LATE PLEISTOCENE MARINE SEDIMENTS AND FOSSILS FROM MUSSEL ROE BAY, NORTHEASTERN TASMANIA

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(with four text-figures)

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Foraminifera- and mollusc-bearing estuarine sediments were encountered in one of a series of auger holes drilled in Late Pleistocene interglacial sands at Mussel Roe Bay, northeastern Tasmania. It is proposed that the estuary formed behind a bay-mouth barrier similar to that presently occurring between Mussel Roe Bay and Great Mussel Roe Bay.

Key Words: Late Pleistocene, estuarine sediments, NE Tasmania.

INTRODUCTION

Seaward-sloping coastal sand plains are distributed widely in northeastern Tasmania and occupy former large coastal embayments (Bowden 1978). The lithology of these deposits ranges from well-sorted coarse quartz sand, through finer sand and poorly-sorted sandy clay to sporadic beds of clay (Baillie in McClenaghan *et al.* 1982). Although fragmental mollusc shells (Baillie, *op.cit.*) and indeterminate sponge spicules (Bowden, *op.cit.*) have been recovered from the deposits at various localities between Bridport and Tomahawk (fig. 1),

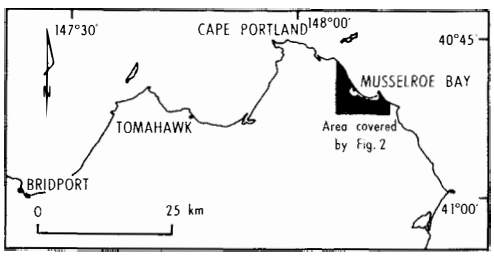

FIG. 1 — Locality Map

it has generally been assumed that well-preserved faunas have not been found because of the acid (pH 4.5–6.5) nature of the groundwater (Bowden, *op.cit.*; Colhoun *et al.*, 1982).

The age of the sand bodies has not been conclusively proved but a Last Interglacial age is probable (Bowden, *op.cit.*; van de Geer *et al.*, 1979).

It is the purpose of this paper to describe a Late Pleistocene foraminifera-and mollusc-bearing deposit from Mussel Roe Bay and to attempt a reconstruction of the palaeogeography of the area at the time of deposition of the sediments.

STRATIGRAPHY

The geology of the area and location of auger drill holes are shown as figure 2. Basement consists of psammites and pelites of the Early Palaeozoic Mathinna Beds which have been intruded by Devonian granitoids of the Eddystone Batholith (Baillie 1984). Northeast of Mussel Roe Bay a complete but attenuated sequence of Permian sedimentary rocks (Baillie 1983) overlies the granite, and has been intruded by Jurassic dolerite sheets and by minor intrusions of Cretaceous shoshonitic rocks.

Quaternary sand bodies are found in coastal areas, in particular, below a sharp break of slope at about 30 metres (fig. 3). A line of auger holes was drilled in November 1983 in an attempt to gain a better understanding of the Quaternary stratigraphy, and to test the possibility that the sands which form the bulk of the coastal sand plains are marine. The stratigraphy of the five auger holes is shown as figure 4.

Late Pleistocene marine and estuarine sands

Holes 1, 2, 3 penetrated sequences of poorly-sorted, generally negatively-skewed, medium to coarse quartz sands, and finer sediments with variable clay content, Because of difficulties in obtaining undisturbed samples from auger holes, assessment of the degree of sorting in the original

