Final Report on Archaeological Excavations at Cooks Cove Z17/311, Tolaga Bay, East Coast, North Island

by

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Southern Pacific Archaeological Research

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1. EXECUTIVE SUMMARY

An archaeological authority (HPT 2008/120) was issued to Dr Rick McGovern-Wilson and Dr Richard Walter for the purpose of archaeological excavation at Z17/311 in Cooks Cove, Tolaga Bay. This investigation resulted in a clear picture of the site's stratigraphic sequence, which represents the entire time-span of New Zealand's occupation history. Postholes (including alignments and configurations, suggesting structural features) and fire features (ovens, pits, ash concentrations) were documented during excavation of several excavation units. A modest assemblage of material culture remains were recovered, such as obsidian and chert tools and debitage, bone and shell fishhooks (one- and two-piece), bone minnow-lures, and other worked bone. Numerous faunal remains were collected and analysed, including shell and a diverse assemblage of bone from moa and other birds, mammals, fish, and a reptile (tuatara).

2. INTRODUCTION

Best known as one of the places where Captain James Cook came ashore in New Zealand in 1769, Cooks Cove is also the location of several archaeological sites, including a fortified pa, numerous isolated storage pits, and a small undefended settlement. It is the latter site which is the subject of this report.

An archaeological authority (2008/120) was issued by the New Zealand Historic Places Trust (NZHPT), pursuant to the *Historic Places Act* (HPA) 1993, Section 18 (1) (b), to Dr Rick McGovern-Wilson and Dr Richard Walter to conduct archaeological research at the site recorded as Z17/311 in the New Zealand Archaeological Association Site Recording Scheme at Cooks Cove, Tolaga Bay (Figure 1). The authority specified that archaeological excavation be carried out following accepted archaeological practice, and reported on to satisfactory standards.

The Cooks Cove site is one of a small number of sites located on the East Coast of the North Island that contain evidence of occupation within the earliest known phase of New Zealand settlement. There are clusters of such sites to the north, on the Coromandel Peninsula, and another to the South in the Cook Strait region, but between these places sites representing what Golson (1959) referred to as the "Archaic Phase" of Maori prehistory are rare.

As well as its historical and archaeological values, Cooks Cove is the type site for New Zealand's Holocene stratigraphy (Wellman 1962), where both Taupo ash and Loisels pumice were recorded in association with two cultural layers. Indeed, one the most significant aspects of the site stems from its stratigraphy and its potential to contribute to questions of culture change in pre-European New Zealand. Although sites with lenses or layers that fall within a single occupation phase are relatively common, stratified sites with multiple, superimposed occupation phases represented are extremely rare in New Zealand (Jacomb *et al*. 2010).

The site, situated along the edge of a small estuary, has suffered considerably from the effects of wave action since being originally recorded in 1958. To recover a representative sample of the remaining intact archaeological deposits, a two-week excavation was carried out during November 2007. The results of the excavation are presented here, and discussed in the context of material culture and economic change.

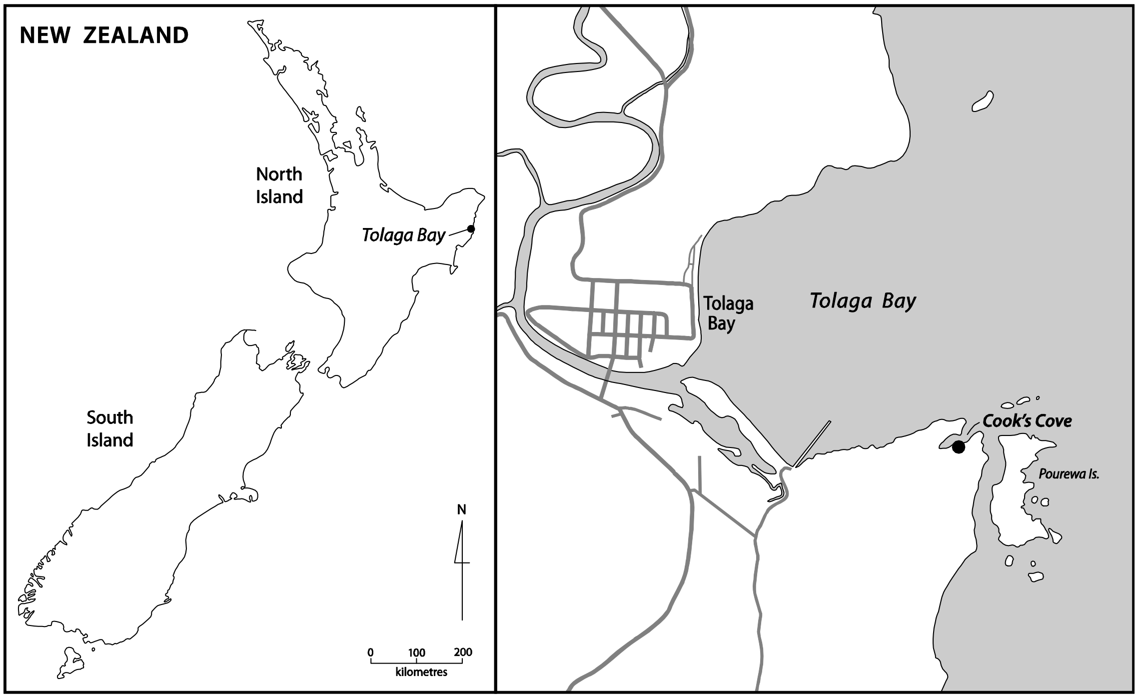

Figure 1. Location of Z17/311, Cooks Cove, Tolaga Bay.

3. RESEARCH OBJECTIVES

The current project was set up as a combined research and management initiative following a site visit by one of the authors (RW) in 2006, along with representatives of Te Aitanga a Hauiti and archaeologists from the Department of Conservation and the NZHPT. The south bank of the estuary showed evidence of heavy recent erosion with midden bone and artefacts scattered along the beach at the base of the bank. The risk of erosion and fossicking, noted in the 1983 Site Record Form, appeared to be accelerating, so a salvage excavation designed to recover information prior to significant loss of site fabric was planned.

The site also displayed attributes that signalled its potential to contribute usefully to on-going archaeological research investigations. Two features of the site stood out in this regard and these underpinned the research design. The first was the opportunity to obtain a comparative sample of early material from an East Coast site to supplement recent work on early phase sites from elsewhere in the country (Furey 2002; Furey *et al*. 2008; Jacomb 2009; Jacomb *et al*. 2004; Jacomb *et al*. n.d.; Smith and Anderson 2008).

