



NEW ZEALAND  
ARCHAEOLOGICAL  
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**NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION NEWSLETTER**



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The site excavated is the northernmost of those which are related to Wairau Bar. Its assemblage bears a close general resemblance to that of the latter site, excepting in the absence of burials and moa egg shells and the relatively lower importance of adzes. On the other hand, the line fishing economy appears to have been far more important. However, with the technical development of Archaeology it has also been possible to obtain a far better plan of the settlement than was previously possible and it is now also possible to make a much more thorough and meaningful study of the faunal remains.

The excavation was initially made possible through the transfer of Auckland University South Pacific Research Programme funds from another project of F. W. Shawcross. It was also very generously supported by the Auckland War Memorial Museum and particular thanks must be expressed to the Director, Mr G. Turbott, and to the Museum Council. We also wish to thank the owner of the site, Mr W. Wagener, and his brother, Mr B. Wagener, and their families and the many other residents of Houhora, for all the ways in which they have helped us. Without all of this assistance it would have been impossible to have carried out our work at so great a distance from Auckland.

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#### CONSOLIDATED ASH FROM NORTH OTAGO ARCHAEOLOGICAL SITES

Michael M. Trotter,  
Canterbury Museum

Thirty years ago a large block of porous calcareous rock was found in the Moa-hunter site near the mouth of the Waitaki River in North Otago (S128/1) and for some years it aroused considerable interest and speculation. Even today the "Waitaki Mystery Stone" is widely considered to have had some esoteric significance.

Teviotdale (1939: 172) in his account of excavations at the site, relates that it had become the subject of several letters and articles in the Dunedin newspaper the "Evening Star", ending in a story that the local Maoris reburied the stone at night, doing the work with stone tools as it was extremely tapu. In actual fact, Teviotdale had reburied the thirty hundredweight stone himself in what proved to be a vain attempt to prevent weathering and damage by cultivation and curio hunters. A long anonymous and rather imaginative article in the "Star" (1937) describes the Stone as a block of sandstone brought from afar for the purpose of nullifying a bad spell placed upon a high ranking chief. According to the writer this ceremonial stone was placed upon a ritual fire which contained as sacrificial offerings the representation of a moa egg and some food.

Generally however, the stone is considered to be ash produced by continuously burning or frequently relit fires (e.g. Teviotdale 1939: 170-171) which because of its considerable age has become consolidated, but a number of analyses have failed to prove this and results have been rather inconclusive.

Although it was the find at Waitaki River Mouth that attracted attention, "consolidated ash" is by no means unique to this site. Julius von Haast in 1871

(Haast 1872:96) reported hard cemented masses containing small pieces of occupational material from a Moa-hunter site at the mouth of the Rakaiia River in South Canterbury (S93/20) and Teviotdale (1939: 172) found a "similar deposit" at the Shag River mouth Moa-hunter site in North Otago.

Teviotdale submitted samples from the Waitaki and Shag River (S155/5) sites to Dr F. J. Turner of the Otago University Geology Department for analysis, and reported that the substance largely comprised grains of sand cemented together by a large amount of calcium carbonate which had been deposited by ground water. As to its origin and age Dr Turner wrote of the Waitaki sample that "it is certainly a superficial, geologically recent accumulation, from the presence of embedded stones of the Waitaki gravel series (Pleistocene) on the under surface, and also from the presence of enclosed bird bone. The low specific gravity and loosely aggregated condition of the deposit also accord with this view. It is quite dissimilar from any of the Tertiary sandstones or limestones of the Waitaki Valley and must have originated where found or somewhere nearby" (Teviotdale 1939: 173).

Lindsay Buick (1937: 170) had some of the Waitaki Stone analysed by the Government Analyst with inconclusive results, but reported that Dr Marwick of the Geological Survey was of the opinion that it was the residuum of an ancient fire. It is not stated on what grounds Dr Marwick based his opinion, and it is noteworthy that neither Dr Turner nor the Government Analyst could find any indication of ash.