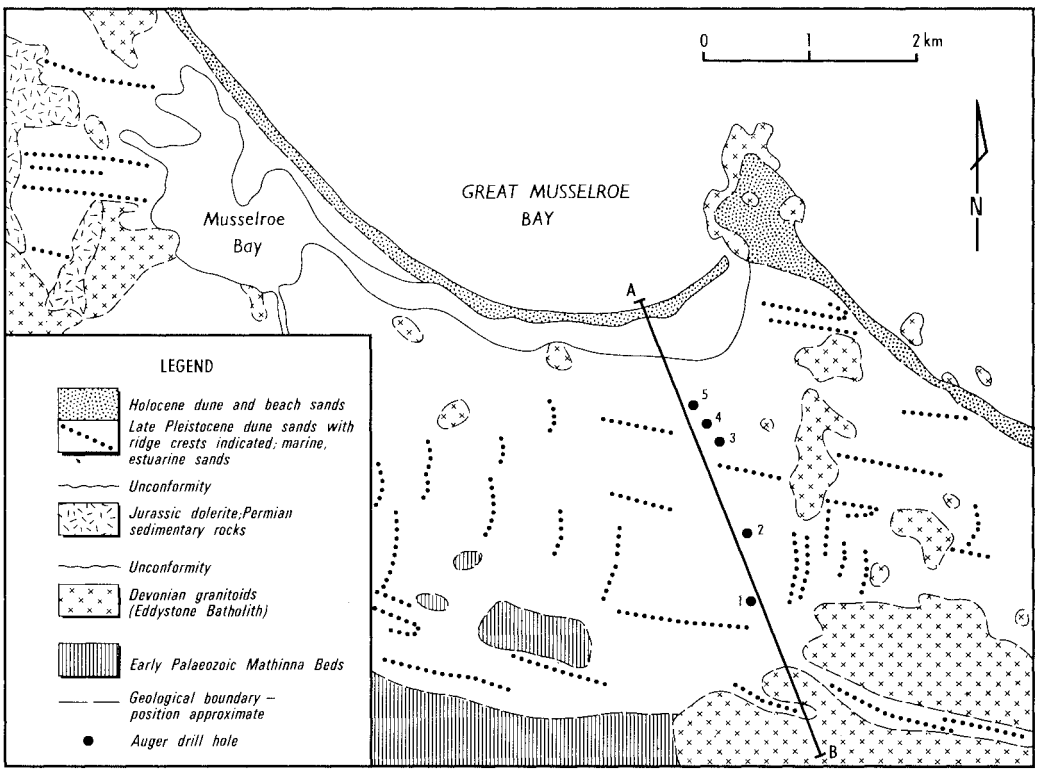

FIG. 2 — Generalised geology of the Mussel Roe Bay area (after Baillie, 1984)

deposits is uncertain. The upper 4 m in Hole 4 consisted of poorly-sorted (but clean), negatively-skewed, medium-coarse quartz sands. The lower 4 m of sediment in this hole consisted of black or dark-gray, shell-bearing, poorly-sorted, medium quartz sand. In Hole 5, from 2–21 m below the collar the sequence consisted of poorly-sorted, negatively-skewed, medium-coarse quartz sand. Indeterminate shell fragments were found in a sample from 8.5 m. In all holes drilled a podsol soil-type was developed in the upper 1–2 m.

In the Stumpys Bay area, some 10 km southeast of Mussel Roe Bay, well-preserved ridges are developed on deposits similar to those drilled at Mussel Roe Bay. The ridges are composed of well-rounded coarse sand and are oriented sub-parallel with the contours of the coastal plain and the present shoreline (Baillie 1984). They are interpreted as being former beach ridges (Bowden 1978).

Late Pleistocene dune sand

Hole 5 was located on a linear sand dune, and the uppermost 2 m of sediment drilled, although strongly podsolised, consisted of very well-sorted medium-grained quartz sand of aeolian origin. The aeolian sands were clearly seen to overlie coarser, less well-sorted sands which contained shell fragments. The dune through which the hole was drilled is part of a field of longitudinal dunes which occurs in the Mussel Roe Bay area (fig. 2), and elsewhere in northeastern Tasmania (Baillie *et al.* 1980; Baillie 1984; Bowden 1978, 1983).

The dunes have an overall WNW–ESE alignment, and, although no absolute age has been determined, are considered to be Last Glacial in age (Bowden 1983; Baillie in McClenaghan *et al.* 1982). Also present in the Mussel Roe Bay area is a series of lunettes (fig. 2) which exhibit strong soil development. The lunettes are developed on sands similar to those encountered in the drill holes and provide an upper age limit for the formation of the older, coarser sands. Lunette formation in south-eastern Australia is usually attributed to the later part of the Last Glacial stage between 10 000 and 26 000 years b.p. (*e.g.* Bowler 1971, 1976).

