1-5)

1902 *Mytilus primulafontensis* Etheridge Jnr, *Mem. Roy. Soc. S. Aust.*, 2 (1), 18, pl. 2, figs 22-24.

1966 *Eyrena primulafontensis* (Etheridge Jnr); Ludbrook, *Geol. Surv. S. Aust. Bull.* 40.

*Material:* Numerous internal casts of both valves in position, common external casts of both valves.

*Description:* The shell is less than 30 mm long, 15 mm wide, and a little over 4 mm thick. The umbo is acute, rounded, depressed, almost terminal.

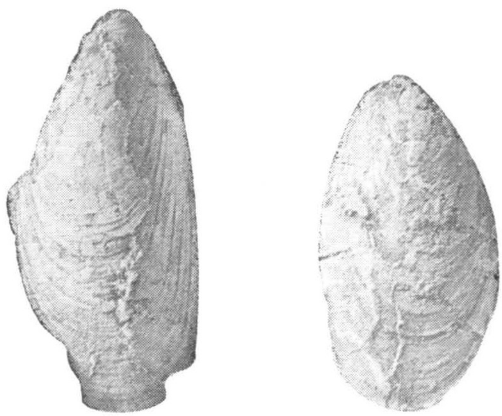

**Fig. 4.** ***Eyrena primulafontensis*** (Etheridge Jnr, 1902). **Latex casts of external impressions of a right (CPC 6950) and a left (CPC 6957) valve. Locality B6. x2.**

The ridge delineating the area of greatest tumidity extends along the entire length of the shell. It originates along the dorsal portion of the umbo and proceeds diagonally across the middle of the shell, terminating at the posteroventral shell margin. The tumidity of the shell, viewed in transverse section, decreases in a straight line below the ridge of greatest tumidity, and in a convex line above this ridge.

The ventral shell margin is less curved than the dorsal margin, but in both the curvature is even. Both the anterior and the posterior margins are sharply rounded. The shell surface is ornamented with very fine growth-lines and coarser growth-rugae.

The two valves are slightly inequivalve; the right valve is somewhat bigger than the left. Teeth are absent.

*Discussion:* The Gibson Desert specimens of *E. primulafontensis* are considerably smaller than those illustrated by Ludbrook (1966). Moreover some of them depart from their usual appearance, increasing in breadth like *E. linguloides* (Hudleston, 1884).

The Gibson Desert specimens which were referred to *E. primulafontensis* are not well enough preserved for their internal structure to be examined. The external appearance is, however, characteristic, and no doubt is felt about specific affinities of this form. Two other forms have affinities with *E. primulafontensis,* viz. *Mytilus planus* Moore, 1870, and *M. inflatus* Moore, 1870. *E. primulafontensis* can be distinguished from *M. planus* by the less pointed, more rounded umbo, and from *M. inflatus* by its smoothly rounded posterior margin which is devoid of any angularity.

*E. primulafontensis* was regarded as one of the pelecypods characterizing the Roma-type (Aptian) sediments of the Great Artesian Basin. Ludbrook (1966), however, considers its range as Albian.

*Occurrence:* Locality B6.

### EYRENA sp. cf. E. LINGULOIDES (Hudleston, 1884)

(Pl. 2, figs 6-10)

*Material:* Numerous internal and rare external impressions of both valves.

*Description:* The shell is up to 37 mm long and 21 mm high, transversely elongate, linguloid in shape. The maximum inflation is near the umbo, and decreases rapidly distally. The external ornament is limited to rather regularly spaced growth-laminae, absent in some specimens, and to very fine growth-lines.

The anterior shell margin is less convex than the posterior margin, which is quite smoothly arched with maximum curvature not far from the umbo. The maximum curvature of the ventral margin is in most cases in its anterior portion. In some specimens the anterior and the posterior convexity are symmetrical, but this may or may not be due to distortion.

The hinge-plate is narrow and one-half to one-third the length of the valve. No teeth are clearly visible, but there seems to be a robust but ill-defined process or processes beneath the left valve umbo.

The thickness of the test slightly exceeds 1 mm in the umbonal region.

*Occurrence:* Localities Be6, 12D, 19.

## Family ISOCARDIIDAE

### Genus FISSILUNULA Etheridge Jnr, 1902

*Type species: Fissilunula clarkei* (Moore, 1870).

### FISSILUNULA CLARKEI (Moore, 1870)

(Pl. 1, figs 9, 10)

1870 *Cytherea clarkei* Moore, *Quart. J. geol. Soc. Lond.,* 26, 250, pl. 13, fig. 1.

1872 *Cyprina expansa* Etheridge Snr, *Quart J. geol. Soc. Lond.,* 28, 338, 339, pl. 19, fig. 1.

1892 *Cyprina clarkei* (Moore); Etheridge Jnr, in Jack & Etheridge, *The geology and palaeontology of Queensland and New Guinea,* 474, 568, pl. 26, figs 18, 19; 27, figs 9-11.

1902 *Fissilunula clarkei* (Moore); Etheridge Jnr, *Mem. geol. Surv. N.S.W.*, Palaeont., 11, 36, 37, pl. 6, fig. 3; pl. 10, figs 1, 2; pl. 11, figs 1, 2.

1902 *Cyprina? (vel Cytherea?) clarkei (Moore);* Etheridge Jnr, *Mem. Roy. Soc. S. Aust.*, 2(1), 32, 33, pl. 5, figs 5, 5a, 6; pl. 6, figs 1, 2.

1915 *Fissilunula clarkei* (Moore); Newton, *Proc. malac. Soc. Lond.,* 11, 218, 223, text-figs A, B.

1960 *Fissilunula clarkei* (Moore); Brunnschweiler, *Bur. Min. Resour. Aust. Bull.* 59, 30-32, pl. 2, figs 8, 9, text-figs 23, 24.

1966 *Fissilunula clarkei* (Moore); Skwarko, *Bur. Min. Resour. Aust. Bull.* 73.

1966 *Fissilunula clarkei* (Moore); Ludbrook, *Geol. Surv. S. Aust. Bull.* 40.

*Discussion: Fissilunula clarkei* is the most widely distributed of all Australian Cretaceous pelecypods. It is known from the Dampier Peninsula in Western Australia (Brunnschweiler, 1960), from the Northern Territory (Sullivan & Öpik, 1951; Skwarko, 1966a), and from numerous localities in New South Wales, South Australia, and Queensland. *F. clarkei* is one of the key fossils in sediments of Aptian age in Australia.

Locality WW1 yielded eight specimens of *F. clarkei* whose internal casts as well as the shell material itself are completely replaced by silica. Although the dentition is not visible, the external appearance of the shell is typical of the species to which it is referred. The single specimen from locality B6 is badly crushed, and its determination is not definite.

## Family TANCREDIIDAE

### Genus Tancredia Lycett, 1850

*Type species: Tancredia donaciformis* Lycett, 1850.

### Tancredia plana Moore, 1870

(Pl. 3, figs 1, 4-7)

1870 *Myacites planus* Moore, *Quart J. geol. Soc. Lond.*, 26, 254, pl. 12, fig. 10.

1870 *Tancredia plana* Moore, *Quart. J. geol. Soc. Lond.,* 26, 254, pl. 13, fig 13.

1872 *?Myacites* sp. Etheridge Snr, *Quart. J. geol. Soc. Lond.,* 28, 348, pl. 25, fig. 7.

1872 *?Tancredia* sp., Etheridge Snr, *Quart. J. geol. Soc. Lond.,* 28, 348, pl. 25, fig. 8.

1892 *Macrocallista plana* (Moore); Etheridge Jnr, in Jack & Etheridge, *The geology and palaeontology of Queensland and New Guinea,* 476, pl. 27, figs 6-8.

1902 *Macrocallista? plana* (Moore); Etheridge Jnr, *Mem. Roy. Soc. S. Aust.,* 2 (11), 35, 36, pl. 5, figs 7-10.

1902 *Macrocallista? plana* (Moore); Etheridge Jnr, *Mem. geol. Surv. N.S.W., Palaeont.,* 11, 37, pl. 5, figs 8, 9.

*Material:* Several internal and fragmentary external impression of both valves.

*Description:* The shell is up to 35 mm high and 56 mm long, well inflated, prosogyrous, produced to the front and more strongly to the rear, with a weak post-umbonal carina. The umbo is obtuse, ill defined except in its most proximal portion, which is depressed and incurved. The ventral periphery of the shell is evenly and gently convex; the anterior and posterior shell margins are sharply curved; the anterior cardinal margin is sigmoidally curved, its concave portion being directly beneath the umbo; the posterior cardinal margin is almost straight.

A weak postumbonal ridge is broadly convex. It extends from the umbo to the posteroventral shell margin. Behind this ridge the surface of the shell dips steeply into the commissure.

The hinge-plates on both valves are narrow and semicylindrical rather than shelflike in shape. Directly beneath the umbo on the left valve the 'plate' widens slightly both ventrally and laterally to allow for a socket which houses a single tooth present on the opposite valve. The socket itself is bordered on its rear by an identical solitary tooth which fits into a corresponding socket on the right valve. Both the socket and the tooth on each valve are oriented in the anteroventral direction.

*Discussion:* The synonymy list which precedes the description of the Western Australian specimens is limited to those references accompanied by figures.

There has been no agreement on the generic placing of *'M. plana'*, and its final reference to *Macrocallista* was regarded even by Etheridge (1902, p. 35) as tentative. This was because the hinge has never been examined, and the basis of the synonymy list is the external appearance of the shell and one or two internal morphological features such as the position and shape of musculature. Nevertheless, it would seem that even on the basis of these features the Western Australian and the eastern Australian forms most probably represent the same species.

The dentition of the Western Australian forms is of the type usually associated with *Tancredia*. They are, therefore, placed in this genus in spite of the lack of posterior gape usually associated with tancrediids, and the relatively lower posterior portion.

Species of *Tancredia* have a wide geographical distribution and are found in strata which range in age from Triassic to Cretaceous.

*Occurrence:* Localities Be7, 40.

## Family VENERIDAE

### Genus APHRODINA Conrad, 1869

### Subgenus TIKIA Marwick, 1927

### ?APHRODINA (TIKIA) WOODWARDIANA (Hudleston, 1884)

(Pl. 4, fig. 2)

*Material:* Several internal and external casts of both valves.

*Description:* The shell is small, up to 7 mm high and 16 mm long. It is well and evenly inflated, equivalve, asymmetrical. The umbo is prosogyrous and obtuse. The anterior cardinal margin is slightly concave, the posterior cardinal margin convex; the ventral shell margin is evenly arched, and the anterior and the posterior margins sharply and rather irregularly convex.

*Discussion:* Some specimens at locality Be6 and most specimens at locality 12D have closer affinities with *A.(T.) woodwardiana* than with *P. mariaeburiensis*

(Etheridge Snr, 1872) (see below). This is seen chiefly in their overall shape. It is possible, however, that forms at both localities are in fact representative of a single species. No definite conclusion can be reached until the types of these two species and additional material from type localities are better known.

*Occurrence:* Localities 12D, Be6.

Superfamily SAXICAVACEA

Family PANOPEIDAE

Genus PANOPEA Menard, 1807

*Type species: Panopea aldrovandi* Menard, 1807

PANOPEA sp. nov?

(Pl. 3, figs 8-15)

*Material:* About a dozen internal and external casts.

*Description:* The shell is up to 35 mm high and 5 mm long. It is well inflated and gapes at its posterior extremity. The umbo is incurved, well defined, and prominent in its youth, but tends to become diffuse and less clearly defined in maturity. The preumbonal carina is sharp in young forms.

The concentric ribbing is strong and variable in regularity in different specimens. It seems to persist on to the inside surface of the shell, and some internal casts appear to have stronger ribbing than their external moulds.

*Discussion:* Some specimens of *Panopea* sp. nov? from the Gibson Desert are diagonally distorted, others are crushed, but the differences in the height-to-length ratio among our specimens are thought to be mainly due to intraspecific variation. Because of this variation several of our specimens closely resemble some species already described from eastern and southern Australia, and it is difficult to be certain of their true status. It is proposed, therefore, to withhold decision until the previously described forms are better known.

*Occurrence:* Localities B5, BR4, 22, 19.

Family TELLINIDAE

Genus PALAEOMOERA Stoliczka, 1870

*Type species: Tellina strigata* Goldfuss

?PALAEOMOERA? MARIAEBURIENSIS (Etheridge Snr, 1872)

(Pl. 4, figs 6, 7, 9)

*Material:* Numerous internal and external casts of both valves.

*Description:* The shell is equivalve and inequilateral, about 1 mm thick, up to 17 mm long, and 11 mm high; but many shells do not reach this size. It is moderately and evenly inflated.

The umbo is pointed, prosogyrous, situated very slightly in front of the middle of the shell. The anterior cardinal margin is gently concave, the posterior cardinal margin gently convex. Both the anterior and the ventral shell margins are evenly rounded, the anterior margin being the more convex. The posterior portion of the shell is attenuated, and its margin is truncated above the juncture of the weak postumbonal carina with the margin.

The external shell ornament consists of numerous but very fine concentric striae; the growth-bands are present but not very common. The internal structure is not known.

*Discussion:* At locality Be6 there are remnants of a shell bed consisting of a layer of leached external impressions of small bivalves. Although many fossils are available and some are quite well preserved, no details of their internal structure can be seen. Despite some variation in morphology, most specimens appear to belong to a single species closely resembling *P. mariaeburiensis* from the Aptian sediments of Maryborough, eastern Queensland. The Gibson Desert specimens are, however, somewhat smaller, and the growth-bands which typify the eastern Queensland forms are present only in some. Differentiation from *A.(T.) woodwardiana* is thus difficult. Some other specimens from the shell bed at locality Be6 seem to have closer affinities with *Pachydomella chutus* Etheridge Jnr, 1908.

*Occurrence:* Localities Be6, 12D.

### Class GASTROPODA

### Family NATICIDAE

### Genus Euspira Agassiz, in Sowerby, 1838

*Type species: Euspira glaucinoides* (Sowerby).

#### Euspira reflecta (Moore, 1870)

(Pl. 4, figs 3, 4, 8)

Two internal casts and one incomplete external cast of a gastropod from localities Be7 and B6 are very similar to *E. reflecta* from the Aptian and Albian sediments of the Great Artesian Basin of eastern and southern Australia.

*E. reflecta* is widely distributed in the sediments of the Great Artesian Basin, and it has been described many times, though usually as *Natica variabilis* Moore. Very recently, however, Ludbrook (1966) put *N. variabilis* into the synonymy of *E. reflecta,* which has a page priority, and which, unlike *N. variabilis,* was not previously occupied.

### Class CEPHALOPODA

### Family OPPELLIDAE

### Genus Sanmartinoceras Bonarelli, 1921

#### Sanmartinoceras? sp.

(Pl. 4, fig. 5)

A single poorly preserved ammonite from locality 46 may belong to genus *Sanmartinoceras,* which is known from the upper Aptian to lower Albian strata of Europe, eastern and western Australia, and Patagonia.

The Gibson Desert specimen is considerably flattened, but its original tumidity, though not known, does not seem to have been great. It is an obviously involute, high-whorled form, with a definite keel. Its suture is not preserved, but falcoid ribs typical of the genus are visible on the mature portion of the whorl.



4713/66.—3

## PROBLEMATICA

### CHONDRITES? sp.

(Pl. 4, fig. 1, 13)

Twig-like bifurcating casts found at localities 12D, 19, 22 and C4 may belong to the long ranging genus *Chondrites*. Material is, however, too fragmentary for definite identification.

### WORM TRAILS?

(Pl. 4, figs 10, 14)

Sinuous casts of what probably were worm trails were found at localities BR9 and VN1 (28° 18′ 48″ S, 126° 03′ 17″ E) ?Permian.

### PROBLEMATICUM

(Pl. 4, fig. 12)

Sediments which are thought to be of Permian age have yielded rather unusual looking 'worm casts' which in some cases have a sponge-like appearance. The unusual feature associated with them is the fact that they are composed of sandstone much coarser than the surrounding rock. Locality BR9.

## REFERENCES


BRUNNSCHWEILER, R. O., 1960—Marine fossils from the Upper Jurassic and the Lower Cretaceous of Dampier Peninsula, Western Australia. *Bur. Min. Resour. Aust. Bull.* 59.

COX, L. R., 1961—The molluscan fauna and probable Lower Cretaceous age of the Nanutarra Formation of Western Australia. *Bur. Min. Resour. Aust. Bull.* 61.

DICKINS, J. M., 1960—Cretaceous marine macrofossils from the Great Artesian Basin in Queensland. *Bur. Min. Resour. Aust. Rec.* 1960/69 (unpubl.).

ETHERIDGE, R., SNR, 1872—Description of the Palaeozoic and Mesozoic fossils of Queensland *in* Daintree's 'Notes on geology of the colony of Queensland'. *Quart. J. geol. Soc. Lond.*, 28 (1), 317-359, 13 pl.

ETHERIDGE, R., JNR, 1892—*In* JACK, R. L., and ETHERIDGE, R. JNR, Geology and palaeontology of Queensland and New Guinea. *Qld geol. Surv. Publ.* 92.

ETHERIDGE, R., JNR, 1902—The Cretaceous Mollusca of South Australia and the Northern Territory. *Mem. Roy. Soc. S. Aust.*, 2 (1), 1-54, 7 pl.

HARRIS, W. K., and LUDBROOK, N. H., 1966—Occurrence of Permian sediments in the Eucla Basin, South Australia. *Geol. Surv. S. Aust., quart. geol. Notes* 17.

LESLIE, R. B., 1961—Geology of the Gibson Desert, W. A. *Frome-Broken Hill Pty Ltd, Rep.* No. 3000-G-38 (unpubl.).

LUDBROOK, N. H., 1958—The stratigraphic sequence in the western portion of the Eucla Basin. *J. Roy. Soc. W. Aust.*, 41(15), 108-114.

LUDBROOK, N. H., 1960—Exoil Pty Ltd Eyre No. 1 and Gambanga No. 1 Wells. Súbsurface stratigraphy and micropalaeontological study. *Geol. Surv. S. Aust., palaeont. Sect. Rep.* Bk 11/60.

LUDBROOK, N. H., 1966—Cretaceous biostratigraphy of the Great Artesian Basin, South Australia. *Geol. Surv. S. Aust. Bull.* 40 (in press).

MCWHAE, J. R. H., PLAYFORD, P. E., LINDNER, A. W., GLENISTER, B. F., and BALME, B. E., 1958—The stratigraphy of Western Australia. *J. geol. Soc. Aust.* 4 (2).

SINGLETON, O. P., 1961—(Appendix *in* Leslie, 1961). Report on fossil collections from Western Australia submitted for identification by Frome-Broken Hill Co.

SKWARKO., S. K., 1962—Notes on Australian Lower Cretaceous palaeogeography. *Bur. Min. Resour. Aust. Rec.* 1962/11 (unpubl.).

SKWARKO, S. K., 1963—Mesozoic fossils from the Gibson Desert, central Western Australia. *Bur. Min. Resour. Aust. Rec.* 1963/2. (unpubl.).

SKWARKO, S. K., 1966a—Cretaceous stratigraphy and palaeontology of the Northern Territory. *Bur. Min. Resour. Aust. Bull.* 73.

SKWARKO, S. K., 1966b—Lower Cretaceous Trigoniidae from Stanwell, eastern Queensland. *Bur. Min. Resour. Aust. Bull.* 80 (in press).

SULLIVAN, C. J., and ÖPIK, A. A., 1951—Ochre deposits, Rumbalara, Northern Territory. *Bur. Min. Resour. Aust. Bull.* 8.

WELLS, A. T., 1963—Helicopter traverses in the Gibson Desert, Western Australia. *Bur. Min. Resour. Aust. Rec.* 1963/59 (unpubl.).

WHITEHOUSE, F. W., 1928—The correlation of the marine Cretaceous deposits of Australia. *Rep. Aust. Assoc. Adv. Sci.* 18, 275-280.

WHITEHOUSE, F. W., 1946—A marine early Cretaceous fauna from Stanwell (Rockhampton District). *Proc. Roy. Soc. Qld*, 57 (2), 1-15, 1 pl.