The second was the unique opportunity to study a complex cultural and natural sequence spanning the full duration of New Zealand's prehistoric occupation. Our specific interest in Cooks Cove was to take advantage of the multi-layered stratigraphy to examine issues of change during the first centuries of New Zealand prehistory. To address this, our research design had the following specific aims:

> ***Stratigraphy***: To develop a detailed description of the Cooks Cove stratigraphy with special reference to the nature and number of cultural phases, and their relationship to natural processes, such as ash depositions and erosion events.

***Dating**:* To recover and date samples from each stratum to potentially provide absolute values for the stratigraphic profile.

***Material Culture**:* To recover material culture in dated stratigraphic contexts so as to investigate patterns of change throughout the sequence. There are many existing models of material culture change in New Zealand (Davidson 1984; Duff 1950; Golson 1959), but few are based on, or have been tested against, stratified and independently dated samples.

***Subsistence**:* To develop a model of early East Coast subsistence practices and changes through time.

4. SITE DESCRIPTION

Cooks Cove is so named after the six-day visit by Captain Cook on HMS *Endeavour* in 1769. Seeking to replenish freshwater supplies, Cook's party had initially landed at Anaura Bay, but heavy surf conditions interfered with the loading. They were then guided south to Cooks Cove, where they met the local chief, probably Whakatatare-o-te-Rangi (Oliver 2007).

Cooks Cove is a shallow, northeast facing inlet located south of Tolaga Bay on the northern east coast of the North Island (see Figure 1). Lying between Tolaga Bay and Cooks Cove is a steep ridge of sandstone which supports a pa site, known as Te Kararoa and recorded as Z17/310 in the New Zealand Archaeological Association Site Recording Scheme (SRS). Te Kararoa is a ridge pa that contains numerous storage pits and terraces, as well as some ditches that cut across the ridge to supplement the strong natural defences. The archaeological site under study here, NZAA Z17/311, lies on a narrow beach terrace at the base of a steep hill slope on the cove's south bank (Figure 2), where it is exposed by wave action in the face of the beach terrace.

Figure 2. Cooks Cove looking east. The site is in the location of the tents visible in the right of the photo.

The archaeological strata at the site are most clearly visible at the eastern end of the wave-cut bank, where they consist of two dark bands of soil separated by layers and lenses of tuffaceous, shelly sand (Figure 3). The lower band extends for about 40 m and is the darker of the two and equivalent to Wellman's (1962) "lower occupation layer." Visible in the eroding section and in lumps of eroded material lying on the beach, are bird and dog bone, flakes of chert and obsidian, fragments of charcoal, and numerous fire-cracked rocks. Closer inspection of the beach profile reveals thin patches and lenses of cultural material at various points in the section, between the two main cultural layers and above the upper of these. This indicates the potential complexity of the Cooks Cove sequence, discussed further below.

Figure 3. Cultural material is visible in two bands in the beach section.

5. METHODS

In preparation for excavation, a grid was established on the site with the N-S axis aligned parallel to the existing fence line at 22 degrees east. Four units were laid out for excavation at the east end of the beach terrace and aligned with the site grid (Figure 4). Units 1 – 3 were placed adjacent to the area where both cultural horizons were well exposed in the nearby bank and were excavated with the aim of recovering spatial information that might allow a functional interpretation of the layers. Unit 4 was excavated immediately inland of Unit 3 and ran east up the slope behind the beach terrace and was positioned to provide information on the history of site development including that of local erosion events.

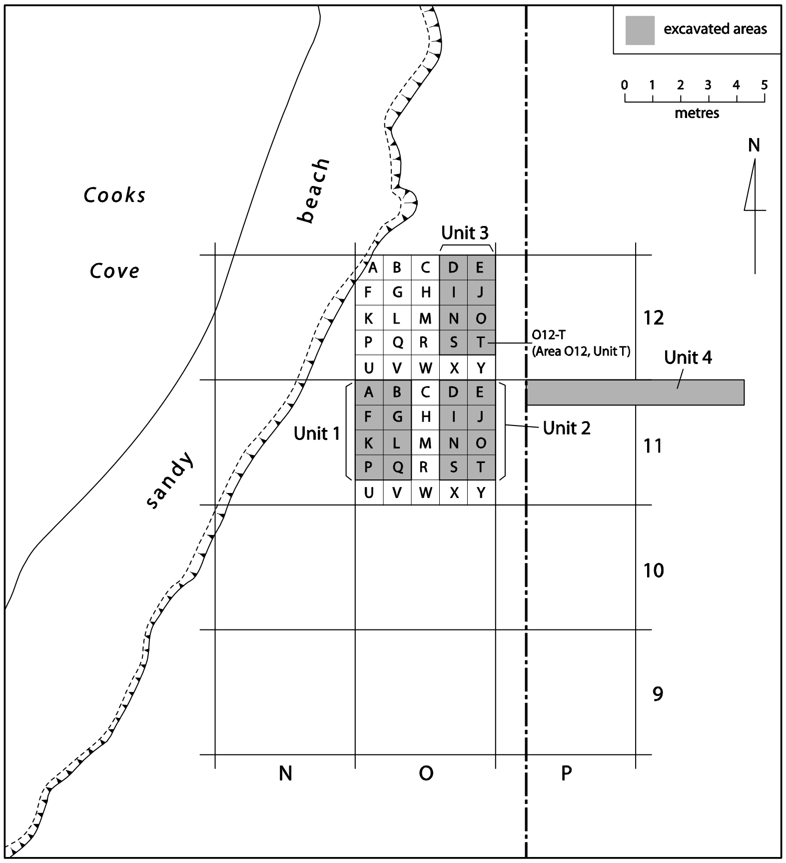

Figure 4. Location of excavation units.

All excavation was carried out by natural stratigraphy using hand excavation methods. Soils were wet sieved through 3.2 mm screens, and all screen residue returned to the Otago Archaeology Laboratories (OAL) at the University of Otago for further analysis.

6. RESULTS

Excavations

Excavation Units 1 – 3

During excavation of Units 1 to 3, a number of historic artefacts were encountered in Layer 3a, as well as two moa bone fishhooks , several other pieces of worked bone, several obsidian flake tools, and a small quantity of midden fauna, predominantly bone. Layer 3b was recognised by the transition to a zone that contained little shell and Layer 3c was a lower zone containing a heavier concentration of crushed shell. Layers 3b and 3c contained no artefacts. The presence of moa bone artefacts, historic period material and 4000 year old shells, plus the lack of clear demarcation between sub-layers makes the interpretation of Layer 3 difficult (see below).

Layer 4 did not contain any artefacts or midden below the surface zone, other than occasional shell and bone fragments. A small number of fire-cracked rocks were recovered but this layer contained no features.

