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Quaternary sub-fossil wood deposits at two locations in southwest Tasmania

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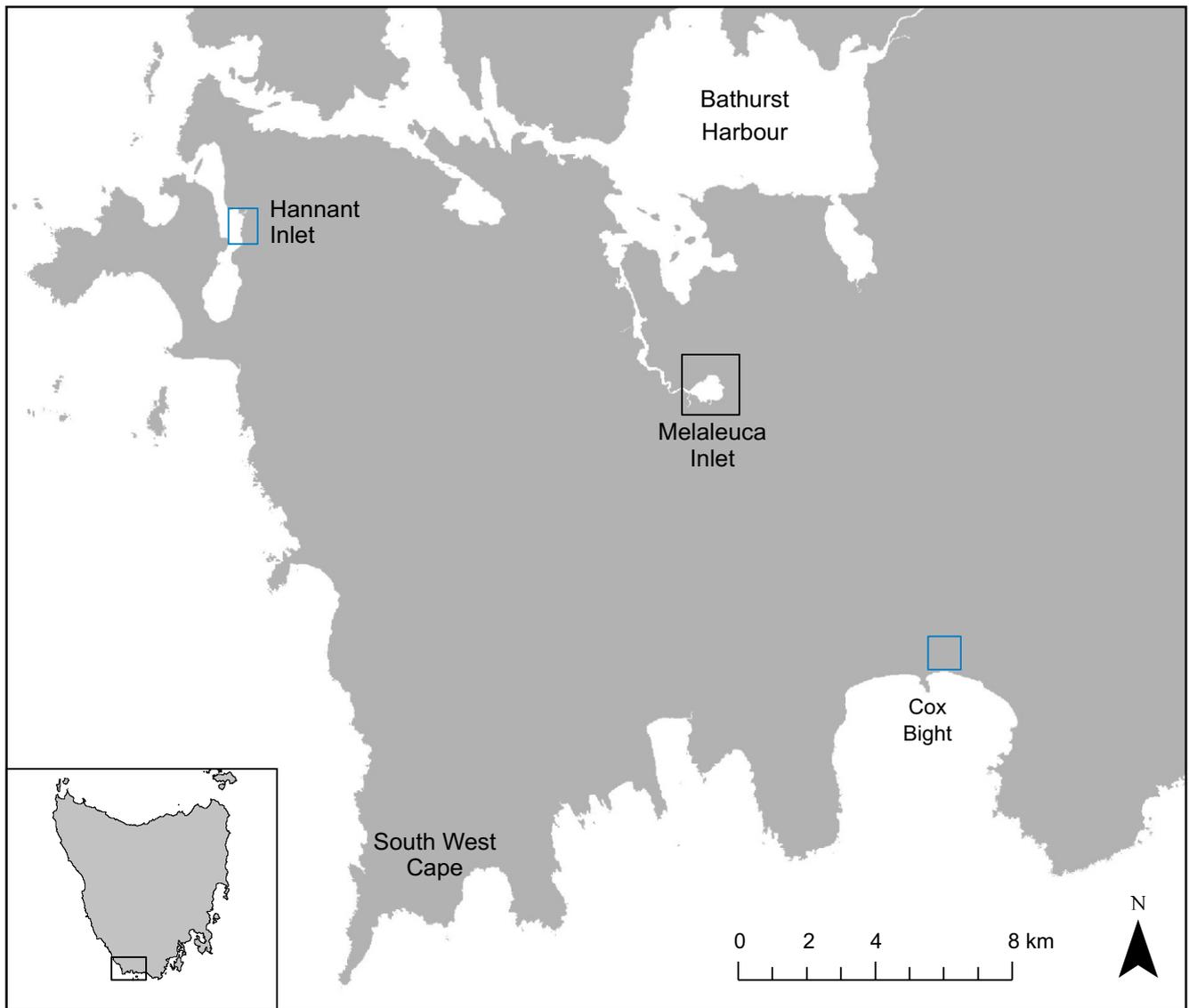


Figure 1

Location of the two fossil wood deposits in southwest Tasmania.

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Abstract

Two deposits of sub-fossil wood from Hannant Inlet and Cox Bight in the far southwest of Tasmania are described. The exact age of the fossil logs deposits remains indeterminate, being outside the range of ^{14}C dating. The sub-fossil wood is associated with Mid to Late Pleistocene palynoflora which indicates their Mid to Late Pleistocene age. One sediment sample collected from the log at Hannant Inlet revealed a palynoflora interpreted as reworked from the underlying Neogene sediments which are also pollen rich. The sites described are of considerable palaeoecological significance, given that they are at sea level in the most southern extremity of Australia, and warrant further investigation.

