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A COLLABORATIVE ARCHAEOLOGICAL RESEARCH AND CONSERVATION PROJECT FOR MORIORI CARVED TREES (RAKAU MOMORI), REKOHU (CHATHAM ISLAND)

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In January–February 2010 a conservation and site-recording project began on Rekohu (Chatham Island) to locate, assess and digitally scan archaeological carved trees known as rakau momori ("dendroglyphs"). Early Chatham Islands Moriori people inscribed these carvings on live kopi trees (also known as karaka, *Corynocarpus laevigatus*), valued for their nutritious edible drupes. It is believed that early Polynesian settlers introduced kopi trees to the Chatham Islands (Costall et al. 2006: 7–8; Leach and Stowe 2005). Rakau momori carving forms include anthropomorphic, animal (especially bird) and more abstract forms that may represent animals as well. Anthropomorphic images range from basic linear forms with heart-shaped heads and ribs and limbs that conform broadly to the ancient Polynesian art canon to more complex, novel representations. The carvings are indented into the soft kopi bark and occasionally highlighted in relief against the exposed sapwood of the tree (Jefferson 1956; Richards 2007; Simmons 1980). These living carved trees are a novel Polynesian art form (Richards 2007) and in their current number and condition represent the most intact, extant world example of this indigenous site type (Maxwell 2010; Turner et al. 2009).

The 2010 rakau momori scanning project was directed by Richard Nester for the Department of Conservation (DoC) with the full collaboration and support of Hokotehi Moriori Trust, the legal representative of Moriori people. Ian Barber of the University of Otago was engaged to direct the archaeological field component of the project. In an innovative field application,

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staff from Te Kura Kairuri/National School of Surveying at University of Otago supervised the 3D handheld digital scanning of rakau momori images under the direction of professional practice fellow Richard Hemi. The 2010 project aims were achieved with considerable success. Nearly 100 images were scanned with high-resolution results that clarified and in some cases discovered new carving details (Galer 2010; Maxwell 2010). All of the scanned trees were photographed, described and assessed. Adjacent archaeological deposits and materials were recorded as well.

A new research project has been developed from this work in full collaboration with Hokotehi Moriori Trust. The project is framed so as to identify core problems and options for the preservation of carving places and trees, and to contribute new archaeological knowledge on the development, significance and meaning of rakau momori trees and landscapes. This paper briefly considers earlier work on carved trees before reporting preliminary and anticipated outcomes from our recent collaborative rakau momori archaeological project.

Previous work

The first comprehensive field investigation of Moriori carved trees was carried out by Christina Jefferson over the course of six field visits between February 1947 and June 1955. As Roger Duff of Canterbury Museum noted, Jefferson "discovered and recorded no fewer than 1,145 dendroglyphs, and made pencil copies of 549 of the glyphs" (cited in Jefferson 1956: v; see also pp. 64–72, Appendix B). Jefferson provided basic information on carving forms and associated midden sites by general location. Unfortunately, her maps are of little use in locating carving stands, or carvings, with any precision. The resulting monograph does at least provide researchers with drawings, a few photos and a basic stylistic analysis for carvings that are now lost (Jefferson 1956: 52).

Moriori carvings were recorded between 1963–1964 as part of a Chatham Island archaeological survey directed by D. R. Simmons (1964; 1980). This research involved a wide ranging survey of archaeological sites on Rekohu. From this work 600 Moriori tree carvings were located from a number of "carving groves" identified in coastal areas of central and northern Rekohu. The greatest concentration of groves and carvings was located along the east coast, where the largest number of carvings ("300 possible") was recorded at Hapupu (Simmons 1964: 65; No. 134 in Figure 1).

In the course of a larger Chatham Islands research project carried out in the 1970s (Sutton 1982), G. S. Park of Otago Museum assessed the overall state of tree carvings and stands so as to provide recommendations on site

Figure 1. Location map of surveyed archaeological sites, Rekohu (Chatham Island), recorded between 1963-1964, including numbered locations of kopi "carving groves", after Simmons 1964: 66 (fig. 4).

protection for the New Zealand Historic Places Trust (Park 1976: 1). In a brief discussion, Park (1976: 6) confirmed that "no trace" could be found of 180 carvings recorded by Simmons at Makeroa (No. 29 in Figure 1). Park (1976: 3, 4) also considered the "well known" carving group at Hapupu and suggested that the kopi carvings recorded by Simmons had survived at this locality. Park (1976: 4, 5) also observed that the loss of small protecting trees through stock grazing on the Hapupu grove margins allowed wind penetration "with devastating result." The Hapupu stand was finally fenced in 1980 (DoC 2000: 6).

