Appendix DR1. Radiocarbon Dates

Table DR1. Radiocarbon Ages from Sand Cay Materials, Reef Core and Reef Flat Samples, Bewick Island, Great Barrier Reef, Australia.

Lab code	Island sample location	Sample material	Depth relative to MSL (m)	Conventional age (yr B.P.)	Calibrated age range (95.4% probability) (cal. yr B.P.)
Wk-17636	T2 C 1	Calcareous sand	2.36	4,608 ± 42	4,570-4,880
Wk-24023	T2 C 1	Calcareous sand	1.38	4,434 ± 42	4,390-4,720
Wk-17630	T2 C 1	*In situ* coral *Porites*	0.09	6,037± 45	6,270-6,530
Wk-17637	T2 C 2	Calcareous sand	2.28	4,525 ± 44	4,500-4,810
Wk-24024	T2 C 2	Calcareous sand	-0.10	4,585 ± 41	4,560-4,850
Wk-17631	T2 C 2	*In situ* coral *Favid*	-0.27	6,044 ± 45	6,280-6,540
Wk-17638	T2 C 3	Calcareous sand	2.98	4,605 ± 41	4,570-4,870
Wk-17635	T2 C 3	Calcareous sand	0.18	4,646 ± 42	4,640-4,960
Wk-17632	T2 C 3	*In situ* coral *Porites*	-0.24	5,619 ± 44	5,840-6,150
Wk-17639	T2 C 4	Calcareous sand	2.05	3,838 ± 40	3,580-3,870
Wk-24025	T2 C 4	Beachrock	1.67	4,024 ± 40	3,830-4,130
Wk-17640	T2 C 5	Calcareous sand	0.95	1,606 ± 47	970-1,250
Wk-24026	T2 C 5	Coral shingle	-0.32	4,937 ± 43	4,990-5,330
*Wk-24027	T2 C 6	Mangrove peat	-0.16	110 ± 0.2	Modern
Wk-17633	T2 C 6	*In situ* coral *Favid*	-0.27	5,553 ± 46	5,720-6,020
Wk-24028	RF	*In situ* coral *Porites* FMA	-0.72	5,270 ± 44	5,450-5,700
ANU-1559	PA	Calcareous sand	1.15	4,380 ± 80	4,200-4,800
ANU-1387	PA	Calcareous sand	1.33	2,950 ± 80	2,380-2,850
ANU-1386	BR	*Tridacna* shell in BR	-	2,030 ± 70	1,340-1,730
ANU-1385	RF P1	Coral *Platygyra* in SR	-	640 ± 70	Mod - 390
ANU-1208	RF P1	Coral in RR	-	2,840 ± 70	2,330-2,710
ANU-1609	RF P1	*Tridacna* shell in RR	-	2,040 ± 70	1,350-1,740
ANU-1608	RF P2	*Tridacna* shell in SR	-	760 ± 65	220-500
ANU-1284	Drill 73	Coral frags *Porites sp.*	-3.7	6,920 ± 130	7,100-7,650

Note: Radiocarbon dates obtained from the Radiocarbon Dating Laboratory, University of Waikato (Wk), New Zealand and Australian National University (ANU). Ages calibrated using OxCal version 3.10 (Bronk Ramsey, 2001) with marine data set (Hughen et al., 2004) and Delta-R of 52 ± 31 as best estimate for northeast Australia. ANU dates from Polach et al. 1978. Sample location refers to: T = transect line, C = core, RF = reef flat, P = profile line, BR = beachrock, Drill = 1973 drill core. FMA = fossil microatoll, RR = cemented rampart rock, SR = non lithified shingle ridge. *Wk-24027 was an AMS date on mangrove peat. Location of transects and reef samples shown in Figure 1.

References

Bronk Ramsey, C., 2001, Development of the radiocarbon program OxCal: Radiocarbon, v. 43, p. 355–363.

Hughen K.A., et al. 2004, Marine 04 Marine Radiocarbon Age Calibration, 0-26 Cal KYr BP. Radiocarbon, v. 46, no. 3, p. 1059-1086.