Introduction

During the Pleistocene, when sea levels were at times as much as 130 m lower than present (Lambeck and Chappell, 2001), the island of Tasmania formed a glaciated peninsula jutting into the Southern Ocean which intercepted cooler westerly air streams of fluctuating intensity (De Deckker et al., 2012; Fletcher and Thomas, 2010). The frigid conditions depressed tree lines to as low as <100 m above modern sea levels (Colhoun and Shimeld, 2012). The bulk of palaeoecological reconstructions for the Pleistocene hinge on interpretation of pollen and charcoal particles in lake sediments (e.g. Colhoun, 1992), fossilised bones of both extinct and extant faunas (Gillespie et al., 2012) and a few fossilised plants and palaeosols (e.g. Gibson et al., 1987; Jordan et al., 1991). Two deposits of sub-fossil wood from the most southerly landscape in Tasmania are described in this report.

Results

Hannant Inlet

On the east side of Hannant Inlet (fig. 1) a steep gravel bank exposed by recent shoreline erosion contains numerous large fragments of well-preserved wood in a crudely stratified clayey-gravel horizon about four metres thick overlain by at least ten metres of clean white quartz gravel with apparent crude cross-bedding (fig. 2). The abundance and small diameter (c. 20 cm) of the logs suggests the woody plants formed a low scrub. The quartz gravels were previously mapped as raised beach deposits (Williams, 1982), partly on the grounds of proximity to the present shoreline, however our results suggest they were laid down well inland of and above the shoreline at the time. The sediment texture and apparent crude cross-beds are consistent with fluvial or alluvial fan sediments and are interpreted as a stacked palaeochannel sequence of inferred Last Glacial age. The base of the sub-fossil wood unit is underlain by at least 0.5 m of clayey sand without wood at the foot of the exposure.

All the sub-fossil logs in the wood-bearing unit are orientated pointing out from the slope, consistent with a stratified alluvial fan deposit formed by outwash from a slumped forested slope above the deposit. Two samples of wood from this unit were radiocarbon dated by the Australian Nuclear Science and Technology Organisation (ANSTO): both samples had ages which were indistinguishable from background (Table I). Palynological analyses of sediment attached to the wood samples, undertaken by Michael Macphail, yielded the following

pollen types, indicating that the area was close to the tree line.

Sample 1 yielded a sparse cool-cold climate microflora dominated by *Pherosphaera* (possibly *P. hookeriana* or a close relative) and frequent *Lagarostrobos franklinii* and an unidentified *Epacris* sp. The sample had low to trace numbers of taxa that are now restricted to the upper subalpine and/or alpine zone (*Microcachrys tetragona*, *Nothofagus gunnii*, *Dichosciadium ranunculaceum*) as well as cool temperate rainforest taxa (*Nothofagus cunninghamii*) and diverse herbs and cryptogams. Cold climate bog taxa, such as *Astelia alpina*, were not recorded. A Middle to Late Quaternary stadial age is inferred, based on these cool-cold climate taxa and trace *Tubulifloridites pleistocenicus* and *Brassicaceae*.

Sample 2 also yielded a diverse cool-cold climate flora dominated by gymnosperms (*Lagarostrobos franklinii*, *Pherosphaera*, *Podocarpus*). The sample included many of the taxa recorded in Sample 1, mixed with taxa that became extinct in Tasmania during the Late Pliocene or earlier, e.g. *Cyatheacidites annulatus*, *Herkosporites elliotii*, *Trilites tuberculiformis*, *Verrucosisporites cristatus*, *V. kopukuensis*, *Araucariacites australis*, *Dacrydiumites florinii*, *Parvisaccites catastus*, *Beaupreaidites elegansiformis*, *Canthiumidites oblatus*, *Cupanieidites orthoteichus*, *Granodiporites nebulosus*, *Nothofagidites brachyspinulosus*, *N. emarcidus-heterus*, *N. flemingii*, *Proteacidites annularis*, *P. obscurus*, *P. stipplatus*, and a few taxa that survived into Middle to Late Quaternary time, e.g. *Droseridites* (*Drosera*-type), *Nuxpollenites* sp. (*Dodoniaea triquetra*-type) and *Stephanocolpites oblatus* (*Haloragodendron*-type). We interpret these taxa to have been reworked from the underlying unit by fluvial erosion.

The underlying clayey sand unit contains a moderately diverse microflora which is essentially that recorded reworked into sample 2 of the overlying wood-bearing unit (see above). Rare species (modern equivalents given in parentheses) in this unit include *Foveotriletes lacunosus* [*Lycopodium*], *Cyathidites splendens* [*Acrostichum*], *Matonisporites ornamentalis* [*Dicksonia antarctica*], *Dilwynites granulatus* [*Agathis/Wollemlia*], cf. *Aglaoreidia qualumis* [*Typhaceae*?], *Ailanthipites paenestriatus* [*Anacardiaceae*?], *Nothofagidites falcatus* [*Nothofagus* (*Brassospora*) sp.] plus a large number of undescribed tricolpate, triporate and tricolporate morphotypes. The sediment is interpreted as fluvio-deltaic and is inferred to be of Late Early to Middle Miocene age (*Canthiumidites bellus* Zone) based on *C. bellus* and *Cyatheacidites annulatus* in a microflora lacking indicator species of older and younger zones. The minimum age is Late Pliocene, based on *Cyatheacidites annulatus* and abundant *Nothofagidites emarcidus-heterus*.