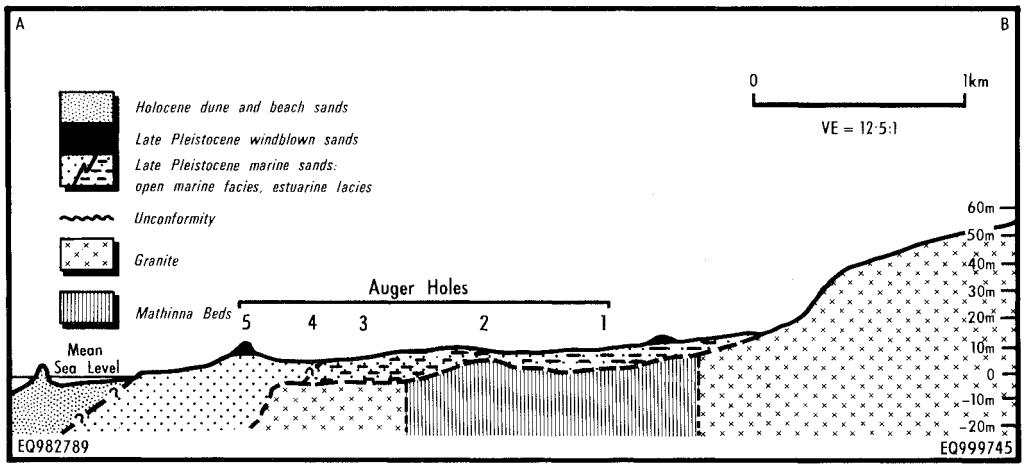

FIG. 3 — Generalised section along Line A–B of figure 2 showing overall stratigraphic relationships as determined by drilling