Layer 5a contained numerous small fragments of fire-cracked rock, scattered midden, and a small quantity of stone, bone and shell artefacts. Several possible post-hole and fire features were identified. The transition to the lower sub-layer was marked by a more compact matrix and the surface of Layer 5b is the only identified occupation surface on the site (Figure 5). The northern Unit (Unit 3) contained the majority of the larger bone fragments and was associated with small-scale butchery. The front limb bones of a New Zealand fur seal (*Arctocephalus forsteri*) were found in the north half of the unit along with several obsidian flake tools. A number of moa bones, including a complete tibiotarsus, tarsometatarsus, and phalanges were recovered in the southern half of the unit in close proximity to two well defined fire features that may have been used for cooking the moa and seal meat.

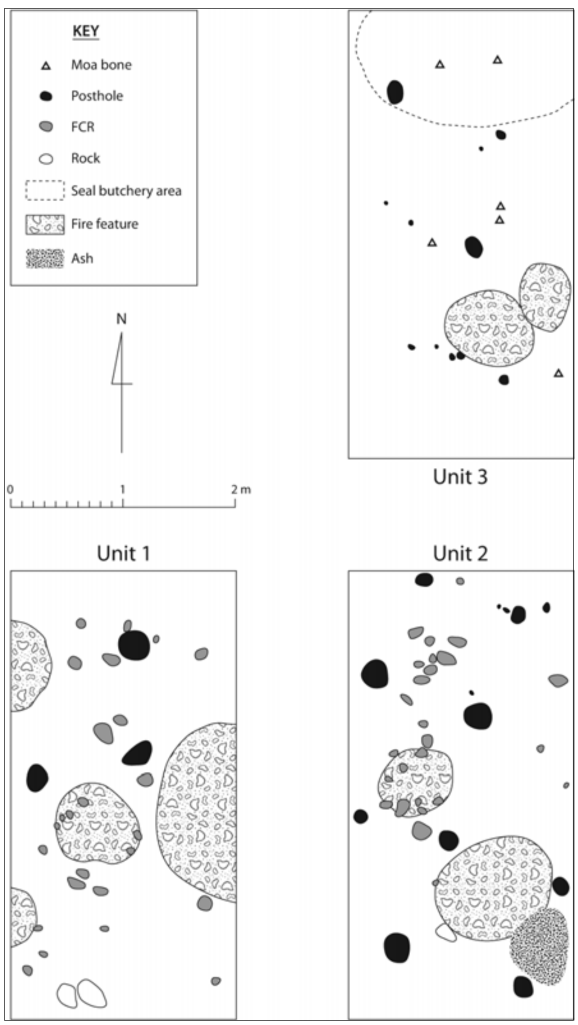

Figure 5. Features visible in Layer 5b.

To the south, in Units 1 and 2, there was a concentration of fire features, ash, fire-cracked rock and several alignments of postholes. The impression is of a cooking zone that may have included one or more structure. The postholes appear to follow a general northeast-southwest alignment, and it is possible that a structure enclosed the large fire feature in the southeast quadrant of Unit 2. The Layer 5b matrix contained a low density of flaked stone tools, but no distinct flaking areas could be identified.

Unit 4

This unit was a long trench excavated up the slope in order to understand the history of soil deposition and, in particular, to explain the Layer 4 material encountered in the Units 1 – 3 excavations. The south facing section of Unit 4 illustrated in Figure 6 shows the Layer 5 soils following a slope-line that closely matches the modern profile. This indicates that the west – east profile across the beach terrace and hillside has not changed significantly since first settlement of the Cove around AD 1300 and that the Layer 5 occupation extended beyond the beach terrace onto the higher slopes above. Layer 4 overlies Layer 5 as far as the east end of the Unit and appears to have derived from much higher up the hillside. Its ultimate origin remains unclear but it is reasonable to assume that it is largely built from hill soils enriched during the first occupation (Layer 5) as a result of direct settlement on the hill slopes or perhaps by gardening. Above Layer 4, the Layer 3 soils are discontinuous which adds support to the view (see below) that the shell was brought in by Maori to enhance the quality of the local soils for gardening. There was no evidence in the trench excavations for any occupation of the hill slopes behind the beach terrace following the first (Layer 5) occupation.

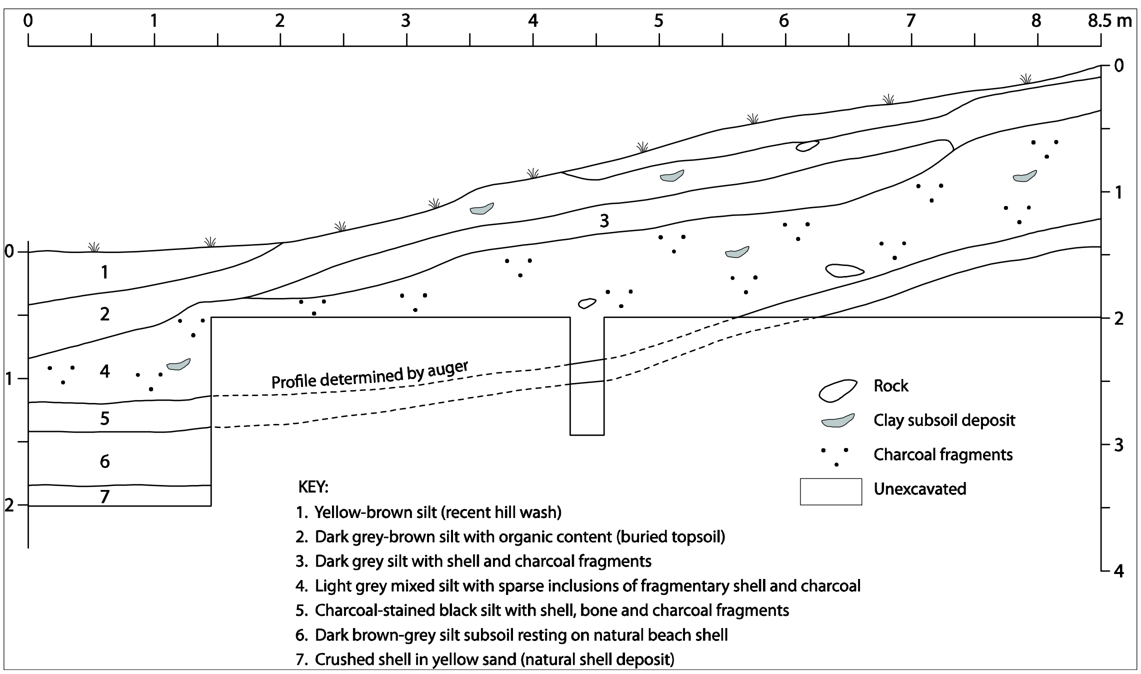

Figure 6. South-facing section of Unit 4.

