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COMMENT: WARDANG ISLAND - A REFUGE FOR MARGINOPORA VERTEBRALIS

GEOLOGICAL SURVEY

by

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BRIEF COMMUNICATION

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Bone[1] recently suggested that tests of *Marginopora vertebralis* found on the intertidal flat between Wardang Is. and Goose Is. are of recent origin, and that this species may be extant within the adjacent reef waters. This hypothesis was based on the fresh and uncemented appearance of individual specimens, on the MgC_{O3} content of various samples, and on the apparent absence of outcropping (erosional) sources of older material. As part of ongoing studies into the stratigraphy and chronology of coastal Quaternary sediments of South Australia [2,3,4,5], we are examining the wider problem of the reworking of Pleistocene bioclastic detritus into Holocene coastal sediments. Previous studies [3,6,7,8] have demonstrated that reworking of older material is a significant process which must be considered, particularly where isotopic dating of the carbonate fraction of sediments is contemplated. One verified indicator of reworking is the presence of the bivalve *Anadara trapezia* in Holocene coastal sediments of South Australia, and a similar conclusion has been assumed in the case of *M. vertebralis* [3]. Our recent but unpublished data on the extent of amino acid racemisation of *M. vertebralis* found in Holocene strata from various areas of the state confirm that, in each case, its presence also results from reworking of Pleistocene deposits.

To test the validity of Bone's hypothesis for Wardang Island, we have examined the Wardang Island reef site, and have used radiocarbon[3] and amino acid racemisation[9] dating techniques on the samples collected.

The results show that the reef connecting Wardang Is. and Goose Is., rather than being modern[1], is of Pleistocene age (Table 1). The surface of this reef is exposed at low tide and is mantled with a thin veneer (mostly <10cm) of recent intertidal sand. The reef rock comprises poorly sorted and weakly cemented bioclastic detritus, including numerous specimens of *M. vertebralis* up to 8 mm in diameter. Detritus from the crumbling seaward reef edge, including *M. vertebralis*, is swept over the reef surface and is the major source of the sediment of the intertidal veneer. Thus the "modern" intertidal veneer is

largely composed of reworked Pleistocene skeletal detritus (lithoskels) and the age indicated by radiocarbon data (Table 1) is the "average age" of the skeletal constituents which make up the sediment. Individual fragments of the crumbling reef rock are visibly calcreted. However evidence of cementation and calcretization enveloping individual grains is apparently reduced and eventually eliminated by continual abrasion in the intertidal environment. In particular specimens of M. vertebralis have secondary carbonate infillings progressively removed with distance landwards away from the reef edge, hence their "fresh" and "uncemented" appearance.

Amino acid racemisation measurements were also undertaken on M. vertebralis extracted from the reef rock (Table 2). Other specimens of known age from northern Spencer Gulf (Late Pleistocene)[3,4] and the Great Barrier Reef (Holocene) provide a basis for calibration. The foraminifera extracted from the Wardang Is. reef rock are clearly of Late Pleistocene age (ca. 110,000 yrs by analogy with the northern Spencer Gulf sample[3]). Amino acid racemisation measurements could not be undertaken on the foraminifera loose on the tidal flat as bacterial and algal contamination penetrates the porous skeletal framework and cannot be satisfactorily removed.

We conclude that the specimens of M. vertebralis found on the tidal flat between Wardang Is. and Goose Is. are derived from erosion of underlying weakly cemented Pleistocene marine sediments. Consequently it is unnecessary, and is most likely incorrect, to invoke an hypothesis that M. vertebralis is extant in the adjacent waters.

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TABLE 1 Radiocarbon measurements on samples from Wardang Island

Sample	Fraction Dated	Radiocarbon Age	Geological Age
6329 RS 75	Reef rock	Bulk carbonate	30,800 $^{+750}_{-700}$ yrs[1]	Late Pleistocene
6329 RS 76	Intertidal sand	Bulk sediment	6,290 ± 90 yrs[2]	Holocene

1. An "apparent age" resulting from the incorporation of some modern carbon into Late Pleistocene (Glanville Fm.) sediment.
2. An "average age" resulting from physical intermixing of Late Pleistocene lithoskels with modern skeletal detritus.

TABLE 2 Extent of amino acid racemisation in samples of *Marginopora vertebralis* ("Total hydrolysate" D/L ratios of alanine, proline and aspartic acid).

Locality	No. of analyses	Amino acid D/L ratios ALA	PRO	ASP	Geological Age
Great Barrier Reef	3	0.06	0.07	0.14	Holocene
Upper Spencer Gulf	1	0.25	0.29	0.37	Late Pleistocene
Wardang Island	2	0.25	0.27	0.32	-