NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION NEWSLETTER

NEW DATES FOR PYRAMID VALLEY MOAS

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Recently determined radiocarbon dates have enabled definite ages to be assigned to some of the Pyramid Valley moas. The dates appear to place these moas beyond the range of archaeology in New Zealand but the results may interest Association members.

Moa bones were discovered in a swamp at Pyramid Valley, near Waikari, North Canterbury, in 1938. The Canterbury Museum started excavations in February 1939 and these revealed a rich deposit of moa and other bird bones in old lake sediment. Excavations have continued intermittently and these have been described in the Records of the Canterbury Museum (Vol. 4, No.7, 1942; Vol. 6, No.4, (1955).

The first radiocarbon dates, on material collected in 1949, were published by Kulp and co-authors (1952) of Lamont Geological Observatory, Columbia University, and by Blau, Deevey, and Gross (1953) of Yale University. The date of the same Dinornis gizzard was determined as A.D. 150±150 by Lamont and as A.D. 1280 by Yale; the true position was left confused. Edward Deevey (1955) discussed the palaeolimnology of the deposit and, accepting the younger of these widely differing dates for the Dinornis gizzard, used it as evidence for the survival of this giant moa into the period of human settlement. Duff (1956: 280-1) had serious misgivings about the younger date as bones of Dinornis are rare in Canterbury Moa-hunter sites.

Because of its relevance to archaeology the extreme rarity of remains of Dinornis maximus (together with D. robustus and D. torosus) in human association throughout the whole range of the natural habitat of this genus along the South Island east coast might be emphasized in passing. From a list prepared by Mr R.J. Scarlett (Canterbury Museum) and based on careful examination of the midden assemblage of 22 Moa-hunter sites from Papatowai to Wairau Bar, the total number of bones or fragments which can be assigned to D. maximus is 17, to D. robustus 11, to D. torosus 5. Of these small totals the majority come from sites south of the Waitaki River. For the whole of the Canterbury-Marlborough coast the remains are confined to D. maximus, comprising 3 fragments from the Redcliffs Flat, and 3 from the Moa-bone Point Cave, Redcliffs, (Duff, 1964: 18). At least some of these bones may be from birds not contemporary with man as was suggested by Teviotdale (1938: 33). Radiocarbon dates for bones determined on carbon including that from bone carbonate are suspect (see later).