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PLATES 1—4

## PLATE 1

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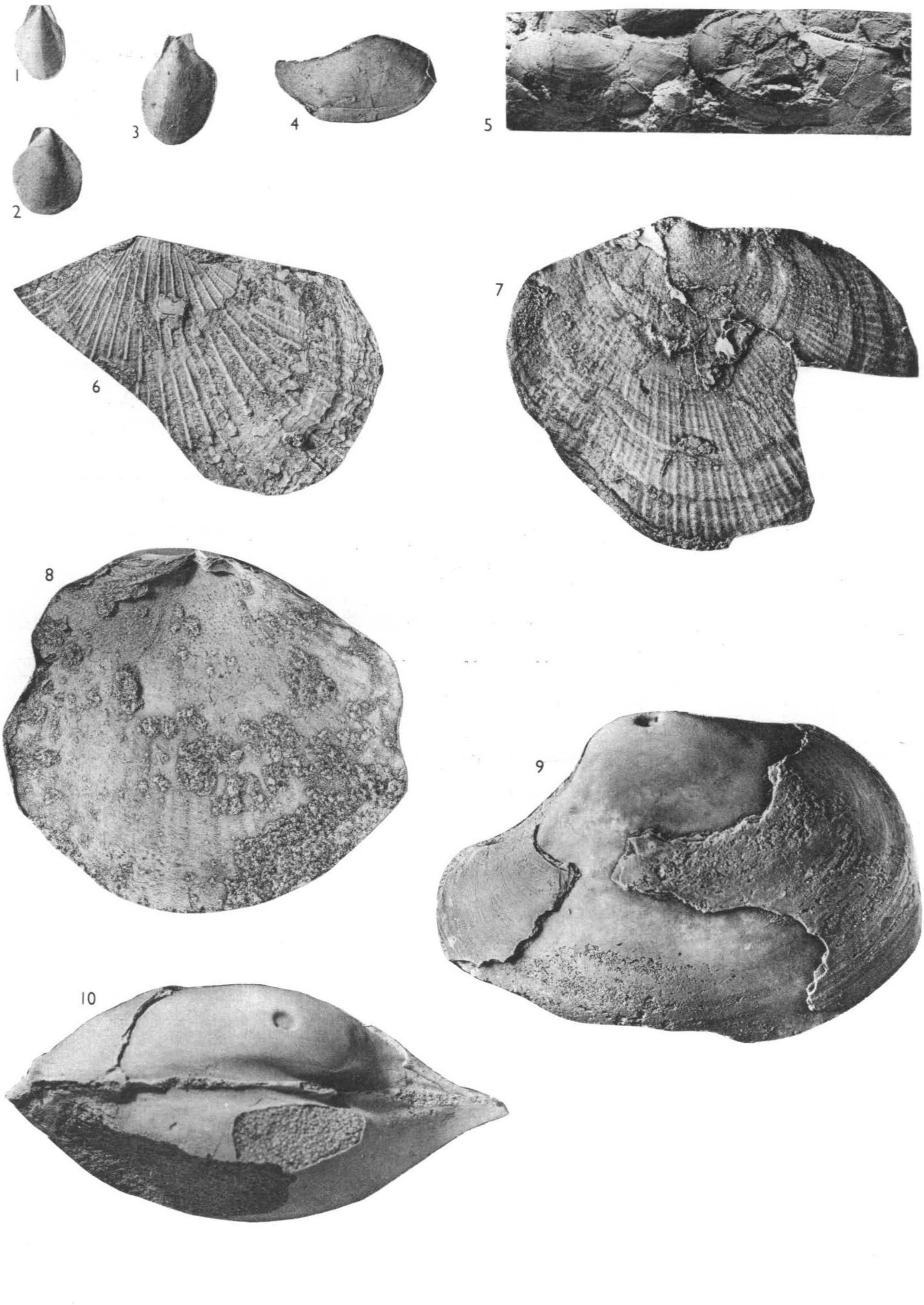
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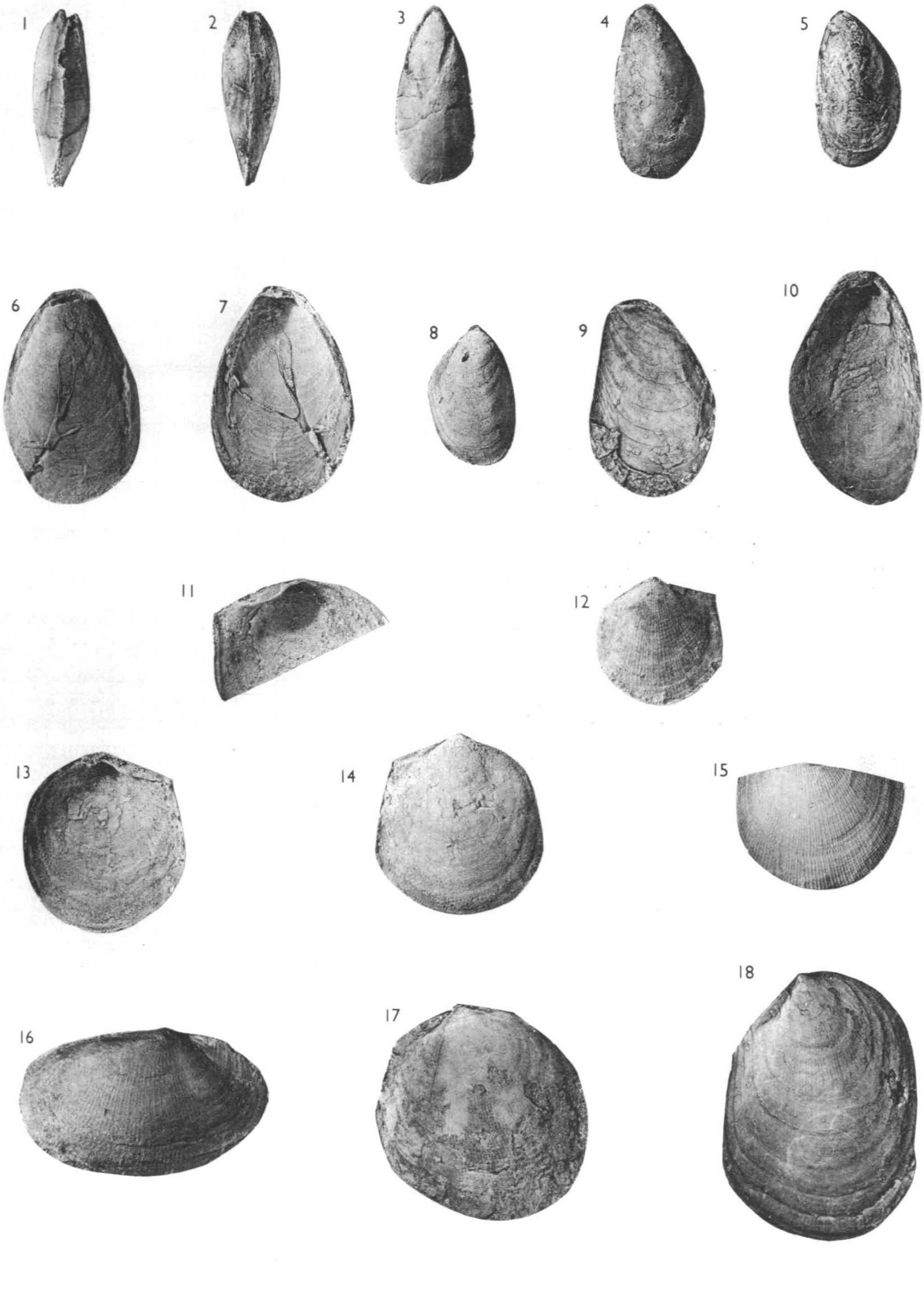
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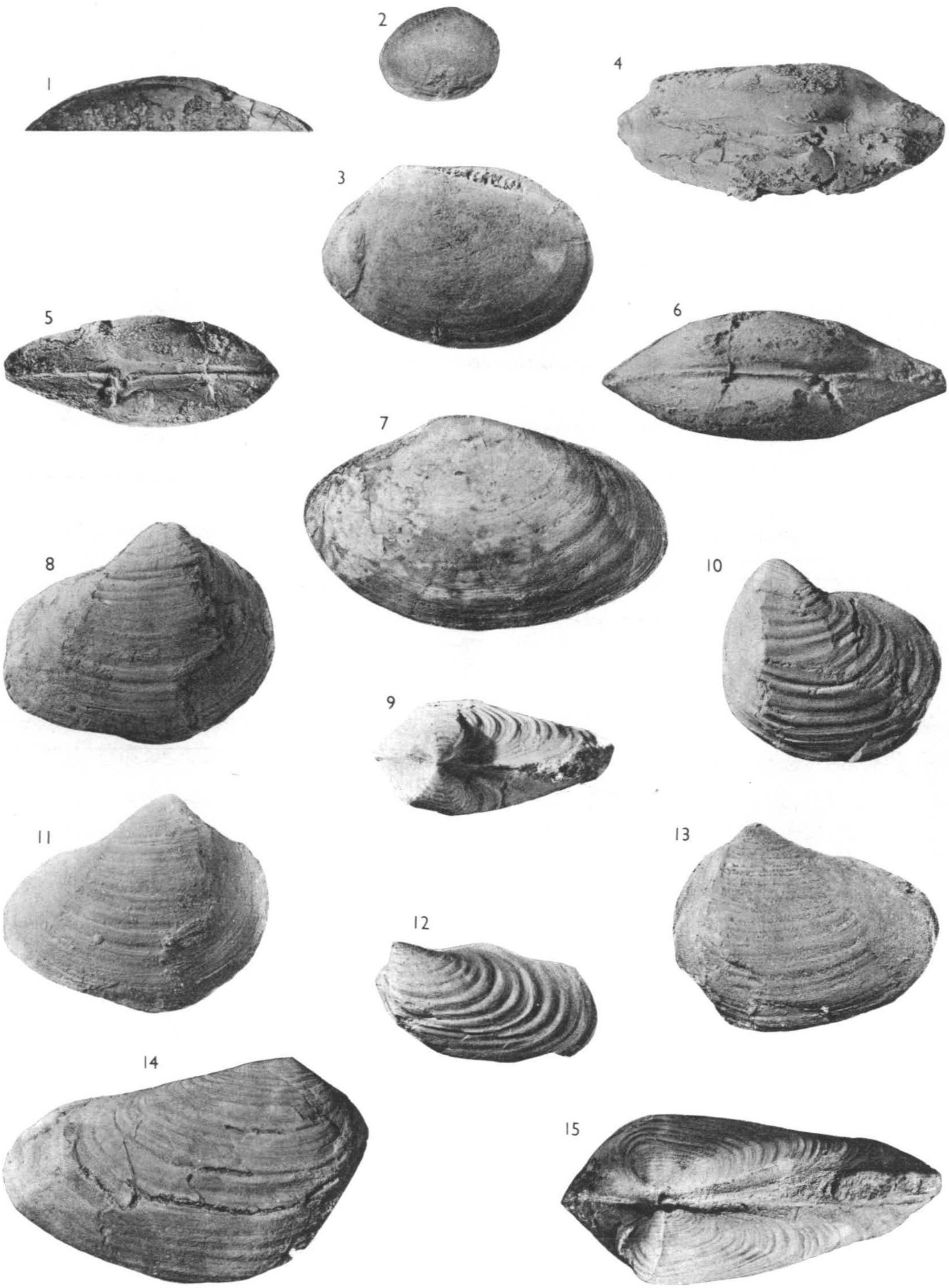
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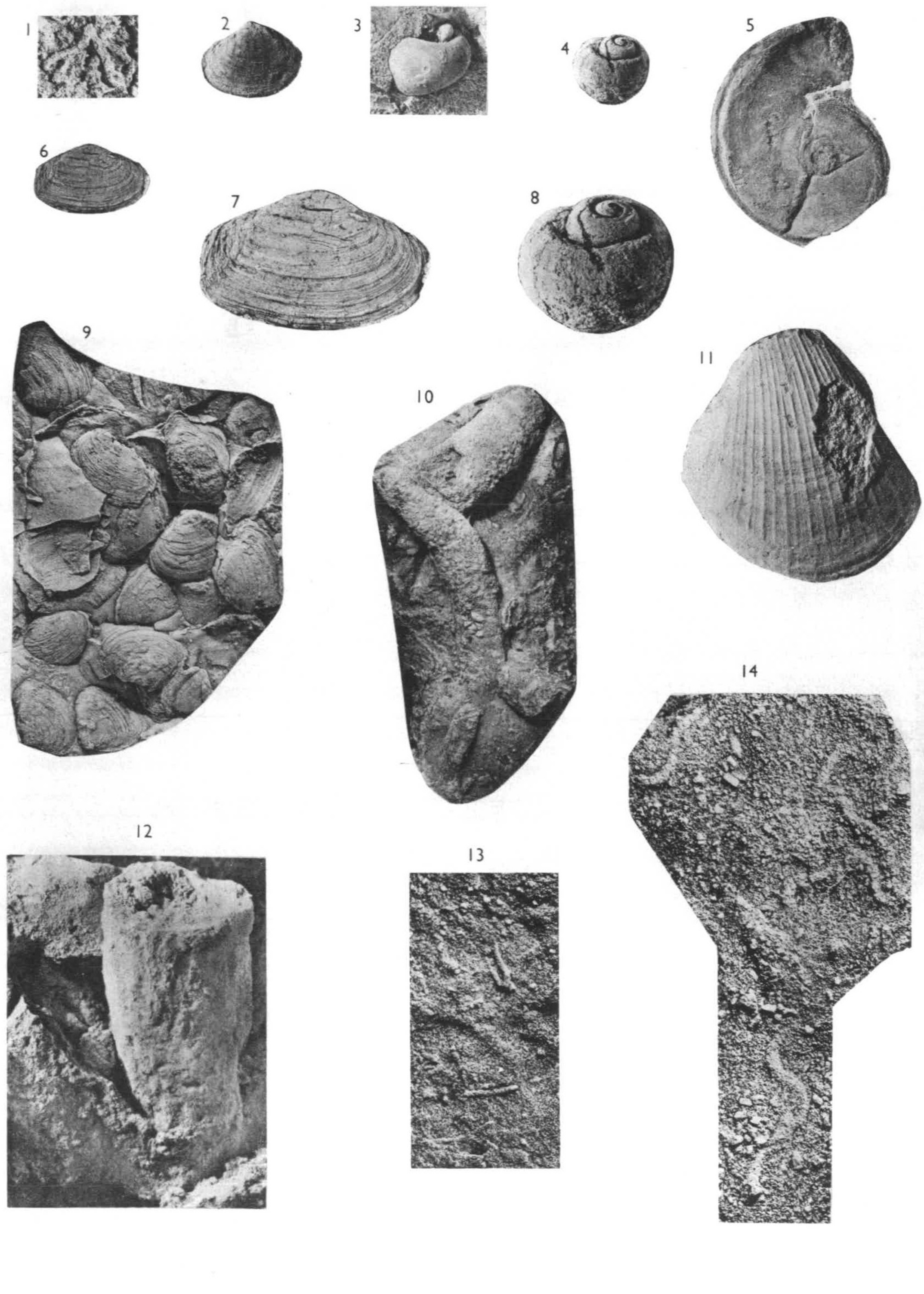
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BULLETIN No. 75

# First Upper Triassic and ?Lower Jurassic Marine Mollusca from New Guinea

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## TABLE



## FIGURES

## SUMMARY

In this paper Upper Triassic and ?Lower and Upper Jurassic marine Mollusca from the Jimi River area, Territory of New Guinea, are described. The Upper Triassic and the ?Lower Jurassic faunas are the first of those ages recorded from mainland New Guinea. Five sedimentary units are represented. Altogether 21 genera and species are described. Of these, two genera and eleven species are new and there is one new subspecies. Four forms were compared to previously described species, and the rest of the fauna is made up of forms which are determinable only at generic level.

The Jimi Greywacke is richly fossiliferous and has yielded the following new fossils: *Bakevellia* (*Maizuria*) *bundiensis*, *B.* (*M.*) *gebaliana*, *Gervillancea coxiella*, *Gervillia* (*Gervillia*) *simbaiana*, *Guineana jimiensis*, *Myophoria kuuoruensis*, *M. staggi*, *Neoschizodus? mongumensis*, *Costatoria melanesiana*, *C. melanesiana sparsicostata*, *Permophorus? hastatus*, and *Rhaphistomella? kumbrufensis*.

The complete assemblage suggests an Upper Triassic (Carnian-Norian) age for the unit.

The Kana Formation is composed of detritus derived from acid volcanics. It is stratigraphically higher than the Jimi Greywacke and its fauna indicates an Upper Triassic age. It consists of: *Costatoria* sp. cf. *C. melanesiana* sp. nov., *Rhaphistomella? kumbrufensis* sp. nov., and *Spiriferina* sp. cf. *S. abichi* Oppel, 1914.

The Balimbu Greywacke is probably Lower Jurassic (Sinemurian-Pliensbachian), as shown by the presence of *Paltechioceras?* sp. and *Tropidoceras?* sp. Some indeterminable brachiopods and carbonized wood were also found.

The Mongum Volcanics are basaltic marine volcanics which have yielded some indeterminable pelecypods. They lie between the Lower Jurassic Balimbu Greywacke and the Upper Jurassic Maril Shale.

The Maril Shale is of Upper Jurassic (Kimmeridgian) age, indicated by *Malayomaorica malayomaorica* (Krumbeck, 1923) and *Inoceramus* sp. cf. *I. haasti* Hochstetter, 1864.

## INTRODUCTION

TRIASSIC strata are found on the island of Misool, west of New Guinea, where the presence of almost 7000 feet of richly fossiliferous shallow-water marine sediments of Carnian-Norian age has been known for a considerable time (Krijnen, 1931).

On the mainland of New Guinea, however, Triassic strata have been mapped in the past only in Central New Guinea Province, West Irian. There the red and mottled clastics of the partly terrestrial Tipoema Formation and the oolitic dolomites of the Brug Formation rest conformably on the Permo-Carboniferous Aifam Formation and are in turn overlain conformably by Jurassic strata. Hitherto the Tipoema and Brug Formations have yielded no fossils (Visser & Hermes, 1962 p. 126).

The Triassic fauna described here is, therefore, the first to be recorded from the mainland and as such fills a gap in our knowledge of the marine sedimentary succession.

The fossils described were collected during the regional survey of the Bismarck Mountains, Central Highlands, Territory of New Guinea, by the Bureau of Mineral Resources in 1961 and 1962. D. B. Dow (1962) made a small collection of Triassic fossils during a reconnaissance in 1961, and in 1962 Dow and F. E. Dekker (Dow & Dekker, 1964), mapped the area systematically and collected the bulk of the material.

Fossils are preserved with their shells intact or as casts and moulds in the enclosing sediments. Although the rocks on the whole appear quite undisturbed by tectonism, some shells are slightly crushed or distorted.

Internal or external impressions were treated with latex solution to regain the original appearance of the shell; in some cases remnants of shell were first dissolved away in dilute hydrochloric acid. Shells preserved whole in greywacke were generally difficult to free from the indurated matrix by mechanical means, though portions of some specimens were exposed by painstaking work. The most satisfactory results were, however, obtained by dissolving out the shell with acid and then making a latex mould of the cast. This method was particularly successful in exposing impressions of hinges which could not be freed for examination in any other way. Both the latex casts and the specimens were coated with ammonium chloride before being photographed.

## ACKNOWLEDGEMENTS

The late Dr L. R. Cox of the British Museum (Natural History) made some progress in reading the manuscript of this paper before his untimely death terminated his work. I wish to express deep appreciation of his assistance, and to pay homage to a great student of palaeontology.

## AGES OF THE COLLECTIONS

### TRIASSIC: JIMI GREYWACKE AND KANA FORMATION

The Jimi Greywacke is a medium-bedded and medium-grained highly indurated grey, blue, or brown greywacke with thin interbeds of shale and siltstone. It is overlain conformably by the Kana Formation, but its relationship with the older rocks is not known as its base is obscured. The greatest measured thickness of the Jimi Greywacke is 2500 feet (Dow & Dekker, 1964).

Triassic fossils were found by Dow (1962) in several localities along the Jimi River (see Fig. 5), and are listed in Table 2. The composite fossil list for the Jimi Greywacke is as follows:

*Nuculana* sp. cf. *N. semicrenulata* (Trechmann, 1918).
*Bakevellia* (*Maizuria*) *bundiensis* sp. nov.
*Bakevellia* (*Maizuria*) *gebaliana* sp. nov.
*Gervillancea coxiella* gen. nov. et sp. nov.
*Gervillia* (*Gervillia*) *simbaiana* sp. nov.
*Ostrea* sp.
*Mytilus?* sp.
*Guineana jimiensis* gen. nov. et sp. nov.
*Myophoria kuuoruensis* sp. nov.
*Myophoria staggi* sp. nov.
*Neoschizodus? mongumensis* sp. nov.
*Costatoria melanesiana* sp. nov.
*Costatoria melanesiana sparsicostata* sp. nov.
*Myophoriopis?* sp.
*Permophorus? hastatus* sp. nov.
*Rhaphistomella? kumbrufensis* sp. nov.
*Sirenites* sp. cf. *S. malayicus* Welter, 1914
*Spiriferina* sp. cf. *S. abichi* Oppel, 1865
*Rhynchonella* sp. cf. *R. mutabilis* Stoliczka

All but four of the forms listed above are either new species or forms determined only at generic level. Other species found, such as *G. coxiella, G.* (*G.*) *simbaiana, Mytilus?* sp., *G. jimiensis,* and *Myophoriopis?* sp., have also little or no value in dating the assemblage. However, the presence of Myophoriidae places the assemblage in the Triassic, and it would seem that the occurrence of such large forms as *C. melanesiana* is usually associated with sediments of Upper rather than Lower Triassic (L. R. Cox, pers. comm.). Most of the remaining forms are similarly indicative of the Upper Triassic: *N. semicrenulata* occurs in upper Carnian strata in New Zealand (Marwick, 1953); *Maizuria,* a recently established subgenus of *Bakevellia,* is hitherto known only from Upper Triassic and Lower Jurassic sediments (Nakazawa, 1959); *Permophorus* is limited to late Triassic sediments—particularly those of Carnian age (Nakazawa, 1955)—while *Rhaphistomella* has a wider range (Middle to Upper Triassic); *Sirenites* and its subgenera occur only in rocks of Carnian-Norian age. Finally, *S. abichi* is a widespread Norian form (Hudson & Jefferies, 1961).

