

ANU RADIOCARBON DATE LIST XI: RADIOCARBON DATES FROM LAKES BARRINE AND EACHAM, ATHERTON TABLELAND, NORTH QUEENSLAND, AUSTRALIA

M. J. HEAD, L. J. TAYLOR and D. WALKER

Quaternary Dating Research Centre, The Australian National University, P. O. Box 4
Canberra, ACT 0200 Australia

INTRODUCTION

Lakes Barrine and Eacham and their small, discrete, forested catchments are sites of intensive sedimentological, palynological and ecological research. The studies that we present here concentrate on integrating population statistics of tree species of the living forest with their histories, as documented by fine-resolution pollen analysis (Green and Dolman 1988). Most of the work has been undertaken at Lake Barrine, where the last 5 ka is recorded in laminated sediments. Additional information about these sites and about aspects of the project is contained in Chen (1986, 1987, 1988), Goodfield (1988), Grindrod (1979), Timms (1976, 1979) and Walker (1988).

The local bedrock is Cenozoic basalt, and the crater rims are pyroclastic mixtures of basalt and metamorphic fragments. The ages of the craters' formations are not known, but are probably >1 Ma. The rims are covered by wet tropical rainforest. Neither lake has inflowing streams. Barrine overflows through a stream only in summer, but Eacham water seems to be lost by seepage through the crater walls; annual water-level fluctuations do not exceed 40 cm at either lake. Table 1 shows comparative statistics for the two lakes.

TABLE 1. Comparative Statistics of Lakes Barrine and Eacham

	Lake Barrine	Lake Eacham
Long/Lat	145°38' E, 17°15'S	145°37'E, 17°17'S
Altitude (m asl)	725	747
Total catchment (km ²)	1.95	0.77
Water surface (km ²)	1.00	0.47
Mean height of rim (m)	27	30
Maximum water depth (m)	67	63

Both lakes stratify for ~4 months each summer with a thermocline at ~15 m depth. Hypolimnion temperature is 19–19.5°C year round. Deep mixing occurs during some winters, more frequently in Eacham than Barrine. The lake waters are very dilute, ~60 ppm total dissolved solutes, except in the lowest few meters where 100 ppm may occur at maximum stratification. At Barrine, the maximum depth sampled was 12 m below mud-water interface at the middle of the lake. The gross stratigraphy from ~30 cores and the generalized ¹⁴C chronology are shown in Tables 2 and 3. At Eacham, the maximum depth sampled was 6 m, at which the ¹⁴C age, at the middle of the lake, is ~5000 BP. The muds are not so consistently stratified as at Barrine, are more detrital and have higher clay content.

METHODS

¹⁴C determinations were made on samples from 5-cm-diameter cores collected with a Mackereth sampler. These cores were transported to the laboratory and exposed by cutting the core longitudinally.

nally. Sediments collected by *in-situ* freezing were transported to the laboratory packed in solid CO₂ and stored in freezers until sampled by dissection over a bed of solid CO₂. Levels are from the top of the relevant core with allowance for gaps caused by outgassing. The brief characterizations of the dated materials given here will be fully expanded in later publications. We use the terms, “mud”, “lake mud” and “organic mud” as synonyms; “lake sediment” implies a more obvious inorganic content. We describe pretreatment methods below for reference. Except where otherwise noted, we used pretreatment A.

Pretreatment A. Rootlets and/or other extraneous materials were removed by hand or by washing, the sample was broken into small pieces, boiled in 2N HCl, filtered, rinsed in demineralized water to pH ~6.5 and dried.

Pretreatment B(i). Rootlets and/or other extraneous materials were removed by hand, washing or sieving. The sample was broken into small pieces or sieved, boiled in dilute HCl, rinsed to pH ~6.5 with demineralized water, and then boiled in 2% NaOH. The sample (NaOH insoluble) was then acidified, allowed to settle or was centrifuged, filtered, rinsed with demineralized water to pH ~6.5 and dried.

Pretreatment B(ii). The supernatant of B(i) was further treated with 10% HCl to give a pH of ~2 and briefly boiled. The NaOH soluble sample (humic acids) was then allowed to settle or was centrifuged. The precipitate was filtered, rinsed with demineralized water to pH ~5 and dried.

Ages are reported as ¹⁴C yr BP, *i.e.*, corrected for isotopic fractionation and based on the Libby half-life of 5568 yr. The modern reference standard was ANU sucrose, secondary international calibration standard, correlated with 95% of ¹⁴C activity of NBS oxalic acid, normalized to $\delta^{13}\text{C} = -19\text{‰}$ wrt PDB (Polach 1979; Currie and Polach 1980). $\delta^{13}\text{C}$ values were estimated at -24.0‰ , and the dilution factor is zero, unless otherwise indicated.

Barrine—Core Samples from Water Depth Presently >50 m (Table 2)

TABLE 2. Barrine Cores (water depth presently >50 m)

Depth (m)	Age (ka BP)	Sediment
0–4.5	0–5	Strongly laminated mud, 30% dry weight organic
4.5–6	5–10	Unlaminated mud, 15% dry weight organic
6–>12	10–>18	Clay, sand, gravel, sometimes banded

Core B6 Series

Collected by D. Walker and J. L. Neale 1977; submitted by D. Walker 1978.

ANU-2072. Lake mud, 430–560 cm depth.

ANU-2072A. (660-min count)

5770 ± 110

ANU-2072B. Dilution; 10% sample (3280-min count).

