Geological Survey of Victoria

THE MID-TERTIARY FORAMINIFERAL SEQUENCE

ESSO GIPPSLAND SHELF NO. 2 WELL.

by

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ESSO Gippsland Shelf No. 2 Well was drilled $2\frac{1}{2}$ miles at a bearing of 236^{o} 30' from ESSO Gippsland Shelf No. 1 and in a similar structural position.

Cutting samples from 820 feet to 4013 feet (T.D.) were examined at 50 foot intervals. Contamination was minimal to 3370 feet, but heavy below this level. Three cores were submitted, but no foraminifera or other microfauna were found in them. Six side wall cores were examined and all except the deepest (No. 25 at 3408 feet) contained foraminifera. Casing and core positions are shown on Fig. 1.

Distribution of foraminifera was similar to that in the No. 1 well, as discussed by Taylor (1965) and illustrated on Fig. 1 of that report. Examination showed differences in thickness of some biostratigraphic units when comparing the two sections and the comparison is summarised on the well correlation diagram (Fig. 1.) of this report. Palaeoecological differences were also noted. Therefore this report will compare in the two wells (1) the thickness and nature of the biostratigraphic units, and (2) the palaeoecology of the biostratigraphic units. Detailed discussion is unwarranted because of the similarity of both sections and the lengthy discussions in the report on the No. 1 section (Taylor 1. c). Comment will also be made on the sea floor sample from the No. 2 well site.

(I) Biostratigraphic comparison:- Fig. 1 shows an apparent thickening of Zonule A and a compensating thinning of Zonule B in the No. 2 section. As stated for the No. 1 section, Zonule A is probably more facies than biostratigraphically controlled, and these differences in thickness suggest that the water shallowing was earlier in No. 2 than in No. 1.

Zonule C and Zonule D are fairly consistent between the sections. However the lack of core samples makes it impossible to designate the top of Zonule E, which is established on the first appearance of Orbulina universa.

The appearance of worn large foraminifera is indicative of Zonule E and the presence of these derived forms, including Lepidocyclina, establishes a correlation of Zonule E between the two sections.

Zonules F & G are missing in both sections. A benthonic fauna which includes Astrononion centroplax, Cidicides brevoralis and C. perforatus makes its first appearance at 2780 feet, thus correlating it with the 3080 feet level in the No. 1 section (the top of Zonule H). Zonule H is consistent in both thickness and faunal character, although Bolivinopsis cubensis is present relatively higher in this section, but was not found in the No. 1 sections. B. sp. 13 is very similar to B. affiliata and is obviously part of the Bolivina pontis - B. sp. 9 - B. sp. 1 lineage (refer Taylor, l.c., p. 6). It is also noted that Vulvulia sp. cf. V. Granulosa occurs in this Zonule and is not restricted to Zonule I as suggested in the earlier report.

Zonule I is twice the thickness in the No. 2 section, but the faunal characters are the same. Globorotalia testarugosa first appears in a cutting sample at 3370 feet, indicating the top of Zonule J but contamination is heavy so that it may have come from slightly higher in the section. The top of Zonule J is within calcareous sediment and is above the development of "greensand" as shown by Side Wall Core No. 25 (at 4008 feet). In the Lakes Entrance Oil Shaft the highest appearance of G. testarugosa is 37 feet above the "greensand" (Jenkins, 1960). In the No. 1 section, the top of Zonule J was well below the base of calcareous sediments. As only cutting samples were available this may have been due to cutting return delay. However the possibility that calcareous sedimentation occurred earlier in the No. 2 section cannot be dismissed. Due to poor samples, Zonule K cannot be recognised, but is probably present.

(II) Palaeoecological comparison:- Will be discussed briefly up the sequence.

Depositional environments in Zonules J, I, H, & E are similar in both wells. A larger percentage of arenaceous species is noted in Zonule D in the No. 2 section than was noted in the No. 1 section, thus shallower water conditions are suspected in the No. 2 section when comparing

Zonule D in both sections. Deposition was in deeper water during Zonule C with apparent shallowing in Zonule B where arenaceous forms and milliolids are more common than in the No. 1 section, but planktonics are still common. As in the No. 1 section, Zonule A was deposited in much shallower water than in Zonules B to D. The absence of Globorotalia spp. and a decrease in the percentage of planktonic forms suggest a regression at the base of Zonule A. As discussed earlier, this regression appears to have taken place earlier in the No. 2 section than in No. 1 section, as Zonule A is more a biofacies expression than a consistent biostratigraphic unit.

(III) Comment on a sea floor sample from the No. 2 well site in regard to the palaeoecology of the No. 1 and No. 2 sections.

Before operations commenced a sample was collected by a diver from the sea floor (depth 150.5 feet M.L.T.) at the site of Gippsland Shelf No. 2 Well (Lat. 38°17'58" S, Long. 147°40'26" E). This sample was highly calcareous and rich in organic remains. The dominant animal remains were bryozoal with mollusca and foraminifera common. The general nature of the sample as well as the foraminiferal fauna is very similar to that described by Brady (1884) from "Challenger Station 162". The H.M.S. Challenger dredged this sample in 38 to 40 fathoms (228 to 240 feet) off East Moncoeur Island on the eastern side of Bass Strait. "Challenger Station 162" is 90 miles on a bearing of 223° from Gippsland Shelf No. 2 Well.