Evidence for the Carnian-Norian age of the Jimi Greywacke would seem, therefore, to be strong, and this is the age here assigned to the unit.

The Kana Formation, which unconformably overlies the Jimi Greywacke, is a shallow-water marine unit at least 2000 feet thick, consisting mainly of feldspathic arenite and tuffaceous siltstone. The base of the formation is formed either of dacite conglomerate or of a transition zone 300 feet thick made up of dark micaceous greywacke and siltstone. The Lower Jurassic Balimbu Greywacke unconformably overlies the Kana Formation (Dow & Dekker, 1964).

TABLE 2: DISTRIBUTION OF FOSSILS IN COLLECTIONS FROM THE JIMI GREYWACKE AND THE KANA FORMATION

| Genera and Species | Jimi Greywacke | | | | | | | | | | | Kana Formation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M26 | M29 | H157 | H176 | H185 | H199 | H200 | H574 | H575 | H607 | H782 | H590 |
| PELECYPODA— | | | | | | | | | | | | |
| *Nuculana* sp. cf. *N. semicrenulata* | | | x | x | | | | | | | | |
| *Bakevellia* (*Maizuria*) *bundiensis* | | | x | | | | | | x | | ? | |
| *Bakevellia* (*Maizuria*) *gebaliana* | | | | x | | | | | | | | |
| *Gervillancea coxiella* | x | | | | | | | | | | | |
| *Gervillia* (*Gervillia*) *simbaiana* | | | | x | x | | x | | | | | |
| *Ostrea* sp. | x | | | | | | | | | | | |
| *Mytilus?* sp. | | | | | x | | | | | | | |
| *Guineana jimiensis* | | | | | | | | | | | x | |
| *Myophoria kuuoruensis* | | | | | | | x | | | | | |
| *Myophoria staggi* | | | x | | | | | | | | x | |
| *Neoschizodus? mongumensis* | | | x | | | | | | | | x | |
| *Costatoria melanesiana* | x | x | x | x | | x | | x | | | x | cf. |
| *Costatoria melanesiana sparsicostata* | x | | | | | | | | | | | |
| *Myophoriopis?* sp. | | | | | x | | | | | | | |
| *Permophorus? hastatus* | | | x | | x | | | | x | | | |
| GASTROPODA— | | | | | | | | | | | | |
| *Rhaphistomella? kumbrufensis* | x | x | | | | x | | x | x | | | x |
| CEPHALOPODA— | | | | | | | | | | | | |
| *Sirenites* sp. cf. *S. malayicus* | | | | | | | | | | x | | |
| BRACHIOPODA— | | | | | | | | | | | | |
| *Rhynchonella* sp. cf. *R. mutabilis* | x | x | | | | | | | | | | |
| *Spiriferina* sp. cf. *S. abichi* | | | | x | | | | ? | x | | | x |

The Kana Formation is poor in fossils. The single fossiliferous locality in this unit yielded:

*Costatoria* sp. cf. *C. melanesiana* sp. nov.
*Rhaphistomella? kumbrufensis* sp. nov.
*Spiriferina* sp. cf. *S. abichi Oppel,* 1865

All three forms occur in the underlying Jimi Greywacke, so the two units cannot be separated on palaeontological grounds. The Kana Formation is younger than Jimi Greywacke, but still Upper Triassic.

JURASSIC: BALIMBU GREYWACKE, MONGUM VOLCANICS, and MARIL SHALE

The Balimbu Greywacke overlies the Kana Formation unconformably and is in turn conformably overlain by Mongum Volcanics. It consists of at least 950 feet of black to grey calcareous greywacke and interbedded dark siltstone (Dow & Dekker, 1964). Fossils were found at four localities, and consist of some indeterminate brachiopods, carbonized wood fragments, and two genera of ammonites, *Paltechioceras?* sp. and *Tropidoceras?* sp. *Paltechioceras* occurs in the upper Sinemurian strata of Europe and North America, while *Tropidoceras* is found in lower Pliensbachian beds of Europe, North Africa, Anatolia, and Indonesia. Because of unfavourable preservation, the generic determination of these ammonites is not definite. Though limited, this is the first probable Lower Jurassic marine macrofauna to be reported from New Guinea.

The Mongum Volcanics are composed of 850 feet of basic submarine volcanics such as pillow lavas and basalt, as well as pebble and cobble conglomerate. They conformably overlie the ?Lower Jurassic Balimbu Greywacke and are in turn overlain, also conformably, by the Upper Jurassic Maril Shale, so that their age must be at least in part Middle Jurassic. Fossils were found in the pebble conglomerate at a single locality but were too poorly preserved for identification.

The Maril Shale consists of up to 3000 feet of fine-grained thin-bedded grey shale and greywacke. Fossils are abundant at one of the two localities where they were collected. They are somewhat distorted by tectonism. Two species are represented:

*Malayomaorica malayomaorica* (Krumbeck, 1923)
*Inoceramus* sp. cf. *I. haasti* Hochstetter, 1863

The age of the Maril Shale is thus Kimmeridgian. The fauna of the Maril Shale has been previously described by Glaessner (1945), who dated it as Upper Jurassic (possibly Callovian to Tithonian). The Maril Shale is unconformably overlain by the Kondaku Tuff, a marine deposit, which is Lower Cretaceous, probably Aptian—Albian in age (Edwards & Glaessner, 1951).

## LISTS OF FOSSILS BY AGES AND LOCALITIES

### TRIASSIC

*Jimi Greywacke (Carnian-Norian)*

*M26:* 5 miles north-east from Tabibuga. Collected by D. B. Dow, September 1962.
*Gervillancea coxiella* sp. nov.
*Ostrea* sp.
*Costatoria melanesiana* sp. nov.
*Costatoria melanesiana sparsicostata* subsp. nov.

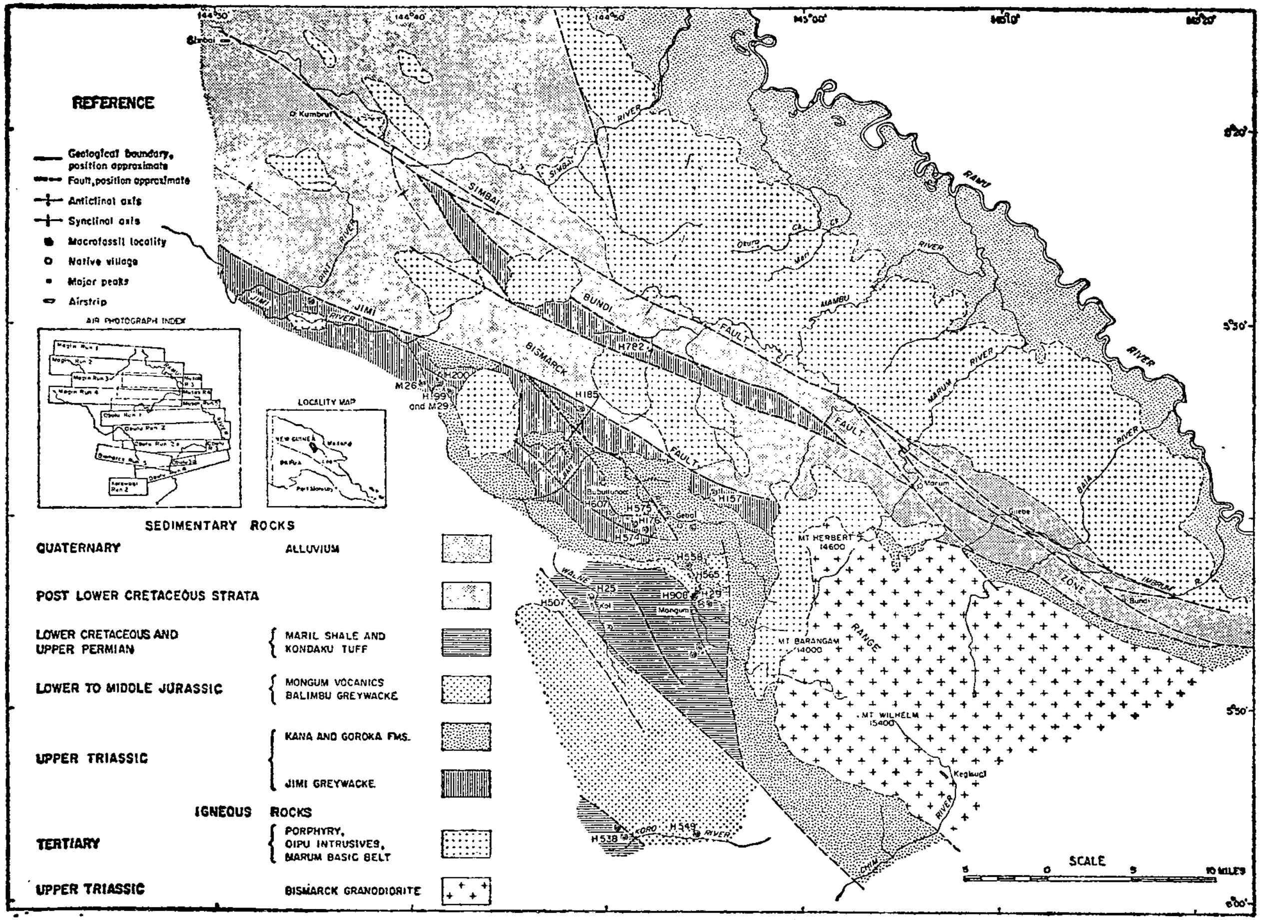

Fig. 5. Simplified geological map of the Jimi River area showing fossil localities.

*Rhaphistomella? kumbrufensis* sp. nov.
*Rhynchonella* sp. cf. *R. mutabilis* Stoliczka
*Dentalium* sp. indet.

*M29:* 5 miles east of Tabibuga. Collected by D. B. Dow, September 1962.
*Costatoria melanesiana* sp. nov.
Pelecypod indet.
*Permophorus? hastatus* sp. nov.
*Rhaphistomella? kumbrufensis* sp. nov.
*Rhynchonella* sp. cf *R. mutabilis* Stoliczka

*H157:* 3 miles north-east of Gebal. Obulu Run 2 Photo 5017. Collected by D. B. Dow, September 1962.
*Nuculana* sp. cf *N. semicrenulata* (Trechmann, 1918)
*Bakevellia (Maizuria) bundiensis* sp. nov.
*Myophoria staggi* sp. nov.
*Neoschizodus? mongumensis* sp. nov.
*Costatoria melanesiana* sp. nov.

*H176:* 3 miles west of Gebal. Obulu Run 2 Photo 5019. Collected by D. B. Dow, September 1962.
*Nuculana* sp. cf. *N. semicrenulata* (Trechmann, 1918)
*Gervillia (Gervillia) simbaiana* sp. nov.
*Costatoria melanesiana* sp. nov.
*Permophorus? hastatus* sp. nov.
*Spiriferina* sp. cf. *S. abichi* Oppel, 1865.

*H185:* 12 miles east of Tabibuga. Obulu Run 1 Photo 5047. Collected by D. B. Dow, September 1962.
*Gervillia (Gervillia) simbaiana* sp. nov.
*Mytilus?* sp.
*Myophoriopis?* sp.

*H199:* 5 miles east-north-east of Tabibuga. Collected by D. B. Dow, September 1962.
*Costatoria melanesiana* sp. nov.
*Raphistomella? kumbrufensis* sp. nov.

*H200:* 4.5 miles north-east of Tabibuga. Collected by D. B. Dow, September 1962.
*Gervillia (Gervillia) simbaiana* sp. nov.
*Myophoria kuuoruensis* sp. nov.

***H574:*** Between Gebal and Bubultunga. Obulu Run 2a Photo 5059. Collected by F. E. Dekker, August 1962.
*Costatoria melanesiana* sp. nov.
*Rhaphistomella? kumbrufensis* sp. nov.
*?Spiriferina* sp. cf. *S. abichi* Oppel, 1865

*H575:* Between Gebal and Bubultunga. Obulu Run 2a Photo 5059. Collected by F. E. Dekker, August 1962.
*Bakevellia (Maizuria) bundiensis* sp. nov.
*Permophorus? hastatus* sp. nov.
*Rhaphistomella? kumbrufensis* sp. nov.
*Spiriferina* sp. cf. *S. abichi*, Oppel, 1865

*H607:* 1.5 miles south of Bubultunga. Obulu Run 2 Photo 5019. Collected by F. E. Dekker, August 1962.
*Sirenites* sp. cf. *S. malayicus* Welter, 1914

***H782:*** Bombu Creek. Musak Run 5 Photo 5037. Collected by F. E. Dekker, September 1962.
*?Bakevellia bundiensis* sp. nov.
*Guineana jimiensis* gen. nov. et sp. nov.
*Myophoria staggi* sp. nov.
*Neoschizodus? mongumensis* sp. nov.
*Costatoria melanesiana* sp. nov.
*Costatoria* sp. indet.

*Kana Formation (Carnian-Norian)*

*H590:* Kana River. 0.5 miles north-east of Gebal. Obulu Run 2a Photo 5057. Collected by F. E. Dekker, August 1962.

*Costatoria* sp. cf. *C. melanesiana* sp. nov.
*Rhaphistomella? kumbrufensis* sp. nov.
*Spiriferina* sp. cf. *S. abichi* Oppel, 1865
*Dentalium* sp.

JURASSIC

*Balimbu Greywacke (Sinemurian-Pliensbachian)*

*H29:* 1.5 miles north of Mongum. Obulu Run 2a Photo 5058. Collected by D. B. Dow, August 1962.

Brachiopoda indet.

*H549:* Koro River headwaters. Kerowagi Run 2 Photo 5129. Collected by F. E. Dekker, July 1962.

*Paltechioceras?* sp.

*H558:* 2.5 miles north of Mongum. Obulu Run 3 Photo 5126. Collected by F. E. Dekker, July 1962.

*Tropidoceras?* sp.

*H565:* 2 miles north of Mongum. Obulu Run 3 Photo 5126. Collected by F. E. Dekker, July 1962.

Carbonized wood fragments

*Mongum Volcanics (?Middle Jurassic)*

*H908:* 1 mile north of Mongum. Obulu Run 2a Photo 5058. Collected by R. Horne, July 1962.

Pelecypoda indet.

*Maril Shale (Kimmeridgian)*

*H25:* 1 mile north of Kol. Bismarck Run 5 Photo 5153. Collected by D. B. Dow, September 1962.

Pelecypoda indet.

*H538:* Koro River. Kerowagi Run 2 Photo 5129. Collected by F. E. Dekker, July 1962.

*Malayomaorica malayomaorica* (Krumbeck, 1923)
*Inoceramus* sp. cf. *I. haasti* Hochstetter, 1863
*Inoceramus* sp. juv.

## REGIONAL SETTING

New Guinea, with New Caledonia and New Zealand, was peripheral to the Tasmantia landmass in Triassic time. Particularly in New Caledonia, and to a lesser extent in New Zealand, the westernmost Triassic sediments are near-shore, richly fossiliferous, shallow-water deposits, while eastwards they become deeper-water and eventually geosynclinal greywackes poor in fossils. In both groups of islands the Triassic succession is well developed, the Lower, Middle, and Upper Triassic being present, with their faunas.

Whereas Tasmantia was situated to the west of New Caledonia and New Zealand, it seems to have been south of New Guinea (Avias, 1953) as no Triassic sediments have been found south of the area mapped. The richly fossiliferous Jimi Greywacke and the less fossiliferous Kana Formation are both clearly shallow-water sediments. Their limited surface outcrop does not allow determination of the source of detritus in Triassic time through study of facies changes. However, Triassic sediments are absent about 20 miles south of the Jimi River, where Upper Jurassic sediments rest unconformably on Permian and older rocks (D. B. Dow, pers. comm.), suggesting a margin of the Triassic sea. Although as many as twelve collections were taken from a total of 4500 feet of sediment, the timespan represented by them is probably short relative to the complete Triassic sequence—possibly no more than a portion of a stage. The horizon may be equivalent to that at which Myophoriidae are most abundant in the New Zealand Otamitan (Carnian) stage, but the kind of fossils found in the Jimi Greywacke, and the nature of the assemblage as a whole, do not in fact justify regional correlation.

The surprising aspect of the New Guinea Triassic fossils is the conspicuous lack of species in common with New Caledonia and New Zealand, especially when it is remembered that a number of similarities on specific level exist between New Caledonia and New Zealand. This would imply that the New Guinea assemblage is mainly an endemic one. Possibly a more active faunal exchange took place with areas to the west and north-west.

Although it is suspected that the overall development of the Trias in New Guinea is probably no smaller than in the islands to the south, the probability of extending the Triassic column here through further surface exploration is not very promising. This is because of the extensive cover of Tertiary sediments overlying the older strata which are only exposed in a few places where they have been uplifted by block faulting (D. B. Dow, pers. comm.).

## SYSTEMATIC DESCRIPTIONS

### Triassic Fossils

Class PELECYPODA

Family NUCULANIDAE

Genus Nuculana Link, 1807

Nuculana sp. cf. N. semicrenulata (Trechmann, 1918)

(Pl. 5, fig. 1, 2; Text-fig. 6)

1918 *Leda semicrenulata* Trechmann, *Quart. J. geol. Soc. Lond.*, 73(3), 191, pl. 21, fig. 20.

1953 *Nuculana semicrenulata* (Trechmann); Marwick, *N.Z. geol. Surv. palaeont. Bull.* 21, 48, pl. 3, fig. 17.

*Material:* One complete and one incomplete external impression of a left valve; one incomplete external impression of a right valve; one incomplete internal impression of a left valve.

*Description:* The shell is about 16 mm long and 10 mm high, well inflated in the front, strongly inequilateral, rostrate at the back. The umbo is broad, low, and strongly opisthogyrous.

The inflation is greatest in the anterior portion of the shell and decreases rapidly posteriorly with increasing attenuation of the valve, and dorsally towards the umbo. The posterior cardinal and ventral margins approach each other at an acute angle, but the part of the periphery where they meet is sharply rounded.

Ornamentation consists of about 30 subconcentric and concentric riblets which are somewhat wavy and whose curvature increases ventrally. A number of riblets terminate on or before reaching the attenuated portion of the shell.

The escutcheon is concave and apparently not striated. Dentition consists of up to twelve taxodont teeth, six on each side of the umbo.

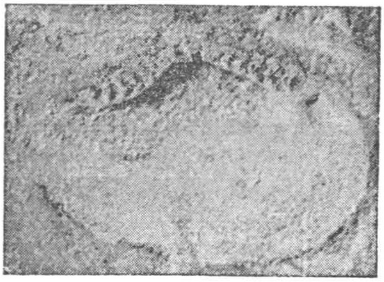

**Fig. 6. *Nuculana* sp.cf. *N.semicrenulata* (Trechmann, 1918). Internal cast of a left valve. CPC 5053. Pl. 5, fig. 2. x4.**

*Discussion:* Trechmann's 'two or three' specimens of *N. semicrenulata* which came from Otamitan (upper Carnian) strata of South Island of New Zealand were not well preserved, and in his bulletin, Marwick (1953) merely reproduces Trechmann's figure. Comparison of our specimens with the original description and figure shows a close resemblance between the two.

*Occurrence and age:* Localities H157, H176, Jimi Greywacke. Carnian-Norian.

### Family BAKEVELLIIDAE

### Genus BAKEVELLIA King, 1848

*Type species: Avicula binneyi* Brown, 1841

*A. binneyi* takes precedence over *A. antiqua* Munster, 1848, as the type species of *Bakevellia* King (L. R. Cox, pers. comm.).

### Subgenus MAIZURIA Nakazawa, 1959

*Type species: Bakevellia (Maizuria) kambei* Nakazawa, 1959.

### BAKEVELLIA (MAIZURIA) BUNDIENSIS sp. nov.

(Pl. 5, figs 15, 17, 18)

*Material:* One internal and one external impression of the left valve; two internal impressions of the right valve; some fragmentary material.

*Holotype:* CPC 5065 (Pl. 5, figs 17, 18). An internal mould of a distally incomplete right valve.

*Diagnosis:* Dentition of the right valve consists of three cardinal teeth followed posteriorly by numerous transversely oriented teeth which are followed in turn by three lateral teeth. The anterior wing is acute and the posterior wing obtuse; both are prominent but not large. There seem to be at least two ill defined ligament pits, the larger of the two directly beneath the anteriorly situated umbo.

*Description:* The shell is probably no more than 5 cm high and 8 cm long. It is bialate, moderately inflated and very inequilateral, being produced strongly in the posteroventral direction. The umbo is weakly inflated, obtusely angular, situated at the anterior quarter of the cardinal margin, its anterior and posterior ridges rapidly fading away distally.

The cardinal margin is straight or very slightly convex. The anterior wing is short but prominent because of its acute shape and sigmoidally curved front margin. Directly below it the shell margin is concave for a small distance, but soon takes on an evenly and gently convex shape. The posterior wing is obtuse. Distally its rear margin curves around poster oventrally and then downwards resulting in a sigmoidally shaped posterior margin. The posteroventral margin is probably sharply rounded.

The outside of the shell is striated with irregular growth-lines and growth-rugae. The maximum shell inflation is along the postumbonal line of convexity.