Through the 1990s several DoC surveys and assessments were undertaken, in the course of which carved trees from larger kopi stands on DoC and private land were tagged and measured (Figure 2). In 1998 these trees were finally mapped to a high relative accuracy by a Universty of Otago surveying team in a total station cadastal survey. In this work a close-range photogrammetric record was created as well (Jopson and McKibbin 2000; Table 1). In 1996, the large Hapupu stand was designated as one of only two national

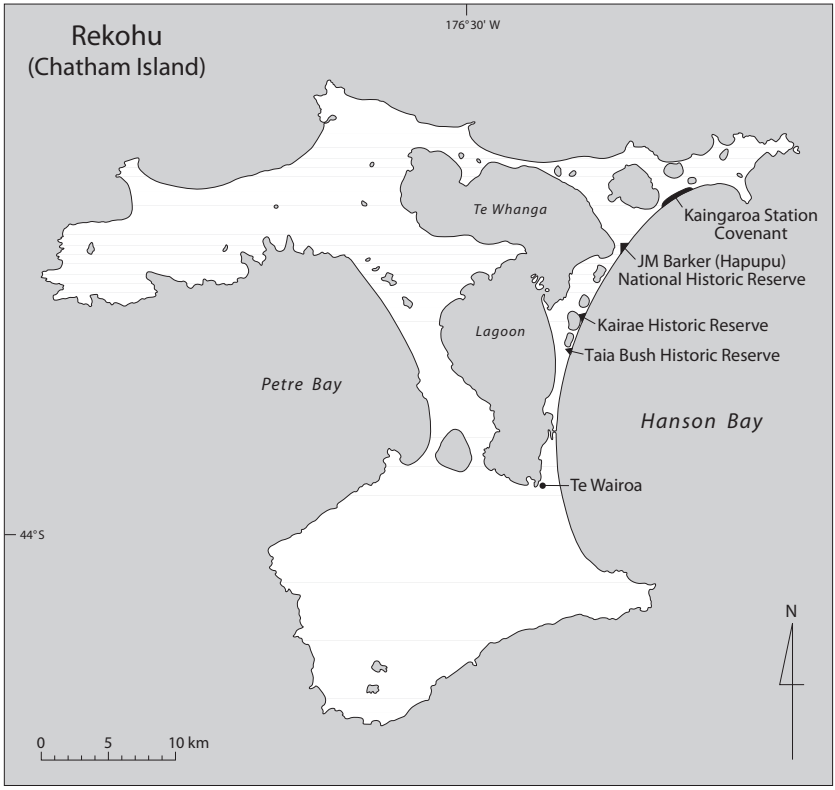


Figure 2. Location map of kopi carving stands, Rekohu, as surveyed by Jopson and McKibbin (2000) and investigated during the 2010-2011 field-work seasons reported in this paper. Location names follow contemporary public sources, including designations on site (cf. Table 1).

historic reserves in New Zealand. This stand is now managed by DoC under the provisions of the Reserves Act 1997 as the J. M. Barker (Hapupu) National Historic Reserve (DoC 1997). The management plan produced by DoC for this reserve recognises conservation problems and prospects for rakau momori.

> The forest canopy is relatively simple in composition and has suffered from some storm damage. It is typical of the rear dune forest that would have once been much more extensive in the general area. It is not known how much longer the kopi will live under the present environmental conditions, especially given the vulnerability of the canopy to the salt-laden winds of frequent storms. In many other parts of the

island, grazing combined with wind damage has destroyed the kopi forests containing tree carvings/raukau momori (DoC 2000: 6).

Conservation

With reference to the 2010 survey data, survey participant Justin Maxwell has quantified and evaluated the loss of rakau momori kopi stands, trees and (where practicable) carving condition over time for a University of Otago BA Hons dissertation (Maxwell 2010). This research tracks the diminishing size of the last significant kopi stands with carvings from eastern Rekohu (Figure 2). Maxwell has also documented the rapid loss of carving detail for a number of now dead or dying rakau momori that have been photographed over time (e.g., Figure 3). For these trees and the larger kopi stands

Figure 3. Anthropomorphic figure on carved tree M1865 photographed in 1997 (courtesy F. Jopson, left), and 2010 (right), J. M. Barker (Hapupu) National Historic Reserve. Note in this figure the characteristic, symmetrical heart-shaped face, linear upturned mouth, and representation of ribs found in many anthropomorhic rakau momori.