Both samples are rich in milliolids, polymorphinids and arenaceous species. Milliolids dominate the Gippsland Shelf sample. Both samples contain what I would consider as a "shallow water fauna" in a mid-Tertiary sample. Thus for the Gippsland and Bass Basins, my use of "shallow water fauna" implies deposition in 240 feet or less of water depth.

A interesting feature of the Gippsland Shelf No. 2 sea floor sample is the rarity of planktonic forms (less than 5% of total foraminiferal fauna) and the complete absence of Globorotalia spp. Brady (l.c) does not note planktonic species from "Challenger Station 162", but he does not give a comprehensive list for this station. This rarity of planktonic forms

may be due to the deflection of the Eastern Australian Current by the wide continental shelf, south of the Gippsland coast.

Zonule A faunas in both sections are similarly constituted to that of the sea floor sample at the No. 2 site as well as "Challenger Station 162". Planktonics are rare and Globorotalia spp. are absent in Zonule A. It can be concluded that Zonule A was deposited in 240 feet or less of water depth, and that oceanic currents did not directly flow over the depositional sites. The factors inhibiting the oceanic currents are unknown, although there may have been a wide continental shelf.

No other fauna in either section is directly comparable to the sea floor samples.

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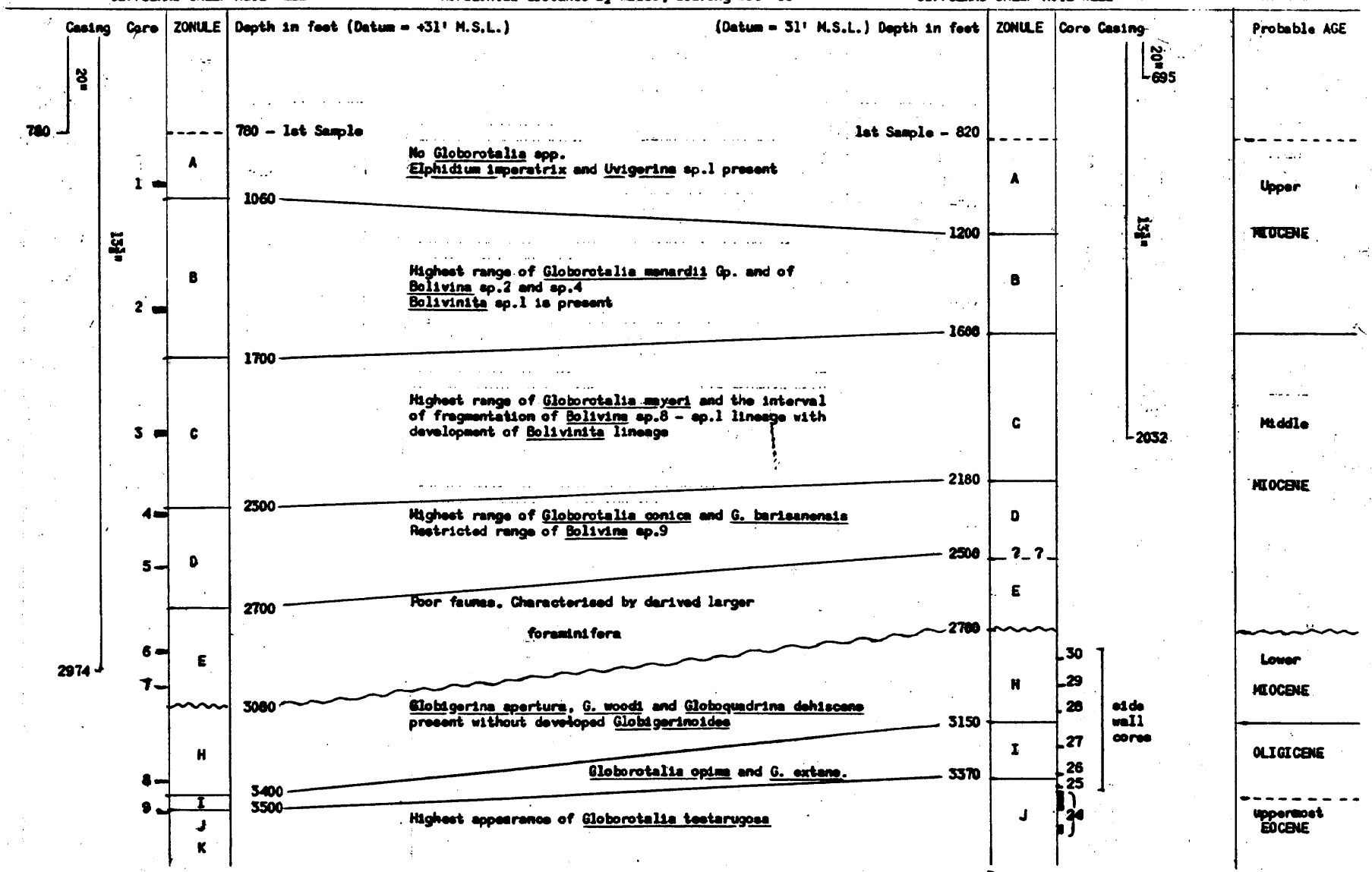

Fig. 1. BIOSTRATIGRAPHIC CORRELATION OF MID-TERTIARY SECTIONS
ESSO GIPPSLAND SHELF No.1 and No.2 WELLS