Table 1

Results of radiocarbon dating of two samples of fossilised wood from Hannant Inlet and two samples from Cox Bight in southwest Tasmania.

Lab. Code	Sample ID	^{13}C	pMC^{a}		^{14}C ages (BP)	
		(‰)	Mean		Mean	
OZNI07 ^b	Sample 1 Hannant Inlet	-20.4	0.00	0.03	NDFB ^c	
OZNI08 ^b	Sample 2 Hannant Inlet	-20.6	0.00	0.03	NDFB ^c	
OZNI06 ^b	Sample 1 Cox Bight	-20.5	0.00	0.03	NDFB ^c	
OZNI09 ^b	Sample 2 Cox Bight	-20.3	0.00	0.03	NDFB ^c	

Note:

- a pMC: percent modern carbon
- b Extracted alpha-cellulose was used for dating
- c NDFB: Not Distinguishable From Background

Cox Bight

About 500 m inland of Cox Bight beach (fig. 1) sub-fossil logs — some in apparent growth position — are exposed in excavations associated with an abandoned tin mine on gentle foot slopes below low ridges of Devonian granite and higher Precambrian quartzite slopes. The logs occur in peaty lenses within and overlying a coarse unlithified, poorly-sorted, sub-rounded quartzite cobble and gravel deposit, probably a Pleistocene alluvial fan deposit, that lies beneath a metre of organic soil (fig. 2). The density and diameter of the logs (c. 40 cm) suggests the woody plants formed a low closed forest. Two samples of the wood had radiocarbon ages indistinguishable from background (Table 1). Basal organic soils adjacent to the sub-fossil wood revealed a typical Last Glacial Maximum (or earlier cold period) tree-less alpine floral assemblage. Key pollen taxa include *Microstobos*, *Microcachrys*, *Epacrids* and *Tubulifloridites pleistocenicus*.

Conclusion

The sites we have described are of considerable palaeoecological significance given that they are at modern sea level in the most southern extremity of Australia, and warrant further investigation. The exact age of the fossil logs deposits remain indeterminate, being outside the range of ^{14}C dating. The sub-fossil logs were associated with a rich Pleistocene microflora with many extinct species. The Pleistocene pollen assemblage at Cox Bight differs from the pollen spectrum reported at nearby Melaleuca Inlet (fig. 1) from around 38 000 BP (Jordan *et al.*, 1991) that was characterised by species that currently grow in the region. The preliminary pollen data from both sites point to flora characteristic of cold conditions. The burial of trees at both sites may have been due to slope instability under cold climate conditions. The underlying Neogene unit at Hannant Inlet is of particular interest as Neogene sequences are rare or have not been recognised in southern Tasmania due to the extreme rarity of the zone index species south of the Bass Basin. Further research needs to identify the wood samples to determine the species and their abundance in the deposits, and more comprehensive pollen and stratigraphic analyses.

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References

- COLHOUN, E. A. 1992. Late glacial and Holocene vegetation history at Poets Hill lake, western Tasmania. *Australian Geographer* 23:11–23.
- COLHOUN, E. A.; SHIMELD, P. W. 2012. Late-Quaternary vegetation history of Tasmania from pollen records, in: HABERLE, S. G.; DAVID, B. (ed.). *Terra Australis 34: Peopled Landscapes: Archaeological and biogeographic approaches to landscapes*. 297–328. ANU E-Press : Canberra.
- DE DECKKER, P.; MOROS, M.; PERNER, K.; JANSEN, E. 2012. Influence of the tropics and southern westerlies on glacial interhemispheric asymmetry. *Nature Geoscience* 5:266–269.
- FLETCHER, M.-S.; THOMAS, I. 2010. The origin and temporal development of an ancient cultural landscape. *Journal of Biogeography* 37:2183–2196.
- GIBSON, N.; KIERNAN, K. W.; MACPHAIL, M. K. 1987. A fossil bolster plant from the King River, Tasmania. *Papers and Proceedings Royal Society of Tasmania* 121:35–42.
- GILLESPIE, R.; CAMENS, A. B.; WORTHY, T. H.; RAWLENCE, N. J.; REID, C.; BERTUCH, F.; LEVCHENKO, V.; COOPER, A. 2012. Man and megafauna in Tasmania: closing the gap. *Quaternary Science Reviews* 37:38–47.
- JORDAN, G. J.; CARPENTER, R. J.; HILL, R. S. 1991. Late Pleistocene vegetation and climate near Melaleuca Inlet, south-western Tasmania. *Australian Journal of Botany* 39:315–333.
- LAMBECK, K.; CHAPPELL, J. 2001. Sea level change through the Last Glacial Cycle. *Science* 292:679–686.
- WILLIAMS, P. R. 1982. Geological Atlas 1:50 000 scale series. Zone 7 Sheet 91 (801 IS). Davey. *Explanatory Report Geological Survey Tasmania*.