4390 ± 290

Comment: Fraction A was given pretreatment B(i) following an ultrasound demineralized water wash; fraction B was given pretreatment B(ii).

ANU-2073. Lake mud, 60.5–76.5 cm depth.

ANU-2073A. Dilution; 56% sample (700-min count).

5950 ± 160

ANU-2073B. Dilution; 39% sample (700-min count).

5660 ± 200

Comment: Fraction A was given pretreatment B(i) following an ultrasound demineralized water wash; fraction B was given pretreatment B(ii). Depths are only approximate due to slight drying of the core.

Core B8 Series

Collected by D. Walker and J. L. Neale 1977; submitted by D. Walker 1978.

ANU-2074. **1800 ± 170**

Organic mud, 20–30 cm depth. Dilution; 27% sample (900-min count).

ANU-2075. **4360 ± 100**

Organic mud, 143–154 cm depth. Dilution; 59% sample (1700-min count).

ANU-2076. **4640 ± 260**

Organic mud, 161–171 cm depth. Dilution; 29% sample (520-min count).

ANU-2081. **6330 ± 170**

Lake mud, 208–218 cm depth. Dilution; 47% sample (900-min count).

Comment: ANU-2074 to -2076 and -2081 were suspended in demineralized water, acidified to pH 2, allowed to stand, filtered, rinsed in demineralized water and dried.

ANU-2082. **8320 ± 270**

Lake mud, 323–333 cm depth. Dilution; 34% sample (900-min count).

ANU-2083. **13,000 ± 290**

Lake clay-mud, 557–567 cm depth. Dilution; 55% sample (1000-min count).

Core B55/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by D. Walker 1979.

ANU-3595. **1080 ± 80**

Lake mud, 22–42 cm depth. Dilution; 72% sample (1080-minute count).

$\delta^{13}C = -28.8\text{‰}$

ANU-2255. **2230 ± 120**

Lake mud, 141–161 cm depth. Dilution; 30% sample (1140-min count).

ANU-2256. **3420 ± 90**

Lake mud, 164.5–184.5 cm depth. Dilution; 73.8% sample (1160-min count).

ANU-2257. **4200 ± 100**

Lake mud, 267–287 cm depth. Dilution; 58.8% sample (1140-min count).

ANU-2258. **5330 ± 90**

Lake mud, 364–384 cm depth (1140-min count).

ANU-3596. **5050 ± 100**

Lake mud, 389.5–409.5 cm depth. Dilution; 60% sample (1100-min count).

$\delta^{13}C = -27.1\text{‰}$

ANU-2259. **6360 ± 100**

Lake mud, 501–521.5 cm depth. Dilution; 90% sample (1040-min count).

Core B56/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by D. Walker 1979.

ANU-3597. **1400 ± 80**

Lake mud, 19–39 cm depth. Dilution; 71% sample (1080-min count).

$\delta^{13}C = -25.3\text{‰}$

ANU-2260. **2780 ± 90**

Lake mud, 147.5–163.5 cm depth. Dilution; 72% sample (1140-min count).

ANU-2261. **4170 ± 80**

Lake mud, 294.5–314.5 cm depth (1060-min count).

ANU-2262. **4980 ± 90**

Lake mud, 402.5–422.5 cm depth (1060-min count).

ANU-3598. **4810 ± 100**

Lake mud, 427.5–447.5 cm depth. Dilution; 78% sample (1100-min count).

$\delta^{13}C = -26.8\text{‰}$

ANU-2263. **6570 ± 90**

Lake mud, 538.5–58.5 cm depth (1060-min count).

Core 58/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by Y. Chen 1983.

ANU-3664. **5840 ± 100**

Organic mud, 433–453 cm depth. Dilution; 83% sample (1000-min count).

$\delta^{13}C = -29.3\text{‰}$

ANU-3665. **6220 ± 90**

Organic mud, 459–479 cm depth. Dilution; 87% (1000-min count).

$\delta^{13}C = -29.3\text{‰}$

ANU-3667. **7150 ± 120**

Organic mud, 510–530 cm (1120-min count).

$\delta^{13}C = -29.9\text{‰}$

ANU-3668. **7440 ± 100**
 Organic mud, 547–567 cm depth (1000-min count). $\delta^{13}C = -28.9\text{‰}$

ANU-3669. **8040 ± 120**
 Organic mud, 571–591 cm depth (1120-min count). $\delta^{13}C = -27.0\text{‰}$

Core 63/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by D. Walker 1979.

ANU-2264. **2040 ± 90**
 Lake mud, 38.5–58.5 cm depth (960-min count).

ANU-2265. **3770 ± 90**
 Lake mud, 172.2–192.2 cm depth (1100-min count).

ANU-3599. **4130 ± 80**
 Lake mud, 200.5–220.5 cm depth (1080-min count). $\delta^{13}C = -25.7\text{‰}$

ANU-2266. **6250 ± 100**
 Lake mud, 290.5–310.5 cm depth (1320-min count).

ANU-3600. **8150 ± 120**
 Lake mud, 417.5–428.5 cm depth (1080-min count). $\delta^{13}C = -24.7\text{‰}$

ANU-2267. **8070 ± 100**
 Lake mud, 431.5–450 cm depth (1100-min count).

ANU-2268. **9180 ± 150**
 Lake mud, 497–517 cm depth. Dilution; 79% sample (1040-min count).

