NEW ZEALAND
ARCHAEOLOGICAL
ASSOCIATION

ARCHAEOLOGY IN NEW ZEALAND

NEW ZEALAND
ARCHAEOLOGICAL ASSOCIATION
ARCHAEOLOGY IN NEW ZEALAND

THE MATCH BOX – THE RAT BONE – THE HUKANUI #7b EXCAVATIONS 1959

John C. Yaldwyn
Honorary Research Associate
Museum of New Zealand Te Papa Tongarewa

For those of us interested in absolute dates it has been a mere 5 years since Richard Holdaway of Palaecol Research, Christchurch, shook the New Zealand scientific and archaeological communities by reporting in a letter to the English journal *Nature* (Holdaway 1996a) a series of:

> "radiocarbon ages of up to about 2,000 yr BP on bone gelatin from Pacific rats from both main islands of New Zealand that imply an early, transient, human contact with New Zealand more than 1,000 years before settlement. Extinctions of small vertebrates vulnerable to rat predation should precede extinctions of moa and other large taxa by human hunting and habitat destruction."

As I had excavated, retained and supplied one of the rat bones dated and reported on by Holdaway in this provocative and original paper (sample NZA – 6636 from Hukanui #7b) I have followed with interest the extensive series of publications since, dealing with the reliability or possible unreliability of radiocarbon dates based on Pacific rat (*Rattus exulans*) bones from New Zealand and Pacific Island archaeological sites and natural deposits (e.g. Anderson 1996, McFadgen 1997, Holdaway and Beavan 1999, Anderson 2000, Hedges 2000, Higham and Petchey 2000). In the same period Holdaway has provided further information on his original conclusions on rat bone dates and human contact with New Zealand (1996b, 1999). I will make no attempt to review Holdaway's claims on early human contact with New Zealand or the problems with the radiocarbon dating of rat bones from archaeological sites and natural deposits but would like to balance Anderson's concern (2000: 243) that "Problems

remain in the radiocarbon dating of rat bone, ... and the reliability of determinations is currently uncertain" with references to recent studies by Beavan-Athfield *et al.* (1999, 2001) on both bone gelatin dating of rat bone and on the influences of diet on rat bone dates from natural sites.

Of direct concern to me however are Anderson's simplistic and critical comments (2000: 253) that:

> "Holdaway (1996) asserted that sample NZA-6636 [from the Hukanui #7b deposit dated] (1775± 93 B.P.) was recovered from beneath Taupo tephra (dated 1850 B.P.), but the evidence consists only of an inscription on a matchbox in which the bone was found 40 years after its recovery, and renewed excavations at Hukanui have failed to support the case."

In defence of my observatory and curatorial skills I must state that Holdaway's assertion was correct, and as I was the person who found the bone, put it in the matchbox, labelled it and looked after it for nearly 40 years, I think it would be worth while describing how the bone was found, why it was in a matchbox and how and where it was stored between 1959 and the mid 1990s.

Hartree's Puketitiri inland Hawke's Bay sites

William H. Hartree jnr. farmed "Manaroa" at Puketitiri near Patoka in inland Hawke's Bay. He had a keen interest in natural history and excavated many rock shelters searching for moa eggshell and bird bones (for a general account of Bill Hartree's interests and results see Worthy and Holdaway 1999: 457-458 with a photo of W.H. Hartree in Worthy and Holdaway 2000: 91). Hartree excavated in 37 natural sites and 5 sites of at least partial archaeological origin in the Puketitiri area in the 1950s and early 1960s until shortly before his death in 1962 (Worthy and Holdaway 2000: 121, 90). An important stratigraphic aspect of most of these sites is the presence of two dated and very different-looking tephra (volcanic ash) layers. The upper tephra layer is the white unconsolidated Taupo ignimbrite, about 1850 ± 10 years B.P., while the lower tephra layer is the orange red Waimihia lapilli, or ash pellets, about 3,300 years B.P. Worthy and Holdaway (2000: 126-153) list all the Puketitiri sites with their individual names, excavation dates, locality (grid reference), origin, presumed avian predator (in the case of natural sites), and detailed list of identified bones registered from each site now held either in the Museum of New Zealand, the Canterbury Museum, or the Hawke's Bay Cultural Trust Museum, Napier. Hartree was in contact with Dr R.A. Falla of the Dominion

Museum while working at these sites and at various times was assisted and encouraged in his excavations by Ron Scarlett of the Canterbury Museum and the writer, John Yaldwyn, representing the Dominion Museum. It is worth recording here that the Waewaepa sites in the Puketoi Range of northern Wairarapa are incorrectly listed in Millener's (1981) catalogue of North Island sites where moa and other subfossil bird bones have been recovered, as if they were part of Hartree's Puketitiri site series in inland Hawkes Bay. This mistake came about through a misunderstanding of locality information supplied to P.R. (Phil) Millener during one of his visits to the National Museum to examine the Hartree bird bone collections. The Waewaepa limestone caves and shelters are all near the Coonoor Cave (a natural site excavated by Dominion Museum staff in 1914, see Oliver 1949: 14) south of Dannevirke.