The Beach Section

A stratigraphic section is exposed along the face of the eroding beach terrace from the sandstone cliffs at the north for about 160 m south into the head of the cove. For the first 70 m, between the cliffs and a small creek mouth, the main cultural layers are exposed intermittently. Wellman's (1962) fig 7 is a composite profile of 230 m (760 feet) of the same section running from the cliffs at the head of the bay to a second stream at the head of the inlet. In this profile Wellman noted natural bands of pumice and ash along with the two occupation layers. Two of these volcanic events (Loisels pumice and Taupo ash) were situated beneath the early occupation layer (correlated to Layer 5 in our excavations). Wellman identified a band of Kaharoa Ash between the two layers. In Appendix 1 we describe the stratigraphy as we observed it in 2007 without commenting on the finer interpretations of the natural ash and pumice lenses described by Wellman below Layer 5. A fuller treatment of the archaeological sequence as it relates to Wellman's earlier profile and description of the Holocene record can be found in Horrocks *et al.* (n.d.). We do note, however, that nowhere in the stratigraphy could we find evidence of Kaharoa ash or any other ash band lying above Layer 5. This is consistent with current dating models which places the Kaharoa eruption at 1314 ± 12 AD (Hogg *et al*. 2003) at or very close to the beginning of the New Zealand prehistoric sequence.

The profiles described in Appendix 1 are measured at points south from the north end of the site as shown in Figure 7, with depths measured down from the top of the beach terrace. The equivalent layer in the type profile is shown in square brackets or discussed in the appendix.

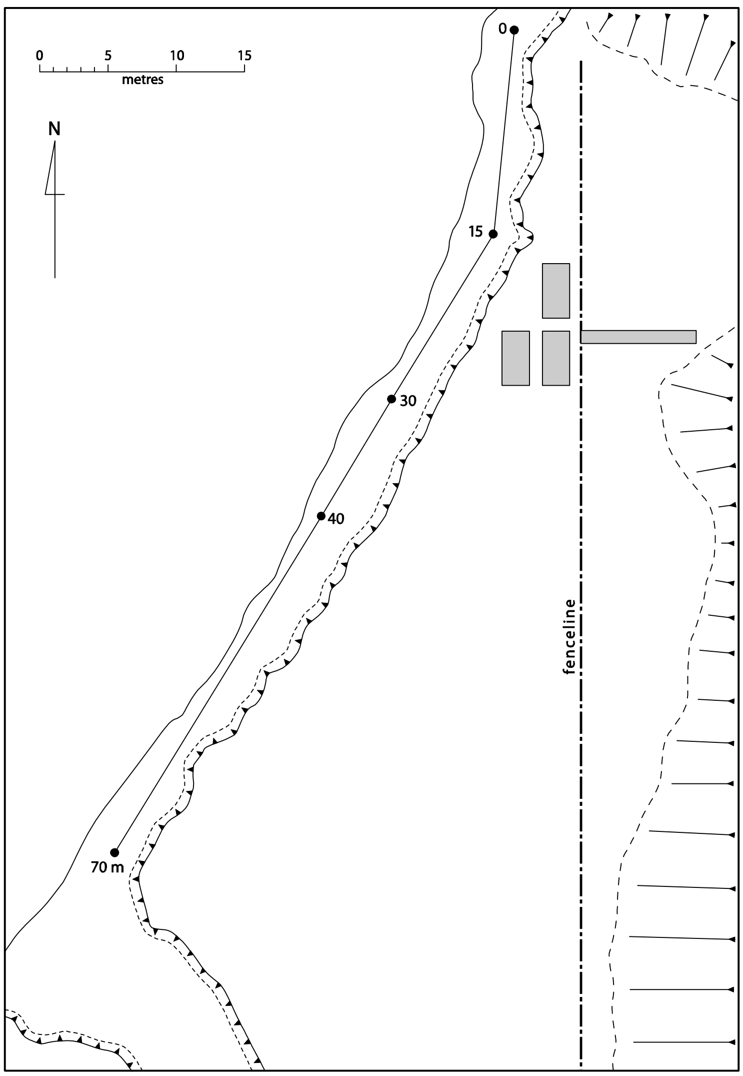

Figure 7. Beach section measurements for comparison with Appendix 1.

Stratigraphy

The stratigraphy was complex and varied in detail between excavation units. During excavation it proved difficult to define the interface between stratigraphic horizons, many of which were uneven and discontinuous. A type profile is described below in reference to the east section of Unit 1, which contained the clearest example of the major cultural and natural strata encountered on the site. This section lay parallel to the beach face and is located close to where Wellman described the eroding section in 1958. Variations to the general profile are described in the discussion of individual excavation units and beach section in the table below.

Table 1. Description of stratigraphy.

Layer	Description
1	A yellow-brown clayey silt with a thin, barely developed topsoil. Much of this material appears to be made up of rapidly eroded sediments most likely caused by Cyclone Bola which struck the East Cape region in March 1988.
2	A dark brown topsoil with no charcoal, shell or other culturally derived inclusions.
3	A dark brown-grey, mixed silty soil that appears to be derived from slope-washed terrestrial sediments augmented by shell. Layer 3 is probably equivalent to Wellman's (1962) "upper occupation layer." Layer 3 comprises three poorly differentiated sub-layers that are distinguished by their relative quantities of shell as follows:
3a	This upper component of Layer 3 contained crushed shell and some charcoal fragments. Artefacts were found in this layer including two moa-bone fish hook points as well as worked bone fragments, stone flakes, several fragments of glass and metal, and a clay pipe stem.
3b	This middle component of Layer 3 contained little or no shell and no artefacts.
3c	This lower component of Layer 3 was similar in appearance to Layer 3a. It contained only one stone flake.
4	Mixed fill (dark brown topsoil and yellow-grey subsoil with inclusions of shell, charcoal and soft sandstone nodules). Layer 4 is deep with no evidence of internal bedding or the development of topsoils. It was laid down rapidly as a single wash or slump from upslope. Near the base of Layer 4 there is a discontinuous lens of light yellow-brown silt that is similar in appearance to Layer 1. This is eroded subsoil, and lumps of similar material lie on the surface of the site where they were washed during the Cyclone Bola event. The interpretation of slope washing or slumping is consistent with the profile shown in the north baulk of Unit 4 (Figure 6). The base portion of Layer 4 was slightly darker than the upper part although this may have been as a result of differential drying.
5	Dark grey to black silt. Layer 5 is equivalent to Wellman's (1962) "lower occupation layer" and is made up of two sub-layers as follows:
5a	Dark grey charcoal-stained silt with charcoal fragments, artefacts and midden. Artefacts include two one-piece fish hook shank portions (moa bone), a one-piece fish hook point portion (shell) and a complete minnow lure point (moa bone).
5b	Dark grey to black charcoal-stained with charcoal fragments, artefacts and midden. This sub-layer is more compact than Layer 5a and contains a poorly defined but detectable living surface from which features had been excavated. Artefacts include

Layer	Description
	two one-piece fish hook shank portions (moa bone), a one-piece fish hook point portion (moa bone), a complete one-piece fish hook (shell) and an unfinished one-piece fish hook (moa bone).
6	Brown silty topsoil.
7	Crushed shell in a coarse yellow sand matrix.