ANU-2269. **9930 ± 130**
 Lake mud, 531.5–551.5 cm depth (1120-min count).

Core 69/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by D. Walker 1979.

ANU-2270. **2020 ± 80**
 Lake mud, 35–55 cm depth (1120-min count).

ANU-3601. **4350 ± 90**
 Lake mud, 149.5–169.5 cm depth (980-min count). $\delta^{13}C = -27.0\text{‰}$

ANU-3602.	5040 ± 90
Lake mud, 169.5–189.5 cm depth (1080-min count).	$\delta^{13}C = -28.9\%$
ANU-2271.	7650 ± 100
Lake mud, 317.3–337.3 cm depth. Dilution; 87% sample (1120-min count).	
ANU-2272.	9430 ± 110
Lake mud, 421.8–441.8 cm depth (1040-min count).	
ANU-2273.	10,600 ± 110
Lake mud, 470.8–490.8 cm depth (1740-min count).	

Core 379 Series

ANU-2719 to -2721 collected by C. Constable, D. Walker and J. L. Neale 1979; submitted by D. Walker 1981; ANU-2717, -2718, -2722 and -2723 collected by C. Constable, D. Walker and J. L. Neale 1979; submitted by C. Constable 1981.

ANU-2717.	2250 ± 90
Lake sediment, 1–17 cm depth. Dilution; 60% sample (940-min count).	
ANU-2718.	3450 ± 150
Lake sediment, 159.5–179.5 cm depth. Dilution; 33% sample (1020-min count).	
ANU-2719.	9110 ± 100
Lake sediment, 567.5–587.5 cm depth (1020-min count).	
ANU-2720.	
Lake sediment, 612.5–621.5 cm depth, and organic sediment, 621.5–632.5 cm depth. Two separate components.	
ANU-2720A. Lake sediment. Dilution; 55% sample (1020-min count).	9360 ± 150
ANU-2720B. Organic sediment. Dilution; 98% sample (1360-min count).	9540 ± 120
ANU-2721.	10,600 ± 120
Lake sediment, 644.5–664.5 cm depth (920-min count).	
ANU-2722.	17,300 ± 550
Lake sediment, 767.5–787.5 cm depth. Dilution; 41% sample (1260-min count).	
ANU-2723.	14,400 ± 570
Lake sediment, 880.5–90.5 cm depth. Dilution; 27% sample (1360-min count).	

Core 479 Series

Collected by C. Constable, D. Walker and J. L. Neale 1979; submitted by D. Walker 1981.

ANU-2724.	3120 ± 90
Lake sediment, 105–125 cm depth. Dilution; 67% sample (1140-min count).	
ANU-2725.	4060 ± 90
Lake sediment, 180–198.5 cm depth. Dilution; 71% sample (1220-min count).	
ANU-2726.	6580 ± 110
Lake sediment, 251–269 cm depth. Dilution; 55% sample (1120-min count).	
ANU-2727.	5100 ± 80
Lake sediment, 292.5–312.5 cm depth. Dilution; 83% sample (1420-min count).	
ANU-2728.	6020 ± 80
Organic sediment, 371.7–391.7 cm depth. Dilution; 99% sample (1000-min count).	
ANU-2729.	7250 ± 110
Organic sediment, 402.2–420.2 cm depth. Dilution; 79% sample (1080-min count).	
ANU-2730.	8640 ± 100
Organic sediment, 530.2–550.2 cm depth (1160-min count).	
ANU-2731.	9260 ± 110
Organic mud, 550.2–567.5 cm depth (960-min count)	
ANU-2732.	10,250 ± 110
Organic mud, 579.2–599.7 cm depth (1160-min count).	
ANU-2733.	10,150 ± 110
Organic mud, 611.2–630.2 cm depth (1120-min count).	
ANU-2734.	13,050 ± 400
Organic sediment, 759.5–779.5 cm depth. Dilution; 26% sample (1060-min count).	
ANU-2735.	13,600 ± 170
Organic mud, 910.7–930.7 cm depth (1800-min count).	

Core 579 Series

ANU-2445 to -2450 collected by C. Constable and J. L. Neale 1979; submitted by C. Constable 1980; ANU-2451 to -2456 collected by C. Constable and J. L. Neale 1979; submitted by D. Walker 1980.

ANU-2445.	3930 ± 140
Lake sediment, 80–92 cm depth. Dilution; 34% sample (1020-min count).	
ANU-2446.	4950 ± 120
Lake sediment, 147.6–167.6 cm depth. Dilution; 49% sample (980-min count).	
ANU-2451.	5990 ± 90
Lake mud, 201.9–214.9 cm depth (1080-min count).	
ANU-2452.	6360 ± 90
Lake mud, 221.9–235.4 cm depth.	
ANU-2447.	7360 ± 100
Lake sediment, 335.1–355.1 cm depth. Dilution; 88% sample (1020-min count).	
ANU-2453.	7490 ± 80
Lake mud, 446.2–467 cm depth (1700-min count).	
ANU-2454.	8890 ± 120
Lake mud, 499–519 cm depth. Dilution; 73% sample (1080-min count).	
ANU-2448.	12,600 ± 290
Lake sediment, 535–554.5 cm depth. Dilution; 31% (1640-min count).	
ANU-2449.	10,800 ± 240
Lake sediment, 663.5–683.5 cm depth. Dilution; 40% sample (860-min count).	
ANU-2455.	11,800 ± 260
Lake mud, 732.1–767.1 cm depth. Dilution; 37% sample (1000-min count).	
ANU-2450.	13,350 ± 210
Lake sediment, 940–957.5 cm depth. Dilution; 63% sample (980-min count).	
ANU-2456.	11,350 ± 400
Lake mud, 1034.5–1054.5 cm depth. Dilution; 21% sample (1040-min count).	