When I joined the staff of the Dominion Museum in 1959 my archaeological excavation experience consisted of intermittent rescue work in disturbed middens at Redcliffs, Canterbury, between 1946 and 1948, in association with Elliot Dawson and under the general supervision of Roger Duff and Dr R.A. Falla of the Canterbury Museum (Dawson and Yaldwyn 1975); two seasons work at Long Beach, Dunedin, 1949/50, with Elliot Dawson; a series of excavations in Martinborough Cave # 1 in Ruakokopatuna Valley, lower Wairarapa, between 1952 and 1957 (1952 visit with Elliot Dawson), as described in Yaldwyn 1956, 1958; an archaeological training excavation in Moa-Bone Point Cave, Redcliffs, in January 1958 organised by the Canterbury Museum and the New Zealand Archaeological Association (Yaldwyn 1975), and a series of excavations in rock shelters at Waewaepa in the Puketoi Range near Dannevirke in 1953 in association with Trevor Hosking, then of Palmerston North. My main interest in all these excavations was in the faunal material, primarily birds and molluscs, recovered from these archaeological and natural sites.

Excavations at Hukanui sites #7a and b in 1959

Ron Scarlett and I joined Bill Hartree after the New Zealand Archaeological Association's Rotorua conference in May 1959, travelled with him to his home at Puketitiri and worked with him at a selection of his sites (Te Waka #1, Hukanui #5, 6, 7a and 7b) from 24-29 May. The location of Hukanui #7 is shown on Worthy and Holdaway's (2000) fig. 2 map of the Puketitiri/Patoka area and in more detail on the Holdaway and Beavan (1999) fig. 2 map of the Hukanui series of sites. Hukanui #7a (grid reference V20 147112, fossil record no. V20/f425 lower chamber, V20/f426 upper chamber) is interpreted by Worthy and Holdaway (2000: 101,138) as a rockshelter roost with the bones accumulated in the deposit within the shelter representing prey remains from the

extinct avian predator Eyles's harrier *Circus eylesi*. Hukanui #7b, see fig. 1 here (grid reference V20 147112, fossil record no. V20/f427) is interpreted as a rockshelter roost of an unknown avian predator as well as a moa nesting site (Worthy and Holdaway 2000: 142).

Figure 1. Entrance of Hukanui #7b shelter, fossil record no. V20/f427, Puketitiri, inland Hawke's Bay, 26 May 1959. Photo John Yaldwyn. Note, spoil dumps are from Bill Hartree's earlier excavations in the shelter as well as from the 26 May excavation. Sieve, long-handled shovel (or rake) and backpacks are from the 26 May excavation in progress.

After photographing the Hukanui site #7 rockshelter complex and its jumble of limestone blocks with scattered snow on the ground on 26 May (negatives held in Museum of New Zealand) I recorded in my field notes what Bill Hartree outlined to us about his earlier excavations at this site (specific identifications added from Worthy and Holdaway's (2000: 138-141) list of vertebrate remains recovered from this site).(See also plans of #7a and 7b in Worthy and Holdaway 2000: fig. 4). On the surface of the inner cave Hartree had recovered mottled petrel (*Pterodroma inexpectata*) bones (including a partial cranium) as well as sheep, and rabbit bones. In the upper post-Taupo tephra layer there were

numerous bones of the moa *Pachyornis mappini*, including juvenile individuals, pigeon (*Hemiphaga novaeseelandiae*) and North Island Kokako (*Callaeas wilsoni*), moa egg shell fragments representing a significant part of one egg, as well as broken specimens of a relatively large subfossil paryphantid landsnail. This snail was described by Dell (1955) as *Rhytida yaldwyni* from specimens I had collected from limestone caves at Waewaepa in the Puketoi range near Dannevirke in 1953, and from additional specimens collected by Dominion Museum staff from Martinborough Cave #1 at Ruakokopatuna in the lower Wairarapa in 1920. *R. yaldwyni* is now regarded as the subfossil state (i.e. the calcareous inner shell denuded of the outer translucent periostracum layer) of the extant southern North Island paryphantid snail *Wainuia urnula* (Pfeiffer, 1855). Examples with strongly developed lime shells are characteristic of *W. urnula* living in limestone (i.e. lime-rich) environments (Parkinson 1971: 3, figs 4, 5).

