DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

AGE OF SIX SAMPLES OF GAMBIER LIMESTONE

by

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ABSTRACT

Four samples from a quarry 8 miles west of Mt. Gambier have rather poor planktonic faunas. Victoriella indicates an Oligocene age; the planktonics indicate "middle" Oligocene, low in the Globigerina euapertura zone and in the vicinity of Blow's zone P.19/20. But there are problems which await richer and better preserved material.

Two samples from a quarry 4 miles south of Mt. Gambier are much richer in planktonics and of a more open-marine facies. They are also younger, being identified as high in the Globigerina woodi zone, and correlated with zones N.5.-N.6 of Blow. This is Lower Miocene.

INTRODUCTION

Six samples have been submitted by Mr. R.J.F. Jenkins (School of Geology, University of Adelaide) for a determination of age or ages. They were collected from two localities and can be treated as two groups on this basis. As indexed in the Palaeontology Laboratory the samples are:

(1) Gambier Limestone, building stone quarry, 30 chains west-southwest of Marte Rail Siding, 8 miles west of Mount Gambier, Co. Grey, Hd. Blanche, Section 28.

F72/70 1ft. above floor of quarry

F73/70 23.5ft. above floor of quarry

F74/70 28ft. above floor of quarry

F75/70 31ft. above floor of quarry

(2) Gambier limestone, road fill quarry, east side of the Port MacDonnell Road, 4 miles south of Mount Gambier, Co. Grey, Hd. Blanche, Section 601.

F76/70 4ft. above floor of quarry

F77/70 22ft. above floor of quarry

The samples were washed and examined for foraminifera by standard methods.

SAMPLES F72/70, F73/70, F74/70, F75/70

Rock: All samples are cream, bryozoal bioclastic calcarenites. Microfossils are not well preserved due to overgrowth by diagenetic carbonate.

Microfauna: F72/70, F73/70 and F75/70 have rather richer and more diverse planktonic foraminiferal assemblages than does the intervening F74/70 (however, all are poor compared with much of the Gambier Limestone).

Planktonics include:

Globigerina juvenilis Bolli plus "Globorotalia" munda Jenkins (? = G. clemenciae Bermudez (1); rare-common)

Globigerina praebulloides Blow, morphotypes in the range of occlusa Blow & Banner to ouachitaensis Howe & Wallace (together relatively abundant)

Globigerina euapertura Jenkins (rare-frequent).

Globigerina ampliapertura Bolli (v.rare in F73/70).

Globigerina aff. senilis Bandy (rare in F73/70)

Globigerina angustiumbilicata Bolli (the most abundant group; morphotypes range from officinalis Subbotina to cf. anguliofficinalis Blow; the latter is a "tendency" with no really convincing examples)

Globigerina praesepis Blow (rare in F75/70)

Globorotalia (Turborotalia) opima opima Bolli (rare in F74/70, F75/70)

Globorotalia (Turborotalia) "cf. siakensis LeRoy" sensu Blow (1)(not entirely convincing; rare in F74/70, F75/70)

Globorotalia (Turborotalia) cf. pseudocontinuosa Jenkins (rare in F73/70, F74/70)

The most significant benthonic species is Victoriella conoidea (Rutten) (two specimens in F74/70). The benthonic assemblages are not rich and are dominated by Notorotalia, "Elphidium aff. crespinae Cushman", Gyroidinoides zelandica (Finlay), Textularia and Cibicides.

Age. The presence of Victoriella conoidea is the first indication of an Oligocene age. Variations in the planktonic component of the three samples are not significant because they are limited to the rare or very rare forms.

With reference to composite range charts (2, 3) there is very little in the planktonics actually present in these samples to indicate a choice between the Globigerina labiacrassata zone and the Globigerina euapertura zone. The presence of "Globoro-

talia" munda is some indication of the former and Globigerina juvenilis the latter but this evidence is not strong. The absence of Guembelitria stavensis, Chiloguembelina cubensis and Globigerina labiacrassata would suggest the Globigerina euapertura zone, the base of which is defined (2) by the disappearance of Ch. cubensis. This species is important because it persists into facies unfavourable to planktonics generally, but the value of its top in the Gambier Limestone needs more facts. The presences and absences noted here lead to the same results in terms of the New Zealand system (4).

The occurrence of Globigerina aff. senilis, G. praesepis, G. euapertura and "Globorotalia" munda (? = clemenciae), along with the absence of Globigerina angiporoides on the one hand and G. angulisuturalis and Globorotalia (T.) opima opima (both recorded (2,3) in the Gambier Embayment and both at least close to typical) on the other, indicates an approximate correlation with zone P.19/20 in Blow's system (1,6), even though Globigerina juvenilis could indicate a higher level. This suggestion is very tentative. Absences are dangerous negative evidence in this biofacies. If, moreover, we are in fact dealing with the lower part of the Globigerina euapertura zone then there is a clash with the tentative placement (5) of the lower boundary at about zone P.21. This problem needs further study of good material.

It is concluded that the samples are about "middle" Oligocene in age and, on the absence of Ch. cubensis in particular, early Janjukian. Rather similar assemblages occur in about this part of the north-temperate Oligocene (7).

SAMPLES F76/70, F77/70

Rock: Both are almost white, bryozoal bioclastic calcarenites. The higher sample has suffered the more from crystalline overgrowth of calcite on the foraminifera and other constituent particles.