Core B779 Series

Collected by D. Walker and J. L. Neale 1979; submitted by C. Constable 1980.

ANU-2405.	2820 ± 130
Mud and clay, 64–82 cm depth. Dilution; 31% sample (1040-min count).	
ANU-2406.	2770 ± 130
Mud and clay, 93–112.5 cm depth. Dilution; 31% sample (1000-min count).	
ANU-2408.	3930 ± 120
Mud and clay, 190.5–207 cm depth. Dilution; 41% sample (1000-min count).	
ANU-2409.	2540 ± 130
Mud and clay, 207–226.2 cm depth. Dilution; 12% sample (4040-min count).	
ANU-2410.	4830 ± 1390
Mud and clay, 275.9–293.7 cm depth. Dilution; 61% sample (1000-min count).	
ANU-2411.	5890 ± 90
Mud and clay, 343.7–357.7 cm depth. Dilution; 79% (1000-min count).	
ANU-2412.	9890 ± 130
Mud and clay, 521.6–531.6 cm depth (1000-min count).	
ANU-2413.	12,650 ± 170
Mud and clay, 577.1–597.1 cm depth. Dilution; 75% sample (1020-min count).	
ANU-2414.	11,300 ± 130
Mud and clay, 597.1–617.1 cm depth. Dilution; 85% sample (1080-min count).	
ANU-2415.	12,500 ± 340
Mud and clay, 697.6–716.1 cm depth. Dilution; 38% sample (1000-min count).	
ANU-2416.	11,400 ± 190
Mud and clay, 958.9–978.9 cm depth. Dilution; 49% sample (1080-min count).	

Core 83/1c Series

Collected by D. Walker and J. L. Neale 1983; submitted by D. Walker 1987.

ANU-5880.	2030 ± 210
Lake sediment, 1–3.8 cm depth. Dilution; 9% sample (1972-min count).	

ANU-5881. Lake sediment, 91.2–94.1 cm depth. Dilution; 8% sample (1972-min count).	2850 ± 220
ANU-5882. Lake sediment, 194.9–197.8 cm depth. Dilution; 6% sample (2959-min count).	3440 ± 270
ANU-5883. Lake sediment, 310.4–313.4 cm depth. Dilution; 12% sample (4438-min count).	5090 ± 170
ANU-5884. Lake sediment, 313.4–316.4 cm depth. Dilution; 12% sample (1972-min count).	4530 ± 200
ANU-5885. Lake sediment, 399.9–403.9 cm depth. Dilution; 21% sample (2958-min count).	6430 ± 140
ANU-5886. Lake sediment, 499.4–502.4 cm depth. Dilution; 20% sample (2465-min count).	7400 ± 160
ANU-6154. Lake sediment, 316.4–319.4 cm depth. Dilution; 12% sample (3600-min count).	4650 ± 320
ANU-6155. Lake sediment, 309.4–310.4 cm depth. Dilution; 16% sample (2958-min count).	4530 ± 380
ANU-6156. Lake sediment, 271.9–274.9 cm depth. Dilution; 7% sample (2465-min count).	4150 ± 220
ANU-6157. Lake sediment, 204.4–207.4 cm depth. Dilution; 15% sample (3600-min count).	4040 ± 240
ANU-6158. Lake sediment, 200.5–203.4 cm depth. Dilution; 7% sample (2760-min count).	3700 ± 470
ANU-6159. Lake sediment, 166.4–169 cm depth. Dilution; 8% sample (2730-min count).	3050 ± 380
ANU-6160. Lake sediment, 69.1–72 cm depth. Dilution; 7% sample (1972-min count).	2820 ± 220
ANU-6161. Lake sediment, 53–56 cm depth. Dilution; 5% sample (1972-min count).	2510 ± 250

ANU-6499. 2740 ± 150

Lake sediment, 76.2–82 cm depth. Dilution; 17% sample (2820-min count).

ANU-6500. 3370 ± 110

Lake sediment, 139.2–145 cm depth. Dilution; 19% sample (2959-min count).

ANU-6501. 3780 ± 150

Lake sediment, 213.4–218.4 cm depth. Dilution; 11% sample (2959-min count).

ANU-6502. 6410 ± 170

Lake sediment, 423.4–429.4 cm depth. Dilution; 38% sample (2010-min count).

ANU-6606. 3550 ± 220

Lake sediment, 118–124 cm depth. Dilution; 17% sample (2880-min count). *Est. $\delta^{13}C = -16.0\text{‰}$*

ANU-6607. 5510 ± 180

Lake sediment, 367.4–373.4 cm depth. Dilution; 29% sample (2850-min count).

ANU-6608. 6430 ± 150

Lake sediment, 437–443 cm depth. Dilution; 40% sample (2820-min count).

ANU-6856. 4240 ± 210

Lake sediment, 42–48 cm depth. Dilution; 60% sample (2959-min count). $\delta^{13}C = -30.3\text{‰}$

ANU-6857. 2580 ± 150

Lake sediment, 156–159 cm depth. Dilution; 10% sample (1973-min count). $\delta^{13}C = -31.5\text{‰}$

Collected 1983 and submitted 1991 by D. Walker.

