

PROGRESS REPORT FOR AINGRA09004

PROJECT TITLE	Holocene landscape and sea level change in eastern Australia (Also incorporating AINGRA08050 Late Quaternary chronology of northeastern Queensland marine sediments based on AMS C14 dating progress report)	
INVESTIGATOR(S)	Institution and Department	
Chief Investigator	Dr Patrick Moss	Geography, Planning & Architecture, The University of Queensland The University of Queensland
Other Investigators	Prof. Roland Gehrels, School of Geography, University of Plymouth, United Kingdom. Dr Craig Sloss, School of Natural Resources, Queensland University of Technology, Brisbane, Queensland.	
Students	Lynda Petherick (PhD student), School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia. Lydia MacKenzie (BSc honours - 2009) School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia.	
ANSTO Investigators	Quan Hua	
Specialist Committee	A	

SCIENTIFIC OBJECTIVES

For AINGRA09004 - We propose improving the understanding of Holocene landscape and sea level change for eastern Australia through a high resolution palaeoenvironmental analysis (i.e. pollen) of coastal sediments from Tasmania and South East Queensland. A key component of this study is the production of accurate age models based on both AMS radiocarbon and lead 210 dates of sediments from two sites (i.e. Bruny Island, Tasmania and Myora Springs, SE Queensland). The results would contribute to an improved understanding of Holocene sea level change, as well as the relative roles of climate and people on the coastal landscapes of eastern Australia.

For AINGRA08050 - This proposal follows on from Grant # 06/129 awarded to Moss et al., in 2005 to address the question of reworking, and the consequent time lag, between production and deposition of pollen in the Queensland Trough at ODP Site 820 site since 40 Ka by comparing pollen ages with ages based on foraminifera from the same stratigraphic horizon. The results, however, were unexpected as the ages of pollen material from sediments of LGM to early Holocene age were substantially *younger* than the foraminiferal ages from the same depths.

PROGRESS REPORT and RESEARCH OUTCOMES

Eight ages granted in 2008 and 2009 for AMS C¹⁴ dating of pollen concentrate samples from the Hazard Lagoon site of eastern Tasmania (three samples) and the ODP 820 marine core from northeastern Queensland (five samples) have now been received (Table 1). In addition, ten bulk sediment samples from the Hazard Lagoon site underwent Pb 210 analysis and this produced a consistent chronology for the first 16 cm (or top four samples) for this site (Table 2).

Hazard Lagoon is located within the Freycinet National Park, eastern Tasmania and is surrounded by eucalypt forest and woodland and the lagoon itself is currently dry and covered with sedges and rushes. A 1.5 metre sediment core was collected from the centre of the lagoon in April 2009 using a D-section corer. The core consisted of peat sediment for the first 80 cm and then sandy sediments from 80 to 150 cm and the base of lagoon sediments were not reached. Lydia Mackenzie is working on the core for her BSc honours thesis and is undertaking moisture content analysis, loss-on-ignition analysis, pollen analysis and charcoal analysis. The key output of this project will be the production of an environmental history of Freycinet National Park based on the results generated from these analyses, in particular focusing on late Quaternary climate change and human environmental impacts (both Aboriginal and European). Therefore, the production of an accurate chronology is crucial for the completion of this research thesis. As discussed previously, three samples have been sent to ANSTO for C¹⁴ dating (HL 1, HL 2 and HL 3 – Table 1) and a further ten samples were dated using Pb 210 analysis (Table 2) and these results are being used to provide age control for the record. The C¹⁴ ages do provide a firm chronology and suggest that the base of the core reaches the Last Glacial Maximum and as such is one of the oldest records from eastern Tasmania to

date. The Pb 210 ages are more equivocal with only the first four samples providing a coherent chronology suggests that the first 16 cm of the record is ~80 years old but this results does not compare well with the C¹⁴ ages and the initial pollen results (lack of exotic taxa) would suggest that this date is not accurate and further research is required to verify this result.

The five C¹⁴ ages (ODP 820 1 to 5) for the Ocean Drilling Program (ODP) core 820 does provide the basis of an excellent chronology for the pollen and foraminifera records that have been generated from these marine sediments (Table 1). These results build on from initial results obtained from AINGRA06129 and provide a firm age model for the interpretation of the terrestrial and marine environmental record that the ODP 820 core provides. These results will greatly improve our understanding of environmental change in the humid tropics, in particular late Quaternary climate change and its impacts on both the marine and terrestrial systems, as well as evidence for possible human arrival in the region and subsequent impacts of the region's ecosystems through the use of fire. One initial finding is that the charcoal peak observed in the ODP 820 record at 15 metres has a similar age to the charcoal peak and vegetation change observed in the Lynch's Crater record and suggests that this environmental alteration occurred at a regional scale. Additional research is required to further investigate this alteration and compare with other terrestrial records, particularly from the Atherton Tableland, for the Late Quaternary period, as well as examining possible implications for understanding human occupation and impacts. Furthermore, additional sedimentological analysis of the ODP 820 sediments is required to better understand alterations in the marine environment, particular focus is required in understanding alterations in sea levels and sea surface temperatures for the last 40,000 years. It is anticipated that at least two manuscripts will be produced which will incorporate the age model produced by this AINSE grant and AINGRA06129, one focussing on the terrestrial environmental record and the other on the marine environmental record.

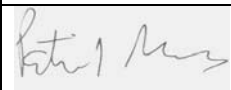
DATA

Sample ID	Depth (cm)	Age (uncalibrated) yrs BP
HL 1	50	6,045±50
HL 2	100	13,830±90
HL 3	150	18,250±100
ODP 820 1	700	13,350±80
ODP 820 2	800	19,460±150
ODP 820 3	1600	38,340±390
ODP 820 4	1300	31,660±380
ODP 820 5	1000	22,570±180

Table 1 – C¹⁴ AMS ages for the Hazard Lagoon site (Tasmania) and ODP 820 (northeastern Australia) pollen concentrate samples

Sample ID	Depth (cm)	Pb 210 Age (years Before Present)
L808	0 to 1	2.5±2.6
L809	5 to 6	27.6±6.8
L810	10 to 11	52.6±12.4
L811	15 to 16	77.7±18.1

Table 2 – Pb210 ages for the Hazard Lagoon site (Tasmania).

Signature of Investigator preparing the report for After signing this report please fax this page with your signature for our files	Proj: AINGRA09004 Date:
	12/04/2010

PUBLICATIONS / REPORTS arising as a result of your work.

No publications to date.

PhD STUDENTS

Lynda Petherick, expected completion of PhD by September 2010, PhD confirmed May 2008. Thesis Title: *Late Quaternary environments of the subtropics of eastern Australia.*