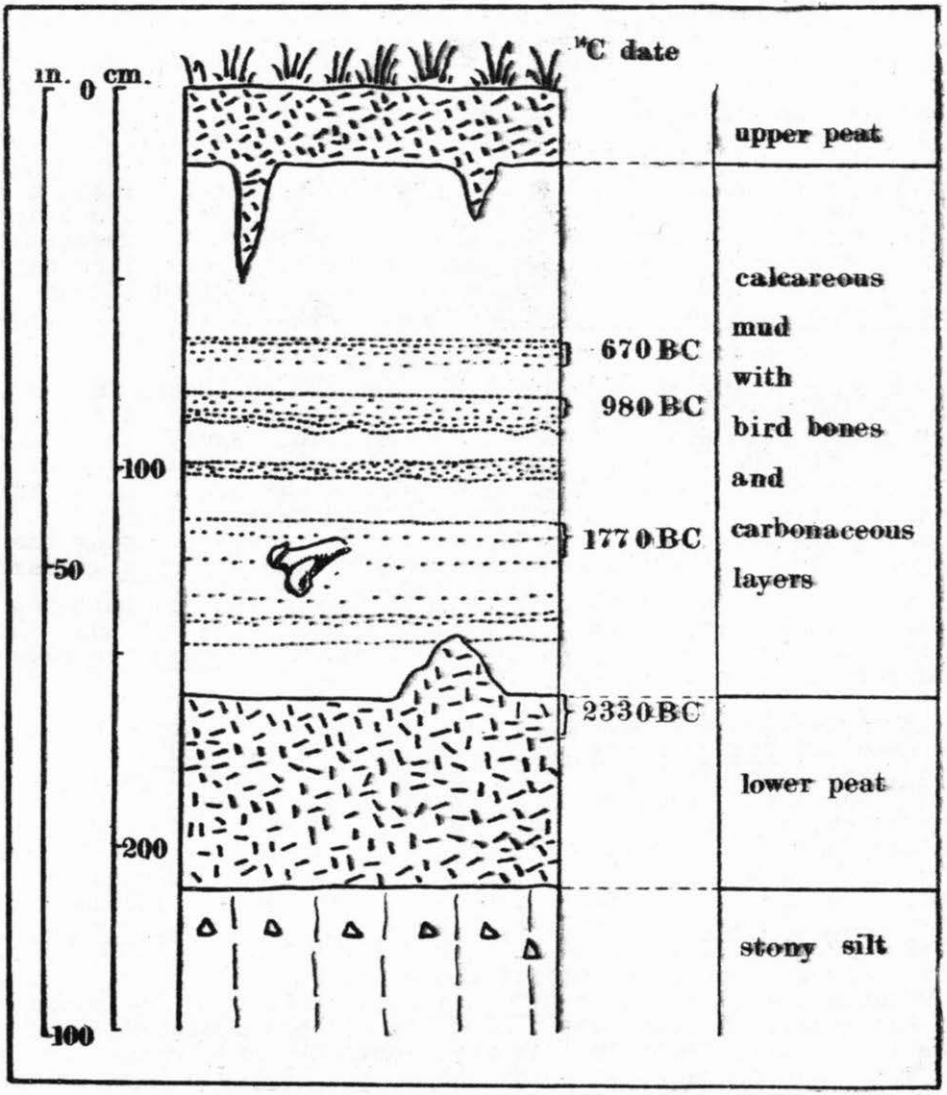

Fig. 1. Diagrammatic stratigraphic column, square 119 Pyramid Valley, showing position of dated sediment samples.

The Yale determinations include dates of 3150, 2250, and 1550 B.C. for three samples of the yellow calcereous lake mud in which the bones are found. These dates have always been regarded as suspect because the carbonate of the mud would include a high proportion of ancient non-radioactive carbon from the much older, Tertiary limestones surrounding the swamp. One date that seemed to be reliable was that of 1750 B.C. for the peat underlying the calcareous mud.

The working out of the history of the Pyramid Valley deposit has been largely based on the work of Deevey (1955) and Harris (1955). This history can be summarized as follows:

> About 1750 B.C. a sedge swamp formed a layer of peat now some 45cm. (18in.) thick. This was submerged under a shallow lake which deposited 120cm. (4ft.) or so of yellow calcareous mud. A change to a drier climate, possibly about A.D. 1300, enabled swamp vegetation to spread over the lake and form the upper peat overlying the calcareous mud. It was after the formation of the upper peat, which forms the present surface, that moas were trapped by walking out on to the treacherous surface of the swamp.

Observations made during excavations in 1965 and the new radiocarbon dates require a revision of this history.

In January 1965 a Canterbury Museum party cut a 11m. (36ft.) long face in the deposit which showed the horizontal stratification in the calcareous mud passing uninterrupted over the moa skeletons. These moas had obviously been trapped during the deposition of the calcareous mud and before the formation of the upper peat. They had walked into a shallow lake and were trapped in the sticky mud lying on the bottom.

Eight new radiocarbon dates determined by the Institute of Nuclear Sciences, D.S.I.R., Lower Hutt, have also thrown new light on the history of the deposit. A sample from the lower peat has been dated as 2330±62 B.C. Three samples from the calcareius mud were dated; these formed part of a series of 10kg. (22lb.) samples of mud from which an ounce or so of seeds and twigs was painstakingly sorted out. The samples were treated with acid to remove traces of ancient carbon present as carbonate. This careful procedure has provided us with the first reliable dates for the calcareous mud in which the moz bones wre found. The dates are:

mud from 68-73 cm.(28in.)	depth	670±49 B.C.
mud from 81-86 cm.(33in.)	depth	980±63 B.C.
mud from 116-123 cm.(48in.)	depth	1770±60 B.C.

These indicate that the mud accumulated uniformly at 0.45mm. per year (1¾in. per century).

