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¹⁴C AMS DATES ON *RATTUS EXULANS* BONES FROM NATURAL AND ARCHAEOLOGICAL CONTEXTS ON NORFOLK ISLAND SOUTH-WEST PACIFIC

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Introduction

The Pacific rat (*Rattus exulans*) was transported throughout the western Pacific by migrant peoples in prehistory (Atkinson 1982; Roberts 1991). Its presence on many islands before European contact is signalled by its occurrence in archaeological sites (e.g., Kirch 1997) and as fossils in natural contexts (e.g., Holdaway and Worthy 1996). As a human commensal, it may be used as a proxy for the arrival of people on a particular island (Allen *et al.* 1996).

Norfolk Island (29°02'S, 167°57'E) lies about 800 km northwest of North Cape, mid-way between New Zealand and New Caledonia. It was not inhabited at the time of the first European contact, by James Cook in 1774. Although there were indications that people had occupied the island before the British arrived, including the presence of living and fossil Pacific rats (Specht 1993), no actual occupation site was known before December 1995 (Anderson 1996).

Meredith *et al.* (1985) reported a minimum date for the presence of *Rattus exulans* on Norfolk Island using dates on charcoal from an apparently enclosing layer (the upper part of their Unit C4) in Cemetery Bay. The four dates on charcoal ranged between 715 ± 75 (I-11,019) and 850 ± 50 (Beta-6821) radiocarbon years b.p., which correspond to calendar date ranges (68% C.I.) of 1263-1379 A.D and 1165-1254 A.D. Meredith *et al.* noted the first appearance of *Rattus exulans* as being at 700 mm below the charcoal layer,

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which could mean an age of at least 1200 A.D. for the rat bones at the bottom of the deposit. No dates were obtained on rat bones themselves.

The dune system at Cemetery Bay was formerly the site of large colonies of seabirds, including both surface-breeding boobies (*Sula* sp., van Tets *et al.* 1988) and burrowing petrels (Meredith 1985). Given the amount of reworking possible as a result of petrels burrowing in the friable sand at Cemetery Bay, it was at least possible that the rat material found well beneath the charcoal layer in Unit C4 (Meredith *et al.* 1985) post-dated the development of the charcoal layer.

To test the hypothesis that Pacific rats were indeed present on Norfolk Island at least 800-900 years b.p., a Pacific rat bone from the Cemetery Bay excavation, and three from the occupation site at Emily Bay (Anderson 1996) were dated by AMS on the bone gelatin fraction. In addition, a bone collected by Meredith from Unit C4 at Cemetery Bay (Anderson 1996) was also dated.

The results of the dating of samples of *Rattus exulans* bone from excavations on the island in December 1995 were briefly noted in Anderson (1996). Here we provide a list of the dates presently available, with details of material, provenance and laboratory data.

Radiocarbon Determinations

The collection data for the samples of Pacific rat bone are given in Table 1, and the date details are given in Table 2. Calibrated ages (before present and A.D.) are given in Table 3 (calibrated using INSCAL, courtesy Rafter Radiocarbon Laboratory).

Samples of bone from two sites were dated. The first site, CB95:01, was in the open dunes of Cemetery Bay (Anderson 1996, Fig. 2). Although there was evidence for European occupation in the upper part of the excavation (<65 cm depth), and perhaps to 1.40 m (Anderson 1996), there was no indication of European or Polynesian occupation below that level. The rat bone dated as part of the present work was obtained from Spit 3 (of 4) from Layer 7, the deepest layer from which rat bones were obtained.

The second site (EB95.06) was at Emily Bay, to the southwest of the Cemetery Bay excavation (see stratigraphy in Anderson 1996). All samples were drawn from Square 4 within the cultural layer, at depths ranging from

the highest (Spit 1) to the lowest (Spit 4) levels.

Acknowledgements

The material was collected during the first season of work of the Norfolk Island Prehistory Project, under permit to the Australian Heritage Commission and KAHVA. The field work was funded by grants from the Wenner-Gren Foundation and the National Estates Grants Programme. Dates NZA6630, 6631, 6634, and 6635 were funded under Contract PLC501 (Time-course of kiore invasion of New Zealand) of the New Zealand Foundation for Research, Science and Technology to RNH.