ANU-7972. 2550 ± 190

Lake mud, 30–36 cm depth. Dilution; 63% sample (2959-min count). $\delta^{13}C = -30.4\text{‰}$

ANU-7973. 3200 ± 170

Lake mud, 140–150 cm depth (2959-min count). $\delta^{13}C = -30.9\text{‰}$

ANU-7974. 3460 ± 140

Lake mud, 180–192 cm depth. Dilution; 28% sample (3000-min count). $\delta^{13}C = -32.9\text{‰}$

ANU-7975. 4800 ± 200

Lake mud, 338–341 cm depth. Dilution; 73% sample (2959-min count). $\delta^{13}C = -30.5\text{‰}$

ANU-8066.	1620 ± 270
Lake mud, 14–20 cm depth. Dilution; 25% sample (2959-min count).	<i>Est. $\delta^{13}C = -30.0\text{‰}$</i>
ANU-8067.	1430 ± 350
Lake mud, 90–95 cm depth. Dilution; 14% sample (2959-min count).	<i>Est. $\delta^{13}C = -30.0\text{‰}$</i>
ANU-8068.	4090 ± 190
Lake mud, 205–218 cm depth. Dilution; 82% sample (2959-min count).	<i>Est. $\delta^{13}C = -30.0\text{‰}$</i>
ANU-8069.	3940 ± 230
Lake mud, 219–222 cm depth. Dilution; 49% sample (2959-min count).	<i>Est. $\delta^{13}C = -30.0\text{‰}$</i>
ANU-8071.	4610 ± 200
Lake mud, 325–331 cm depth. Dilution; 77% sample (1973-min count).	<i>Est. $\delta^{13}C = -30.0\text{‰}$</i>
ANU-8072.	4670 ± 90
Lake mud, 412–418 cm depth. Dilution; 26% sample (2959-min count).	
ANU-8125.	3910 ± 180
Lake mud, 258–270 cm depth (2959-min count).	<i>$\delta^{13}C = -30.0\text{‰}$</i>
ANU-8126.	5230 ± 190
Lake mud, 430–440 cm depth. Dilution; 24% sample (2850-min count).	<i>Est. $\delta^{13}C = -30.0\text{‰}$</i>
Core 83/9 Series	
Collected by D. Walker and J. L. Neale 1983; submitted by D. Walker (5622–5632) 1986, (6604–6605) 1988 and Y. Chen (4464–4471, 4024–4030) 1984.	
ANU-5622.	1640 ± 130
Lake sediment, 1–4 cm depth. Dilution; 10% sample (3452-min count).	
ANU-6604.	2240 ± 120
Lake sediment, 28–32 cm depth. Dilution; 14% sample (2958-min count).	
ANU-5623.	2440 ± 160
Lake sediment, 51–54 cm depth. Dilution; 8% sample (2959-min count).	
ANU-5624.	2980 ± 200
Lake sediment, 55–58 cm depth. Dilution; 7% sample (2465-min count).	

ANU-5625.	3340 ± 140
Lake sediment, 93.5–96.5 cm depth. Dilution; 14% sample (2904-min count).	
ANU-6605.	3630 ± 90
Lake sediment, 96.5–101.5 cm depth. Dilution; 29% sample (2958-min count).	
ANU-5626.	3550 ± 150
Lake sediment, 104.5–107.5 cm depth. Dilution; 10% sample (2959-min count).	
ANU-5627.	4260 ± 160
Lake sediment, 148.5–151.5 cm depth. Dilution; 15% sample (1972-min count).	
ANU-5628.	4250 ± 160
Lake sediment, 153.5–156.5 cm depth. Dilution; 13% sample (1972-min count).	
ANU-5629.	4960 ± 160
Lake sediment, 191–194 cm depth. Dilution; 14% sample (2958-min count).	
ANU-5630.	4820 ± 210
Lake sediment, 194–197 cm depth. Dilution; 10% sample (2465-min count).	
ANU-5631.	5340 ± 150
Lake sediment, 220–223 cm depth. Dilution; 17% sample (2958-min count).	
ANU-5632.	5820 ± 150
Lake sediment, 252–255 cm depth. Dilution; 15% sample (2959-min count).	
ANU-4024.	5630 ± 160
Lake mud, 283–288 cm depth. Dilution; 28% sample (1400-min count).	$\delta^{13}C = -31.0\text{‰}$
ANU-4464.	6640 ± 160
Lake mud, 332.6–337.6 cm depth. Dilution; 31% sample (1380-min count).	$\delta^{13}C = -27.8\text{‰}$
ANU-4025.	6520 ± 150
Lake mud, 381.2–386.2 cm depth. Dilution; 22% sample.	$\delta^{13}C = -30.2\text{‰}$
ANU-4465.	6590 ± 220
Lake mud, 405.6–410.6 cm depth. Dilution; 31% sample (1320-min count).	$\delta^{13}C = -28.4\text{‰}$
ANU-4466.	7100 ± 250
Lake mud, 430–435 cm depth. Dilution; 35% sample (1080-min count).	$\delta^{13}C = -24.0\text{‰}$