Locality (contemporary name where different) *	No. carved trees	No. carvings
Te Wairoa	8	8
Hapupu (J M Barker (Hapupu) National Historic Reserve)	82	98
Taia (Taia Bush Historic Reserve)	21	26
Lake Kairae (Kairae Historic Reserve)	16	22
New Barker Bros Ltd Block (Kaingaroa Station Covenant)	22	24

* Contemporary locality names are provided in brackets for reference to Figure 2.

Table 1. Numbers of carvings and carved trees for rakau momori localities recorded by Jopson and McKibbin (2000).

more generally, this research identifies the loss of upper canopy growth as a critical measure of declining tree health (Figures 4–6; Maxwell 2010).

Late in 2010, Hokotehi Moriori Trust approved the return of a small University of Otago archaeological team in February 2011 to monitor the condition and measure canopy health of carved trees and stands against the 2010 baseline data. Ian Barber directed the February project with the research and field support of Justin Maxwell, and funding support from a University of Otago Research Grant. While these data are yet to be analysed and quantified in full, we can report that upper canopy loss for many of the 63 standing carved trees monitored at the national historic reserve between 2010 and 2011 is measureable and significant (e.g., Figures 5–6). Indeed, in February 2011 a relatively full and healthy upper canopy was recorded for two national reserve trees only.

The number of dead trees with carvings at the National Reserve has also increased from 40 percent in 2010 to over 50 percent of the 2011 total with a corresponding loss of carving detail in several cases. The mature continuous canopy of the larger national reserve stand is almost entirely lost now (Figure 4), other than on the western fringe. Overall, the rate at which carvings are deteriorating as the host tree becomes stressed is rapid.

For many of these trees removal and conservation treatments are necessary if the carvings are to be preserved in any detail. For those few trees at the national reserve and elsewhere with reasonable or at least, recoverable canopy health, fertilization treatments may be of some assistance in extend-

Figure 4. Dead outer trees and sparse canopy for the kopi stand beyond the fence at J M Barker (Hapupu) Historic Reserve, February 2011.

Figure 5. Carved tree M1861, J M Barker (Hapupu) National Historic Reserve. The anthropomorphic figure presents a relatively rare, down-turned mouth. This is the largest recorded carved tree at the reserve, with a DBH of 1046mm.

Figure 6. The upper trunk and bare branches of M1861 (cf. Figure 5). The loss of canopy cover for this important tree increased from about 50% to 75% between 2010 and 2011.

ing longevity and halting condition loss. Hokotehi Moriori Trust are now considering these options in consultation with appropriate agencies.

Chronology and context

The cultural heritage and conservation loss of rakau momori stands and trees also represents a significant loss for archaeological research. We believe that it is reasonable to assume a cultural relationship in history between the management of economically and spiritually significant kopi stands and the figures carved on individual trees. The last may include recently deceased or ancestral persons of importance and other human and animal deities. In this variety, the carvings may have been intended to improve tree fertility (Richards 2007: 26–27) or to mark places of harvest and perhaps settlement and resource use more broadly for particular descent groups. These and other

suggestions need to be assessed against archaeological data of course, addressing such questions as the chronology of kopi introductions and dispersal, the antiquity of the rakau momori tradition, and spatial and temporal variation in carving style and form.

At a fundamental level of knowledge it is especially problematic that so little is known about the age of the carved kopi trees. The tree stems cannot be dated by dendrochronology due to "copious parenchymatous rays" and the absence of consistent seasonal growth rings (Costall et al. 2006: 11). Our project has been concerned to identify radiocarbon dating options for carved kopi trees and places as a priority for sound archaeological interpretation and management. In 2010 a smaller, dead rakau momori tree trunk that had been tagged in an earlier survey (M1864) was located on the ground. The carved trunk was removed by chainsaw for conservation treatment under the direction of Hokotehi Moriori Trust and DoC. At the same time a section of trunk immediately below the carving was sent to the University of Otago so that a radiocarbon sample could be prepared.

The trunk sample was air-dried at Otago, after which the exposed section was cut further with a clean handsaw so as to remove any contaminant. A concentric sample from one half of the new section was removed in the area near the core, within 100mm of the estimated centre. Consequently, this sample dates the tree when approximately 200mm or less in diameter.

