

Late-Holocene initiation of ice-free ecosystems in the southern Ross Sea, Antarctica

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Appendix 1. *Pygoscelis adeliae*. Radiocarbon dates (in calibrated yr BP) of Adélie penguin remains from the southern Ross Sea, including 36 dates acquired in this project. All 119 dates were corrected and calibrated using a reservoir value $\Delta R = 750 \pm 50$ yr based on modern (pre-1950) penguin remains that have been dated from the Ross Sea region (Emslie 1995). The uncorrected conventional dates \pm SD are given with the 2σ calibrated range determined from the Calib 4.3 software program and marine calibration curve (Stuiver & Reimer 1993, Stuiver et al. 1998). This range provides 95 % confidence that the true age of the specimen falls within the specified time period. All dates are ordered from youngest to oldest from each locality; see source references for stratigraphic information. Dates without references are those completed in this project; an asterisk indicates dates considered to be anomalous because they are inconsistent with other, multiple dates from the same sediments or location (see source reference for explanation). Dochat et al. (2000) dates are from raised beaches or non-ornithogenic soils and do not represent a breeding colony; although it is possible that penguins bred nearby at this time, it would require recovery of ornithogenic soils with bones of juvenile penguins to support this (moreover, hundreds of bones of dead adults can accumulate in beach terraces near molting sites; S. D. Emslie pers. obs.)

	Sample	Material	Conventional date (mean \pm SD)		2σ calibrated range		Source
Beaufort Island	NZ ?	Bone	1150	45	–	–	Baroni & Orombelli (1994)
	NZA 12287	Bone	1313	55	328	0	Lambert et al. (2002)
Cape Barne	NZ 1044	Body	1338	62	412	0	Spellerberg (1970)
	NZ 1043	Body	1400	94	492	0	Spellerberg (1970)
	NZA 13372	Eggshell	1493	55	506	261	
	NZ 1042	Body	1495	50	504	265	Spellerberg (1970)
	NZ 677	Tissue	1591	64	570	302	Stonehouse (1970)
	NZA 13370	Bone	1602	55	567	318	
	NZA 14054	Feather	1676	55	643	432	
Cape Royds	NZA 13371	Tissue	2187	70	1170	790	
	NZA 13369	Eggshell	1241	55	281	0	
	NZA 14055	Bone	1336	60	407	0	
Clear Lake	NZA 13368	Bone	2007	60	947	653	
	NZ 1045	Body	1837	99	878	492	Spellerberg (1970)
Cape Bird	UGA 6802	Bone	730	65	–	–	Dochat et al. (2000)
	UGA 6792H	Skin	1035	50	–	–	Dochat et al. (2000)
	UGA 6792H	Skin	1080	50	–	–	Dochat et al. (2000)
	AA 15328	Bone	1187	45	–	–	Dochat et al. (2000)
	UGA 6792B	Bone	1195	55	–	–	Dochat et al. (2000)
	NZA 13314	Eggshell	1233	60	281	0	
	NZA 14057	Bone	1319	55	338	0	
	UGA 6810	Bone	1440	60	482	146	Dochat et al. (2000)
	NZA 13209	Bone	1452	70	498	143	
	NZA 13210	Bone	1458	75	504	141	
	NZA 13363	Bone	1470	70	506	233	
	NZA 13364	Bone	1485	55	502	257	
	NZA 13367	Bone	1547	55	534	286	
	NZA 13366	Bone	1580	55	551	304	
	NZA 13365	Bone	1606	55	592	322	
	NZA 13374	Feather	1856	65	797	530	
	UGA 6799	Bone	1915	60	889	599	Dochat et al. (2000)
	UGA 6807	Bone	3510	60	2713	2299	Dochat et al. (2000)
	UGA 6805	Bone	4295	80	3642	3212	Dochat et al. (2000)
	UGA 6826	Bone	4415	80	3818	3351	Dochat et al. (2000)
	UGA 6796	Bone	4420	75	3816	3360	Dochat et al. (2000)
	AA 15333	Bone	4504	56	3868	3471	Dochat et al. (2000)
	AA 15332	Bone	4537	56	3910	3539	Dochat et al. (2000)
	UGA 6808	Bone	4820	90	4398	3823	Dochat et al. (2000)
	UGA 6809	Bone	4885	95	4487	3885	Dochat et al. (2000)
	AA 15330*	Bone	5175	58	4809	4392	Dochat et al. (2000)
	NZ 5990*	Remains	7070	180	7231	6343	Dochat et al. (2000), Speir & Cowling (1984)
NZ 5590*	Remains	8080	160	8128	7481	Dochat et al. (2000), Heine & Speir (1989)	
AA 15331*	Bone	11039	74	11902	11887	Dochat et al. (2000)	

Appendix 1. (continued)