Polach, H.A., McLean R.F., Caldwell, J.R., Thom, B.G. 1978, Radiocarbon ages from the northern Great Barrier Reef: Philosophical Transactions of the Royal Society London, A, 291, p. 139-158.

Figure DR1. Fossil Microatolls from Bewick Island

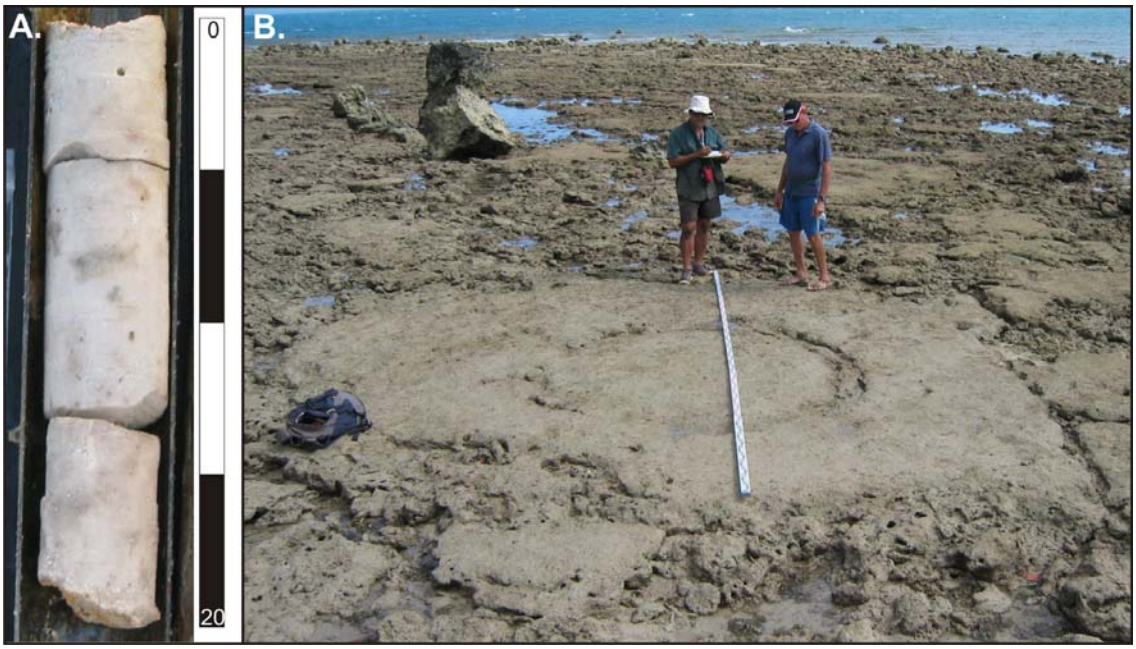

Figure DR1. A) Fossil *Porites* at base of core hole 1 beneath island sediments at depth +0.09 to -0.12 m relative to msl. Conventional age 6,037 ± 45 cal yr BP. B) Fossil *Porites* microatoll exposed on contemporary reef flat, 50 m southwest of island. Microatoll 4.9 m diameter, elevation -0.72 m relative to msl, radiometric age 5,575 cal yr BP. Note additional microatolls in background.

Corals adopt the microatoll morphology when upward growth is constrained by prolonged subaerial exposure at low tide but lateral colony growth can continue (Smithers and Woodroffe, 2000). Corals at base of cores in holes through Bewick cay are interpreted as *in situ* fossil microatolls based on three characteristics: i) corallite orientation showed the primary growth axis was lateral; ii) the colonies were of comparable thickness (~20-40 cm) to fossil microatolls preserved on the surrounding reef flat (Fig. DR1 A, B); and iii) taphonomic traces of boring and encrustation preserved on the upper and lower surfaces suggested the material was *in situ* and upward coral growth was sea level constrained.

Reference

Smithers, S.G., and Woodroffe, C.D., 2000, Microatolls as sea level indicators on a mid-ocean atoll: Marine Geology, v. 168, p. 61-78.