The radiocarbon date for M1864 is reported as 196 ± 33 BP (Lab number Wk28800; Table 2). Unfortunately, this relatively late date falls within a very wiggly section of the applicable calibration curve. This means that the calibrated result is reported with a wide range (Figure 7). The calibrated age does at least demonstrate that there is an almost 60% probability that the tree had grown as much as 200 mm at some point between AD 1650 and 1810. This means that the tree could easily have been carved during the eighteenth century. There is a smaller statistical possibility (about 17%) that it may have been large enough to carve in the late seventeenth century, especially since there is evidence that trees of relatively small diameter were carved on occasion (Richards 2007: 21–22).

Lab no.	δC13	% Modern	Conventional age
Wk28800	-24.4 ± 0.2	97.6 ± 0.4	196 ± 33 BP

Table 2. Details and values for radiocarbon date Wk28800.

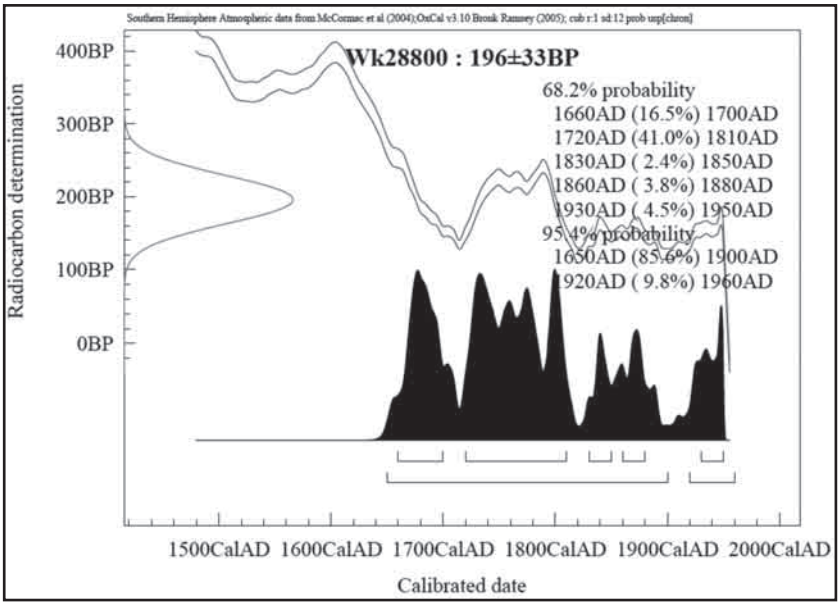


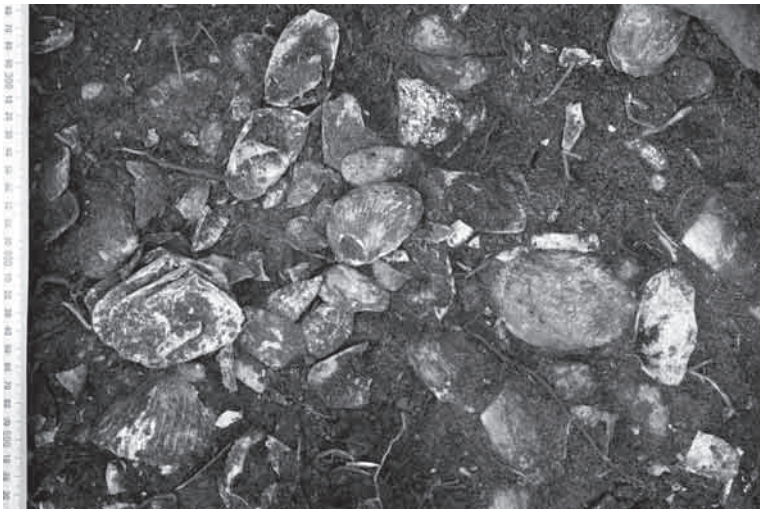
Figure 7. Calibrated radiocarbon date for rakau momori tree core sample Wk28800 (southern hemisphere atmospheric data from McCormac et al. 2004).