	Sample	Material	Conventional date (mean ± SD)		2σ calibrated range		Source
Cape Crozier	NZA 13201	Bone	1272	65	307	0	
	NZA 13202	Bone	1323	65	401	0	
	NZA 10306	Bone	1380	60	440	70	Lambert et al. (2002)
	NZA 13313	Eggshell	1397	95	492	0	
	NZA 13203	Bone	1463	80	510	139	
	NZA 8818	Bone	1475	59	501	248	Lambert et al. (2002)
	NZA 9182	Bone	1534	57	528	278	Lambert et al. (2002)
	NZA 8819	Bone	1503	57	511	264	Lambert et al. (2002)
	NZA 8821	Bone	1564	57	544	293	Lambert et al. (2002)
NZA 8820	Bone	1616	62	617	322	Lambert et al. (2002)	
Peninsula by Depot Island	TO 4971	Guano	3320	50	2356	2059	Lambert et al. (2002)
	GX 16915	Guano	3825	150	3260	2457	Baroni & Orombelli (1994)
	NZA 13373	Eggshell	3890	55	3136	2747	
	GX 16916	Guano	3990	100	3343	2763	Baroni & Orombelli (1994)
	GX 16917	Guano	4580	100	4080	3474	Baroni & Orombelli (1994)
Cape Roberts	GX 20572	Guano	3955	155	3401	2694	Lambert et al. (2002)
	NZA 13354	Eggshell	3999	65	3306	2842	
	TO 4963	Guano	4150	60	3441	3059	Lambert et al. (2002)
Spike Cape	GX 20570	Guano	5800	100	5615	5071	Lambert et al. (2002)
	TO 5572	Guano	5840	70	5604	5271	Lambert et al. (2002)
Cape Ross	GX 21407	Guano	4135	125	3557	2870	Lambert et al. (2002)
	GX 16914	Guano	4220	160	3726	2906	Baroni & Orombelli (1994)
	GX 16920	Guano	4255	155	3800	2954	Baroni & Orombelli (1994)
	GX 16918	Guano	4310	155	3842	3049	Baroni & Orombelli (1994)
	TO 4967	Guano	4310	60	3630	3267	Lambert et al. (2002)
	GX 16911	Guano	4315	90	3688	3216	Baroni & Orombelli (1994)
	NZA 13205	Bone	4399	60	3727	3363	
	GX 16912	Guano	4465	90	3888	3377	Baroni & Orombelli (1994)
	NZA 13204	Bone	4480	60	3845	3452	
	GX 16921	Guano	4555	90	4003	3468	Baroni & Orombelli (1994)
	GX 16913	Guano	4570	90	4057	3481	Baroni & Orombelli (1994)
	NZA 13206	Bone	4580	60	3975	3574	
	GX 16919	Guano	4735	165	4435	3543	Baroni & Orombelli (1994)
GX 16922	Guano	4780	160	4502	3607	Baroni & Orombelli (1994)	
Dunlop Island	TO 5576	Guano	3530	60	2724	2310	Lambert et al. (2002)
	TO 5575	Guano	3690	70	2869	2467	Lambert et al. (2002)
	NZA 13353	Eggshell	3897	60	3153	2747	
	GX 21409	Guano	3985	175	3470	2689	Lambert et al. (2002)
	NZA 13207	Bone	4142	60	3434	3050	
	NZA 13208	Bone	5217	60	4829	4415	
	TO 4968	Guano	5630	70	5433	4909	Lambert et al. (2002)
	TO 5578	Guano	5750	70	5562	5109	Lambert et al. (2002)
	TO 5577	Guano	6330	80	6187	5738	Lambert et al. (2002)
	NZA 14056*	Bone	41600	1100			
Franklin Island	QL 170	Remains	1750	70	705	468	Baroni & Orombelli (1994)
	QL 169	Remains	3150	80	2293	1813	Baroni & Orombelli (1994)
	QL 141	Remains	5340	50	4960	4601	Baroni & Orombelli (1994)
Marble Point	AA 18913	Remains	3170	61	2288	1865	Hall & Denton (1999)
	NZA 13196	Bone	3276	65	2345	1977	
	NZA 13195	Bone	3340	85	2493	2004	
	NZA 13197	Bone	3347	60	2452	2082	
	NZA 13200	Bone	3498	60	2707	2294	
	GX 16924	Guano	3905	145	3342	2669	Baroni & Orombelli (1994)
	NZA 13198	Bone	4467	70	3850	3426	
	NZA 13199	Bone	4491	60	3861	3460	
Prior Island	GX 16933	Guano	1845	75	820	515	Baroni & Orombelli (1994)
	GX 16932	Guano	1860	75	838	523	Baroni & Orombelli (1994)
	GX 16931	Guano	1910	75	902	550	Baroni & Orombelli (1994)
	GX 16930	Guano	2105	75	1077	701	Baroni & Orombelli (1994)
	GX 16929	Guano	2205	75	1206	815	Baroni & Orombelli (1994)
	GX 16928	Guano	2385	80	1351	970	Baroni & Orombelli (1994)
	OS 27679	Guano	4610	65	4055	3607	Lambert et al. (2002)
	OS 27680	Guano	5080	40	4618	4282	Lambert et al. (2002)
	GX 23277a	Guano	5825	55	5585	5276	Lambert et al. (2002)
Cape Day	GX 16923	Guano	4180	90	3541	3026	Baroni & Orombelli (1994)
	GX 16910	Guano	4230	85	3582	3117	Baroni & Orombelli (1994)
	TO 4972	Guano	4360	50	3676	3345	Lambert et al. (2002)
Cape Hickey	GX 23278am	Guano	3485	55	2698	2291	Lambert et al. (2002)
	GX 23280	Guano	4265	55	3567	3231	Lambert et al. (2002)
	GX 16967	Guano	4365	90	3767	3294	Baroni & Orombelli (1994)
	GX 16966	Guano	4395	90	3816	3323	Baroni & Orombelli (1994)
	OS 27675	Guano	7540	60	7434	7171	Lambert et al. (2002)
	GX 23279a	Guano	10005	85	10291	9544	Lambert et al. (2002)
	GX 16925	Guano	11325	360	12905	10382	Baroni & Orombelli (1994)
	OS 27351	Guano	12250	50	13750	12667	Lambert et al. (2002)
	GX 18843	Guano	13070	360	15305	13026	Baroni & Orombelli (1994)