

Southern Connections and Convergences: climate, environment and cultural adaptations in the cool temperate southern hemisphere

By the Environmental Futures Network working group on Southern Connections and Convergences*



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In the quiet village of Little Oneroa on Waiheke Island, just a 30 minute ferry ride from Auckland, a group of 10 scholars from southern Australia, New Zealand and southern Chile met over 3 days (25-27 November 2008) to explore similarities and differences of environmental and cultural histories across a 'southern circumpolar zone' (Figure 1, ~40-50°S). The possibility that domestic fowl (*Gallus gallus*) was transported prehistorically to southern Chile from East Polynesia (Storey *et al.*, 2007, 2008; Gongora *et al.* 2008a, 2008b), together with some artefactual and linguistic data implicating New Zealand, indicates some potential connections. In addition, the influence of similar climates (e.g. "roaring forties") and ecologies (e.g. cool temperate rainforest dominated by *Nothofagus*) on convergent adaptations in each region may be revealed in the archaeologies. To what extent do historical connections versus adaptive convergences explain perceived similarities in ecology or culture between isolated landmasses?

The evidence now available from archaeology, palaeoecology and ethnohistory in each region revealed a surprising series of historical connections and adaptive convergences that warrant further exploration and explanation. Four major issues were identified as key to understanding cultural change in the southern cool temperate zone. (1) interactions between climate-biodiversity-people on different time scales, (2) prehistoric human settlement, (3) human interaction with the southern ocean, and (4) late dispersal of commensals.

Interactions between climate-biodiversity-people

Research into the interactions between climate-biodiversity-people will focus on outlining biodiversity trends in the southern mid-latitudes - the zone of westerly circulation - and the cool temperate rainforest zones. While there is a remarkable similarity between regional climate histories and the response of natural ecosystems to climate change, the timing and nature of human impact on these environments is

very different. In Tasmania human occupation, the use of fire and maintenance of open vegetation may have persisted for the last 43 cal kyr BP. In southern Chile (14 cal kyr BP) and New Zealand (0.7 cal kyr BP) the impact of people is much shorter. Comparing palaeoecological records of environmental change will provide the basis for assessing human population dynamics and resource abundance in relation to climate change. This will include the long term population changes in response to large scale climate shifts such as glacial and interglacial changes and also responses to sub-millennial scale climate shifts (e.g., ENSO and Little Ice Age).

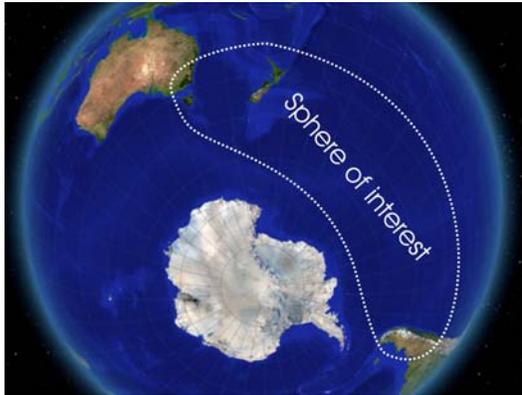


Figure 1. Sphere of interest for the Southern Connections and Convergences group.

Prehistoric human settlement

The archaeological sequences are best known from Tasmania and southern New Zealand. These are at the extremes of human settlement in the Pacific; Tasmania in the late Pleistocene during the initial expansion of modern humans and southern New Zealand at the termination of Polynesian dispersal. They are also at very different scales of resolution. Tasmanian archaeology spans 43,000 years and is written largely at the millennial scale, while the archaeology of southern New Zealand is entirely within 7-800 years. As might be expected, narratives of human prehistory relate more easily to patterns of long-term climate change in Tasmania than in New Zealand, where extensive deforestation and faunal extinction near the beginning of the sequence loom large in explanatory models. However, we are aware that even minor climatic changes in southern New Zealand, as represented by the LIA, might have been influential in changing settlement patterns and, conversely, that sequences of high resolution in Tasmania, as at West Point, might disclose patterns and suggest explanations at that scale which are more similar to models for southern New Zealand prehistory.