Only two deep and narrow muscle pits beneath the umbo are preserved on available specimens. They are probably scars of the pedal retractor and the vestigial anterior adductor muscles.

There does not seem to be a clearly marked ligament plate along the cardinal margin, but there are two ill defined elongate depressions, which have probably housed ligament attachments between the cardinal margin and the cardinal teeth. The front one, the larger of the two, extends on to the hinge-plate, reducing the size of the transverse teeth.

Dentition of the mature right valve consists of three large cardinal teeth followed posteriorly by seventeen other transverse teeth which are somewhat irregular in size and spacing. Generally, the largest teeth are in the front portion of the hinge and they decrease in size posteriorly. The cardinal and succeeding transverse teeth are followed in the rear portion of the hinge-plate by three or perhaps four elongate lateral teeth, the most dorsal of which is parallel to the cardinal margin. The remaining laterals are oriented obliquely to the cardinal margin.

*Discussion:* In 1940 Cox restricted *Gervillia* Defrance, 1820, to those Mesozoic forms which resemble most closely the genotype *G. solenoides* Eudes-Deslongchamps and which are characterized by the peculiar shape of the shell, extreme reduction of the anterior wing, considerable width and high position of the byssal gape, and the rostrum which tends to be developed below the gape. He separated these into two subgenera on the basis of hinge structure, grouping the ancestral ones in the subgenus *Cultriopsis,* possessing one cardinal and one to four lateral teeth, and the younger ones in *Gervillia* s. str. He went on to suggest that all the remaining *Pteria*-like 'Gervillias' should be referred to *Bakevellia* King, 1848. According to Cox, only *Bakevellia* s. str. with its unstable hinge structure occurs in the Trias, while two different groups occur in the Jurassic. Dentition of the first group, which included *'G.' hartmanni* Goldfuss, consists of numerous transverse crenulations in addition to the cardinal teeth, and the name proposed to include these was *Augileria* White, 1887, a subgenus of *Bakevellia.* Most of the remaining Jurassic 'Gervillias' were grouped by Cox in the subgenus *Gervillella.*

On the basis of this subdivision both *bundiensis* and *gebaliana* (see below) would be included in *Bakevellia* s. str. More recently, however, Nakazawa restricted *Bakevellia* s. str. to the Permian forms possessing a relatively large anterior muscle scar, whose '. . . Hinge consists of one or a few cardinal teeth anterior to the beak, and one or two lateral teeth nearly parallel to the hinge margin' (Nakazawa, 1959, p. 198). He separated a subgenus *Maizuria,* which is '. . . characterized by one or two broad, transversely crenulated teeth and sockets posterior to one or two linear or subtrigonal cardinal teeth. These cardinals are separated from the subhorizontal laterals or connected with numerous denticles between them. Sometimes the cardinals are differentiated into a series of denticles (anterior denticles) making pseudotaxodont teeth together with the laterals and posterior denticles (or crenulation of cardinal margin)' (op. cit., p. 201).

It would seem on the basis of this subdivision and definition that both *bundiensis* and *gebaliana* should be placed with *Maizuria* Nakazawa, 1959, which is limited in distribution to Upper Triassic and Lower Jurassic.

*Occurrence and age:* Localities H157 and H575, Jimi Greywacke. Carnian-Norian.

### BAKEVELLIA (MAIZURIA) GEBALIANA sp. nov.

(Pl. 5, fig. 12)

*Material:* One internal impression of a left valve.

*Holotype:* CPC 5061 (Pl. 5, fig. 12) as above.

*Diagnosis:* The clearly defined ligament plate, which is wider than the hinge-plate, carries only one ligament pit. The cardinal margin is short. A single robust oblique cardinal tooth is followed by transverse teeth and probably two laterals. The shell maintains a constant breadth for about two-thirds of the distance from the cardinal to the ventral margin. The wings are inconspicuous.

*Comparison with other species: B.(M.) gebaliana* sp. nov. can be distinguished from *B.(M.) bundiensis* sp. nov. by its shorter cardinal margin, less conspicuous wings, and centrally situated umbo. Combination of similar features with others listed under the diagnosis distinguish the new species from previously described forms.

*Description:* The shell is moderately inflated, suboval in outline, measuring 4.3 cm both in length and in height. The umbo is prosogyrous, pointed, but its bordering ridges become rapidly obsolete even a short distance from the cardinal margin, which it slightly overhangs. The cardinal margin is straight and short, only 2.3 cm long.

The anterior wing is acute and pointed, but like the obtuse posterior wing only slightly developed. The anterior shell margin is gently curved, with convexity increasing distally and greatest at the posteroventral portion of the shell margin. The posterior shell margin is sigmoidally curved, with the concave part close to the cardinal margin. The shell maintains a constant breadth for three-quarters of the distance from the cardinal to the ventral margin, when it narrows rapidly.

The ligament plate is broad and clearly defined, but with only a single obliquely inclined pit situated just a little behind the umbo.

The hinge-plate is narrower than the ligament plate. It is occupied by a single, very robust, oblique cardinal tooth followed by short transverse teeth which spread out on both sides of the umbo and are inclined away from it, and by one or two



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diagonal teeth along the rear portion of the hinge-plate. In the only specimen available the ligament pit extends on to the hinge-plate, reducing the total number of transverse teeth to eight.

The pallial line is punctate and clearly defined for most of its length. It joins the posterior adductor muscle scar, which is small and oval, with the vestigial narrow and deep anterior adductor scar under the front portion of the hinge-plate. The similarly shaped pit after the retractor pedis is situated slightly behind the anterior adductor scar.

*Occurrence and age:* Locality H176. Jimi Greywacke. Carnian-Norian.

### Genus GERVILLANCEA nov.

*Type species: Gervillancea coxiella* sp. nov. from the Upper Triassic of New Guinea.

*Diagnosis:* Most shell margins are complexly flexed. The cardinal margin is straight, but the hinge is twisted about a longitudinal axis. It is extended to the front of the umbo by the greatly developed lance-shaped anterior wing. The umbo has a median depression. It curves over the hinge and encloses the umbo of the right valve, which in its proximal portion is concave outwards. The margins of the left valve overlap those of the smaller right valve. Cardinal teeth are situated beneath the umbo on a robust cardinal process.

*Comparison with other genera:* The prominent anterior wing of *Gervillancea* nov. as well as other morphological features such as the position and nature of the umbonal furrow distinguish the new genus from such related forms as *Reubenia* Cox, 1924, *Hoernesia* Laube, 1865, *Cassianella* Beyrich, and *Lilangina* Diener, 1908. On the other hand *Gervillella* Waagen, 1907, can be distinguished from the new genus by the simplicity of its commissural plane and by the straight ventral margin of the anterior wing.

The genus most closely resembling *Gervillancea* nov. is *Gervillaria* Cox, 1954. Its hinge-plate is not, however, twisted along its longitudinal axis and consequently the whole of its right valve is convex outwards and lacks the invaginated umbo of the new genus. Radial ribbing on the immature left valve, as well as the ventral development of the anterior wing, in *Gervillaria* find no counterpart in the new genus.

### GERVILLANCEA COXIELLA gen. nov. et sp. nov.

(Pl. 7, figs 1-10; text-fig. 7)

*Material:* Numerous specimens of the bivalve, and very incomplete external and internal impressions of the left valve.

*Holotype:* CPC 5087 (Pl. 7, fig. 6). Proximal portion of the left valve.

*Paratypes:* CPC 5083 (Pl. 7, fig. 1) shows the dentition and musculature of the right valve; CPC 5084 (Pl. 7, fig. 2) shows the outside appearance of the anterior ear and of the umbo of the left valve; CPC 5086 (Pl. 7, fig. 4) illustrates the nature of the dentition immediately below the umbo of the left valve; CPC 5089 (Pl. 7, fig. 7) shows the nature of dentition on the posterior portion of the hinge of the left valve; CPC 5090 (Pl. 7, fig. 8) shows the ornament of the left valve; CPC 5092 (Pl. 7, fig. 10) shows the nature of the musculature on the left valve.

*Diagnosis:* The left valve is twisted about its vertical axis. The umbonal ridge is conspicuous and is preceded by an umbonal depression. The anterior wing of the left valve is unusually long and attenuated. To the rear of the prosogyrous umbo the hinge-plate is twisted about its longitudinal axis until its posterior extremity is at right angles to the plane of the hinge-plate in front of the umbo. This brings about pronounced incurving of the right valve and strong invagination of the right valve umbo, while the remaining portion of this valve is flat or slightly convex.

*Description:* The shell is bialate, strongly asymmetrical and inequivalve, with the margins of the left valve overlapping those of the right valve.

The left valve is convex but weakly inflated, very asymmetrical, and twisted in a complex manner about its vertical axis. It is produced in a posteroventral direction.

The cardinal margin of the left valve is straight but twisted about its longitudinal axis—which extends through the dorsal edge of the cardinal margin—and its length is greatly increased in front of the shell by an extreme development of the anterior wing (Pl. 7, fig. 6). The anterior wing is at least 6 cm long in mature specimens. It grows out of the anterior portion of the umbo, where it is about 1.2 cm thick in mature specimens, and tapers evenly and gradually forward to within about 0.6 cm from its anterior end, then rapidly to a pointed extremity (Pl. 7, fig. 5).

The umbo is prosogyrous and incurved over the hinge-plate. It is narrow, sharply pointed, and well defined proximally; it widens rapidly at first, then more gradually with increasing distance from the cardinal margin. Its anterior margin is indistinct as it merges into the anterior shell margin, but its posterior margin is maintained as a well defined postumbonal ridge for almost the entire length of the shell.

The umbonal ridge marks the area of greatest convexity of the valve, but is preceded by a shallow antecarinal depression which is prominent only in the umbonal region. The convexity of the valve decreases very rapidly behind the umbonal carina, particularly near the umbo, but only gradually to the front of the shell.

The posterior shell margin is sigmoidally curved, its sharply concave portion being located near the top of the shell at the junction with the dorsal margin, where the small posterior ear is located. The posteroventral shell margin is convex; the anterior shell margin is broadly and evenly arched.

On the cardinal area of the left valve there are about 15 subcircular or circular ligament pits, the deepest one situated beneath the umbo (Pl. 7, fig. 6). Transverse cardinal teeth are present only beneath the umbo, on an anterior portion of the hinge ledge, which originates directly beneath the umbo where it is thickest, and where it has a form of a robust globular cardinal process (Pl. 7, fig. 4). In mature specimens oblique lateral teeth are present along the entire length of the posterior wing. The hinge ledge decreases in breadth to the rear of the umbo at first, but again becomes wide and prominent close to the end of the posterior wing.

Musculature of the left valve is not very well known. The posterior adductor scar is situated some distance below the posterior ear (Pl. 7, figs 7, 10). It is large, measuring about 1.6 by 1.2 cm, and oval. The exact point of departure of the pallial line from the posterior adductor scar was not observed. Once separated from it, it parallels first the central and then the anterior periphery of the shell to near and beneath the cardinal process, where it joins the deeper and slightly larger of the two small but deep muscle impressions (Pl. 7, fig. 4). This larger muscle scar probably marks the attachment of the vestigial anterior adductor muscle.

The structure of the right valve is not known entirely. It is smaller than the left valve, with its margins probably overlapped by those of the left valve, and most of its exterior surface is flat or concave outwards. Its overall shape is at least in part governed by the complexly flexed commissure. The umbo is narrow and strongly invaginated to fit into the convex umbo of the left valve.

Both valves are ornamented with incremental lines and rugae only.

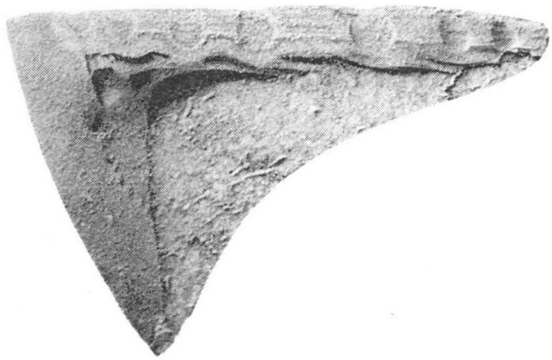

**Fig. 7. *Gervillancea coxiella* gen. nov. et sp. nov. Latex cast of an incomplete internal impression of a proximal portion of a right valve. CPC 5083. Pl. 7, fig.1. x2.**

Right valve dentition corresponds closely to that of the left valve and consists of ligament pits as well as of oblique longitudinal teeth (Fig. 7). Transverse teeth below the umbo were not observed, but this may be owing to the state of preservation.

The character of the right valve musculature is known only on the posterior, proximal portion of the umbo. It consists of a punctate pallial line which joins the deepest of the three muscle scars which are situated at or near the junction of posterior portion of the hinge shelf and the umbo (Fig. 7).

*Occurrence and age:* Locality M26. Jimi Greywacke. Carnian-Norian.

Genus GERVILLIA Defrance, 1820

*Type species: Gervillia solenoides* Defrance, 1820

GERVILLIA s. str.

GERVILLIA (GERVILLIA) SIMBAIANA sp. nov.

(Pl. 5, figs 7-11)

*Material:* Numerous fragmental and complete left and right valves and bivalve specimens. Three incomplete internal impressions of the right valve and two of the left valve.

*Holotypes:* CPC 5057 (Pl. 5, figs 7, 9), a distally incomplete internal impression of a left valve.

*Paratypes:* CPC 5058 (Pl. 5, fig. 8), an incomplete internal impression of the right valve; CPC 5059 (Pl. 1, fig. 10), a distally incomplete bivalve; CPC 5060 (Pl. 5, fig. 11), a proximally incomplete right valve.

*Diagnosis:* The shell is produced negligibly to the front but very strongly towards the rear, with only a very small ventral component. The anterior wing is lacking. The dorsal portion of the hinge-plate is occupied by three subcircular or elongate ligament pits, while its ventral portion contains about 18 short transverse teeth behind a single cardinal tooth and in front of at least two elongate lateral teeth on each valve.

*Comparison with other species: G. nepangensis* and *G. rugosa* Healey, 1908, from the Nepang Beds of Upper Burma have a similar orientation to that of the new species, but they are longer and more slender forms with a smaller posterior ear and a more attenuated anterior portion of the shell. *G. rugosa* has been also reported from Upper Triassic beds of Sumatra (Krumbeck, 1914). Probably the closest ally of the new species hitherto described is *G. wagneri* Winkler, 1861, from the Upper Keuper beds of the Bavarian Alps. The new species has, however, a somewhat shorter wing and more attenuated posterior extremity; also it has transverse cardinal teeth beneath the umbo.

*Description:* The shell is up to 5 cm long and 1.5 cm high. It is equivalve, very inequilateral, and produced strongly posteriorly with only a very small ventral growth component. The umbo is pointed and narrow, but broadens very rapidly, and its bordering ridges quickly become ill defined. Neither the umbo nor the rest of the shell is well inflated.

The cardinal margin is straight for most of its length, but slopes downward at its distal extremity where it forms the posterior wing margin. An anterior wing is lacking, but the posterior wing is prominent and well developed. The anterior shell margin is evenly rounded, its convexity decreasing ventrally. The whole ventral margin is broadly and evenly arched and meets the posterior portion of the dorsal margin in a sharply rounded acute extremity.

The hinge-plate is up to 5 mm wide. Its dorsal portion is occupied by three subrounded or rectangular ligament pits, the most anterior of which is directly beneath the umbo. Ligament pits are separated from each other by flat portions of the hinge-plate, which are from two and a half to four times as wide as the pits. Teeth occupy the lower portion of the hinge-plate. The dentition consists of about 18 short transverse or slightly oblique teeth near and beneath the umbo, directly behind a single robust cardinal tooth. They are usually oriented in a posteroventral direction and are subparallel to each other. The most anterior ligament pit may be produced downwards, displacing or obscuring the transverse teeth. Two elongate oblique teeth are present on both valves behind the transverse teeth.

The posterior adductor muscle scar is up to 4 mm long and 4.5 mm high. It is subcircular in shape with its anterior periphery less convex than its posterior periphery. The pallial line departs from the anteroventral portion of the posterior adductor scar ventrally and then continues to the front of the shell parallel to the ventral margin and at some distance from it. It meets the lower of the two tubular



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narrow muscles which occupy a position beneath the hinge-plate under the umbo. This muscle is probably a degenerate anterior adductor muscle, while the dorsal one is the adductor pedis.

*Discussion:* The generic name *Gervillia* Defrance, 1820, which was once applied to a wide variety of species possessing a basically similar dentition but differing greatly from each other in external appearance, was restricted by Cox (1940) on the basis of general shell morphology to include only the narrow ensiform group of species. In addition Cox divided the restricted *Gervillia* into two subgenera, basing his subdivision on the hinge characters. Subgenus *Cultriopsis* Cossmann, 1904, has a single transverse cardinal tooth in the anterior portion of the hinge and two or three short lamelliform laterals in the posterior portion of the hinge (Cox, 1946). *Cultriopsis* is an Upper Triassic and Lower Jurassic form and its dentition was regarded by Cox as ancestral to that of the Jurassic-Cretaceous *Gervillia* s. str., which consists of numerous closely set lamellar transverse teeth anterior to one or two elongate lateral teeth.

The specimens from New Guinea which are described above must, because of their peculiar pseudotaxodont dentition, be placed in *Gervillia* s. str., thus extending back the range of this subgenus to Carnian-Norian. *Cultriopsis* was elevated to generic level by Ichikawa (1954), and *Angustella,* which was synonymized with *Cultriopsis* by Cox (1940), was made its subgenus. The oldest known occurrence of the primitively hinged *Angustella* is from the Ladinian of the Southern Alps (Ichikawa, 1954), so that in spite of the New Guinea discovery it is still possible, and very likely, that the dentition of *Cultriopsis* and *Angustella* is parental to that of *Gervillia* s. str. as suggested by Cox.

*Occurrence and age:* Localities H176, H185 and H200. Jimi Greywacke. Carnian-Norian.

### Family OSTREIDAE

### Genus OSTREA Linn., 1758

*Type species: Ostrea edulis* Linn., 1758

### OSTREA sp.

(Pl. 5, fig. 13)

Oysters make their first appearance, but are rare, in the Triassic. The New Guinea Triassic oysters are thus of particular interest, especially as they most probably represent a species hitherto undescribed.

The dozen or so specimens are all from locality M26, and are found attached to the inside surface of left valves of *Gervillancea coxiella* sp. nov. In their obviously gregarious habit and irregularity of shape, they clearly do not differ from oysters of later epochs. They are small, the largest specimen being only 17 mm in its greatest dimension. Their structure is simple: each oyster consists of a flat area of attachment surrounded by protruding sides which are from 2 to 5 mm high. No hinge apparatus is discernible, and no specimens of the free valves have been found. These are thought to be simple lids. The external appearance of this species of *Ostrea* is not known.

## Family MYTILIDAE

### Genus MYTILUS Linn., 1758

*Type species: Mytilus edulis* Linn., 1758

MYTILUS? sp.

(Pl. 5, fig. 16)

A single small specimen, which is here illustrated for the sake of completeness of faunal presentation, externally resembles *Mytilus*. Its internal structure is not known. The specimen was collected from the Jimi Greywacke at locality H185.

## Family TRIGONIIDAE

### Subfamily TRIGONIINAE Kobayashi, 1954 em.

### Genus GUINEANA nov.

*Type species: Guineana jimiensis* gen. nov. et sp. nov. from the Upper Triassic of New Guinea.

*Diagnosis:* The general outline of the shell is somewhat variable. The umbo is prosogyrous. A concentrically ribbed flank is separated from the radially ribbed area by a prominent, broadly convex carina which has a shallow and narrow antecarinal depression in front of it. The dentition is of the type found in Trigoniidae.

*Other included species: Trigonia postera* Quenstedt, 1857, from Rhaetic beds of Europe; *Myophoria emmerichii* Winkler, 1859, from the Rhaetic beds of Europe and possibly Upper Burma; *M. micrasiatica* Bittner, 1891, from Triassic strata of Balia; and *M. alta* Gabb, 1864, from the Norian beds of the United States; all have external morphological features in common with the newly established genus, and should be included in *Guineana* gen. nov. if their hinges are similar to that of the new genus.

*Comparison with other genera: Guineana* gen. nov. shares with *Trigonia* s. str. the concentrically ribbed flank, distinct marginal carina, and radially ribbed area, but the distinguishing features of the new genus—its prosogyrous umbo and a posteriorly produced subrostrate shape—distinguish it from *Trigonia.*

In overall shape *Guineana* gen. nov. resembles *Nototrigonia* Cox, 1952, but its sulcus is poorly developed, its flank is larger and its area is wider than are usual in the Nototrigoniinae. Umbones are invariably opisthogyrous in Nototrigoniinae, whereas they are prosogyrous in *Guineana.*

The recently described *Praegonia* Fleming, 1962, from the Ladinian of New Zealand, has a similar hinge to that in *Guineana,* and similarly ornamented flank and area, but differs in its overall shape, lack of sulcus, and lack of a prominent marginal carina.

