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

by Peter Baillie, Elizabeth Turner, and Patrick G. Quilty

(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), 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
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 southeastern 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).
Late Pleistocene marine sediments and fossils from Mussel Roe Bay, northeastern Tasmania.

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.
Species

- Austrocochlea constrica zebra (Menke, 1829)
- Clanculus dinkkeri (Koch, 1843)
- Clanculus plebejus (Philippi, 1851)
- Gibbula hisseyana (Tenison Woods, 1876)
- Lissotesta mica (Tenison Woods, 1877)
- Brooikula densilaminata (Verco, 1907)
- Pisiana frenchensis (Garif and Gabriel, 1908)
- Assiminea tassmanica (Tenison Woods, 1876)
- Hydrobia buccinooides (Quoy and Gaimard, 1835)
- Hydrobia sp.
- Zeacumantus diemenensis (Quoy and Gaimard, 1834)
- Diaha laura (A. Adams, 1862)
- Diaha progula (A. Adams, 1862)
- Diaha transatucta (Hedley, 1905)
- Agatha metacaffei (Pritchard and Gatliff, 1900)
- Chemnitzia mariae (Tenison Woods, 1876)
- Seila albosutura (Tenison Woods, 1876)
- Lepsella vinosa (Lamarck, 1822)
- Propefusus sp.
- Retusa spp.
- Nassarius pauperatus (Lamarck, 1822)
- Nassarius pyrrhus (Menke, 1843)
- Mytilus sp.
- Ostrea angas (Sowerby, 1871)
- Micromytilus cresataliferus (Tate, 1892)
- Radiocondyla pecinata (Tate and May, 1900)
- Myrtea sp.
- Wallucina assimilis (Angas, 1867)
- Arboridea helmei (Hedley, 1915)
- Myitella donaciformis (Angas, 1878)
- Katehsia rhizophora (Lamy, 1937)
- Katehsia scalarina (Lamarck, 1818)
- Anapella cycladea (Lamarck, 1818)
- Tellina (Macomona) deltoildalis Lamarck, 1818
- Legrandina bernardi Tate and May, 1902

<table>
<thead>
<tr>
<th>Species</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zeacumantus diemenensis</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Diaha laura</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Diaha progula</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Diaha transatucta</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Agatha metacaffei</td>
<td>small rock</td>
</tr>
<tr>
<td>Chemnitzia mariae</td>
<td>small rock</td>
</tr>
<tr>
<td>Seila albosutura</td>
<td>small rock</td>
</tr>
<tr>
<td>Lepsella vinosa</td>
<td>large rock</td>
</tr>
<tr>
<td>Propefusus sp.</td>
<td>small rock</td>
</tr>
<tr>
<td>Retusa spp.</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Nassarius pauperatus</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Nassarius pyrrhus</td>
<td>rock</td>
</tr>
<tr>
<td>Mytilus sp.</td>
<td>rocks in sand or mud</td>
</tr>
<tr>
<td>Ostrea angas</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Micromytilus cresataliferus</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Radiocondyla pecinata</td>
<td>mud or sand flats</td>
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<td>Tellina (Macomona)</td>
<td>mud or sand flats</td>
</tr>
<tr>
<td>Legrandina bernardi</td>
<td>mud or sand flats</td>
</tr>
</tbody>
</table>

**TABLE 1**

**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 foraminifera 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. poyrynum* (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 *Pisiana, Seila, Chemnitzia* and *Agatha* may have inhabited smaller boulders. *Assiminea* and *Hydrobia* 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 Stumpy 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 0.5 (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.

ACKNOWLEDGMENTS

Legrandina bernardi was identified by Dr N.H. Ludbrook, Adelaide. The paper was critically read by M.J. Clarke and E. Williams. PWB publishes with permission of the Director of Mines, Hobart.

REFERENCES


(accepted Jan 29, 1985)