The sequence from Parmerpar Meethaner in central Tasmania provides one overarching model for Tasmanian prehistory. Early occupation pulses occur at 38-31 cal kyr BP and between 22-12.2 cal kyr BP (peaking at 16.8 cal kyr BP), periods of occupancy that correspond with late Pleistocene climatic ameliorations and other temporal correlates from southwest and southeast Tasmania (Figure 2 below). In southern New Zealand, lying south of the limits of Polynesian agriculture, there is no such single-site sequence covering the prehistoric era and adaptive responses are read from the settlement patterns. The early loss of moa plus deforestation in Canterbury and north Otago and the relative unfavourable coast for subsistence led to increased settlement about Foveaux Strait, where seals and other marine resources were abundant, but continuing regional resource depression led to decline of coastal

villages in Otago and effective abandonment of Foveaux Strait. Only late in prehistory was permanent settlement re-established. The relative roles of anthropogenic resource depression and climate change in settlement pattern decisions remain to be explored further.

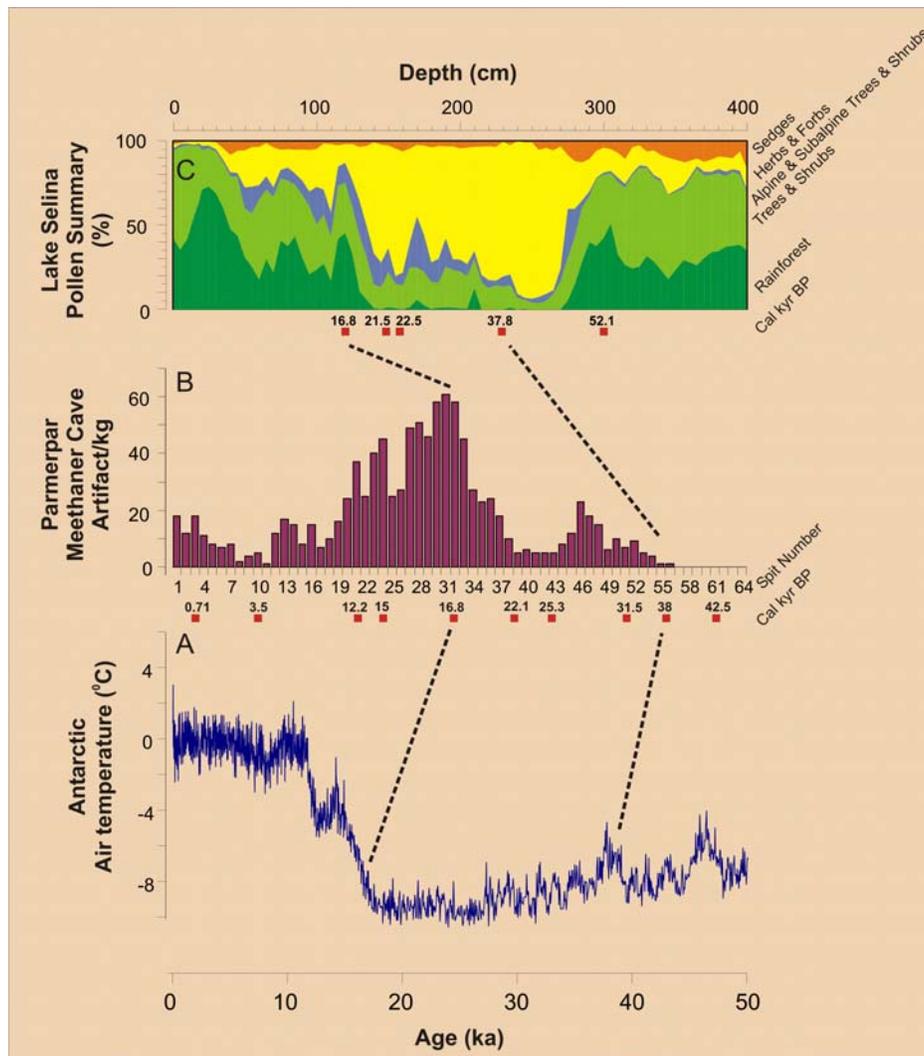


Figure 2. Proxy records for the last 50,000 years illustrating the coupling between warming in Antarctica, forest expansion in western Tasmania and human occupation pulses in the central Tasmania. (A) Air temperature over Antarctica derived from a deuterium proxy from the Epica Dome C ice core on the EDC1 timescale (Jouzel *et al.* 2007); (B) Discard rate of artefacts (per kg) of sediment per spit in square A of the excavation at Parmerpar Meethaner Cave indicating human population densities in central Tasmania (Cosgrove 1995); (C) Pollen summary diagram from Lake Selina (Colhoun *et al.* 1999). The black dashed lines indicate the beginnings of occupation pulses in Tasmania corresponding to periods of expanding forest and warming temperatures.