In recent years deposits of "consolidated ash" have been found in North Otago during the investigation of late Moa-hunter sites at Tai Rua (S136/1) and Ototara (S136/2) and a later, post-Moa-hunter, site at Shag Point (S146/5), see Trotter (1965 a:349-352). Without doubt it occurs on numerous other sites too, but I have not come across any record of it. In all six sites the matrix in which it was found was fairly dry, and the substance was notably absent at Waimataitai (S146/2) (Trotter 1965 a ;351) where the occupational level is kept continually damp by seepage from the adjacent lagoon.

At Tai-Rua and Ototara (Trotter 1965 b: 112) the "consolidated ash" occurred as irregularly shaped lumps weighing from a few ounces up to about one pound in or immediately adjacent to a fire-place (See Fig. 2), and at Mata Kaea it was amongst burnt stones and charcoal removed from an oven. Beneath the Waitaki Mystery stone was a quantity of wood ash and charcoal and the underlying soil was baked hard (Evening Star, 1937). In appearance the "consolidated ash" resembles a soft limestone, greyish-white to light fawn in colour and contains small fragments of burnt shell and bone. In no case are there any large shells, bones or other objects. It has a slightly greasy feel which led me at first to assume that it was basically ash consolidated by fat or other organic substance, but it was subsequently shown to be due to the fine particle size of the substance.

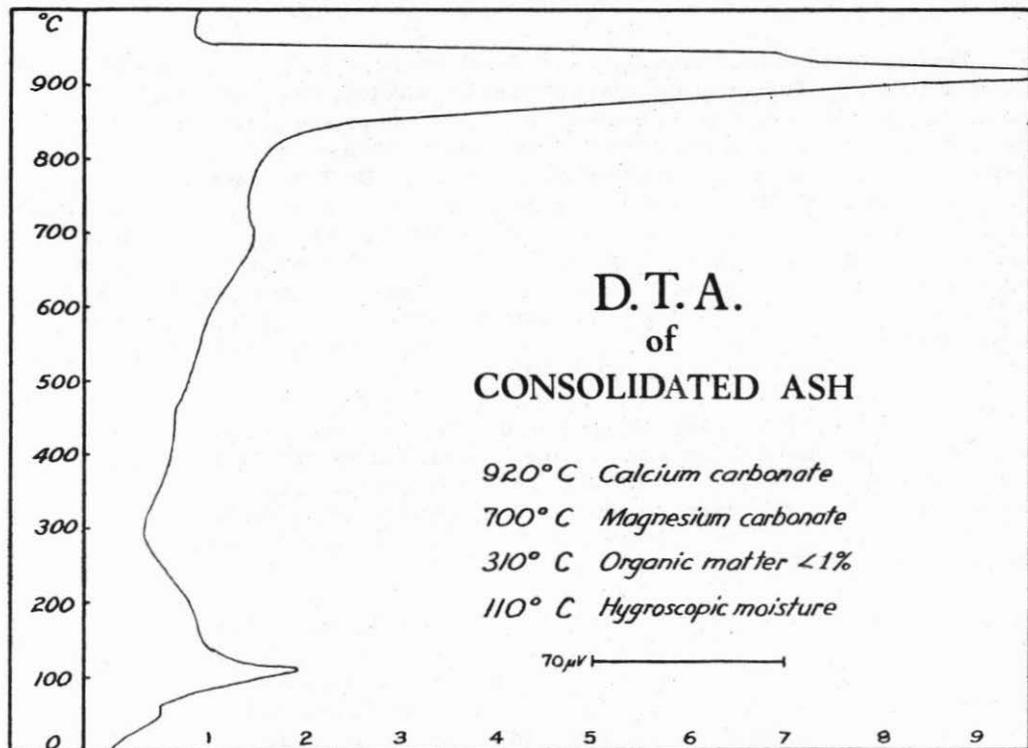
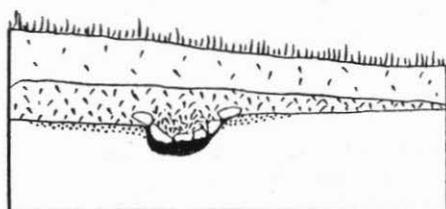
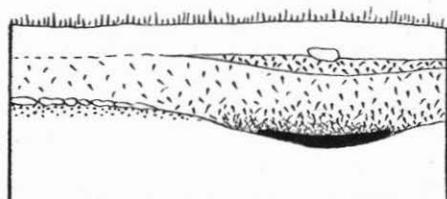


Fig. 1



K.0 TAI RUA



C.7 OTOTARA

○ Consolidated ash    ■ Black stained soil    ☒ Midden    ☒ Heat stain

Fig. 2 Sections of 5<sup>th</sup> Squares showing Ash in position.