ANU-4467.	5740 ± 200
Lake mud, 455–460 cm depth. Dilution; 32% sample (1080 count time)	$\delta^{13}C = -25.1‰$
ANU-4468.	8630 ± 210
Lake mud, 479.3–484.3 cm depth. Dilution; 39% sample (1360-min count).	$\delta^{13}C = -27.2‰$
ANU-4469.	8020 ± 210
Lake mud, 498.5–503.5 cm depth. Dilution; 40% sample (1120-min count).	$\delta^{13}C = -28.0‰$
ANU-4470.	8740 ± 160
Lake mud, 530–535 cm depth. Dilution; 66% sample (1120-min count).	$\delta^{13}C = -26.7‰$
ANU-4471.	9480 ± 160
Lake mud, 548–553 cm depth. Dilution; 56% sample (1000-min count).	$\delta^{13}C = -31.3‰$
ANU-4026.	9960 ± 290
Lake mud, 558–563 cm depth. Dilution; 28% sample (940-min count).	$\delta^{13}C = -26.1‰$
ANU-4027.	11,160 ± 260
Lake mud, 568–573 cm depth. Dilution; 37% sample (960-min count).	$\delta^{13}C = -24.1‰$
ANU-4028.	13,440 ± 300
Lake mud, 985–995 cm depth. Dilution; 25% sample (2100-min count).	$\delta^{13}C = -21.7‰$
ANU-4029.	11,240 ± 380
Lake mud, 1000–1010 cm depth. Dilution; 22% sample (1000-min count).	$\delta^{13}C = -20.2‰$
ANU-4030.	11,570 ± 420
Lake mud, 1180–1190 cm depth. Dilution; 18% sample.	$\delta^{13}C = -20.2‰$

Barrine—Core Samples from Water Depth Presently ≤ 50 m (Table 3)

TABLE 3. Barrine Water (presently ≤50 m)

Depth (m)	Age (ka BP)	Sediment
0–3.7	0–5.5	Unlaminated mud, variously clayey
3.7–3.8		Slip structures
3.8–4.6		Sandy clay
4.6–5.9	8–10	Compact silty clay mud

Core 68/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by Y. Chen 1983.

ANU-3671.	5040 ± 120
Organic mud, 190–210 cm depth. Dilution; 81% (1000-min count).	$\delta^{13}C = -31.8\text{‰}$
ANU-3672.	6480 ± 100
Organic mud, 300–320 cm depth. (940-min count).	$\delta^{13}C = -28.9\text{‰}$
ANU-3673.	9150 ± 130
Organic mud, 420–440 cm depth. Dilution; 80% (1000-min count).	$\delta^{13}C = -27.7\text{‰}$
ANU-3675.	10,090 ± 120
Organic mud, 540–560 cm depth (1000-min count).	$\delta^{13}C = -28.0\text{‰}$
Core 71/78 Series	
Collected by D. Walker and J. L. Neale 1978; submitted by Y. Chen 1983.	
ANU-3655.	1750 ± 80
Organic mud, 50–70 cm depth. Dilution; 87% sample (1000-min count).	$\delta^{13}C = -22.7\text{‰}$
ANU-3656.	850 ± 90
Organic mud, 179–199 cm depth. Dilution; 52% sample (1000-min count).	$\delta^{13}C = -25.3\text{‰}$
ANU-3657.	2050 ± 100
Organic mud, 240–260 cm depth. Dilution; 77% sample (980-min count).	$\delta^{13}C = -28.6\text{‰}$
ANU-3658.	3730 ± 90
Organic mud, 439–459 cm depth. Dilution; 71% sample (1000-min count).	$\delta^{13}C = -28.7\text{‰}$
ANU-3659.	4110 ± 80
Organic mud, 471–491 cm depth (1020-min count).	$\delta^{13}C = -29.2\text{‰}$
Core B75/78 Series	
Collected by D. Walker and J. L. Neale 1978; submitted by D. Walker 1979.	
ANU-2300.	2180 ± 70
Lake mud, 64–84 cm depth. Dilution; 66% sample (2480-min count).	
ANU-2301.	3070 ± 80
Lake mud, 138–158 cm depth. Dilution; 85% sample (1400-min count).	
ANU-2302.	4880 ± 80
Lake mud, 246.5–266.5 cm depth (1300-min count).	

ANU-2303. **5880 ± 90**

Lake mud, 314–334 cm depth (1160-min count).

Core 83/7A Series

Collected by J. L. Neale and Y. Chen 1983; submitted by Y. Chen 1984.

ANU-3899. **3500 ± 200**

Organic mud, 300–320 cm depth. Dilution; 68% (1080-min count).

$\delta^{13}C = -28.9\text{‰}$

ANU-3900. **4700 ± 200**

Organic mud, 360–380 cm depth (920-min count).

$\delta^{13}C = -29.9\text{‰}$

ANU-4461. **5200 ± 80**

Lake mud, 390–410 cm depth. Dilution; 80% sample (1340-min count).

$\delta^{13}C = -25.5\text{‰}$

ANU-4462. **5940 ± 90**

Lake mud, 450–470 cm depth. Dilution; 93% sample (1060-min count).

$\delta^{13}C = -26.3\text{‰}$

ANU-4463. **7630 ± 100**

Lake mud, 500–520 cm depth. Dilution; 79% sample (1120-min count).

$\delta^{13}C = -24.7\text{‰}$

Barrine—Frozen Samples from Water Depth Presently 67 m

Samples of uppermost very unconsolidated mud collected by *in-situ* freezing at Point 1, lake center.