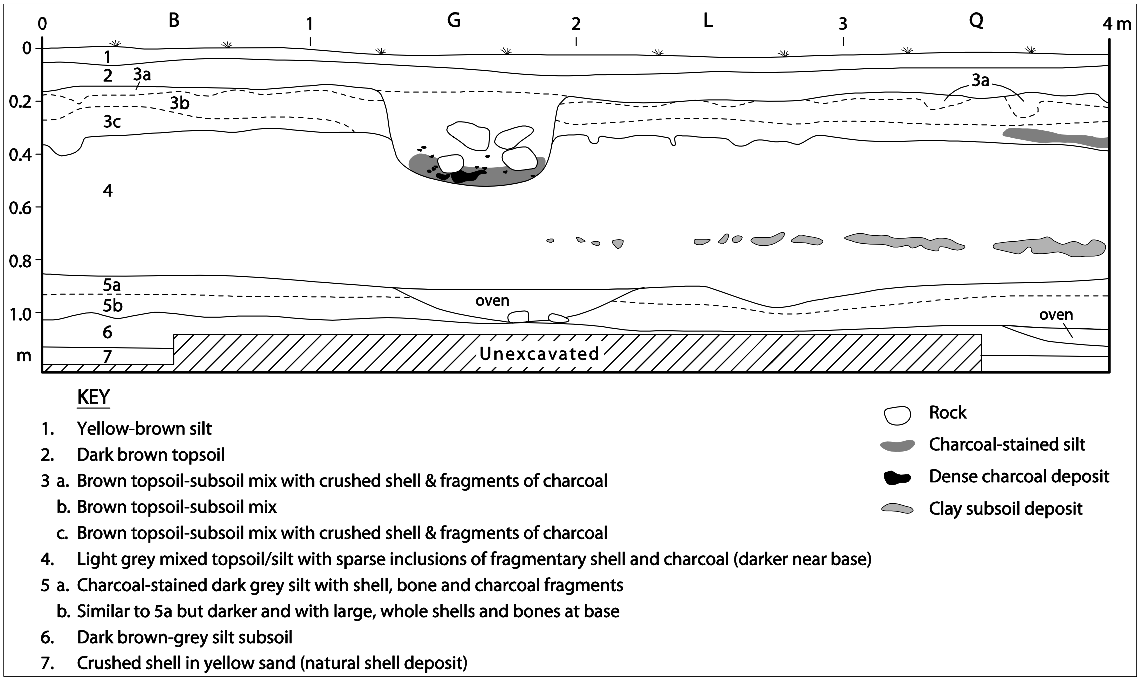

Figure 8. East section, Unit 1.

Soils, Pollen and Spores

A total of twenty-eight soil samples were collected by Mark Horrocks of Microfossil Research Ltd for plant microfossil identification, especially for the identification of pollen and starch remains. The samples reported here were collected from the east face of Unit 1.

The identification of pollen from archaeological sites provides insight into vegetation history, and the possible identification of anthropomorphic species such as bottle gourd (*Lagenaria siceraria*), paper mulberry (*Broussonetia papyrifera*) and European crops (Horrocks 2004; Horrocks *et al*. 2008b). Starch grains can provide direct evidence of Pacific root or corm crops such as sweet potato (*Ipomoea batatas*), taro (*Colocasia esculenta*), yams (Dioscorea spp.); and European crops such as the white potato (*Solanum tuberosum*) (Horrocks *et al*. 2008b). The analysis also included the identification of raphides which are needle-like calcium oxalate crystals found in bundles in specialised cells in both the aerial and subterranean parts of many plants species (Torrence and Barton 2006). All laboratory methods for the preparation and analysis of specimens followed standard practices for microfossil identification and are described in detail in Horrocks (2008).

Results

Pollen preservation was mostly poor, with many samples having insufficient grains for counting. At both sample points *Cyathea* and other ferns were abundant in the natural soils of Layers 6 and 7. Bracken (*Pteridium*) had high values from Layer 4 along with increasing quantities in Layer 2 of puha (*Sonchus* sp.) and dandelion (*Taraxacum* sp.). Also prevalent in Layer 2 were further exotic species including pine (*Pinus* sp.), broom (*Cytisus* sp), gorse (*Ulex* sp.) and various grasses. Two types of starch grain were identified in the Cook's Cove archaeological samples. One of these was consistent with *Ipomoea batatas* and the other with *Colocasia esculenta* although the tiny grains of the latter were extremely damaged and their identification as *Colocasia* could not be confirmed. The raphide data, however, lent support to the identification of *Colocasia* in the samples (Horrocks 2008: 4). The "long-thin" and "short-thick" raphide types identified in the Cooks Cove sample are especially abundant in corms and shoots of *Colocasia esculenta* (Loy *et al.* 1992; Sunell and Healy 1979). These, along with kumara starches were most abundant in Layer 5 but diminish into Layer 6 and throughout all layers the remains of kumara were more abundant than taro. The results of the plant microfossil analysis from Unit 2 are shown in Figure 9; Figure 10.

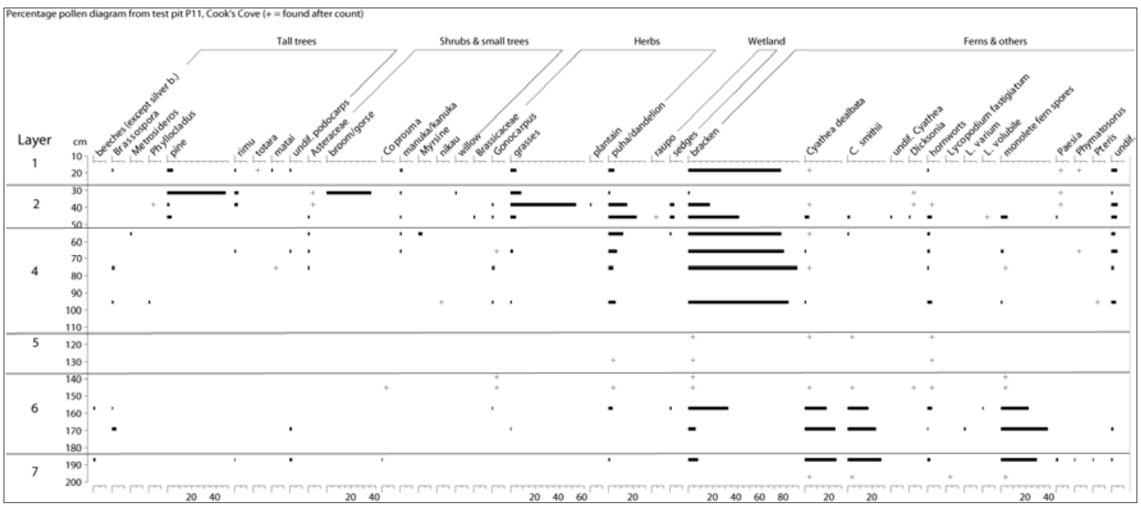

Figure 9. Pollen profiles from Unit 4 (from Horrocks 2008 Figure 1a).