Other vertebrate bones recovered from Hukanui #7a that day and now in the Museum of New Zealand or presented to the Museum from Worthy's 1998 excavation in the upper chamber at this site include kiwi, Finsch's duck, Hodgens' rail, weka, snipe, parakeet, laughing owl, owlet-nightjar, stout-legged wren, robin, whitehead, bellbird, tui, saddleback, piopio and short-tailed bat (all listed with their Museum registration numbers in Worthy and Holdaway 2000: 138-141).

In the Hukanui #7b shelter Bill Hartree had already excavated three moa nest scrapes and provided us with the following information recorded in my field notes on the site. (Imperial measurements used in my Hukanui field notes are converted to metric measurements for this report). There was a post-Taupo tephra nest located 6 cm above the post-Taupo/Taupo tephra boundary. When in use the nest level would have been 68 cm below the limestone slab forming the roof in that part of the shelter and *Pachyornis mappini* with a standing height of no more than about 65 cm was quite small enough to comfortably nest under such a low overhang. The centre of the nest would have been 50 cm from the east wall, 152 cm from the west wall and about 3.6 m from the entrance. The Taupo tephra was 20 cm thick below the post-Taupo nest. The upper pre-Taupo tephra nest was 10 cm below the Taupo/pre-Taupo boundary and the lower pre-Taupo tephra nest was 10 cm below the upper pre-Taupo nest. Moa nests were recognised by Hartree from the features described in his paper (1999: 459) on moa nesting habits to which Worthy and Holdaway (1999) wrote the introduction.

The Hukanui #7b stratigraphy revealed by Bill Hartree and re-examined by the three of us on 28 May 1959 was recorded by me on the day as follows:

Limestone forming roof of shelter
68 cm gap

Original surface of post-European layer
layer 1 *3 cm of black post-European material now mainly stripped away by stock*

Surface of post-Taupo layer
layer 2 *12 cm of brown post-Taupo deposit with black flecks extending down worm burrows from the post-European layer*

Surface of Taupo tephra layer
layer 3 *20 cm of horizontally stratified and undisturbed white Taupo tephra with a zone of larger lapilli up to 2 cm in diameter at the bottom*

Surface of pre-Taupo clays
layer 4 *30 cm of red-brown pre-Taupo debris, nest sites and scattered bones*

Surface of Waimihia tephra
layer 5 *15 cm of orange-brown Waimihia tephra and lapilli*

Surface of pre-Waimihia sandy clay
layer 6 *18 cm of pre-Waimihia clays*

Irregular mudstone and limestone fragments forming floor of shelter.

We excavated a series of bones from the various layers in this shelter and these were taken back for identification to the Dominion Museum by the writer and to the Canterbury Museum by Ron Scarlett. Among the bones I excavated, labelled and took back with me to the Dominion Museum was a rat jaw bone (dentary) and an associated pigeon coracoid from layer 4, stratigraphically pre-Taupo tephra in age. These two bones are listed in Worthy and Holdaway 2000 (last item on page 142 and 10th item from bottom of page 142 respectively) in the inventory of bones retained from Hukanui #7b. They are listed there with their Museum of New Zealand registration numbers (MNZ S35800 and MNZ S35801 respectively) allocated to them after the Dominion Museum had passed through its National Museum of New Zealand phase and become the present day Museum of New Zealand Te Papa Tongarewa. These two bones were placed

in a matchbox that day, labelled as from Hukanui #7b pre-Taupo and packed with other bones I retained from that day's excavation. Worthy and Holdaway's (2000) list indicates that I retained 5 other bone lots each with stratigraphic data (as identified by them and later registered with MNZ registration numbers) from this site (each registered "lot" consisting of one, or more than one, bone of an identified vertebrate species). Ignoring the moa ribs listed as donated to MNZ by Wilton Hartree in 1999, these five other lots comprise a specifically unidentified parakeet (*Cyanoramphus*) bone from the pre-Taupo layer, several additional pre-Taupo pigeon bones, 3 pre-Taupo North Island saddleback (*Philesturnus rufusater*) bones, 4 pre-Taupo North Island kokako bones, and some bones of the extinct Markham's frog (*Leiopelma markhami*).