The diameter at breast height (DBH) of the dated tree was 302 mm. At the Hapupu National Reserve, rakau momori DBH range between 246 mm and 1046 mm. This means, as indicated above, that the dated tree M1864 with its maximum age of 360 years is one of the smaller rakau momori at this locality (Maxwell 2010). If more radiocarbon data become available from larger kopi trees, it may be possible to test whether there is a relationship between DBH and maximum tree age within discrete kopi stands and environments. These results might clarify whether there is a range of ages represented among rakau momori of different size (cf. Costall et al. 2006: 16).

Dates from tree cores provide only a maximum age for the time of the carving of course. Tuatua (*Paphies subtriangulatum*) shell deposits found in several kopi stands that appear to be associated with rakau momori provide a further option to radiocarbon date Moriori use of the stands. Calibrated shellfish dates can be more precise than atmospheric dates, and open shore, filter-feeding tuatua are a preferred New Zealand species for dating. However, regional variance in marine radiocarbon values can affect the accuracy of

Figure 8. Test excavation (1m x 1m) into intact stratigraphy below scattered, surface tuatua midden in the vicinity of carved tree N0505, Kaingaroa Station Covenant, February 2011.

Figure 9. A level of soft shore tuatau and hard shore paua valves as excavated in a test unit in the vicinity of carved tree N0511, Kaingaroa Station Covenant, February 2011.



shellfish dates. Unfortunately, a recent study suggests that there is considerable radiocarbon variance in Rekohu shellfish sampled from the southern to southwestern part of the island. This variance may be the result of the upwelling and mixing of cold Antarctic waters along the Chatham rise, affecting shellfish in the western to southern part of Rekohu (Petchey et al. 2008).

Radiocarbon values for shellfish from northern Rekohu may not be as variable, although this is still to be confirmed. Paired marine shellfish and short-lived terrestrial materials such as carbonised seeds and twigs would potentially identify significant variance in, and therefore, the accuracy of, shellfish dates. With this clarification, samples of tuatua from different layers could be dated and compared further to help determine how long Moriori have been using kopi stands. Animals have disturbed a number of shell deposits in these stands. These surface disturbances provide the opportunity to dig small, low impact test pits to identify archaeological stratigraphy within the tuatua deposits, and to carefully recover discrete samples to the base of the deposit. Radiocarbon dates from associated middens provide the next best indication of the likely period(s) within which the kopi stands were used and the trees carved.

Hokotehi Moriori Trust and landowners consented to the February 2011 excavation sampling of disturbed tuatua shellfish deposits found adjacent to some carvings (under New Zealand Historic Places Trust Authority 2011/263). In total, five discrete localities and deposits were sampled at the privately owned and managed Kaingaroa Station Covenant and the DoC managed Taia Bush Historic Reserve. In spite of its importance, the national historic reserve was not tested as only two shallow, isolated midden deposits were located there. Other larger middens in the now open grassy lands outside of the national reserve may have been associated with rakau momori, but this cannot be confirmed at present.

Intact basal stratigraphy with good sampling integrity was identified for each tested deposit in spite of widespread surface disturbance (Figure 8). Appropriate radiocarbon materials were recovered, including a carbonised kopi seed. These samples are being pre-treated at University of Otago archaeology lab facilities currently, and will be submitted as soon as they are ready for radiocarbon processing. Midden components were also sampled and sieved to recover diagnostic fauna and flora of value as required by a condition of the authority. From this work, a surprising range of species is identified from deposits dominated otherwise by soft shore tuatua, including hard shore shellfish (especially paua, *Haliotis iris*; see Figure 9), inshore finfish species (especially blue cod, *Parapercis colias*), bird and occasional sea mammal bones. These resources have been procured from a number of discrete envi-

ronments over some distance. The study of these components in landscape context should offer new perspectives on the use of kopi stands, and on later Moriori economy and society more generally.

Future directions

Funding is now sought for a new research phase of the project that will provide for the identification, scanning and comparative analysis of all remaining rakau momori on the Chatham Islands, especially those on private land, and to investigate associated archaeological places and landscapes where approved. This research has been designed in collaboration with Hokotehi Moriori Trust around the fundamental questions of when, how and why a novel Polynesian Moriori culture emerged on the Chatham Islands, and the place of rakau momori in the Moriori cultural revival (Galer 2010; Maxwell 2010). The project is also designed to provide conservation advice and options for rakau momori preservation. There is considerable urgency in this project given the evidence of ongoing and rapid loss of carved trees and associated kopi stands. The imminent loss of most if not all rakau momori on Rekohu represents a national archaeological conservation crisis in our view.

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