Three moa gizzards were recovered during these excavations, fortunately one from each of the most common species found at Pyramid Valley. These were dated as follows:

Dinornis maximus	gizzard	1690±72 B.C.
Emeus crassus	gizzard	1790±72 B.C.
Euryapteryx gravis	gizzard	1500±71 B.C.

Bones from the Emeus skeleton were also submitted for dating. The carbon contained in the collagen, or bone protein, was dated as 1650±45 B.C., and this checks well with the gizzard age considering the limits of error in the method. This has provided a valuable confirmation of the collagen method (see Rafter, 1965:455). Previously bone ages had been determined on carbon including that from bone carbonate, and this has been shown to be very susceptible to contamination by radioactive fall-out from bomb tests. The bone carbonate from the Emeus gave a date of A.D. 585±58.

The moa gizzards and their associated skeletons were found within the calcareous mud and overlain by the upper peat. A comparison of the dates for the moas and those for the mud samples shows that the birds must have been trapped during the deposition of the calcareous mud in the shallow lake occupying the site of the present swamp. The dates have thus confirmed the field observations.

Coming back to the history of the deposit, we now have an additional date for the lower peat, three good dates for the calcareous mud, and dates for three moas. We have no date for the upper peat, and for the time range which this represents we will have to depend on the pollen determinations being carried out by Dr Neville Moar of Botany Division, D.S.I.R., Lincoln. For the present we have no real reason to discard the conclusions of Deevey and Harris as to the age of this uppermost layer.

A problem that will remain, presumably for ever, is the true age of the Dinornis gizzard excavated in 1949. Should we still accept the Yale date of A.D. 1280, or should we preferably disregard this date as one determined in the pioneering days of the radiocarbon method? Deevey believes (pers. comm. 23 February 1966) that the date "is strongly suspect .... but of course we'll never know for sure, and accumulation of more and more 4000-year dates for moas from this site won't disprove the possibility of one having been younger."

My present interpretation of the history of the Pyramid Valley deposit is:

> Sometime about 2300 B.C. a sedge swamp formed a layer of peat. About 2000 B.C. this was submerged under a shallow lake in which calcareous mud began to settle. This mud built up at the rate of about 4.5cm.(1¾in.) per century until 120cm.

(4ft.) had accumulated. At times during the life of the lake, moas waded out into it and were trapped in the sticky mud on its floor. Sometime subsequent to 670 B.C., and possibly as late as A.D. 1300, swamp vegetation spread over the lake and formed the upper peat which continues to accumulate. Some moas may have been trapped as they walked over this swamp.

In 1956, Roger Duff wrote concerning the Yale dates: "In spite of this apparently definitive evidence, crumbling the edifice of our previous hypothesis, let us fall back on caution and suspend judgement." The new dates have vindicated Duff's caution.

References.

Blau, M.
Deevey, E.S.
Gross, M.S.
1953 "Yale Natural Radiocarbon Measurements I. Pyramid Valley, New Zealand, and its Problems." Science 118. 1-6

Deevey, E.S.
1955 "Paleclimnology of the Upper Swamp Deposit, Pyramid Valley." Rec. Canterbury Mus.6: 291-344

Duff, R.S.
1956 The Moa-hunter Period of Maori Culture. 2nd edition. Government Printer, Wellington.

1964 "The Problem of Moa Extinction." Cawthron Lect. Ser. 38.27pp.

Harris, W.F.
1955 "Progress Report on Pollen Statistics from Pyramid Valley Swamp." Rec. Canterbury Mus. 6: 279-90.

Kulp, J.L.
Tryon, L.E.
Eckelman, W.R.
Snell, W.A.
1952 "Lamont Natural Radio Carbon Measurements, II" Science 116: 409-14

Rafter, T.A.
1965 "Carbon - 14 Variations in Nature. Part 1 - Technique of 14C Preparation, Counting, and Reporting of Results." N.Z.J. Sci. 8: 451-71

Teviotdale, D.
1938 "Further excavations at the Moa-hunters' Camp at Papatowai." J. Polynes. Soc. 47: 27-37