Microfauna: Both planktonic assemblages include:

Globigerina woodi Jenkins (very abundant; the dominant component; includes morphotypes woodi connecta Jenkins and cf. brazieri Jenkins; also specimens referable to ampliapertura Bolli and apertura Cushman, sensu Wade (8), although neither species, sensu Blow (1) is present)

Globigerina praebulloides Blow s.l. (with specimens approaching praebulloides occlusa Blow & Banner) (abundant)

Globigerina angustiumbilicata Bolli (frequent)

Globoquadrina dehiscens dehiscens (Chapman, Parr & Collins) (common; typical, if not developed to extreme form found later)

Globorotalia (Turborotalia) siakensis LeRoy (abundant in F76/70, rare in F77/70; actually, many specimens agree more closely with G. (T.) aff. siakensis sensu Blow (1)

Globorotalia (Turborotalia) semivera (Hornibrook)(abundant; not always clearly distinguishable from G.(T.) siakensis in apertural form; includes specimens referable to G.(T.) nana pseudocontinuosa Jenkins and G. (T.) continuosa Blow)

F77/70 includes also:

Globigerinoides cf. quadrilobatus primordius Blow and Banner (very rare; more similar to Globigerina woodi s.s. (not woodi connecta) in aperture and wall structure than to G. praebulloides occlusa (cf. 8, 9 in contrast to 1); primary aperture recalls G. quadrilobatus altiaperturus Bolli)

"Globoquadrina" cf. larmeui Akers s.s. (rare)

Globigerina cf. foliata Bolli (rare)

Benthonics include species of Textularia, Cassidulina, Uvigerinidae, Anomalinoides, Cibicides and others, as well as Carpentaria, Gyroidinoides zelandica, Astrononion centroplax, etc.

Age. The association of Globigerina woodi s.s. with Globoquadrina dehiscens s.s. in the absence of Globigerinoides trilobus indicates the Globigerina woodi zone (2,3). In terms of New Zealand zones as defined (4,10) the assemblage falls within the Globigerina woodi connecta zone. The presence of Globorotalia (T.) semivera (and "pseudocontinuosa") and absence of G. zealandica and G. praescitula is consistent with this. Similarly, results are consistent with a Zone 6 identification (8), the upper part of Zone 6 having been correlated with the Globigerina woodi zone (2,5).

However, the identification of Globorotalia kugleri Bolli in about the middle part of the Globogerina woodi connecta zone (10) and the problems arising therefrom (5) mean that further consideration is required. Typical Oligocene species, including those important in correlating horizons up to the level of G. kugleri, are absent, and such negative evidence is significant in

this facies with high planktonic numbers. In terms of the N-zones (1) the samples are no older than N.5 at most (occurence of Globoquadrina dehiscens s.s.) and the presence in F77/70 of Globorotalia (T.) semivera (including continuosa), Globigerina cf. foliata and Globoquadrina cf. larmeui together points rather to zone N.6. This too is broadly consistent with a previous correlation of biostratigraphic units (see 5, in contrast to 10). The overlap of G. (T.) cf. siakensis and G. (T.) siakensis in N.2-N.3 (1) is too low to be consistent with the other evidence. The differences listed between F76/70 and F77/70 are not resolvable in terms of current local biostratigraphy.

It is concluded that the samples fall in the upper Globigerina woodi zone (locally), can be correlated with Globigerina woodi connecta zone in New Zealand, and are in the vicinity of lower zone N.6 in Blow's system. That is, they are Lower Miocene in age, perhaps Upper Aquitanian or Lower Burdigalian (1).

NOTE ON FACIES

The Oligocene samples are somewhat coarser-grained than those of Lower Miocene age and the general aspect of the bryozoan assemblage is distinctly different. The abundance of Elphidium and Notorotalia together with a much smaller planktonic component are also in striking contrast. The differences indicate that the younger samples, while still shelf carbonates, are more "open marine" - if not clearly so in estimable water depth, then in terms of salinity and the influence of oceanic currents.

REFERENCES

(1) Blow, W.H. (1969) Proc. 1st Internat. Conf. Planktonic Microfossils, Geneva 1967, 1, 199.

(2) Ludbrook, N.H., Lindsay, J.M. (1969) Ibid., 2, 366.

(3) Ludbrook, N.H. (1971) Spec. Bull. Geol. Survs. S.Aust. Vict. (in press).

(4) Jenkins, D.G. (1966) N.Z. J. Geol. Geophys. 8, 1088.

(5) McGowran, B., Lindsay, J.M., Harris, W.K. (1971) Spec. Bull. Geol. Survs. S.Aust. Vict. (in press).

(6) Blow, W.H. (1970) Micropaleontology 16, 257.

(7) Berggren, W.A. (1969) Proc. 1st Internat. Conf. Planktonic Microfossils, Geneva 1967, 1, 121.

(8) Wade, M. (1964) Micropaleontology 10, 273.

(9) Jenkins, D.G. (1965) Contr. Cushman Found. Foramin. Res. 16, 116.

(10) Jenkins, D.G. (1967) N.Z. J. Geol. Geophys. 10, 1064.

(11) Hornibrook, N. deB. (1969) Rept. N.Z.G.S. 42, (unpubl.).

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13/11/70

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