In 1963 John Linzey kindly agreed to make Differential Thermal Analyses and microscope examinations of samples from Tai Rua, Ototara, and part of the Waitaki Mystery Stone which Peter Gathercole had obtained during his 1961 investigation of that site (Knight and Gathercole 1961: 24). In the Differential Thermal Analysis apparatus, the powdered sample to be analysed is placed in a container and heated at 10 degrees centigrade per minute and the increase or decrease in temperature of any chemical or physical change which takes place (most reactions involve the absorption or evolution of heat) is registered relative to that of an inert reference sample by thermocouples in the container. This is amplified and recorded on the chart of the instrument from which can be determined the relative amounts of component materials. Fig. 1 shows the trace line as produced on the chart and reads from bottom to top. The further the line goes to the right the greater the reaction at that particular temperature.

The results were all the same. The Differential Thermal Analysis showed hygroscopic water of moderate quantity, a very small amount of carbon or organic matter (less than one per cent), some magnesium carbonate and quartz, and a very large amount of calcium carbonate (shown by the deviation of the line right off the chart at 920° in Fig. 1). Under the microscope the calcium carbonate proved to have the very small particle size of water-deposited lime. A sample was then dissolved at pH 3, oxidised with hydrogen peroxide and deferated using Aguilera and Jackson's citrate, bicarbonate, dithionite reagent and the insoluble residue re-examined. This residue proved to be mainly fine grains of quartz, mostly sharp and angular, but one or two water-worn particles, plus a few specks of olivine, mica grains etc., and a quantity of flocks of iron oxide, the individual grains of which were scarcely able to be resolved under a one-twelfth inch objective. (Such flocks are typical of the iron oxide-silica-clay coating on grains which are just sufficiently soluble to be detached without going into solution).

Although there is plenty of natural limestone in the vicinity at Ototara, there is none on the other sites, in fact Tai Rua and Shag River are both on sand dunes, so the calcium carbonate must have been derived from occupational material, taken into solution and redeposited. The only logical sources is calcined shells -- not shells that accidentally fell into a fire or those that got discoloured by heat (which are quite common in the North Otago sites), but quantities of shells, burned in such a way that little or no charcoal contaminated the resultant lime. With the addition of impurities - the grains of quartz sand etc. - and the absorption of ground moisture, this lime forms a natural mortar similar to that used by bricklayers. In the course of time reaction to atmospheric carbon dioxide would convert it to calcium carbonate.

It is interesting to note in this connection that during last century Europeans burnt shells from the midden in Moa-bone Point Cave (S84/77) to produce lime (Haast 1875: 57), and there are quantities of this powdered calcined shell in the hopelessly disturbed and intermixed Maori and European occupational material in the cave. The relative absence of moisture here has prevented it from setting hard but even so it is partially consolidated and lumps of it can be handled without breaking.

So it seems that the "hard cemented masses" of Rakaia, the Mystery Stone of Waitaki, and the Consolidated Ash of North Otago sites, are all calcium carbonate deposits derived from burnt shell and solidified after absorption of moisture. The question remains, under what circumstances, and for what reason (if any) was the shell burnt? I would be glad to hear of finds of Consolidated Ash from other sites, and any theories as to its presence. In a small way it makes an interesting comparison to the mysterious "concrete" cores of similar composition in the tumuli of New Caledonia (Golson 1962: 170-172).

I am very grateful to Mr John Linzey of McSkimming Industries Ltd. for analysing the samples; and to Mr Peter Gathercole for supplying some "Mystery Stone"; to Mr W. J. Noble, Editor of the "Evening Star" for a typescript of the 1937 Mystery Stone article; and to Dr and Mrs J. B. Stott for their help.

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