The significance of a rat jaw bone from below the Taupo tephra and thus presumably more than 1800 years old was firmly realised by me on 26 May 1959. I discussed the archaeological consequence of an early rat date from New Zealand lightly with Bill Hartree and Ron Scarlett both in the excavation trench during the day and at Hartree's home that night when packing up the samples retained from the day's excavations. My interest in this "old rat" and its associated pigeon coracoid (a distinctive bone then specifically recognisable by me in the field) was the reason for the special label and the separate matchbox storage of these two specimens at the time. I knew these were important specimens that deserved their distinctive treatment and separate storage.

Now we have the rat bone in the matchbox, the next step is to understand how it remained undisturbed in its container for the next 40 years.

The 40-year wait

In 1959 I was a zoologist at the Dominion Museum with special responsibilities for research on and curation of Crustacea and in addition was acting curator of the subfossil bird and other subfossil vertebrate collections. On my return from Puketitiri I put the Hukanui #7a and 7b material, including the matchbox with its pre-Taupo finds, in standard, large Museum brown storage boxes, labelled these boxes as to their contents and shelved them with the other subfossil collections in the moa storage room in the old Dominion Museum building in Buckle Street. I was responsible for access to them and for their wellbeing from 1959 to 1961, except for a year (1960) I spent in California. I left the Museum's staff to work at the Australian Museum, Sydney, from 1962 to 1968, when the subfossil birds were in the care of vertebrate curator Charles McCann. I returned to the Dominion Museum as Curator of Crustacea and Assistant Director from 1969 to 1979 and resumed duties as acting curator of subfossil vertebrates. These collections in their storage boxes were moved from the moa

room to new shelving in an inner basement with better access and working space. In 1985 they were moved again to new natural history storage and research facilities at 129 Taranaki Street where they were under the direct curatorial control of the Curator of Birds, J.A. (Sandy) Bartle. During the 1970s the only researcher to examine the Hukanui bones in detail was Phil Millener from the University of Auckland (see Millener 1981, and Worthy and Holdaway 2000: 91). Under my supervision Millener identified some of the bird bones from the Hartree sites but did not undertake any special study of the rat or other non-avian bones from these sites.

From 1980 to 1990 I was Director of the Museum under its then name National Museum of New Zealand. In 1987 Sandy Bartle and I were able to appoint Phil Millener as the first biologist on the Museum's staff with special responsibilities for research on extinct and fossil birds. He was based in the Taranaki Street natural history building and took over direct curatorial responsibility for the fossil bird bone collection under the general supervision of Sandy Bartle.

It should be stated here that it is internal Museum of New Zealand traditional protocol that all bird, mammal, reptile and amphibian bones from natural sites (swamps, caves, rock shelters, sand dunes etc.) are held and curated with the fossil moa and other bird bone collection by the Department of Birds rather than being split into and variously held with the Museum's systematic non-bird (e.g. mammal, reptile or amphibian) vertebrate collections.

During 1996 Richard Holdaway visited the Museum to examine collections from the Hartree Puketitiri sites. In my retirement from the formal Museum staff I was then based at the Taranaki Street building as an Honorary Research Associate. With approval from Bartle and Alan Tennyson, newly appointed Collection Manager Birds, who had taken over the curation of the fossil bird bone collection following the retirement of Millener, I showed Holdaway the Hukanui bones and lent him my photographs, maps and notes. I drew his attention to the matchbox with the rat and pigeon bones from and labelled as "pre-Taupo", described how I had excavated and retained them since 1959 and briefly discussed the significance of their age if it could be substantiated by accurate radiocarbon dates. The rest we now know. Richard Holdaway obtained radiocarbon ages on bone gelatin from the two bones as well as from a series of Pacific rat bones from other (mostly South Island) sites and published them in 1996. From this as quoted above he went on to state that "radiocarbon ages of up to about 2,000 yr BP imply an early, transient, human contact with New Zealand more than 1,000 years before settlement."

I hope I have been able to answer Anderson's challenge (2000: 253) by documenting here that the Hukanui #7b rat bone that provided the NZA-6636 sample dated 1775 ± 93 B.P. was recovered from beneath the Taupo ignimbrite by a reasonably responsible amateur archaeologist, who had realised its potential significance, and that the bone was indeed labelled and stored in a matchbox, and that the matchboxed bone remained under his general care in a responsibly curated collection, and very clearly remained in his scientific thoughts, for almost 40 years (1959 to 1996) before being passed on to Richard Holdaway for testing and publication. The fact that renewed excavation at the Hukanui sites has not as yet provided further pre-Taupo rats (as far as I am aware) is beside the point. This absence may have failed to support the case but does not in any way invalidate it.