References

- Allen, J.S., T.N. Ladefoged, E. Matisoo-Smith, M. Roberts, W. Norman, H. Parata, S. Clout, D. Lambert. 1996. Maori prehistory: ancient DNA of the kiore and kuri. *Archaeology in New Zealand* 39 (4):291-295.
- Anderson, A.J. 1996. Discovery of a prehistoric habitation site on Norfolk Island. *Journal of the Polynesian Society* 105 (4):479-486.
- Holdaway, R.N. and T.H. Worthy. 1996. Diet and biology of the laughing owl *Sceloglaux albifacies* (Aves: Strigidae) on Takaka Hill, Nelson, New Zealand. *Journal of Zoology, London* 239:545-572.
- Kirch, P.V. 1997. Changing landscapes and sociopolitical evolution in Mangaia, Central Polynesia. pp. 147-165 in: Kirch, P.V. and T.L. Hunt. (ed.) *Historical ecology in the Pacific Islands: prehistoric environmental and landscape change*. Yale University Press, New Haven. 331 p.
- Meredith, C. 1985. The vertebrate fossil fauna of Norfolk Island, and the phylogeny of the genus *Pterodroma*. Unpublished PhD thesis. Monash University, Clayton, Victoria, Australia. 255 p.
- Meredith, C.W., J. Specht, P.V. Rich. 1985. A minimum date for Polynesian visitation to Norfolk Island, South-west Pacific, from faunal evidence. *Search* 16 (9-12):304-306.
- Specht, J. 1993. Additional evidence for pre-1788 visits by Pacific Islanders to Norfolk Island, South-West Pacific. *Records of the Australian Museum Supplement* 17:145-155.
- van Tets, G.F., C.W. Meredith, P.J. Fullagar, P.M. Davidson. 1988. Osteological differences between *Sula* and *Morus*, and a description of an extinct new species of *Sula* from Lord Howe and Norfolk Islands, Tasman Sea. *Notornis* 35 (1):35-57.

Table 1. Provenance of Pacific rat bones from Norfolk Island, South-west Pacific, dated by AMS ^{14}C . NIPP, Norfolk Island Prehistory Project.

Site	Trench	Square	Layer	Spit	NIPP	Element	Date collected	Date code
Cemetery Bay	1	A3	7	3	39/60	L femur	xx.XII.1995	NZA6635
Emily Bay	6	A4		4	67/39	R mandible	18.XII.1995	NZA6630
	6	A4		3	66/21	L femur	17.XII.1995	NZA6631
	6	A4		1	56/55pt	R tibiofibula	17.XII.1995	NZA6634

Table 2. Radiocarbon dates on *Rattus exulans* bone from Norfolk Island. CRA, conventional radiocarbon age based on the Old (Libby) half-life. CY, collagen yield (mg); GY, gelatin yield (mg).

Date code	Measured	Material	CRA	$\delta^{13}\text{C}(\text{‰})$	Wt. (mg)	CY	% collagen	GY	% gelatin	%C
NZA6630	9.IV.96	Redentary+inc+molar	874±84	-19.30	127.1	12.3	9.7	8	65	42
NZA6631	9.IV.96	Left femur	1142±86	-19.30	142.4	16.2	11.4	13.7	84.6	38
NZA6634	9.IV.96	Right tibiofibula	1206±94	-19.80	116.9	15.8	13.5	10.7	67.7	43
NZA6635	9.IV.96	Left femur	1077±79	-19.10	161.5	14.2	8.8	9.5	66.9	53

Table 3. Calibrated ages of rat bones from Norfolk Island, South-west Pacific.

Date code	CRA	Calibrated age (years A.D.)	
		(95% C.I.)	(68% C.I.)
NZA 6630	874±84	1023-1283	1047-1096, 1116-1144, 1154-1244
NZA 6631	1142±86	688-1028	812-992
NZA 6634	1206±94	668-998	716-743, 762-896, 913-957
NZA 6635	1077±79	785-1160	883-1067