*Lyriomyophoria* was erected by Kobayashi in 1954 to accommodate concentrically ribbed myophoriids. Its type species is *Myophoria elegans* Dunker, 1849, a small form with concentrically ribbed flank, a prominent marginal carina, and a flat broad area divided into two parts by a conspicuous radial groove and ornamented with concentric riblets. The past placing of *M. emmerichii, M. micrasiatica* and *M. alta* in *Lyriomyophoria* by the British palaeontologists (L. R. Cox, pers. comm.) would thus seem to be not justified, as these species have radially ribbed areas. This is irrespective of whether these species possess myophoriid or trigoniid hinges.

### GUINEANA JIMIENSIS gen. nov. et sp. nov.

(Pl. 6, figs 1-8; text-fig. 8)

*Material:* Numerous but mostly brittle and fragmentary specimens, and internal and external impressions of both valves. The shell material is preserved in many specimens, but is difficult to free from matrix.

*Holotype:* CPC 5067 (Pl. 6, fig. 2) shows the external appearance of the left valve.

*Paratypes:* CPC 5069 (Pl. 6, fig. 4) is an anteriorly incomplete external impression of a right valve; CPC 5070 (Pl. 6, figs 5, 6) shows the internal structure of a left valve; CPC 5071 (Pl. 6, fig. 7) shows internal structure of a right valve.

*Diagnosis:* The flank is large in relation to the remainder of the shell surface, and ornamented with fine but conspicuous and numerous concentric riblets which transgress the narrow antecarinal depression and extend on to the distinct but rounded marginal carina. The area is moderately broad, lined with up to 12 fine radial riblets which are separated into two groups by a wide interspace. An elevator pedis muscle scar is present on the left valve (Text-fig. 8).

*Comparison with other species:* The new species can be distinguished externally from the closely related *G. alta* (Gabb, 1864), *G. emmerichii* (Winkler, 1859) and *G. postera* (Quenstedt, 1857) mainly by a somewhat greater length-to-breadth ratio, but also by the detail of ribbing and marginal carina.

*G. micrasiatica* (Bittner, 1891) is perhaps the closest in external appearance to the new species, but its marginal carina is sharply triangular in cross section, not rounded as in *G. jimiensis,* and its concentric riblets become conspicuous in the portion of the shell occupied by the sulcus and marginal carina, but reappear on the area.

*Myophoria germanica* Hohenstein, 1913, lacks radial ribbing on its concentrically striated area.

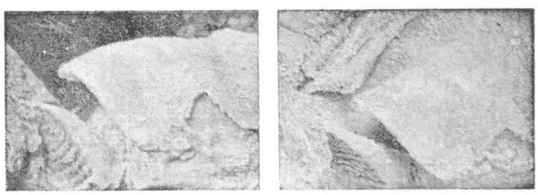

**Fig. 8.** ***Guineana jimiensis*** **gen. nov. et sp. nov. Internal cast of a left valve showing the small projection after elevator pedis on the tip of the umbo. a: anterior view, b: lateral view. CPC 5136. xl**

*Description:* The shell is up to 3 cm long and 2 cm high, produced anteriorly and much more strongly posteriorly, subrostrate, equivalve, inflated. The umbo is well defined, prosogyrous. The flank is relatively large, ornamented with numerous closely spaced fine concentric riblets which extend backwards over the narrow sulcus and marginal carina. The sulcus is narrow and shallow throughout its length but widens slightly distally. The marginal carina is prominent, rounded in cross-section, simple, transversely striated with continuation of flank costae. The area is moderately broad, ornamented with faint concentric growth-lines and up to 12 more prominent radial striae, which are separated into two equal groups by a wider interspace. The escutcheon carina is simple and not conspicuous. The escutcheon is narrow and striated only with growth lines.

Dentition is of the type characterizing the Trigoniidae, with 3a and 3b on the right valve striated, widely divergent, and without a linking hinge-plate. The elevator pedis muscle pit is present on the left valve (fig. 8).

*Occurrence and age:* Locality H782. Jimi Greywacke. Carnian-Norian.

## Family MYOPHORIIDAE

### Genus MYOPHORIA Bronn, 1837 partim Cox, 1951

*Type species: Myophoria vulgaris* (Schlotheim, 1820)

### MYOPHORA KUUORUENSIS sp. nov.

(Pl. 6, figs 9-12)

*Material:* One complete and three incomplete left valves; one almost complete and two incomplete right valves; one internal impression of the left valve and one incomplete internal impression of the right valve.

*Holotype:* CPC 5074 (Pl. 6, figs 10, 11) shows external morphology of the left valve.

*Paratypes:* CPC 5073 (Pl. 6, fig. 9) shows internal structure of the left valve; CPC 5075 (Pl. 6, fig. 12) shows external morphology of the right valve.

*Diagnosis:* The diagnostic feature of the new species is the combination of a radially ribbed strongly carinate left valve with a sulcate right valve devoid of radial ribbing. Both valves lack radial ribbing on the area, but have moderately prominent growth-lines.

*Comparison with other species:* The right valve of *M. vulgaris* Schlotheim from the Upper Muschelkalk strata of Germany closely resembles the right valve of *M. kuuorensis* sp. nov., but the radial riblets on the left valve of the New Guinea species are not found on the German shell.

*Description:* A mature shell is about 3.3 cm long and 3.0 cm high. It is subrhomboidal in shape, inequivalve, strongly inflated, carinate, with prosogyrous umbo. The flank of the left valve is ornamented with up to nine narrow almost linear radiating riblets which are separated from each other by flat portions of the surface, and is striated with conspicuous concentric growth-lines. The area of the left valve is strongly offset from the flank along the marginal carina, and steeply inclined to the commissure. It is striated with growth-lines and devoid of radial lineation apart from a single median groove. A simple escutcheon carina separates the area from a narrow escutcheon which is striated with growth-lines.

Dentition on the left valve consists of a prominent but unstriated 2, separated from smaller but similarly triangular 4a and 4b by moderately deep sockets.

The right valve is striated with growth-lines and is devoid of radial ribbing. Its flank is large and consists of a rather narrow 'disc' and a fairly broad weakly depressed sulcus. The only radial lineation on the right valve is a weak cardinal ridge and another more conspicuous ridge which marks the anterior border of the shallow wide sulcus. The area of the right valve is similar to that of the left valve.

*Remarks:* The generic name *Myophoria* as used here is *Myophoria* s. str. and corresponds to Waagen's (1907) group of *M. laevigata* and subgroup of *M. kefersteini,* both of which Waagen included in his subgeneric name *Tropiphora.*

*Occurrence and age:* Locality H200. Jimi Greywacke. Carnian-Norian.

### MYOPHORIA STAGGI sp. nov.

(Pl. 6, figs 13-16)

*Material:* Two almost complete and five incomplete external impressions of the left valve; one impression of most proximal portion of a left valve.

*Holotype:* CPC 5079 (Pl. 6, fig. 16) shows the external structure of the left valve.

*Paratype:* CPC 5078 (Pl. 6, fig. 15) shows the dentition on the left valve.

*Diagnosis:* The flank is striated with about 14 thin, diverging, somewhat uneven but usually closely spaced radial riblets which gradually increase in breadth distally. These riblets are rare on the anterior portion of the shell, and in most specimens are confined to near the umbo. The area is smooth except for a single radial median groove, and growth striae and growth rugae which persist from the flank. On the left valve 2 and 4a are of about the same size and of similar inclination to the cardinal margin. 4b is long and thin.

*Comparison with other species: M. staggi* sp. nov. can be distinguished from the previously described forms by the close spacing of the flank costae and by the type of dentition.

*Description:* The shell is about 3 cm long and 2.8 cm high. It is subquadrate, carinate but not very strongly inflated. The umbo is prosogyrous, narrow, well defined, incurved. The flank slopes forward towards the commissure; it is weakly inflated and occupies a limited surface area. It is ornamented with radial riblets and concentric growth-rugae and striae.

The riblets are thin but prominent and increase distally in thickness very gradually. They are round in cross-section and may be limited to the proximal portion of the shell, or alternatively may persist to the ventral shell margin. They are absent from or are rare on the anterior portion of the flank. The spacing of these riblets is close but not very even. The interspaces, which broaden distally, are striated with growth-lines.

Growth-rugae are prominent on the flank and persist, together with growth-lines, on to the area.

The area is broad, strongly offset from the flank and sloping steeply to the commissure. It is devoid of radial lineation apart from a radial median groove, but is striated with growth-rugae and numerous growth-lines which persist from the flank. A prominent simple ridge, the marginal carina, separates area from flank.

The escutcheon carina is weak and inconspicuous. The escutcheon itself is narrow and unstriated except for growth-lines.

On the left valve 4a is almost of the same size as 2, and the two teeth are inclined at the same angle to the cardinal margin. 4b is prominent, long and thin.

*Occurrence and age:* Localities H157 and H782. Jimi Greywacke. Carnian-Norian.

### Genus NEOSCHIZODUS Giebel, 1855

*Type species: Lyrodon laevigatus* Goldfuss.

In Moore's Treatise on Invertebrate Palaeontology (MS) Cox regards *Leviconcha* as subjective synonym of *Neoschizodus* Giebel, 1855 (Type species *Lyrodon laevigatus* Goldfuss)

#### NEOSCHIZODUS? MONGUMENSIS sp. nov.

(Pl. 6, figs 17-19)

*Material:* Two impressions of a left valve, one internal and the other external. One external impression of the right valve.

*Holotype:* CPC 5081 (Pl. 6, fig. 18) shows the external appearance of the right valve.

*Paratypes:* CPC 5066 (Pl. 6, fig. 17) and CPC 5068 (Pl. 6, fig. 19) show the external and internal aspects of the left valve.

*Diagnosis:* The shell is subtrigonal in outline, produced to the rear. Its surface is smooth except for very fine concentric growth-lines. The marginal carina is broad and ill defined, and the sulcus is shallow and narrow.

*Description:* The shell is up to 3.5 cm long and 3 cm high. It is moderately well inflated, produced to the rear much more than to the front, with prosogyrous and well defined umbones. It is equivalve. The umbo is acute and well defined proximally, but its bordering ridges rapidly become broad and indistinct. The flank is relatively large and separated from the area by a broad and ill defined marginal carina which is preceded by a shallow and poorly developed antecarinal depression. The area is relatively narrow and slopes steeply into the commissure. It is crossed concentrically by fine striae which parallel the periphery of the shell.

On the left valve 2 and 4a are almost of the same size, 2 being only slightly larger. 2 is inclined a little more steeply to the cardinal margin than 4a. 4b is indistinct and close to the posterodorsal portion of the cardinal margin.

*Occurrence and age:* Localities H157 and H782. Jimi Greywacke. Carnian-Norian.

### Genus COSTATORIA Waagen, 1907

*Type species: Donax costatus* Zenker, 1833

#### COSTATORIA MELANESIANA sp. nov.

(Pl. 8, figs 1-7; Pl. 9, figs 2, 4, 5; text-fig. 9)

*Material:* Numerous external and internal impressions of both valves. In some specimens a varying amount of the original shell material is still preserved.

*Holotype:* CPC 5096 (Pl. 8, figs 4, 6). Specimen of a bivalve with both valves in position, with some of the shell material still attached.

*Paratypes:* CPC 5095 (Pl. 8, fig. 3) shows the internal structure of the right valve; CPC 5097 (Pl. 8, figs 5, 7) shows the internal structure of the left valve; CPC 5101 (Pl. 8, fig. 4) shows the structure of the area.

*Diagnosis:* The shell is large for the genus, pyriform to ovate, its entire surface covered with radial costae. There is a marked variation in the distribution and nature of ribs in individuals. The antecarinal sulcus is broad and shallow in some specimens, inconspicuous in others. Radial costae which occupy the sulcus are invariably thinner than the flank costae. The marginal carina is very prominent and protruding in its proximal portion, but less prominent distally; in some specimens it tends to be altogether inconspicuous away from the umbo. The area is lined with thin but closely and regularly spaced radial riblets. Growth-lines are very regular and prominent on the whole surface of the shell. The hinge is myophoriid. A pedal retractor muscle pit is present on the left valve. The posteroventral portion of the internal shell margin is crenulated.

*Comparison with other species:* Of the previously described forms, *Costatoria inequicostata* (Klipstein) resembles the new species most closely. This similarity is seen particularly in the type of ribbing on the flank and in the imbricating growth-bands on the whole shell surface. The only illustrations of *C. inequicostata* available to me are those of Newton (1900), from the Malayan Peninsula, and that of a single fragment from Timor, which was illustrated by Krumbeck (1924) as *Myophoria* sp. indet. cf. *M. inequicostata.* Both specimens, which are of the same size, are much smaller than the New Guinea form. They seem to be produced to the front more than to the rear, and are readily distinguishable from young specimens of *C. melanesiana.*

*Myophoria shoshonensis* from the Upper Carnian strata of Nevada (Silberling, 1959) is a more equilateral shell, and its radial ribbing is absent not only from its area but also from the proximal portion of the antecarinal depression.

*Description:* The shell is large for the genus, mature specimens measuring no less than 5 cm in height and 6 cm in length. It is pyriform to ovate, produced strongly to the rear but very little anteriorly. It is well inflated and carinate to a varying degree. The umbo is prosogyrous and located in the extreme front portion of the shell.

The entire surface of the shell is covered with radiating ribs of varying thickness and uneven distribution and with regular prominent and characteristically imbricating growth-bands. The irregularity of spacing and thickness of ribs varies from one specimen to another. On the flank, i.e. in front of the marginal carina, two sets of ribs can be discerned in most specimens; those which occupy the front portion of the flank are robust, straight or slightly curved, flat-topped, and separated from each other by concave interspaces only slightly wider than the ribs; the others, immediately in front of the marginal carina, are thinner and much more attenuated. The sulcus in front of the carina is a rather shallow and not very wide depression which varies in prominence in different specimens. There may be any number from one to five attenuated ribs in the sulcus.

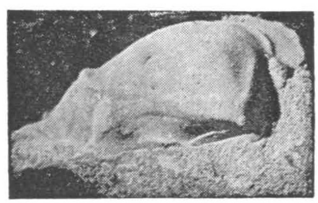

**Fig. 9.** ***Costatoria melanesiana*** **sp.nov. Dorsal view of an internal cast of a left valve with a small projection after adductor pedis on the tip of the umbo. CPC 5093. xl.**

The marginal carina is prominent in its proximal extremity but becomes less conspicuous with increasing distance from the umbo. The area slopes steeply to the commissure. It is striated by over a dozen thin closely and regularly spaced radial riblets which start at the umbo and cover the entire length of the area. There is a tendency in some specimens for the areal costae to thicken greatly, but this is regarded as an aberrant feature. The escutcheon carina is inconspicuous, and the escutcheon is narrow and lined with weak radial costae.

The growth-lines are unusually prominent and wide. The hinge is typically myophoriid, as is the internal shell structure. A pedal retractor muscle pit is present on the left valve. The posteroventral portion of the inside of the shell is deeply and conspicuously crenulated.

*Occurrence and age:* Localities M26, M29, H157, H176, H199, H172, H574, H782, Jimi Greywacke; cf. H590 Kana Formation. Carnian-Norian.

### COSTATORIA MELANESIANA SPARSICOSTATA subsp. nov.

(Pl. 9, figs 6, 8)

Several specimens from locality M26 are distinguishable from *C. melanesiana* only in the extreme thinness and much wider spacing of flank costae. I have separated these specimens from *C. melanesiana* as its subspecies, *sparsicostata* subsp. nov. The specimen illustrated on Plate 5, figure 6, was chosen as holotype for the new subspecies.

## Family ASTARTIDAE

### Genus MYOPHORIOPIS Wöhrmann, 1889

### MYOPHORIOPIS? sp.

(Pl. 5, fig. 14)

*Description:* The shell is small, measuring 1.3 cm in length and 1.1 cm in height, well inflated, carinate, and with a prosogyrous acute umbo.

The umbo is prominent and well and evenly inflated. The posterior umbonal carina continues for the entire length of the shell as a sharp ridge. Inflation of the shell decreases suddenly to the rear of the carina, and only gradually to the front of it.

The anterior shell margin is sigmoidally curved: it is concave for a short distance in its dorsal portion and regularly convex distally. Convexity of the margin decreases posteriorly so that the rear portion of the ventral margin is straight where it meets the postumbonal carina. The posterior shell margin is straight and directed posteroventrally near the umbo, but plunges downwards in a shallow arc to meet the ventral shell margin at the umbonal carina.

*Discussion:* The only specimen available, a small right valve, is probably an immature form. The nature of its hinge apparatus is not known, but in its external appearance the shell resembles *Myophoriopis* more than other Triassic pelecypods.

*Occurrence and age:* Locality H185. Jimi Greywacke. Carnian-Norian.

Family PERMOPHORIDAE

Genus PERMOPHORUS Chavan, 1954

*Type species: Arca costata* Brown, 1841

PERMOPHORUS? HASTATUS sp. nov.

(Pl. 9, figs 1, 3)

*Material:* One external impression of the right valve and three incomplete external impressions of the left valve.

*Holotype:* CPC 5099 (Pl. 9, fig. 3) shows the external aspect of the right valve.

*Paratype:* CPC 5098 (Pl. 9, fig. 1) shows some of the external morphology of the left valve and supplements the description of the species.

*Diagnosis:* The shell is elongate subtriangular in outline, ribbed with rather fine regularly spaced costae which follow the outline of the shell. Growth-rugae are common but of low relief and not very prominent.

*Description:* The shell is very inequilateral, elongate-triangular, weakly inflated, apparently equivalve, produced anteriorly and much more strongly posteriorly. The height of the shell decreases rapidly in front of the umbo, resulting in a tightly convex anterior extremity. Behind the umbo the height increases very gradually.

The posterior cardinal margin is straight. The posterior shell margin is gently and regularly convex. The ventral margin is straight or very gently convex posteriorly, increasing in convexity from beneath the umbo. The anterior cardinal margin is very gently convex. The junction of the posterior cardinal margin with the posterior margin is moderately convex, that of the posterior margin with the ventral margin closely arched, that of the ventral margin with the anterodorsal margin very closely arched.

A weak carina joins the umbo with the posteroventral corner of the shell. The umbo is angular and very obtuse.

Ornamentation is confined to concentric riblets and growth-rugae, both of which follow the outline of the shell. Riblets are closely spaced, narrow, about the same width as the interspaces and rounded in cross-section. The nature of the dentition is not known.

*Discussion:* A diligent search through the literature failed to locate a description of a species which would fit on specific level the shell just described. The generic determination presents a greater difficulty, and this is because the material available for examination is limited to external casts and gives no insight into the internal structure of the shell.

Cox (1924, pl. 2, fig.10) figured an internal cast of a right valve of *Myoconcha* aff. *goldfussi* (Dunker), from Triassic beds of Jordan Valley. This figure resembles the new species in the general outline and in the presence of a carina, but the ratio of length to height is much smaller than in *hastatus*. It is very doubtful whether the New Guinea form can be referred to *Myoconcha*.

*Taimyria* Lutkevich, 1951, from Upper Permian sediments of Western Taimir, U.S.S.R., resembles *hastatus* in the overall shape and the type of ornament, but in the Russian species the anterior portion of the shell is much less produced, and its costae have an upward arch in the midventral portion of the shell in a fashion usually associated with Modiolopsidae.

The New Guinea species was tentatively placed with *Permophorus* Chavan, 1954 (previously *Pleurophorus* King, 1844), whose external ornamentation varies considerably between individual species but which seems to resemble it most closely in outline. The true generic affinity of *hastatus* will not be known until additional material will show its internal structure. *Permophorus* is limited in distribution to the late Triassic (particularly Carnian) sediments of Japan, Siberia, and the Arctic portion of Northern America.

*Occurrence and age:* Localities M29, H176 and H575. Jimi Greywacke. Carnian-Norian.

## Class GASTROPODA

### Family EOTOMARIIDAE

### Genus RHAPHISTOMELLA Kittl, 1891

*Type species: Pleurotomaria radians* Wissmann in Münster, 1841

RHAPHISTOMELLA? KUMBRUFENSIS sp. nov.

(Pl. 5, figs 3-6; text-fig. 10)

*Material:* Numerous complete specimens enclosed in rock; several incomplete external impressions and internal casts.

*Holotype:* CPC 5056 (Pl. 5, figs 5, 6). The most complete specimen available.

*Paratype:* CPC 5055 (Pl. 5, fig. 4) shows the dorsal aspect of the shell.

*Diagnosis:* The shell is small, turbiniform, consisting of four whorls. The spire is obtuse, with one row of tubercles on the dorsal portion of all whorls. The body whorl is ornamented with three revolving lines. The umbilicus is filled with callus. The aperture is circular or slightly oval in shape.

*Description:* The shell is small, measuring less than 16 mm in breadth and 10 mm in height. It is turbiniform in shape and consists of almost 4 whorls.

The spire is obtuse, the apical angle being 110°. Its profile is broken by triangular ledges formed by a row of tubercles which is present on the dorsal portion of all the whorls. The upper surface of the ledge is made up of flattish upper margins of tubercles which depart from the suture lines.