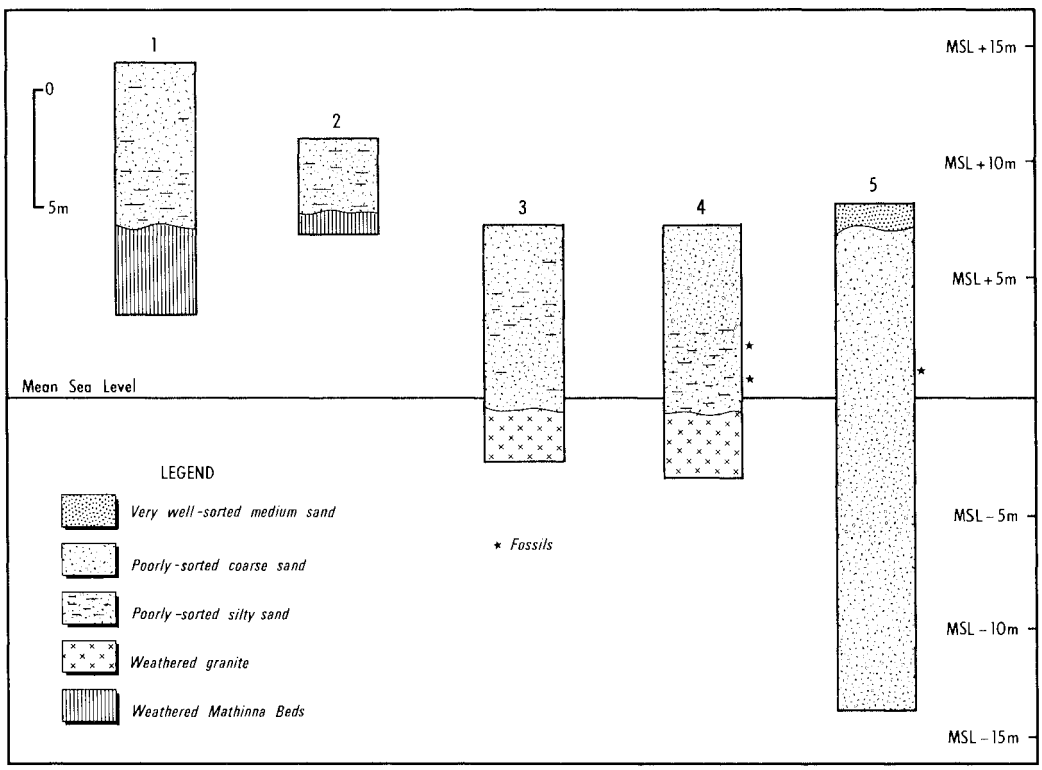

FIG. 4 — Stratigraphy of auger holes drilled at Mussel Roe Bay

TABLE 1

Species	Environment
Austrocochlea constrica zebra (Menke, 1829)	large rock, intertidal
Clanculus dunkeri (Koch, 1843)	large rock, intertidal
Clanculus plebejus (Philippi, 1851)	large rock, intertidal
Gibbula hisseyana (Tenison Woods, 1876)	small rock
Lissotesta micra (Tenison Woods, 1877)	small rock
?Brookula densilaminata (Verco, 1907)	small rock
Pisinna frenchiensis (Gatliff and Gabriel, 1908)	small rock
Assiminea tasmanica (Tenison Woods, 1876)	some freshwater influence
Hydrobia buccinoides (Quoy and Gaimard, 1835)	some freshwater influence
Hydrobia sp.	
Zeacumantus diemenensis (Quoy and Gaimard, 1834)	mud or sand flats
Diala lauta (A. Adams, 1862)	mud or sand flats
Diala pagodula (A. Adams, 1862)	mud or sand flats
Diala translucida (Hedley, 1905)	mud or sand flats
Agatha metcalfei (Pritchard and Gatliff, 1900)	small rock
Chemnitzia mariae (Tenison Woods, 1876)	small rock
Seila albosutura (Tenison Woods, 1876)	small rock
Lepsiella vinosa (Lamarck, 1822)	small rock
Propefusus sp.	large rock
Retusa spp.	small rock
Nassarius pauperatus (Lamarck, 1822)	mud or sand flats
Nassarius pyrrhus (Menke, 1843)	mud or sand flats
Mytilus sp.	rock
Ostrea angasi (Sowerby, 1871)	rocks in sand or mud
Micromytilus crenatuliferus (Tate, 1892)	mud or sand flats
Radiocondyla pectinata Tate and May, 1900	mud or sand flats
Myrtea sp.	mud or sand flats
Wallucina assimilis (Angas, 1867)	mud or sand flats
Arthritica helmsei (Hedley, 1915)	mud or sand flats
Mysella donaciformis (Angas, 1878)	mud or sand flats
Katelysia rhytiphora (Lamy, 1937)	mud or sand flats
Katelysia scalarina (Lamarck, 1818)	mud or sand flats
Anapella cycladea (Lamarck, 1818)	mud or sand flats
Tellina (Macomona) deltoidalis Lamarck, 1818	mud or sand flats
Legrandina bernardi Tate and May, 1902	mud or sand flats

Holocene deposits

Mussel Roe Bay is the estuary of the Great Mussel Roe River and is largely cut off from the sea by a bay-mouth bar which is over 5 km in length. This bay-mouth bar forms the beach of Great Mussel Roe Bay (fig. 2), and is, in part, developed on Late Pleistocene sands (Baillie 1984). The configuration of the bar indicates longshore drift towards the southeast. The entrance to Mussel Roe Bay is about 50 metres wide at high tide.

PLEISTOCENE FAUNAS

The faunas encountered in Hole 4 contained both foraminifera and molluscs. Although stratigraphic relationships have demonstrated that the fossil status of the fauna is unequivocal, all specimens belong to extant species.

Of the foraminifera about 65% are *Ammonia beccarii* (Linne). The remaining 35% consists dominantly of *Elphidium crispum* (Linne), with isolated examples of *E. jenseni* (Cushman) and *E. poeyanum* (d'Orbigny). In the Australian context the foraminifera are typical of the river channel part of an estuarine system where salinity changes regularly (Quilty 1977).

The molluscs (table 1; see later) include 34 species in a good state of preservation. Most species indicate deposition in an estuarine environment of tidal mud or sand flats, but trochids such as *Austrocochlea* and *Clanculus* indicate that some large rocks were also present. Other trochids (*Gibbula* and *Lissotesta*), together with *Pisinna, Seila, Chemnitzia* and *Agatha* may have inhabited smaller boulders. *Assiminea* and *Hybrobia* indicate freshwater influence.

AGE AND ENVIRONMENT

The shell-bearing deposits are older than aeolian sands for which a Late Glacial age is indicated. Because the deposits occur close to, or above present sea level an interglacial age is most probable. The Last Interglacial reached its maximum about 125 000 years b.p., and earlier interglacials occurred at about 230 000 years b.p. and earlier. (Shackleton *et al.* 1984; Shackleton and Opdyke 1973.