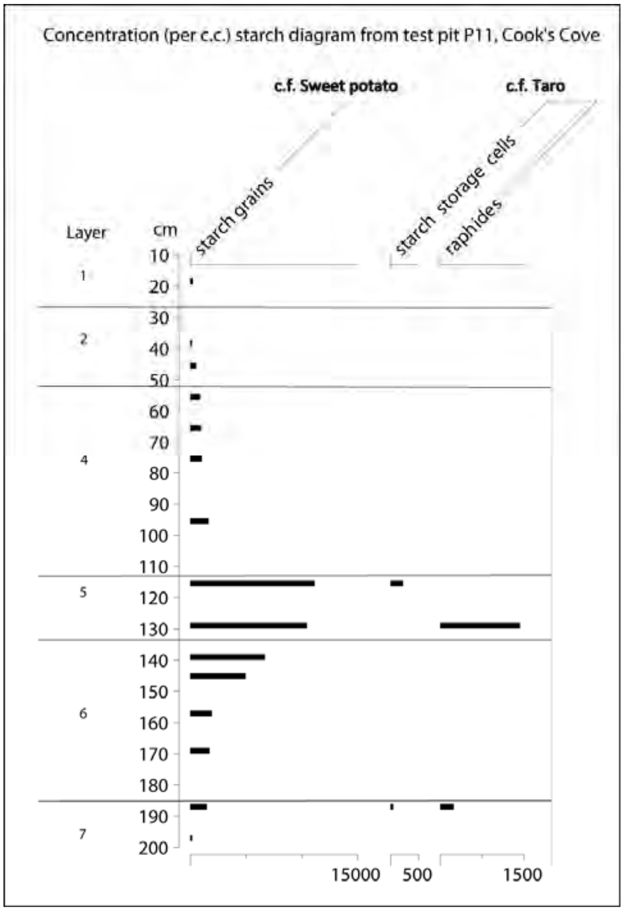

Figure 10. Starch and raphides from Unit 4 (from Horrocks 2008 Figure 2c).

Interpretation

Layer 5 shows evidence of human impact and the introduction of horticulture. This layer contains very little tall tree pollen and, while this is certainly due in part to differential preservation factors (Horrocks 2008: 4), significant quantities of bracken and hornwort spores were also present. The former is almost always associated with the burning of forest and the later is a coloniser of freshly exposed soils. This layer also contained the highest concentrations of kumara and taro starch. Raphides of kumara and taro are present in the natural soils of Layer 6 and there are high bracken counts in Layers 6 and 7. This may indicate a human presence in the catchment prior to the events recorded in Layer 5b although Horrocks et al. (2008b) have demonstrated that, in these types of soil, downwards percolation of pollen and starch can occur through water transportation and it is not unexpected that these introduced species will appear below the level of first occupation.

The presence of pollen from *Brassospora*, a Nothofagus species which became extinct in southern Australia and New Zealand about a million years ago (Mildenhall and Byrami 2004) is a signal of upslope soil disturbance and the incorporation of eroded material into soils at lower elevations. Such erosion is most notable in Layer 4 and might signal a prior expansion of swidden agriculture. Pollen of puha or dandelion throughout the profiles is also an indication of human activity within the wider landscape. In short, the microfossil record indicates early forest clearance and the introduction of horticulture concomitant with the first direct record of human presence in Layer 5b. Upslope clearance, perhaps for the expansion of swidden gardens is reflected in the presence of extinct beech pollens and compliments the stratigraphic evidence for rapid erosion events in Layer 4. The presence of bracken and puha throughout the sequence indicates a generally cleared landscape.

Dating

Samples were selected for radiocarbon dating and submitted to the Waikato Radiocarbon Dating Laboratory for analysis. Charcoal samples were identified to species by Dr Rod Wallace at the University of Auckland and sub-samples of short-lived species selected for dating (Wallace 2008). The results of the radiocarbon analysis and calibration are shown in Table 2 and Figure 11.

Table 2. Radiocarbon dates from Cooks Cove. Southern Hemisphere atmospheric data from McCormac *et al.* (2004); marine data from Hughen *et al.* (2004); Delta R-7±45; OxCal v4.10 (Bronk Ramsey 2009).

Lab. No.	Provenance	Material	CRA[1]	Calibrated Age	δ13C
WK-24844	Layer 3, Feature 1	Charcoal	80 ± 35	1σ - AD 1710-modern (68.2%) 2σ - AD 1697-modern (95.4%)	-26.0 ± 0.2
WK-24845	Layer 3, Feature 1	Charcoal	137 ± 35	1σ - AD 1700- modern (68.2%) 2σ - AD 1680- modern (95.4%)	-26.1 ± 0.2
WK-23487	Layer 3	Marine shell	4542 ± 40	1σ - BC 2884-2726 (68.2%) 2σ - BC 2937-2606 (95.4%)	0.7 ± 0.2
WK-23488	Layer 3	Marine shell	4254 ± 34	1σ - BC 2496-2326 (68.2%) 2σ - BC 2576-2239 (95.4%)	0.5 ± 0.2
WK-24846	Layer 5a	Charcoal	361 ± 35	1σ - AD 1404-1627 (68.2%) 2σ - AD 1478-1642 (95.4%)	-25.7 ± 0.2
WK-24847	Layer 5a	Charcoal	389 ± 36	1σ - AD 1464-1622 (68.2%) 2σ - AD 1459-1628 (95.4%)	-26.6 ± 0.2
WK-23489	Layer 5b	Marine shell	844 ± 33	1σ - AD 1430-1517 (68.2%) 2σ - AD 1391-1621 (95.4%)	2.6 ± 0.2
WK-23490	Layer 5b	Moa bone	624 ± 30	1σ - AD 1321-1406 (68.2%) 2σ - AD 1308-1420 (95.4%)	-22.5 ± 0.2