Acknowledgements

I wish to sincerely thank my colleagues Dr Janet Davidson, Elliot Dawson, Dr Richard Holdaway, Dr Bruce McFadgen, Alan Tennyson and Trevor Worthy for greatly improving the wording, coverage and clarity of this rather overdue personal excavation report.

References

Anderson, A. 1996. Was *Rattus exulans* in New Zealand 2000 years ago? AMS radiocarbon ages from Shag River Mouth. *Archaeology in Oceania* 31: 178-184.

Anderson, A. 2000. Differential reliability of 14C AMS ages of *Rattus exulans* bone gelatin in south Pacific prehistory. *Journal of the Royal Society of New Zealand* 30: 243-261.

Beavan-Athfield, N., McFadgen, B. and Sparks, R. 1999. Reliability of bone gelatin AMS dating : *Rattus exulans* and marine shell radiocarbon dates from Pauatahanui midden sites in Wellington, New Zealand. *Radiocarbon* 41(2): 119-126.

Beavan-Athfield, N.R., McFadgen, B.G. and Sparks, R.J. 2001. Environmental influences on dietary carbon and ^{14}C ages in modern rats and other species. *Radiocarbon* 43(1): 7-14.

Dawson, E.W. and Yaldwyn, J.C. 1975. Excavations and faunal remains at Hamilton's and adjacent properties, Redcliffs, 1946-1948 *in* Trotter, M.M. Archaeological investigations at Redcliffs, Canterbury, New Zealand. *Records of the Canterbury Museum* 9(3): 214-218.

Dell, R.K. 1955. Some New Zealand subfossil land Mollusca. *Records of the Dominion Museum* 2:135-144.

Hartree, W.H. 1999. See Worthy and Holdaway 1999.

Hedges, R.E.M. 2000. Appraisal of radiocarbon dating of kiore bones (Pacific rat *Rattus exulans*) in New Zealand. *Journal of the Royal Society of New Zealand* 30: 385-398.

Higham, T.F.G. and Petchey, F.J. 2000. On the reliability of archaeological rat bone for radiocarbon dating in New Zealand. *Journal of the Royal Society of New Zealand* 30:399-409.

Holdaway, R.N. 1996a. Arrival of rats in New Zealand. *Nature* 384 (21 November 1996): 225-226.

Holdaway, R.N. (interviewed by Rudman, B.) 1996b. Rat revisionists. *New Zealand Listener* 7 December 1996: 20-22.

Holdaway, R.N. 1999. A spatio-temporal model for the invasion of the New Zealand archipelago by the Pacific rat *Rattus exulans*. *Journal of the Royal Society of New Zealand* 29: 91-105.

Holdaway, R.N. and Beavan, N.R. 1999. Reliable 14C AMS dates on bird and pacific rat *Rattus exulans* bone gelatin, from a $CaC0_3$-rich deposit. *Journal of the Royal Society of New Zealand* 29: 185-211.

McFadgen, B. 1997. The case of the ancient rats. *Conservation Science Newsletter* (NZ Department of Conservation) 24: 8-10.

Millener, P.R. 1981. *The Quaternary avifauna of the North Island, New Zealand.* Unpublished Ph.D. thesis, Geology Department, University of Auckland.

Oliver, W.R.B. 1949. The moas of New Zealand and Australia. *Dominion Museum Bulletin* 15.

Parkinson, P. 1971. The subfossil species of *Rhytida* Albers (Mollusca : Paryphantidae). *Journal of the Royal Society of New Zealand* 1: 1-6.

Worthy, T.H. and Holdaway, R.N. 1999, introduction to Hartree, W.H. A preliminary report on the nesting habits of moas on the East Coast of the North Island. *Notornis* 46: 457-460.

Worthy, T.H. and Holdaway, R.N. 2000. Terrestrial fossil vertebrate faunas from inland Hawke's Bay, North Island, New Zealand. Part 1. *Records of the Canterbury Museum* 14:89-154.

Yaldwyn, J.C. 1956. A preliminary account of the sub-fossil avifauna of the Martinborough caves. *Records of the Dominion Museum* 3(1): 1-7.

Yaldwyn, J.C. 1958. Notes on the environment and age of the sub-fossil deposits of the Martinborough caves. *Records of the Dominion Museum* 3(2): 129-135.

Yaldwyn, J.C. 1975. Observations on the Mollusca excavated at Moa-Bone Point Cave, January 1958 *in* Trotter, M.M. Archaeological investigations at Redcliffs, Canterbury, New Zealand. *Records of the Canterbury Museum* 9(3): 218-219.