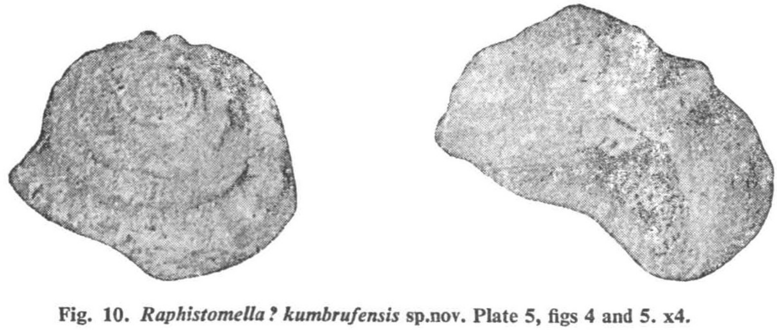

**Fig. 10. *Raphistomella? kumbrufensis* sp.nov. Plate 5, figs 4 and 5. x4.**

In addition to the row of tubercles, the body whorl is ornamented with a prominent persistent line which is situated halfway between the row of tubercles and the midcentre of the whorl. Two additional fine revolving lines occupy a central position on the whorl. A considerable portion of the body whorl ventral to the midline is striated with similar lines. The ventral portion of the body whorl is obscured with callus which completely fills up the umbilicus. The aperture is circular or slightly oval and not well preserved.

*Discussion:* It is very difficult to assign this commonly occurring species to any known genus, and it is provisionally placed with *Rhaphistomella.*

*Occurrence and age: Localities* M26, M29, H199, H574 and H575, Jimi Greywacke; H590, Kana Formation. Carnian-Norian.

### Class CEPHALOPODA

### Family TRACHYCERATIDAE

### Genus SIRENITES Mojsisovics, 1893

*Type species: Ammonites senticosus* Dittmar, 1866.

#### SIRENITES sp. cf. S. MALAYICUS Welter, 1914

(Pl. 9, fig. 7)

*Material:* A single fragment of a portion of a whorl.

*Description:* The shell is compressed, the whorl-sides flattened convex. There is a deep furrow on the venter. The ribs are sigmoidally curved, bifurcating near the ventrolateral edge, tuberculate. There seem to be six rows of tubercles ornamenting ribs. The suture was not observed on our specimen.

*Discussion:* In its overall shape and the distribution of its ribs and tubercles, as well as in the presence of a deep groove on its keel, the New Guinea specimen closely resembles *P. malayicus* Welter, 1914, which was originally dscribed from Carnian-Norian beds of Timor. In the size and density of outermost tubercles the New Guinea specimen more resembles *S. dianae* Mojsisovics, 1893, which, however, is a thicker form. The suture has not been preserved on the New Guinea specimen, which is a fragment, and it is not possible to make a definite comparison.

*Occurrence and age:* Locality H607. Jimi Greywacke. Carnian-Norian.

## JURASSIC FOSSILS

### Class PELECYPODA

### Family INOCERAMIDAE

### Genus INOCERAMUS Sowerby in Parkinson, 1818

*Type species: Inoceramus cuvieri* Sowerby in Parkinson, 1818.

#### INOCERAMUS sp. cf. I. HAASTI Hochstetter, 1864

(Pl. 10, figs 5, 6)

1945 *Inoceramus* sp.; Glaessner, *Proc. Roy. Soc. Vic.*, 56 (N.S.), Pt 2, 155.

*Material:* Two incomplete external impressions, one internal and one external impression; numerous fragmentary impressions.

*Discussion:* There is some uncertainty about the specific affinity of the abundant but somewhat fragmental and deformed Inocerami which occur associated with equally numerous specimens of *M. malayomaorica* at locality H538. Some of the specimens examined have a more slender outline than normally encountered in *I. haasti* Hochstetter, 1864, and while the spacing of ribs is broader than in *I. galoi* Boehm, 1907, another apparently related form, the number of ribs per specimen is in fact greater than encountered in the New Zealand specimens of *I. haasti.* Their association with *M. malayomaorica,* however, suggests *I. haasti,* a Kimmeridgian fossil.

### Family AVICULOPECTINIDAE

#### Genus MALAYOMAORICA Jeletzky, 1963

*Type species: Aucella malayomaorica* Krumbeck, 1923.

#### MALAYOMAORICA MALAYOMAORICA (Krumbeck, 1923)

(Pl. 10, figs 1, 3)

1911 *Aucella plicata* Zittel; Boehm, *N. Jb. Miner. Geol. Paläont.,* 1, 13, pl. 2, figs 1-4.
1923 *Aucella malayomaorica* Krumbeck, *Paläont. Timor,* 12 (12), 65, pl. 2, figs 2-12, 17, pl. 6, figs 13a, b.
1945 *Buchia malayomaorica* (Krumbeck); Glaessner, *Proc. Roy. Soc. Vic.,* 56 (2), 154, 5, pl. 6, figs 5-7.
1960 *Buchia malayomaorica* (Krumbeck); Brunnschweiler, *Bur. Min. Resour. Aust. Bull.* 59, 10, pl. 1, figs 6-8, 10-13, text-figs 5, 6.
1964 *Malayomaorica malayomaorica* (Krumbeck); Jeletzky, *Palaeontology,* 6 (1), 148-160, pl. 21.

Specimens of *M. malayomaorica* from the Maril Shale have already been figured and described by Glaessner (1945). Additional specimens collected during the recent survey are poorly preserved, and in their stead I have figured on Plate 10, figures 1, 3, two better preserved forms from locality R294 (north-facing slopes of Kubor Ranges south-west of Kami Village, 5° 52′ S., 144° 31′ E.).

## Class CEPHALOPODA

### Family ECHIOCERATIDAE

#### Genus PALTECHIOCERAS Buckman, 1924

*Type species: Paltechioceras elicitum* Buckman, 1924.

#### PALTECHIOCERAS? sp.

(Pl. 10, fig. 2)

The only specimen collected is an almost complete external side impression of a whorl whose suture is not preserved. In its numerous evolute whorls, dense ribbing, and tricarinate bisulcate venter, it seems to resemble most closely the genus *Paltechioceras* from the upper Sinemurian (middle Lower Jurassic) of Europe and North America (California and Oregon). The ribs are not, however, prorsiradiate in what seems to be the mature portion of the New Guinea specimen.

*Occurrence and age:* Locality H549. Balimbu Greywacke. Lower Jurassic (Sinemurian-Pliensbachian).

## Family POLYMORPHITIDAE

### Genus TROPIDOCERAS Hyatt, 1867

*Type species: Ammonites messeanus* d'Orbigny, 1844.

### TROPIDOCERAS? sp.

(Pl. 10, fig. 4)

The single incomplete specimen lacks a suture and is somewhat squashed, but in its overall shape and ribbing it is similar to *Tropidoceras,* which occurs in sediments of lower Pliensbachian (Lower Jurassic) age in Europe, North Africa, Anatolia, and Indonesia.

*Occurrence and age:* Locality H558. Balimbu Greywacke. Lower Jurassic (Sinemurian-Pliensbachian).

## DERIVATION OF NEW NAMES

*bundiensis* (*Bakevellia*): after the Bundi patrol post.
***coxiella*** (*Gervillancea*): after the late Dr L. R. Cox, one of the foremost British experts on Mollusca.
***gebaliana*** (*Bakevellia*): after the village of Gebal.
*Gervillancea,* f. (L. lancea, a light spear): referring to the shape of the species.
*Guineana,* f.: after New Guinea.
*hastatus* (*Permophorus*) (L. hasta, a spear): referring to the shape of the species.
*jimiensis* (*Guineana*): after Jimi River.
*kumbrufensis* (*Rhaphistomella?*): after Kumbruf Gold Prospect.
***kuuoruensis*** (*Myophoria*): after Mount Kuuoru of the Wilhelm Massif.
*melanesiana* (*Costatoria*): after Melanesia.
*mongumensis* (*Neoschizodus*): after Mongum village.
*simbaiana* (*Gervillea*): after Simbai River.
*sparsicostata* (*Costatoria melanesiana*) (L. sparsus, scattered; costa, rib): referring to the few ribs of this species.
*staggi* (*Myophoria*): after Mr N. Stagg, a pioneer explorer in the area.

## REFERENCES


AVIAS, J., 1953—Contribution à l'étude stratigraphique et paléontologique de la Nouvelle-Caledonie Centrale. *Sci. Terre,* 1 (1-2).

COX, L. R., 1924—A Triassic fauna from the Jordan Valley. *Ann. Mag. nat. Hist.* Ser. 9 (14), 52-94.

COX, L. R., 1940—Jurassic lamellibranch fauna of Kucch (Cutch). *Palaeont. indica,* 3 (3).

COX, L. R., 1946—Undescribed lamellibranch species from the English Inferior Oolite. *Proc. malac. Soc. Lond.,* 27 (1).

DOW, D. B., 1962—A geological reconnaissance of the Jimi and Simbai Rivers, T.P.N.G. *Bur. Min. Resour. Aust. Rec.* 1962/110 (unpubl.).

DOW, D. B., and DEKKER, F. E., 1964—The geology of the Bismarck Mountains, New Guinea. *Bur. Min. Resour. Aust. Rep.* 76.

EDWARDS, A. B., and GLAESSNER, M. F., 1951—Mesozoic and Tertiary sediments from the Wahgi Valley, New Guinea. *Proc. Roy. Soc. Vic.,* 64.

GLAESSNER, M. F., 1945—Mesozoic fossils from the Central Highlands of New Guinea. *Proc. Roy. Soc. Vic.,* 56.

HUDSON, R. G. S., and JEFFERIES, R. P. S., 1961—Upper Triassic brachiopods and lamellibranchs from the Oman Peninsula, Arabia. *Palaeontology,* 4 (1).

ICHIKAWA, K., 1954—Triassic Mollusca from the Arai Formation of Iwai near Itsukaichi, Tokyo Prefecture. *Jap. J. Geol. Geogr.,* 24.

KOBAYASHI, T. 1954—Studies on the Jurassic Trigonians, in Japan, Part 1, Preliminary Notes. *Jap. J. Geol. Geogr.,* 25 (1-2).

KRIJNEN, W. F., 1931—Palaeozoic and Mesozoic Gastropoda, Lamellibranchia and Scaphopoda. *Leid. geol. Meded.,* 5, 196-205.

KRUMBECK, L., 1914—Obere Trias von Sumatra. *Palaeontographica,* suppl. 4.

KRUMBECK, L., 1924—Die Brachiopoden, Lamellibranchiaten und Gastropoden der Trias von Timor: 2. *Paläont. Timor,* 13.

MARWICK, J., 1953—Division and faunas of the Hokonui System (Triassic and Jurassic). *Geol. Surv. N.Z., palaeont. Bull.* 21.

NAKAZAWA, K., 1955—A study on the pelecypod-fauna of the Upper Triassic Nabae Group in the northern part of Kyoto Prefecture, Japan, Part 3. Halobiids and others. *Mem. Coll. Sci. Univ. Kyoto Ser. B.,* 22 (2).

NAKAZAWA, K., 1959—Permian and Eo-Triassic *Bakevellias* from the Maizuru Zone, Southwest Japan. *Ibid.,* 26 (2).

NEWTON, R., 1900—On marine Triassic Lamellibranchia discovered in the Malay Peninsula. *Proc. malac. Soc. Lond.,* 4 (3).

SILBERLING, N. J., 1959—Pre-Tertiary stratigraphy and Upper Triassic palaeontology of the Union District, Shoshone Mountains, Nevada. *U.S. geol. Surv., prof. Pap.* 22.

VISSER, W. A., and HERMES, J. J., 1962—Geological results of the exploration for oil in Netherlands New Guinea. *Staarsdruk. Uitgeveribedrijf.* (1962).

WAAGEN, L., 1907—Die Lamellibranchiaten der Pachycardientuffe der Seiser Alm nebst vergleichend paläontologischen Studien. *Abh. geol. Reichsanst.,* 18 (2).

## PLATE 5

All figures natural size and photographed in lateral view unless otherwise stated.

| | PAGE |
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*Raphistomella? kumbrufensis* sp. nov. .. .. .. .. .. .. .. 65

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4. Paratype CPC 5055. Dorsal view of latex reproduction of dorsal portion of shell. Locality M26
5. **Holotype** CPC 5056. Lateral oblique view of latex cast of shell. Locality M26. X2
6. Frontal lateral view of **holotype.** Locality M26. X2

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7. **Holotype** CPC 5057. Internal cast of anterior portion of shell. Locality H200
8. Paratype CPC 5058. Latex cast of internal impression of incomplete right valve. Locality H200 X2
9. Latex cast of **holotype**
10. Paratype CPC 5059. Distally incomplete left valve. Locality H185
11. Paratype CPC 5060. Proximally incomplete right valve. Locality H200

*Bakevellia* (*Maizuria*) *gebaliana* sp. nov. .. .. .. .. .. .. .. 51

12. **Holotype** CPC 5061. Latex cast of internal impression of left valve. Locality H176

*Ostrea* sp. .. .. .. .. .. .. .. .. .. .. 56

13. Latex cast of a colony attached to inside of *G. coxiella* sp. nov. CPC 5086. Locality M26

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14. Right valve of young specimen. CPC 5063. Locality H185

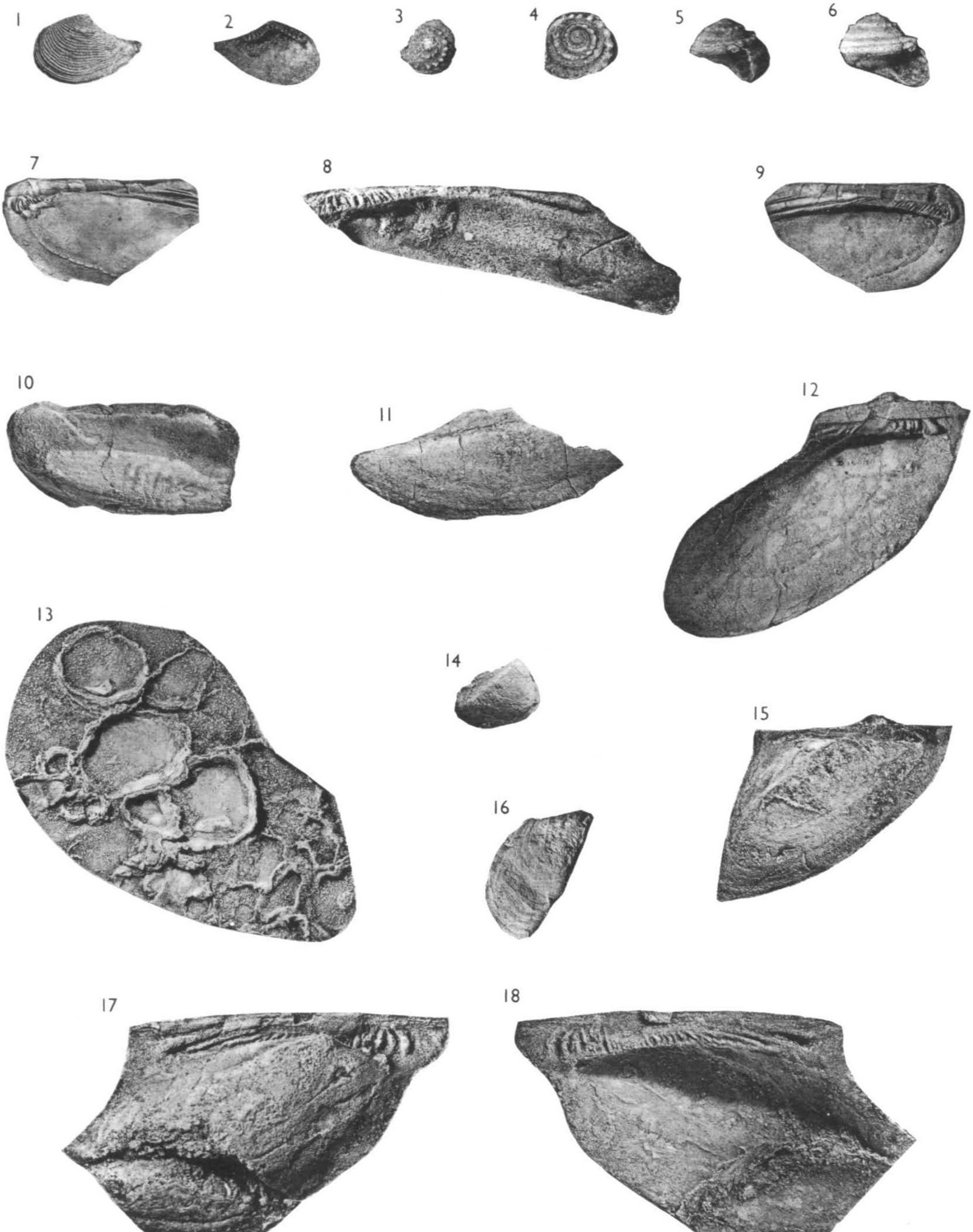
*Bakevellia* (*Maizuria*) *bundiensis* sp. nov. .. .. .. .. .. .. .. 49

15. Latex cast of internal impression of immature left valve. CPC 5064. Locality H157

17, 18. **Holotype** CPC 5065. An internal cast of distally incomplete right valve and its latex cast. Locality H157

*Mytilus?* sp. .. .. .. .. .. .. .. .. .. .. 57

16. Proximally incomplete right valve. CPC 5062. Locality H185




Triassic Fossils

## PLATE 6

All figures natural size and photographed in lateral view unless otherwise stated.

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4. Paratype CPC 5069. Latex cast of anteroventrally incomplete external impression of right valve
5, 6. Paratype CPC 5070. Internal cast and its latex cast of internal impression of right valve
7. Paratype CPC 5071. Latex cast of internal impression of right valve
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14. Latex cast of external impression of two incomplete left valves CPC 5077. Locality H157.
15. Paratype CPC 5078. Latex cast of proximal portion of left valve showing dentition. Locality H157
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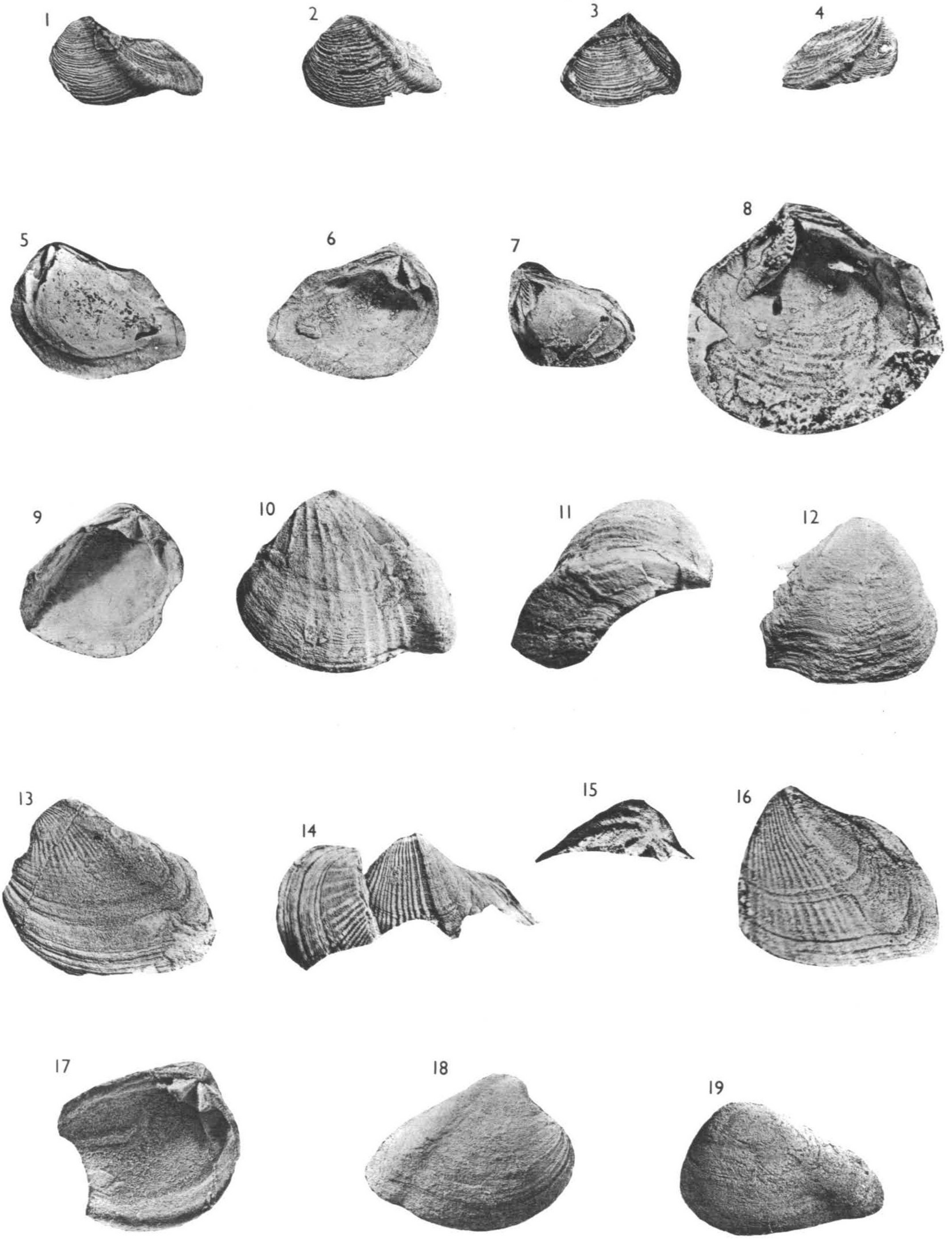


Triassic Fossils

## PLATE 7

All figures natural size and photographed in lateral view unless otherwise stated.



