

# Environmental change recorded in sediments from Tasmanian lakes

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**Tasmania experienced a sequence of glaciations during the past few million years. Whereas many northern hemisphere lakes were scoured out by the last glaciation, which peaked at about 18–20 000 y ago, Tasmania is well supplied with lakes that lay at the fringe or beyond the limit of glaciation. Some of these lakes preserve excellent sedimentary records of environmental conditions leading to the onset of glaciation, post-glacial recovery, and the subsequent impact of fires and human occupation on the vegetation.**

Little or nothing was known about the sedimentary record in any of Tasmania's many lakes until a few years ago. Work undertaken by AGSO in collaboration mainly with the University of Newcastle (Prof. Eric Colhoun, Sharon Anker, Tony Fowler, Feli Hopf, Warwick Dyson) has established the basic characteristics of selected lakes in critical locations (Fig. 9).

Dove Lake and Lake St Clair were at the ice front and contain typical late glacial–Holocene records — namely, a basement zone of grey thixotropic glacial flour produced under late glacial conditions, overlain by organic-rich Holocene mud. Records of this type are common in northern hemisphere lakes in glaciated regions. The grey clay contains pollen that indicates the presence of herbaceous and alpine shrub vegetation communities before 11–10 000 y ago. Wet forests dominated by southern beech and *Eucalyptus* spp. developed during the Holocene.

Lake Johnston, situated a short distance below the summit of Mount Read, near Rosebery, lies in a basin containing a diverse range of plant life, including the highest-elevation growths of Huon pines yet found. One of the Huon pines here has been tree-ring-dated at 3700 y, which makes it one of the oldest trees in the world. Because of its remarkable vegetation and sensitivity to climatic change, this basin has attracted widespread interest from Quaternary scientists. Pollen analysis shows that the Huon pine has maintained a similar density for the last 10 000 y, and is a high-altitude relict species surviving from the last glaciation. The sediments preserve a record of gradual changes in direction of the geomagnetic field which can be correlated

with the dated master curve for Lake Keilambete (SW Vic.). The resulting magnetic timescale is in broad agreement with the radiocarbon ages for Lake Johnston.

Great Lake (max. depth 20 m) and Lake Echo (max. depth 23 m), at an elevation of about 850 m on the doleritic Central Plateau, and Lake Selina (max. depth 7 m), at the foot of Mount Murchison, each escaped scouring during the last glaciation. These lakes contain fascinating records of the waxing and waning of glacial conditions going back to the penultimate glaciation over 130 000 y ago. The pollen record in Lake Echo shows a sequence of shifts in *Eucalyptus* forest and alpine/steppe vegetation across the southeastern Central Plateau. The Last Glaciation Maximum was dry, and coincided with mainly herbaceous vegetation. The surface sediments in Great Lake contain evidence that eucalypt pollen is readily transported over large distances, implying that the now treeless plain on the western side of the lake reflects human impact and is not a natural feature.

Lake Selina records the Last Glacial Maximum as a prominent peak in magnetic susceptibility at 100-cm depth in a core from the deepest part of the lake (7 m). A similar peak occurs at a depth of 115 cm in a core from below 18.5 m of water in Lake Echo, 90 km to the southeast. The Lake Echo peak is considered to mark the Last Glacial Maximum. A further magnetic susceptibility high in the Lake Echo sequence is considered to mark the penultimate glacial maximum. These susceptibility peaks are attributed to intense erosion of mineral sediment in the catchments during peak glacial conditions. The pollen and vegetation record in Lake Selina is one of the best in Australia for the entire last glacial–interglacial cycle extending back to ca 130 000 y ago, and is the first Australian continental record of all the isotope substages of Zone 5 (i.e., 5a to 5e, spanning the interval 73–128 000 y ago). It shows that substages 5a, 5c, and 5e had rainforest vegetation, and that rainforest during the peak interglacial was more prominent than during the

Holocene.

Macquarie Harbour was cored this year during a project run by Paul Augustinus (University of Auckland) and David Hannan (University of Tasmania). Sediment accumulation in the Harbour is rapid, and the 6-m long sections of sulphurous brown muds recovered are

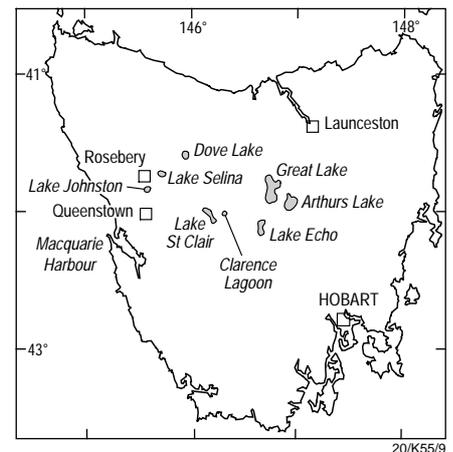


Fig. 9. Locations of the lakes in Tasmania from which sediment cores have been recovered.



Fig. 10. AGSO's Mackereth lake-bed corer surfacing in Great Lake behind Professor Eric Colhoun.

thought to span no more than the late Holocene. Issues that are being addressed include the history of influx of mine waste into the Harbour from the Mount Lyell mine via the King River, and the acceleration of bank erosion caused by boats in the lower reaches of the Gordon River.

AGSO's Mackereth lake-bed corer was used to collect all the sediment cores. The corer is lowered to the floor of a lake, and is operated remotely from a small dingy by compressed air stored in dive bottles. Coring is accomplished by pneumatically driving 6-m-long PVC drainpipes into the sediment. On com-

pletion of coring, air is diverted into a buoyancy drum, which raises the corer to the surface (Fig. 10). This lightweight equipment is ideal for operating in remote locations, and can be used in water depths up to 100 m. The PVC core tubes serve as permanent core retainers. Being non-magnetic, they permit rapid 'whole-core' scanning for magnetic properties such as susceptibility.

Analysis of the cores has focused mainly on the pollen content (which is diagnostic of vegetation cover), <sup>14</sup>C dating (at the University of Sydney and the Australian Nuclear Science & Tech-

nology Organisation), and palaeomagnetic properties. The palaeomagnetic properties provide stratigraphic information and, under favourable conditions, an independent timescale based on the dated master curve of geomagnetic secular variation in southeastern Australia.

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