Frozen Fingers. Collected by D. Walker and J. L. Neale 1979; submitted by D. Walker 1983.

ANU-3618. **98.2 ± 1.2 pMC**

Lake sediment, 0–15 cm depth. Dilution; 64% sample (1380-min count).

$\delta^{13}C = -25.2\text{‰}$

ANU-3619. **99.0 ± 1.0 pMC**

Lake sediment, 15–21 cm. Dilution; 61% sample (1080-min count).

$\delta^{13}C = -27.0\text{‰}$

ANU-3620. **101.1 ± 1.0 pMC**

Lake sediment, 21–26.5 cm depth. Dilution; 69% sample (1100-min count).

$\delta^{13}C = -31.2\text{‰}$

Comment: Depths are from apparent mud-water interface. Similar levels were bulked to attain adequate sample size. Excess water was removed by centrifugation and the samples were oven-dried.

Frozen Slabs. Collected by D. Walker and J. Neale 1986 and 1987; submitted by D. Walker 1989.

ANU-6964. **103.0 ± 3.2 pMC**

Lake mud, 0–5 cm depth. Dilution; 24% (2959-min count).

ANU-6965.	98.2 ± 1.2 pMC
Lake mud, 5–10 cm depth. Dilution; 15% sample (2764-min count).	
ANU-6966.	640 ± 90
Lake mud, 10–15 cm depth. Dilution; 17% sample (2959-min count).	
ANU-6967.	260 ± 80
Lake mud, 15–20 cm depth. Dilution; 20% sample (2959-min count).	
ANU-6968.	450 ± 170
Lake mud, 20–25 cm depth. Dilution; 80% sample (2959-min count).	
ANU-6969.	99.1 ± 1.0 pMC
Lake mud, 25–30 cm depth. Dilution; 21% sample (2959-min count).	
<i>Comment:</i> Depths are from mud-water interface.	
<i>Frozen Slabs.</i> Collected by D. Walker and J. Neale 1987; submitted by D. Walker 1991.	
ANU-7968.	650 ± 80
Lake mud, 50–55 cm depth. Dilution; 55% sample (3240-min count).	$\delta^{13}\text{C} = -28.8\text{‰}$
ANU-7969.	630 ± 110
Lake mud, 60–65 cm depth. Dilution; 26% sample (3210-min count).	$\delta^{13}\text{C} = -30.9\text{‰}$
ANU-7970.	1050 ± 210
Lake mud, 70–75 cm depth. Dilution; 62% sample (1973-min count).	$\delta^{13}\text{C} = -30.3\text{‰}$
ANU-7971.	1080 ± 60
Lake mud, 80–85 cm depth. Dilution, 44% sample (2959-min count).	$\delta^{13}\text{C} = -29.6\text{‰}$
ANU-8111.	230 ± 70
Lake mud, 19–24 cm depth. Dilution; 25% sample (2959-min count).	$\delta^{13}\text{C} = -31.7\text{‰}$
ANU-8112.	430 ± 50
Lake mud, 29–34 cm depth. Dilution; 45% (2959-min count).	$\delta^{13}\text{C} = -30.5\text{‰}$
ANU-8113.	1240 ± 160
Lake mud, 90–95 cm depth (2959-min count).	$\delta^{13}\text{C} = -31.0\text{‰}$
ANU-8114.	490 ± 70
Lake mud, 39–44 cm depth. Dilution; 42% sample (2466-min count).	

Comment: Depths corrected to distances below reference lamination (~20 cm below mud-water interface).

Barrine—Contemporary Sedimentation

1. Collected by D. Walker and J. L. Neale 1979; submitted by D. Walker 1980.

ANU-2545. **134.5 ± 7.3 pMC**
 $\delta^{13}\text{C} = -27.3\text{‰}$

Leaf litter from water's edge, about to enter the lake. Dilution; 91% sample (1080-min count).

Comment: No pretreatment.

ANU-2546. **980 ± 50**
 $\delta^{13}\text{C} = -29.5\text{‰}$

Lake mud, upper 5–10 cm of thick unconsolidated mud at sediment interface, beneath 65 m of water at center of lake (1080-min count).

2. Collected and submitted by D. Walker 1983.

ANU-3615. **110.0 ± 0.9 pMC**
 $\delta^{13}\text{C} = -24.2\text{‰}$

Twigs and wood fragments, coarse fraction (>2 mm) (1000-min count).

ANU-3616. **122.3 ± 0.9 pMC**
 $\delta^{13}\text{C} = -25.4\text{‰}$

Woody material, medium fraction (0.25–2 mm). Dilution; 95% sample (1300-min count).

ANU-3617. **127.4 ± 0.9 pMC**
 $\delta^{13}\text{C} = -24.2\text{‰}$

Woody material, fine fraction (<0.25 mm) (1320-min count).

Comment: ANU-3615 to -3617 are from the same grab sample (Z1) under 1 m of water at the north-west lake margin. No pretreatment.

3. Grab samples of mud-water interface. Collected and submitted by D. Walker 1990.

ANU-7412. **98.4 ± 1.1 pMC**

Slurpy mud, surface deposit Point 1, below 67 m water. Dilution; 83% sample (3000-min count).

ANU-7413. **100.2 ± 1.1 pMC**

Slurpy mud, surface deposit Point 6, below 42 m water. Dilution; 89% sample (3000-min count).

ANU-7414. **97.8 ± 1.3 pMC**

Slurpy mud, surface deposit Point 9, below 63 m water. Dilution; 40% sample (3000-min count).