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3. Latex cast of internal impression of left valve. CPC 5085
4. Paratype CPC 5086. Latex cast of umbonal region. View from inside of shell
5. Latex cast of anterior wing and portion of umbo of mature left valve. CPC 5088
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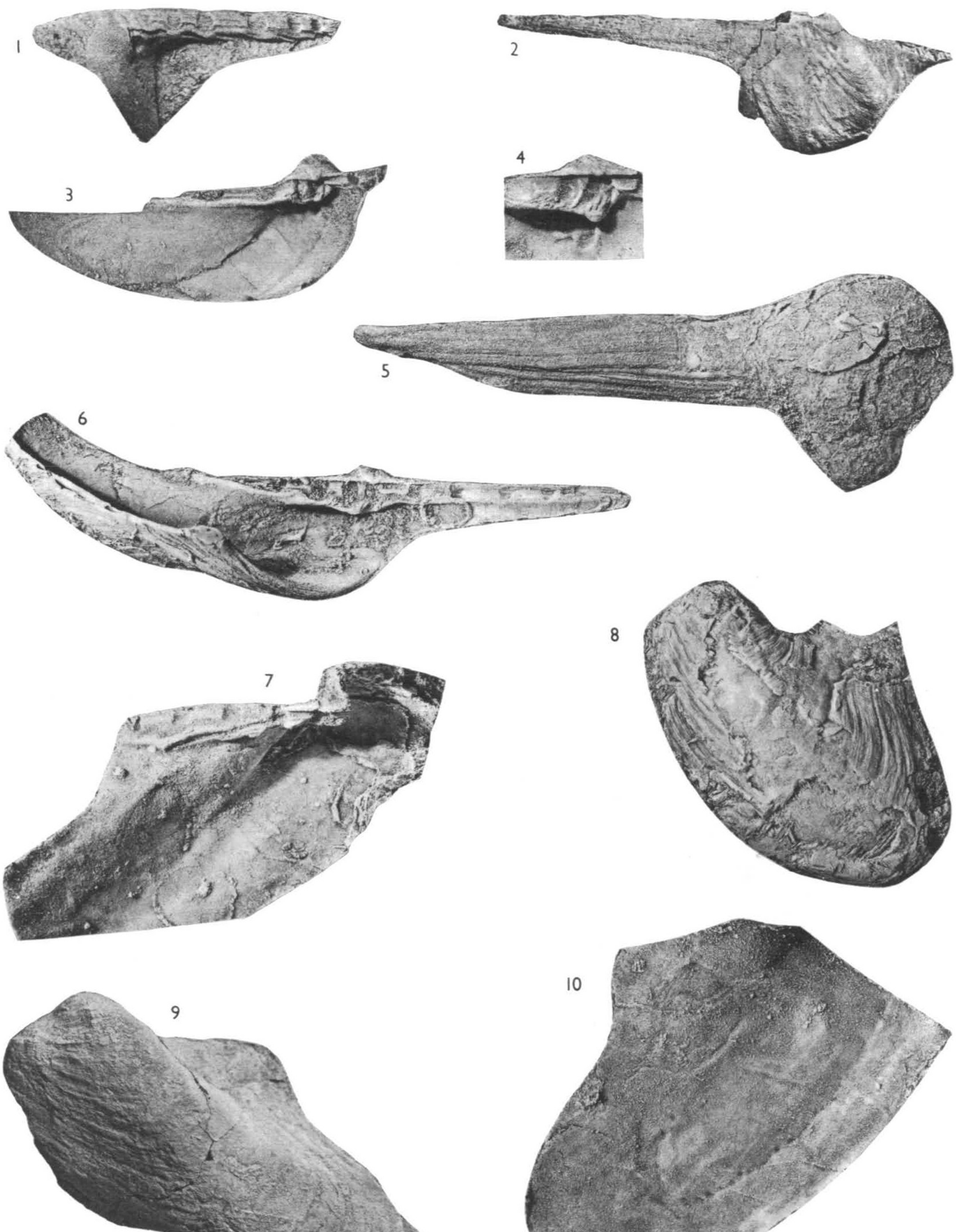
Locality M26




Triassic Fossils

## PLATE 8

All figures natural size and photographed in lateral view unless otherwise stated.

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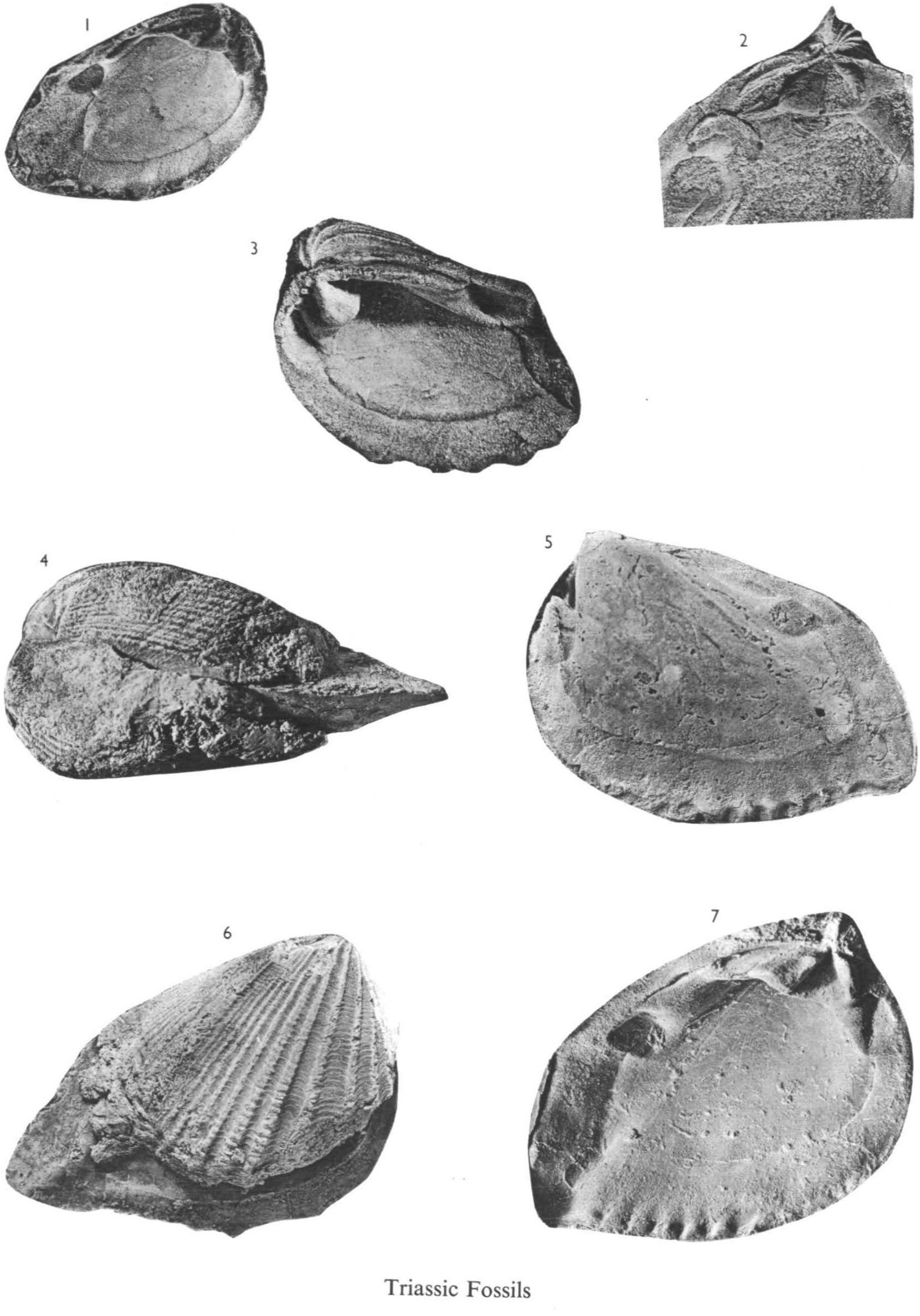
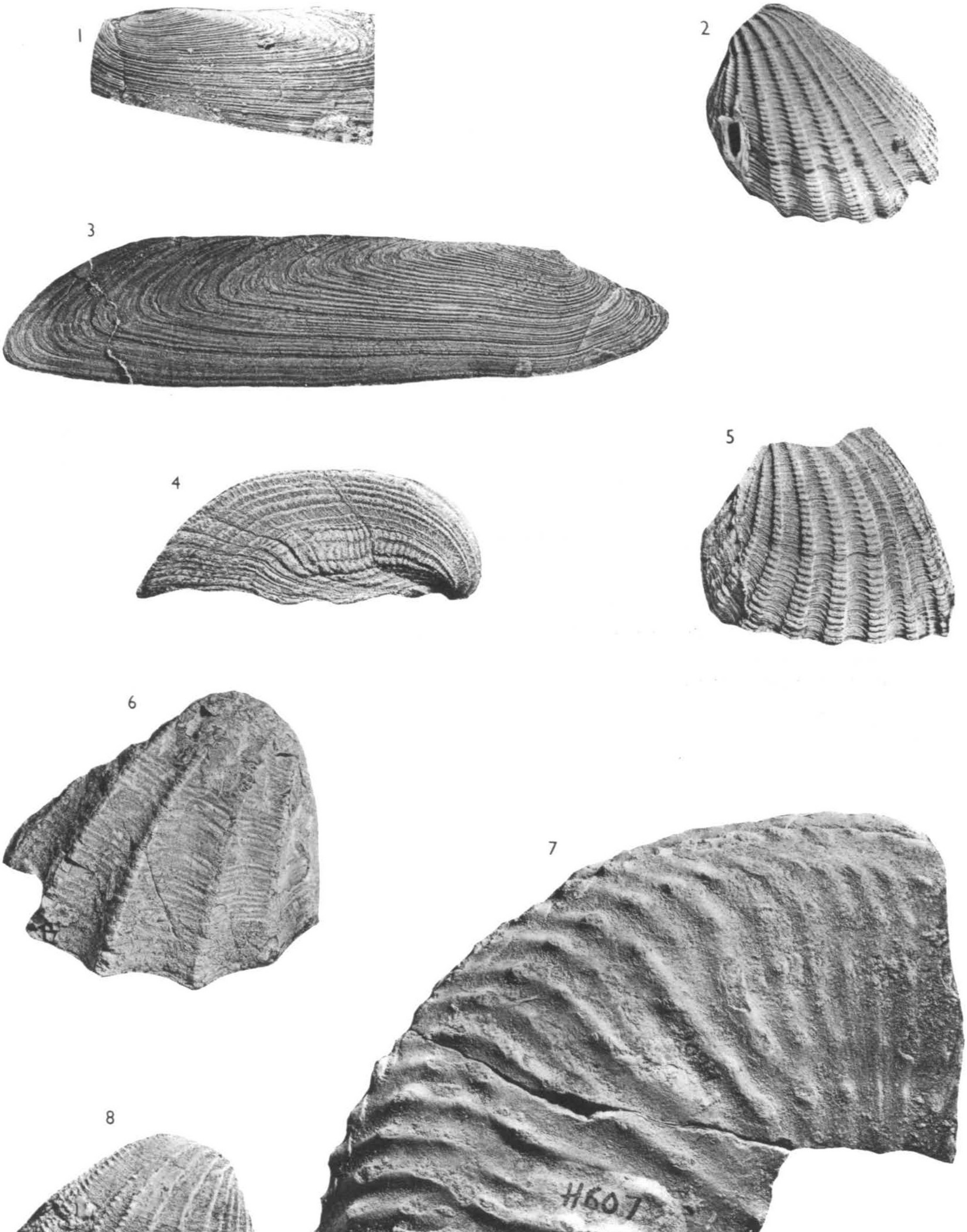
6. Right valve of **holotype**
7. Latex cast of paratype CPC 5097




Triassic Fossils

## PLATE 9

All figures natural size and photographed in lateral view unless otherwise stated.




Triassic Fossils

PLATE 10

All figures natural size and photographed in lateral view unless otherwise stated.

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| 3. Right valve. CPC 5107. Locality R294 | |
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| 4. Fragment of shell. CPC 5109. Locality H558 | |
| *Inoceramus* sp. cf. *I. haasti* Hochstetter, 1864 .. .. .. .. .. .. | 68 |
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| 6. Almost complete valve. CPC 5111 | |

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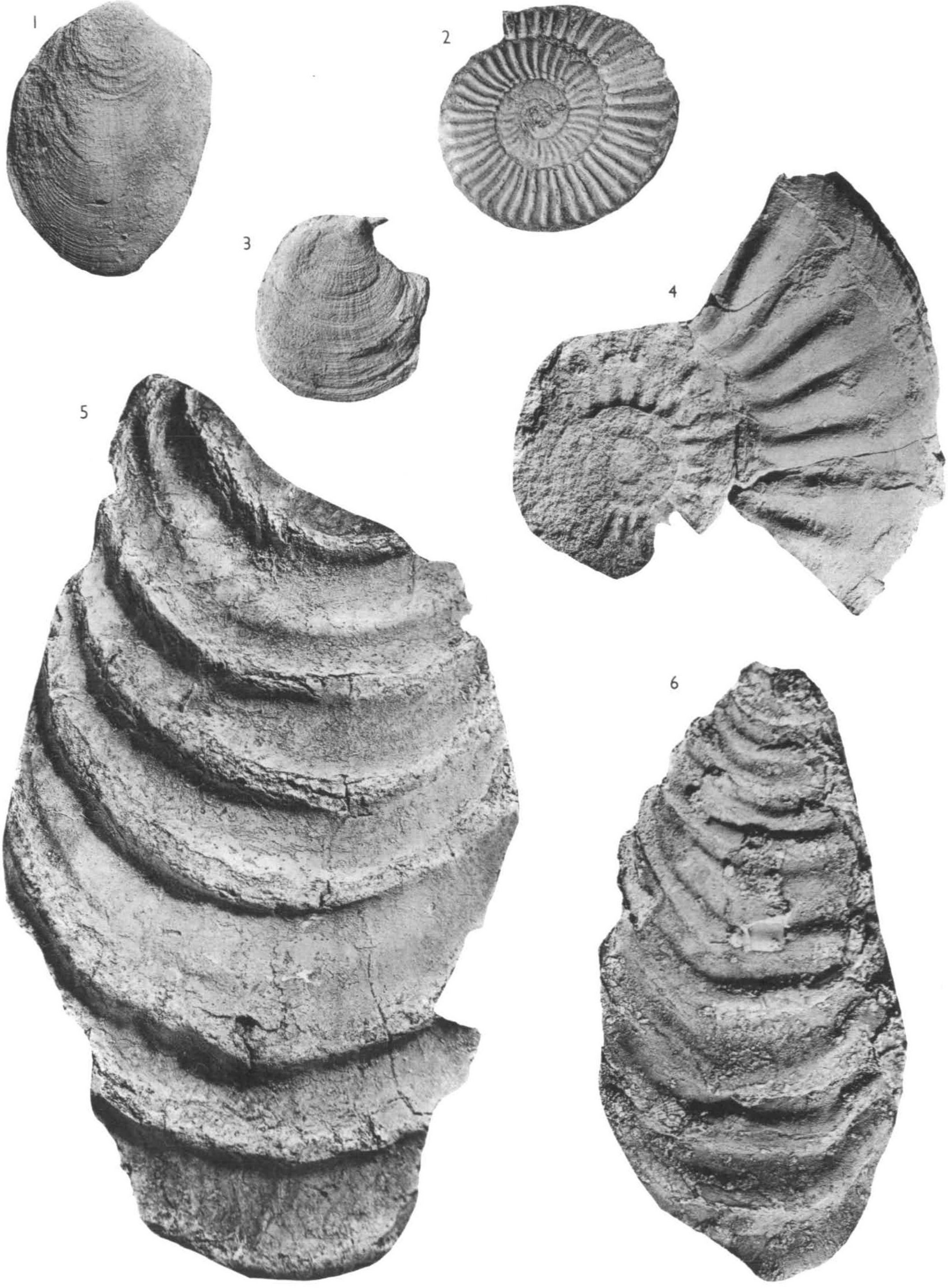


Jurassic Fossils

BULLETIN No. 75

# Lower Cretaceous Mollusca from the Sampa Beds near Wau, Territory of New Guinea

4713/66.—10

# CONTENTS

## SUMMARY

**ELEVEN molluscs are described from the Cretaceous Sampa beds of the Lake Trist area,** Territory of New Guinea. They include the following new species: *Pinna pacifica, Trigonia? Sampana, Climacotrigonia wauensis, Cardium kuperensis* and *Panopea arafurana;* and four additional forms previously described from the Snake River Beds some 40 miles to the north-west: ***Ashcroftia distorta*** Glaessner, 1949, *Glycymeris* sp., *Tibia? morobica* Glaessner, 1949, and *Cardium sp.* (now *Cardium kuperensis*). It is suggested that the Sampa beds may have been deposited at about the same time as the Snake River Beds. No new light is **shed, however, on the age of the Sampa beds,** which are regarded as Lower Cretaceous **in age.**





4713/66.—11

## INTRODUCTION

In 1949 M. F. Glaessner described an assemblage of Cretaceous fossils collected by G. A. V. Stanley from phyllitic strata outcropping along the Snake River about 20 miles north-north-west of Wau. These fossils replaced the lost collection made in 1943 by Whitehouse. In 1960 D. B. Dow, Bureau of Mineral Resources, collected fossils from the Sampa beds (SF20) at the headwaters of Buiawim River (7° 26′ S., 146° 55′ E.), Lake Trist area, near Wau, about 40 miles south-east of the site of the Snake River collections. Relevant geological and locality maps appear in Glaessner (1949) and Dow & Davies (1964). The fossils collected by Dow are described here.

Glaessner was able to reconstruct the original shape of a number of his specimens which were badly distorted, to enable description and naming of the following genera and species:

*Cucullaea* (*Ashcroftia*) *distorta* Glaessner, 1949.
*Glycymeris* sp.
*Trigonia* (*Acanthotrigonia*) *phyllitica* Glaessner, 1949.
*Cardium* sp.
*Volsella* sp.
*Inoceramus* sp.
*Tibia? morobica* Glaessner, 1949.

He dated these as Cretaceous on the basis of the presence of *Acanthotrigonia* and *Glycymeris,* both of which were at the time regarded as Cretaceous forms; Cox (1952), however, has since included *Acanthotrigonia* in *Pterotrigonia,* thus extending its range into the Upper Jurassic. Lithological similarities with the Aptian-Albian Purari Formation influenced Glaessner into favouring Lower rather than Upper Cretaceous as the age of his assemblage.

## CORRELATION AND AGE OF THE SAMPA BEDS

The list of determinations for the Sampa beds collection is as follows:

*Ashcroftia distorta* Glaessner, 1949
*Glycymeris* sp.
*Pinna pacifica* sp. nov.
*Trigonia* sp.
*Trigonia? sampana* sp. nov.
*Climacotrigonia wauensis* sp. nov.
*Astarte?* sp.
*Cardium kuperensis* sp. nov.
*Panopea arafurana* sp. nov.
*Amphitrochus?* sp.
*Tibia? morobica* Glaessner, 1949.
Barnacle.

Comparison of the two fossil lists suggests that the Sampa beds fauna is apparently richer than the Snake River fauna. Four out of seven Snake River genera and species occur also in the Sampa beds fauna; these are *Ashcroftia distorta, Glycymeris* sp., *Cardium kuperensis,* and *Tibia? morobica.*

The list for the Snake River sediments is not complete because only part of the fauna could be identified owing to the poor state of preservation of the fossils. This, together with the fact that the Cretaceous pelecypods have in many parts of the world only a very limited geographical distribution, makes it surprising that there are so many forms in common between the two assemblages. The palaeontological evidence now available suggests that the Sampa beds are equivalent to the Snake River Beds and hence of the Purari Formation, but a definite correlation cannot yet be made.

With regard to the lithological evidence for correlating the Sampa beds and the Snake River Beds, Dow writes:

> 'In the type locality the Snake River Greywacke can be distinguished from the more highly metamorphosed and more highly folded Kaindi Metamorphics which it overlies, apparently conformably. The Cretaceous fossils in the Sampa River Region were collected from transported boulders of greywacke, and they were not found *in situ*. The rocks exposed in Sampa Creek are however less highly metamorphosed, and less complexly folded than the Kaindi Metamorphics which crop out about five miles to the west. The greywacke is finer-grained than the Snake River Greywacke, and is more basic in composition, but it was probably deposited in a similar environment.
>
> 'The available evidence therefore favours a direct correlation of the Snake River and Sampa Creek fossiliferous rocks' (pers. comm.).

But although it can be assumed provisionally that the deposition of the Snake River Beds and the Sampa beds was probably isochronous, the Sampa assemblage, in spite of a greater number of genera and species, throws no new light on the age of the Snake River Beds. This is because of the predominance of new species in the assemblage, the long time-range of most genera contained, and the lack of positive identification of the remaining forms. *Pinna* ranges from Jurassic to the present day, *Cardium* ranges from Trias to the present day, and the stratigraphic range of *Panopea* is from Jurassic to Holocene. The time range of *Amphitrochus* is Upper Trias to Neocomian, but this cannot be taken as evidence for Neocomian age of the assemblage as it is not certain whether the Sampa beds gastropod is in fact an *Amphitrochus*. Finally, the very recently described *Climacotrigonia* is hitherto known only from the Cenomanian of Bathurst Island, N.T. (Cox, 1964).