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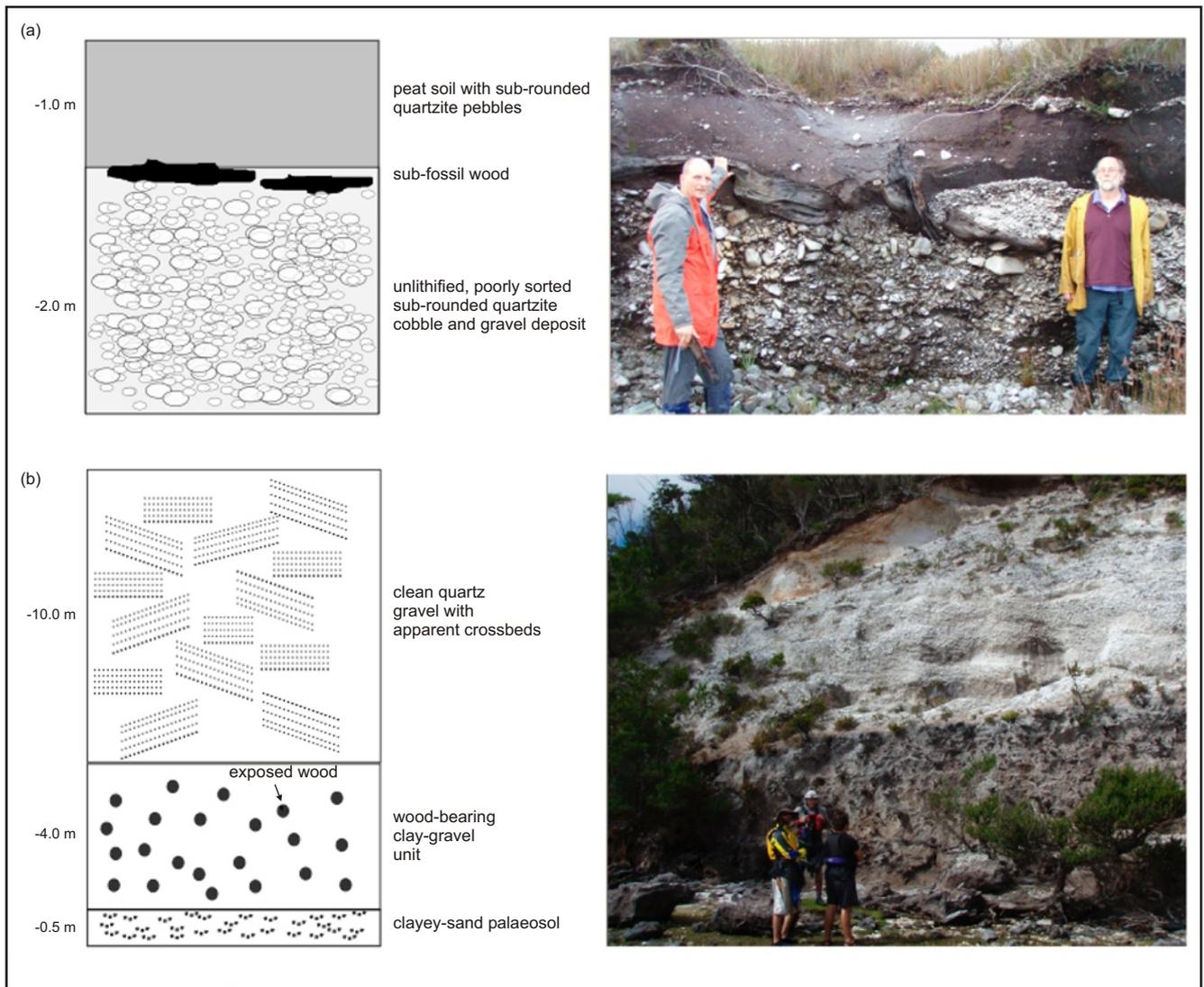


Figure 2

Profiles of the fossil wood bearing deposits at Cox Bight (a) and Hannant Inlet (b) in southwest Tasmania. The Cox Bight exposure appears to be a broken stump in growth position with roots extending into underlying quartzite gravel. One of the radiocarbon dates was obtained from this stump, and pollen described are from the basal organic soil adjacent the stump.