Comment: ANU-7412 to -7414 had excess water removed by centrifugation and were then oven-dried.

*Eacham—Core Samples from Water Depth Presently ~64 m***Core E1/77 Series**

Collected by D. Walker and J. L. Neale 1977; submitted by C. Constable 1982.

ANU-3169. **320 ± 100**

Lake sediment, 0–18 cm depth (1100-min count).

ANU-3170. **4990 ± 80**

Lake sediment, 488–508 cm depth (1220-min count).

Core E2/77 Series

Collected by D. Walker and J. L. Neale 1977; submitted by C. Constable 1981.

ANU-3016. **1470 ± 100**

Lake sediment, 75–93 cm depth (2500-min count).

ANU-3017. **3020 ± 80**

Lake sediment, 316–336 cm depth (1100-min count).

ANU-3018. **4480 ± 100**

Lake sediment, 498.3–518.3 cm depth. Dilution; 91% sample (1040-min count).

Core E77/78 Series

Collected by D. Walker and J. L. Neale 1978, submitted by C. Constable 1981.

ANU-3171. **1230 ± 70**

Lake sediment, 118–137 cm depth. (1580-min count).

ANU-3172. **1690 ± 150**

Lake sediment, 214–233 cm depth. (1100-min count).

ANU-3173. **2720 ± 80**

Lake sediment, 311–331 cm depth. (1200-min count).

ANU-3174. **3660 ± 80**

Lake sediment, 448–461 cm depth. (1320-min count).

Core E78/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by D. Walker and M. Goodfield 1983.

ANU-3532.

Lake mud, 30–50 cm depth.

ANU-3532A.

Coarse fraction (>250 μ). Dilution; 12% sample (1460-min count).

590 \pm 240
 $\delta^{13}C = -28.5\text{‰}$

ANU-3532B.

Fine fraction (<250 μ). Dilution; 29% sample (1000-min count).

400 \pm 120
 $\delta^{13}C = -29.4\text{‰}$

ANU-3533.

Lake mud, 238–258 cm depth (1500-min count).

1860 \pm 70
 $\delta^{13}C = -25.1\text{‰}$

ANU-3534.

Lake mud, 256–276 cm depth (1100-min count).

2060 \pm 70
 $\delta^{13}C = -26.5\text{‰}$

ANU-3537.

Lake mud, 406–426 cm depth. Fine fraction (<250 μ) (1020-min count).

3200 \pm 80
 $\delta^{13}C = -26.1\text{‰}$

ANU-3538.

Lake mud, 431–451 cm depth. Fine fraction (<250 μ) (1000-min count).

3510 \pm 80
 $\delta^{13}C = -25.9\text{‰}$

ANU-3535.

Lake mud, 524–534 cm depth (1000-min count).

4470 \pm 80
 $\delta^{13}C = -23.6\text{‰}$

ANU-3536.

Lake mud, 539–549 cm depth. Fine fraction (<250 μ). Dilution; 94% sample (1020-min count).

3930 \pm 90
 $\delta^{13}C = -26.1\text{‰}$

Comment: ANU-3532A, -3536 to -3538 were macerated lightly, wet sieved, and then given pretreatment A; ANU-3532B was given pretreatment B(i).

Core E80/78 Series

Collected by D. Walker and J. L. Neale 1978; submitted by C. Constable 1981.

ANU-3019.

Lake sediment, 107–127 cm depth (1280-min count).

1540 \pm 90

ANU-3020.

Lake sediment, 537.5–557.5 cm depth (1220-min count).

4640 \pm 80

Core 83/23A Series

Collected by D. Walker, J. L. Neale and Y. Chen 1983; submitted by Y. Chen 1984.

ANU-4031.	4210 ± 130
Lake mud, 475–480 cm depth. Dilution; 41% sample (1000-min count).	
ANU-4032.	6260 ± 160
Lake mud, 790–795 cm depth. Dilution; 36% sample (1100-min count). $\delta^{13}\text{C} = -30.7\text{‰}$	
ANU-4033.	9130 ± 190
Lake mud, 970–975 cm depth. Dilution; 25% sample. $\delta^{13}\text{C} = -26.3\text{‰}$	
ANU-4034.	8980 ± 190
Lake mud, 975–980 cm depth. Dilution; 42% sample (1000-min count). $\delta^{13}\text{C} = -28.6\text{‰}$	
<i>Eacham—Contemporary Sedimentation</i>	
Collected and submitted by D. Walker 1977.	
ANU-2046.	138.2 ± 1.0 pMC
Leaves (<i>Ficus</i>), from ground surface beside lake (2100-min count). <i>Est.</i> $\delta^{13}\text{C} = -27.0\text{‰}$	
ANU-2047.	140.7 ± 1.1 pMC
Leaves (mixed), from ground surface beside lake (3440-min count).	
ANU-2048.	136.6 ± 1.0 pMC
Leaves (<i>Acacia</i>), from ground surface beside lake (1420-min count). <i>Est.</i> $\delta^{13}\text{C} = -27.0\text{‰}$	
ANU-2049.	142.2 ± 1.1 pMC
Leaves (<i>Pandanus</i>), from surface beside lake (3480-min count).	
ANU-2050.	142.5 ± 1.1 pMC
Leaves (<i>Araucaria</i>), from plantation on lake edge (3420-min count).	

Comment: No pretreatment for this series.

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