Between the long Tasmanian and short southern New Zealand prehistories is the 14,000 year occupation of southern South America. This involved terminal exploitation of terrestrial megafauna, amongst a wide range of animal and plant resources, as at Monte Verde in Chile, and a later focus upon coastal resources during the Archaic era. During the late Holocene settlement expanded into the forested interior prior to the arrival of agriculture and ceramics around 2500 cal yr BP. More

details of this settlement sequence and its relationship to environmental dynamics is being sought.

Human interaction with the southern ocean

The first people to reach the ocean littoral in each of the three study areas benefitted from the enormous productivity of the southern ocean through exploitation of marine mammals, birds, fish and shellfish. Despite this, their impact on the ocean's resources was minimal, with only localised extirpations (eg northern NZ seal populations, sea bird nesting colonies e.g. *Megadyptes waitaha*).

Beginning in the late 18th century, there was a change in human interaction from subsistence to entrepreneurial imperatives in exploitation of the littoral and pelagic zones. But for coastal hunting and fishing this initiated exploration of the immensely productive, largest single biological zone on the planet, the southern ocean. Pelagic whaling, shore whaling and sealing for skins and oil were driven by northern hemisphere capitalism, industrialisation and urbanisation – especially the need for machine and lighting oil. Sealing and shore whaling were short-lived, but pelagic whaling persisted throughout the 19th century and still continues.

The new form of exploitation led to entirely new contacts between the southern lands in question. People, plants and animals were moved across the southern ocean. Shore whaling and sealing had important social, cultural and economic outcomes for the people and regions where it took place, leading significantly to a new wave of settlement and the emergence of mixed race populations. The wider exploitation of the southern ocean led to profound and continuing changes. Pelagic whaling led to substantial reductions in the populations of large whales and subsequent industrial exploitation of the southern ocean has led to further simplification of the food chain.

Late dispersal of commensals

The introduction and translocation of a range of non-native species to Pacific Islands began nearly 20,000 years ago but humans and their commensal plants and animals arrived in the more southern regions of Polynesia only within in the last 1000 years. Polynesian agriculture was transplanted successfully to northern New Zealand (albeit with a reduced range of commensals) but reached the limits of tolerance just south of Cook Strait.

The presence of the sweet potato (*Ipomoea batatas*) and bottle gourd (*Lagenaria siceraria*) throughout Polynesia provides evidence of prehistoric contact between Polynesia and South America. Recent evidence for pre-Columbian chicken introductions to the coast of south central Chile, though still debated, suggests that exchanges were made in both directions. We do not yet understand the extent, specific timing and full impact of these prehistoric interactions on the populations and environments concerned. If chickens were introduced to South America, were other Pacific commensal animals as well? When were they introduced and were there multiple introductions? Did Polynesians settle on some of the small off-shore islands of south central Chile, as some human osteological data suggest, or were there merely brief encounters?

European arrival in the southern Pacific also resulted in the introduction of a range of plant and animal species which significantly affected social interactions, economies

and environments in the region. The introduction of potatoes and pigs to southern New Zealand, for example, dramatically increased the economic productivity of this otherwise marginal environment. Maori adopted several varieties of potatoes and have maintained production of many of these which are now often referred to as “Maori potatoes”. Where did these varieties originate? Are they evidence of later South American connections? Further archaeological and genetic research is planned to investigate these issues.

This meeting was funded through the ARC Environmental Futures Network (<http://www.adelaide.edu.au/efn/>). A follow up meeting will be held at the next VI Southern Connections Congress to be held Bariloche, Argentina on February 15-19, 2010 (<http://www.scongress2010.com.ar/php/index.php>).

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