1. Conventional radiocarbon age after Stuiver and Polach (1977).

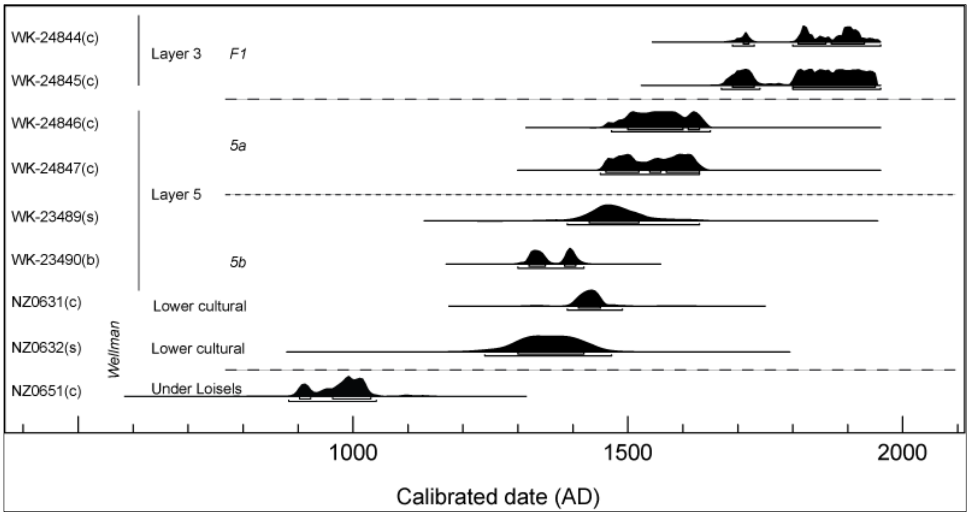

Figure 11. Calibrated radiocarbon dates from Cooks Cove (c=charcoal, s=marine shell, b=moa bone). Does not include WK23487 and WK23488.

Layer 5 comprises two occupation phases which span the period from about AD 1300 to AD 1650 at 1 sd. Layer 5b, the first occupation horizon at Cooks Cove, is dated by two samples from our excavation: one on moa bone (WK-23490) and one on paua shell (*Haliotis iris*) (WK-23489). These dates overlap at 1 sd with an overlap range of AD 1391 – AD 1420. This range provides the best estimate for the age of Layer 5b on available evidence, and it is consistent with current models indicating extinction of moa by the mid fifteenth century (Holdaway and Jacomb 2000). WK-23489 overlaps with the two dates from Layer 5a (WK-24846 and WK-24847), but the delta-R value incorporated into the marine calibration of WK-23489 has introduced a spreading effect into the age range. The two dates WK-24846 and WK-24847 each show two peaks in the calibration chart. We consider the first, higher probability peak to represent the correct age range for the Layer 5a occupation. This can be further checked by recalibrating the two samples as a combined age range (Table 3). As Table 3 shows the highest probability (77%) is that the correct age range lies within the 60 year span commencing in the mid fifteenth century AD.

Table 3. Combined dates from Layer 5b. Southern Hemisphere Atmospheric data from McCormac *et al.* (2004); Calib 6.0.1.

Sample	**Pooled mean age**	**Calibrated Age Range at 1σ**	**Probability**
WK-24846 & WK-24847 combined	1575 ± 25	1455 – 1512 AD	77%
		1601 – 1616 AD	22%

Layer 4, the hill-washed fill layer, did not contain any suitable dating material.

Layer 3 is dated with four samples. Two samples of marine shell (WK-23487 and WK-23488) were selected from the edges of a fire feature, and from within the soil matrix of Layer 3. These samples returned calibrated ages of more than 4000 BP with tight overlap, and we consider that they give a good indication of the age of the shell matrix that makes up the bulk of Layer 3. It seems clear that Layer 3 contains crushed shell that was deposited by a storm surge, tsunami, or through deliberate human transport. We favour the third of these options as discussed below.

We submitted two further samples (WK-24844 and WK-24845), both charcoal from Feature 1. This oven or fire-scoop had been excavated into the top surface of Layer 3; therefore, these samples do not date the layer, but simply show that the oven was dug sometime between AD 1650 and AD 1950. The historical artefacts, fauna and botanical remains in the upper part of Layer 3 show that it was probably about the middle of this range, sometime after the contact period.

Faunal remains

All excavated material was wet sieved through a 3.2 mm mesh on site and bulk material removed to the OAL in Dunedin for further analysis. A total of 272 bags were labelled as containing faunal material. This was made up of 200 bags of bulk material collected from the screens, plus 67 bags of bone and five bags of shell hand collected by the excavators during excavation.

On inspection the screened fraction appeared to comprise crushed shell, with a very small quantity of bird and fishbone, as well as the occasional chip of obsidian or chert. Because of the large quantity of material, a sampling strategy was devised which involved removing a 20 per cent sample from each layer for final analysis. The bags each represented a single bucket of soil matrix, and since each layer was well mixed, each bag contained very nearly the same weight of material. The sample was made up of two bags from Layer 3 and 31 bags from Layer 5. The shell and bone collected and bagged during excavation represented the larger fragments of fauna, and the total sample was analysed.

Midden arrived in the laboratory in clean condition, but the bulk sample was rinsed, dried and sorted to primary faunal class: shell, bird, mammal, and fish. The fauna was identified to the lowest possible taxonomic classification using the OAL reference specimens. Vertebrate fauna were quantified using the standard zooarchaeological methods of number of identified specimens (NISP), minimum number of elements (MNE) and minimum number of individuals (MNI) (Grayson 1984; Reitz and Wing 1999). These figures were calculated on a site-wide basis rather than within individual excavation areas.

Shellfish

The shellfish fraction tended to be highly fragmented, and very few whole shells were recovered. Fragments were first sorted to the classes of bivalve and gastropod, and then specimens containing unique quantifiable attributes were removed for identification. For gastropods this was the operculum, apex and basal keel and for bivalves the hinge section. All identifications were made using the New Zealand Marine Shell Reference Collection in the OAL and with reference to shellfish identification guidelines in Crowe (1999) and Powell (1946). The quantification units used were MNI (minimum number of individuals) and weight (Grayson 1984; Reitz and Wing 2008). No quantifiable shell fragments were recovered from Layer 3, and the results of the identifications from Layer 5 are shown in Table 4 as MNI, with the weight of unidentified fragments provided in Table 5.

Table 4. Shellfish identification (MNI) from Layer 5.

Taxon	Layer 5a	Layer 5b	Total
*Turbo smaragdus**	2023	805	2828
*Austrovenus stutchburyi**	491	1978	2469
Evechinus chloroticus	753	78	831
*Paphies australis**	96	206	302
*Sypharochiton pelliserpentis**	120	16	136
*Turbinidae sp**	71	47	118
Veneridae sp*	-	102	102
*Paphies subtriangulata**	69	19	88
Zeacumantus lutulentus	21	55	76
Protothaca crassicosta	5	67	72
Macomona liliana	5	58	63
Melagraphia aethiops	55	2	57
Cookia sulcata	43	13	56
Patelloida corticata	18	28	46
Nerita atramentosa	18	19	37
Diloma nigerrima	25	12	37
Cellana radians	24	6	30
Trochidae sp	15	12	27
Haustrum haustorium	18	7	25
Ruditapes largillierti	19	2	21
Cellana ornata	9	1	10
Diloma bicanaliculata	6	-	6
Tugali elegans	3	3	6
Haliotis iris	5	1	6
Argobuccinum pustulosum tumidum	5	-	5
Nodilittorina antipodum	2	2	4
Austrofusus glans	1	1	2
Amalda australis	2	-	2
Cominella maculosa	2	-	2
Cominella glandiformis	2	-	2
Ostreidae sp	-	1	1
Crepidula monoxyla	1	-	1
Notoacmea pileopsis	-	1	1
Unidentified to Taxon	485	62	547
Grand Total	**4412**	**3604**	**8016**

* Shellfish categories represented at 2% or greater within the total assemblage

Table 5. Weight of shellfish from Layer 3 and Layer 5.