Because primary depositional features are preserved at Stumpys Bay it is considered that a Last Interglacial age is likely, as older morphological forms would not have survived the Last Interglacial unless at a higher level. This age is in agreement with the findings of van de Geer *et al.* (1979) who conclude that all Pleistocene marine deposits known from mainland Tasmania are of Last Interglacial age.

The environment of deposition of the sediments drilled is considered to be the same as that currently present in the area. The estuarine sediments encountered in Hole 4 were barred from the open sea by a bay-mouth bar as seen in the coarse sands of Hole 5. The transgressive nature of the system is seen in Hole 4 where the estuarine sediments are overlain by cleaner, coarser sands.

It is noteworthy that all samples were bimodal in character with some 12–30% by weight occurring as grains greater than 0ϕ (very coarse sand, granules, pebbles). This indicates that the local granite was the major sediment source. Granitoids in the area vary from medium-grained (quartz approx. 2 mm diameter) to very coarse-grained (quartz greater than 4 mm diameter). As every sample examined displayed bimodality it is considered that the effect is real, and not an artifact resulting from auger drilling.

CONCLUSIONS

Estuarine and marine sands in the Mussel Roe Bay area were deposited during the Last Interglacial Stage, about 125 000 years b.p. The depositional environment was similar to present, i.e. on estuary barred from the sea by a bay-mouth barrier.

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REFERENCES

BAILLIE, P.W., 1983: The Parmeener Super-Group at Musselroe Bay: drilling results and possible Permian volcanic rocks. *Dep. Mines Tasm. Unpubl. Rep.* 1983/58.

BAILLIE, P.W., 1984: *Geological atlas* 1:50 000 *series. Sheet 25 (8516S). Eddystone.* Department of Mines, Tasmania.

BAILLIE, P.W., TURNER, N.J., COX, S.F., 1980: *Geological atlas* 1:50 000 *series. Sheet 24(8416S). Boobyalla.* Department of Mines, Tasmania.

BOWDEN, A.R., 1978: Geomorphic perspective on shallow groundwater potential, coastal northeastern Tasmania. *Tech. Pap. Aust. Nat. Resour. Council. 36.*

BOWDEN, A.R., 1983: Relict terrestrial dunes : legacies of a former climate in coastal northeastern Tasmania. *Z. Geomorph., 45,* 153–174.

BOWLER, J.M., 1971: Pleistocene salinities and climatic change : evidence from lakes and lunettes in south-eastern Australia, *in* MULVANEY, D.J. & GOLDSON, J. (Eds). *ABORIGINAL MAN AND ENVIRONMENT IN AUSTRALIA* : 47–65. ANU Press : Canberra.

BOWLER, J.M., 1976: Aridity in Australia : age, origins and expression in aeolian landforms and sediments. *Earth Sci. Rev.*, 12:170–310.

COLHOUN, E.A., TURNER, E., VAN DE GEER, G., 1982. Late Pleistocene molluscan faunas from four sites in Tasmania. *Pap. Proc. R. Soc. Tasm.*, 116:91–96.

McCLENAGHAN, M.P., TURNER, N.J., BAILLIE, P.W., BROWN, A.V., WILLIAMS, P.R., MOORE, W.R., 1982: Geology of the Ringarooma-Boobyalla area. *Bull. Geol. Surv. Tasm.*, 61.

QUILTY, P.G., 1977: Foraminifera of Hardy Inlet, southwestern Australia. *J. R. Soc. W. A.*, 59:79–90.

SHACKLETON, N.J., & OPDYKE, N.D., 1973: Oxygen isotope and palaeomagnetic stratigraphy of equatorial Pacific core V 28–238: Oxygen isotope temperatures and ice volumes on a 10^3 year and 10^6 year scale. *Quaternary Research*, 3, 39–55.

SHACKLETON, N.J., BACKMAN, J., ZIMMERMAN, H., *et al.* 1983: Oxygen isotope calibration of the onset of ice-rafting and history of glaciation in the North Atlantic region. *Nature*, 307:620–623.

VAN DE GEER, G., COLHOUN, E.A., BOWDEN, A.R. 1979: Evidence and problems of interglacial marine deposits in Tasmania. *Geol. en Mijnbouw*, 58:29–32.

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