## SYSTEMATIC DESCRIPTIONS

### Class PELECYPODA

### Family CUCULLAEIDAE

### Genus ASHCROFTIA Crickmay, 1930

*Type species: Ashcroftia inversidentata* Crickmay, 1930

#### ASHCROFTIA DISTORTA Glaessner, 1949

(Pl. 11, figs 8-14)

1949 *Cucullaea* (*Ashcroftia*) *distorta* Glaessner, *Mem. Qld Mus.*, 12 (4), 169-171, pl. 14, figs 1-4, text-fig. 3.

*Material:* Three external and three internal impressions of a left and a right valve.

*Discussion:* Specimens which provided the basis for Glaessner's (1949) description of *C.* (*A.*) *distorta* were much more distorted than the more recently collected specimens. Examination of this later material resulted in the following additions and changes to the original diagnosis and description:

The general outline of the shell is subrectangular. The external ornament of the right valve consists of shallow flat ribs radiating from the umbo, increasing very gradually in breadth distally, and separated from each other by narrow linear interspaces. Left valves are similarly ornamented, though there is a tendency for second-order interspaces to develop on ribs. The margins of valves are slightly crenulated. Hooking of lateral teeth is very common on both the rear and the front portion of the hinge. Transverse striations are present on hooked teeth, but it is not known whether median teeth are similarly striated. A weak ridge borders the anterior margin of the posterior adductor scar. A weak, rounded umbonal ridge is also present. The length of the hinge is about 4 cm; the greatest height of a valve probably does not exceed 4 cm.

Persistence of hinge characters suggests a generic rather than subgeneric distinction of *Ashcroftia* from *Cucullaea,* as originally suggested by Crickmay (1930).

### Family GLYCYMERIDAE

#### Genus GLYCYMERIS da Costa, 1778

*Type species: Arca glycymeris* Linn., 1758.

GLYCYMERIS sp.

(Pl. 11, figs 5, 6)

1949 *Glycymeris* sp., Glaessner, *Mem. Qld Mus.,* 12 (4), 171, pl. 14, figs 5, 6, text-fig. 4.

*Material:* Two internal impressions of a left valve and one of a right valve; a single incomplete external impression of a valve.

*Description:* The shell is circular, up to 3 cm in diameter. The ligament area is moderately wide, with about eight chevron striae. The dorsal margin of the hinge-plate is straight for about 0.8 cm beneath the umbo and the rest of the shell is evenly curved and is crenulated in its lateral and ventral portions only.

The ventral margin of the hinge-plate is gently curved. The hinge-plate itself is high and wide with up to 24 teeth, eight of which are dwarfed by the development of ligament area. All teeth increase and decrease in size quite gradually and evenly. Transverse teeth are almost straight and parallel to each other. The exterior ornament consists of faint concentric striae and fainter short radial striations.

*Remarks:* The recently collected material is less distorted than that examined by Glaessner (1949) and thus probably allows a more faithful description than was possible previously, but it is still not sufficient to justify a specific assignment.

### Family PINNIDAE

#### Genus PINNA Linn., 1758

*Type species: Pinna muricata* Linn., 1758.

PINNA PACIFICA sp. nov.

(Pl. 12, figs 11, 12)

*Material:* A single external cast of the shell lacking its distal portion.

*Holotype:* CPC 5132 (Pl. 12, figs 11, 12).

*Diagnosis:* The left valve is striated by about 14 regular longitudinal ribs narrower than interspaces. The right valve is lined with irregular oblique ribs which join on the angular portion of the valve, forming a proximally-pointing v-pattern.

*Comparison with other species:* The combination of the oblique type of ribbing with longitudinal ribbing distinguishes the new species from the previously described forms.

*Description:* The shell is at least 9 cm long by 3 cm by 2 cm, subrhomboidal in cross-section, widening gradually towards the anterior extremity. Other dimensions are altered by distortion. The left valve is striated by about 14 regular longitudinal ribs, which are about one-third the width of the interspaces. The right valve is lined with irregular oblique ribs which join on the angular portion of the valve forming a proximally-pointing v-pattern.

## Family TRIGONIIDAE

### Subfamily TRIGONIINAE Kobayashi, 1954 em.

### Genus TRIGONIA Bruguière, 1789

*Type species: Venus sulcata* Hermann, 1781

### Subgenus TRIGONIA s. str.

#### TRIGONIA sp.

(Pl. 12, fig. 1)

*Material:* Single external impression of a distally incomplete right valve.

*Description:* The shell is small, subtriangular in outline, high and short. The umbo is narrow, acute and opisthogyrous. The flank is about the same size as the area, ornamented with no less than 9 concentric ribs which are a little wider than the interspaces. The marginal carina is prominent and simple. The area is large, striated with 3 or 4 robust radial ribs which are similar to the flank ribs.

*Remarks:* The single specimen in the collection is too poorly preserved to allow definite comparison with the previously described species.

#### TRIGONIA? SAMPANA sp. nov.

(Pl. 12, figs 6-9)

*Material:* Two almost complete external impressions, one of a left valve and the other of the right valve. One incomplete internal impression of the right valve.

*Holotype:* CPC 5128 (Pl. 12, fig. 7). The almost complete external impression of the right valve.

*Paratypes:* CPC 5127 (Pl. 12, fig. 6). Cast showing internal structure of the right valve; CPC 5130 (fig. 9) shows external aspect of the left valve.

*Diagnosis:* The diagnostic features of the new species are a combination of the large height-to-width ratio, the prominent concentric ribs on the flank, whose anterior extremities initiate well to the rear of the anterior shell margin, the very high and broad marginal carina, and finally the area, which seems to be devoid of any kind of ribbing.

*Comparison with other species:* Features listed above distinguish the new species from previously described forms.

*Description:* The shell is triangular in outline, its height-to-length ratio being unusually large. The umbo is very narrow and opisthogyrous. The disc is ornamented with less than 10 concentric or oblique prominent ribs which extend not from the anterior shell margin but from some distance to the rear of it, and proceed as far as or near to the marginal carina. The marginal carina is strongly developed. In cross-section its shape is that of a right-angle triangle. It is devoid of any ornament. The area slopes steeply into the commissure. It is moderately wide and seems to be devoid of ornamentation.

### Genus Climacotrigonia Cox, 1964

*Type species: Climacotrigonia dailyi* Cox, 1964.

#### Climacotrigonia wauensis sp. nov.

(Pl. 12, figs 2, 3)

*Material:* Two external impressions of a young left valve.

*Holotype:* CPC 5125 (Pl. 12, fig. 3), external impression of a probably immature left valve.

*Diagnosis:* Concentric ribs on the flank are prominent but few and widely spaced. The sulcus is wide and unornamented. The marginal carina is simple and prominent. The area is moderately large and free of radial ornament.

*Comparison with other species:* The simple marginal carina as well as the overall shape of the shell distinguish the new species from *C. dailyi,* the only hitherto known species of *Climacotrigonia.*

*Description:* The shell is subquadrate in shape, with an orthogyrous umbo. It is weakly inflated. The anterior margin of the shell is weakly convex; the posterodorsal margin virtually straight with no suggestion of an escutcheon; an obtuse angle is formed between the posterodorsal margin and posterior margin; the ventral shell margin is sigmoidally shaped.

The disc occupies slightly more than two-thirds the area of flank, and is ornamented with robust concentric ribs separated by flat interspaces about three times the width of the ribs. The sulcus is broad and flattish.

The marginal carina is simple but prominent; it rises well above the level of sulcus but is in one plane with the area. The area is moderately wide and unornamented.

## Family ASTARTIDAE

### Genus Astarte Sowerby, 1818

*Type species: Pectunculus sulcatus* da Costa, 1778.

#### Astarte? sp.

(Pl. 12, fig. 13)

A single internal impression of a right valve shows that the shell is circular, with vertical axis a little longer than the lateral axis. The hinge is narrow with a large triangular median tooth. The anterior adductor scar is regularly ovate, with its long axis vertical. The posterior scar is not preserved. The pallial line appears to be entire.

### Family CARDIIDAE

### Subfamily CARDIINAE Lamarck, 1819

### Genus CARDIUM Linn., 1758

*Type species: Cardium costatum* Linn., 1758.

CARDIUM KUPERENSIS sp. nov.

(Pl. 11, figs 3, 4, 7)

1949 *Cardium* sp.; Glaessner, *Mem. Qld Mus.,* 12 (4), 173, pl. 15, figs 9, 10.

*Material:* Two internal casts of a right valve and six incomplete external impressions of both valves.

*Holotype:* CPC 5115 (Pl. 11, fig. 7), shows internal structure of a mature ?left valve.

*Paratype:* CPC 5113 (Pl. 11, fig. 3), shows external appearance of two immature left valves.

*Diagnosis:* The ribs are high, rectangular or square in cross-section, closely spaced with discontinuous grooves along their longitudinal axes.

*Description:* The shell is ovate, higher than long, the largest specimen measuring 4.6 cm by 4.0 cm. The external ornamentation consists of about 40 radiating ribs separated by narrow deep interspaces. The ribs are rectangular or square in cross-section, with short discontinuous grooves along the middle of their flat surfaces. The interspaces are triangular in transverse section, extremely narrow proximally, widening gradually at first then rapidly close to the distal margin. Some growth-rugae are present.

The median tooth and the lateral teeth are well developed. The adductor scars are deeply incised and the pallial line entire.

The interior shell margin is crenulate. Irregularly spaced lines of crenulations, parallel to the distal margin of the shell, mark successive growth-stages along the distal portion of the interior of the shell.

### Family PANOPEIDAE

### Genus PANOPEA Menard, 1807

*Type species: Panopea aldrovandi* Menard, 1807.

PANOPEA ARAFURANA sp. nov.

(Pl. 12, figs 4, 5)

*Material:* A single externo-internal cast of a bivalve with the opposite valves in position. The specimen is somewhat compressed dorsoventrally.

*Holotype:* CPC 5126 (Pl. 12, figs 4, 5). Lateral and dorsal views of the specimen.

*Diagnosis:* The shell is small, with an anterior and posterior gape, a very sharp antero-umbonal carina, and thin concentric ribs on the portion of the shell behind the carina.

*Description:* The shell is 4 cm long and 1.5 cm high. It is strongly inflated with somewhat depressed incurved and obtuse umbones. The anterior umbonal carina is sharp, and the tumidity of the shell decreases rapidly towards the front of the carina. The portion of the shell behind the carina is ornamented with concentric riblets which are round in cross-section and separated from each other by narrow, v-shaped interspaces.

The bivalve gapes at both ends.

## Class GASTROPODA

### Family NODODELPHINULIDAE

#### Genus AMPHITROCHUS Cossman, 1907

*Type species: Trochus duplicatus* Sowerby, 1817.

AMPHITROCHUS? sp.

(Pl. 12, figs 14-16)

*Material:* A single incomplete and distorted impression of the shell.

*Description:* The shell is obliquely distorted. On reconstruction it appears to be turbonate in shape. The height is comparable to the breadth and measures about 5 cm. The spire is conical but broad and rather low, and is probably made up of five whorls. The periphery of the last whorl is made up of two prominent nodose cords. On the spiral whorls only the dorsal cord is prominent, the lower one being located just above the suture. On all whorls the corresponding nodes are joined together, the vertical riblets in particular being prominent. The ramp has a weakly sigmoidal shape in cross-section. It is lined with oblique growth-lines.

The base is concave and depressed and apparently phaneromphalous. It is lined with vertical riblets which are an extension of the peripheral vertical riblets; they become less prominent ventrally.

A weakly nodose carina adorns the umbilical margin. The aperture is not preserved.

*Remarks:* The shell is obliquely distorted, and the latex mould had to be appropriately stretched to restore the original shape of the shell. It seems to resemble the genus *Amphitrochus,* to which it is tentatively referred.

### Family STROMBIDAE

#### Genus TIBIA (Bolten) Roeding, 1798

*Type species: Tibia fusus* (Linn.).

TIBIA? MOROBICA Glaessner, 1949

(Pl. 12, fig. 10)

1949 *Tibia? morobica* Glaessner, *Mem. Qld Mus.,* 12 (4), 174, 175, pl. 15, figs 11, 12, text-fig. 6.

Specimens of *T.? morobica* are common in the assemblage under discussion, but there is little that can be added to Glaessner's reconstruction and description of this species.

## DERIVATION OF NEW NAMES

*arafurana* (*Panopea*): after the Arafura Sea.
*kuperensis* (*Cardium*): after the Kuper Range near Wau.
*pacifica* (*Pinna*): after the Pacific Ocean.
*sampana* (*Trigonia?*): after the Sampa River.
*wauensis* (*Climacotrigonia*): after the township of Wau.

## REFERENCES


Cox, L. R., 1952—Notes on the Trigoniidae, with outlines of a classification of the family. *Proc. malac. Soc. Lond.*, 29.

Cox, L. R., 1964—New genera and subgenera of Trigoniidae from Australia and Madagascar. *Ibid.*, 36.

Crickmay, C. H., 1930—The Jurassic rocks of Ashcroft, British Columbia. *Univ. Calif. geol. Publ.* 19.

Dow, D. B., and Davies, H. L., 1964—The geology of the Bowutu Mountains, New Guinea. *Bur. Min. Resour. Aust. Rep.* 75.

Glaessner, M. F., 1949—Mesozoic fossils from the Snake River, Central New Guinea. *Mem. Qld Mus.*, 12 (4).


### PLATE 11

All figures natural size and photographed in lateral view unless otherwise stated

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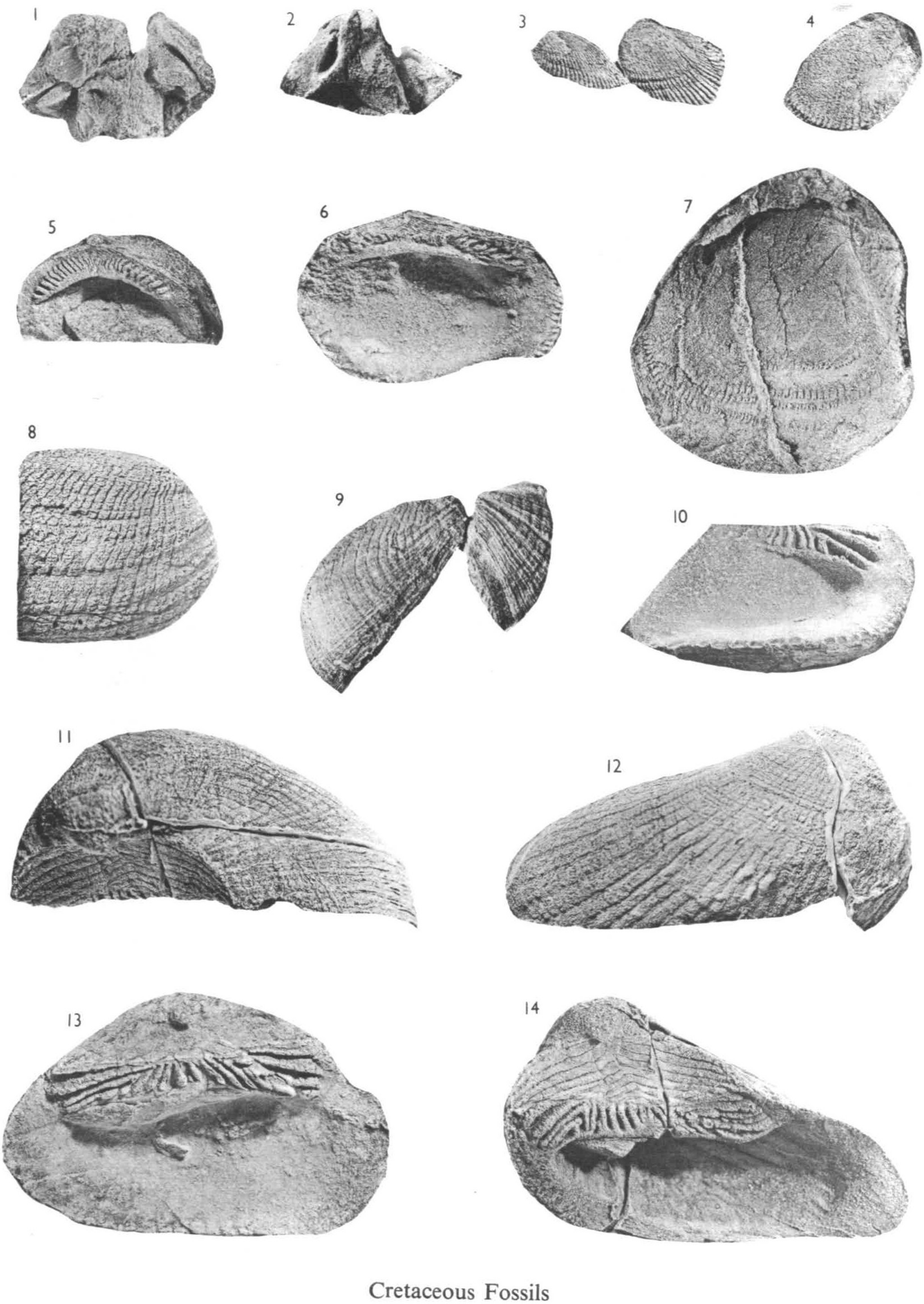


Cretaceous Fossils

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**All figures** natural size and photographed in lateral view unless otherwise stated.

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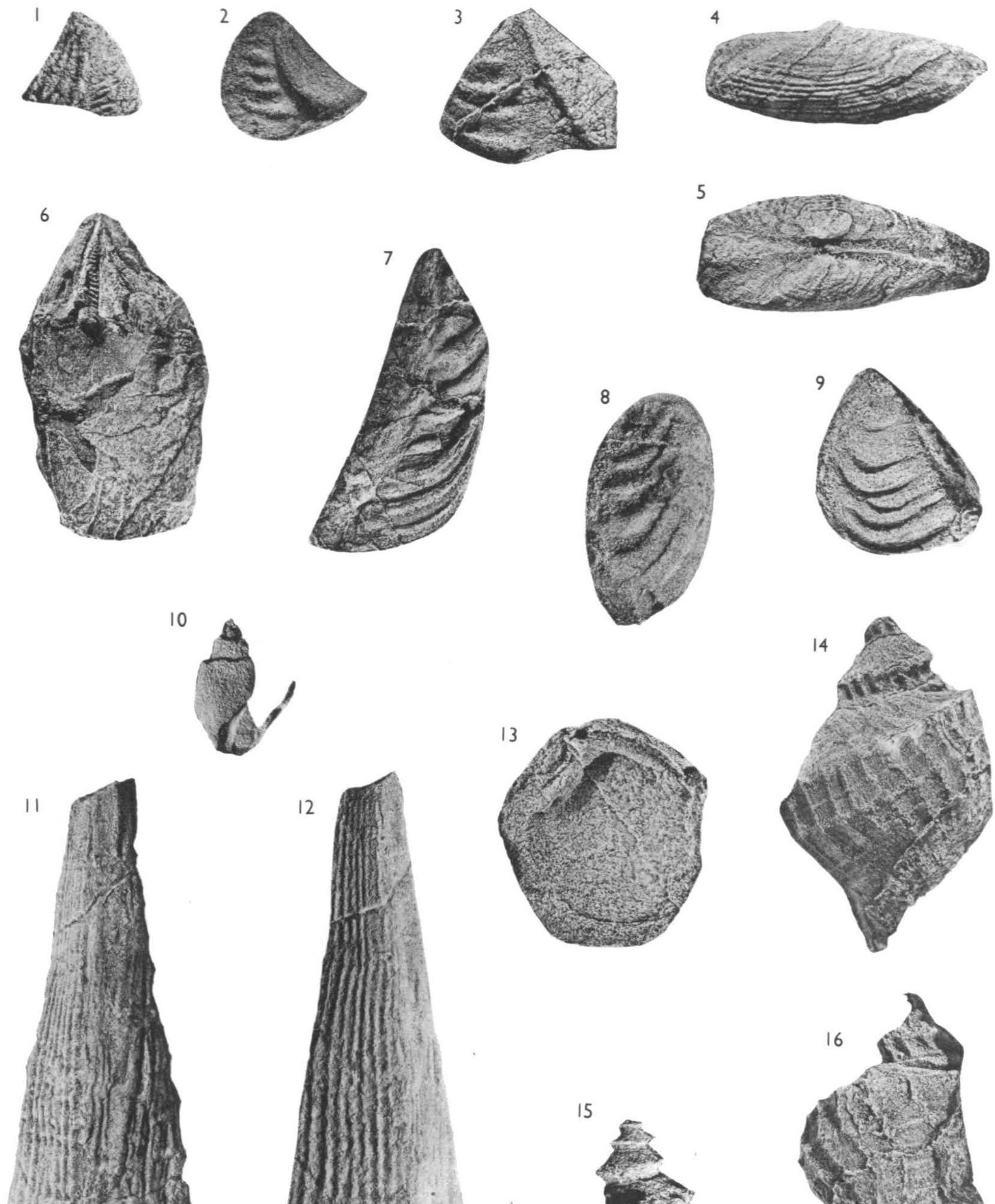


Cretaceous Fossils