Layer	Weight in grams
Layer 3	370
Layer 5a	14,053
Layer 5b	4,446
Grand Total	**18,869**

Layer 5 contained a wide range of species. A measure of assemblage diversity can be obtained using the Shannon-Weaver function (H'), which assesses the heterogeneity of a sample, or the amount of uncertainty in predicting the species of a randomly selected individual from that sample (Reitz and Wing 2008:105). Despite the relatively large number of taxonomic categories, Layers 5a and 5b both showed low heterogeneity values. This reflects the fact that most of the taxonomic categories are represented at extremely low counts (Table 6). This factor is also demonstrated using the related V' statistic, which measures the degree to which species are equally abundant and where values approaching 1.00 represent an even distribution of specimens across taxa. Both sub-layers give similar low measures for V' reflecting the dominance of a small number of taxa (see Table 6). In fact, only seven taxa (representing 90 per cent of the total count) have greater than 2 per cent representation in the assemblage. These are made up of 43 per cent rocky shore gastropods and 57 cent bivalves, which prefer a sandy shore or estuarine substrate. All of the gastropod species represented in the midden can be obtained within a few hundred metres of the site today, but the bay has a muddy substrate that does not currently support a bivalve population. The nearest locations for obtaining tuatua (*Paphies subtriangulata*), pipi (*P. australis*) or cockle (*Austrovenus stutchburyi*) would be in Tolaga Bay or beaches further to the north. It is likely that the beach at Cooks Cove has been altered significantly through silting up and erosion since the fourteenth century, and it is possible that some of these species might have been present nearby at the time of occupation.

Table 6. Table of H' and V' statistics for shellfish.

Layer	Shannon-Weavers H'	Equitability measure V'
Layer 5a	1.66	0.49
Layer 5b	1.51	0.46

Bird

A total of 374 bird bones was identified which represents 3.70 per cent of the total vertebrate sample. Of these 253 were so fragmentary that it was not possible to identify the element or species. Thirteen species were confidently identified, along with one genus and one family. The majority of the bird is from Layer 5b (78.53 per cent of the bird bone assemblage). There is a broad range of species present in Layer 5b, which suggests that no one species was the focus of exploitation. Of the sea birds, blue penguin (*Eudyptula minor*) and petrels (Procellariiformes) have the greatest NISP (6 and 14 respectively). In terms of the forest birds, tui (*Prosthemadera novaeseelandiae)* and kaka (*Nestor meridionalis septentrionalis*) have the highest NISP (6 and 4). The Layer 5a assemblage is considerably less diverse with only four bird species (blue penguin, kaka, tui, and yellow-crowned parakeet) identified. Two bird species were present in Layer 3 (spotted shag and chicken). A list of identified species is presented in Table 7 with NISP and MNI values.

Moa was present in all layers but the majority was fragmentary. The presence of phalanges, including two claws, in the Layer 5b sample is an indication that the carcass was not carried very far from the kill site. The entire moa NISP from the whole sample is only 36.

Table 7. NISP and MNI of bird taxa from Layer 3 and Layer 5.

Taxon		Layer 3		Layer 5a		Layer 5b	
		NISP	MNI	NISP	MNI	NISP	MNI
Black Backed Gull	*Larus dominicanus*	-	-	-	-	1	1
Blue Penguin	*Eudyptula minor*	-	-	1	1	8	2
Cf Chicken	*Gallus gallus*	1	-	-	-	-	-
Cf Sooty Shearwater	*Puffinus griseus*	-	-	-	-	1	1
Chicken		5	1	-	-	-	-
Kaka	*Nestor meridionalis septentrionalis*	-	-	1	1	4	2
Little Shag	*Phalacrocorax melanoleucos*	-	-	-	-	1	1
Spotted Shag	*Stictocarbo punctatus*	1	1	-	-	1	1
Diving Petrel	*Pelecanoides urinatrix*	-	-	-	-	5	1
Oystercatcher	*Haematopus unicolor*	-	-	-	-	1	1
NZ Pigeon	*Hemiphaga novaeseelandiae*	-	-	-	-	2	1
Mottled Petrel	*Pterodroma inexpectata*	-	-	-	-	3	1
Petrel	*Pterodroma* sp.	-	-	-	-	5	2
Tui	*Prosthemadera novaeseelandiae*	-	-	2	1	6	2
Weka	*Gallirallus australis*	-	-	-	-	4	1
Yellow-crowned Parakeet	*Cyanoramphus auriceps*	-	-	2	1	-	-
Perching Bird	Passerine	-	-	-	-	2	2
Procellariiforme		-	-	-	-	2	1
Unidentified		13	-	58	-	182	-
Moa		1	-	6	1	27	1
Total		**21**	**2**	**70**	**5**	**247**	**20**

Mammal

Mammal remains account for 9.13 per cent of the vertebrate sample with a NISP of 854 (Table 8). Of these over half (58.57 per cent) were too fragmentary to identify beyond class. The fragmentation meant that a further 27.01 per cent of the sample was not able to be assigned further than the category sea mammal (most likely fur seal or sea lion). The majority of these bones were fragmentary ribs, vertebrae, cranial or long bone fragments which lacked distinctive markers. Three fragments of probable cetacean were also recovered in Layer 5a.

Table 8. NISP and MNI of mammal taxa from Layer 3 and Layer 5.

Taxon		Layer 3		Layer 5a		Layer 5b	
		NISP	MNI	NISP	MNI	NISP	MNI
Cetacean		-	-	1	-	-	-
Cf Dog		-	-	-	-	1	-
Cf Cetacean		2	-	-	-	-	-
Cf Fur Seal		1	-	-	-	9	-
Cf Rat		-	-	-	-	1	-
Cf Sea Lion		-	-	-	-	2	-
Cf Sea Mammal		1	-	1	-	-	-
Dog	*Canis familiaris*	2	1	4	-	6	1
Fur Seal	*Arctocephalus forsteri*	2	1	11	2	31	1
Pig	*Sus scrofa*	12	1	-	-	-	-
Rat	*Rattus exulans*	1	1	17	2	8	3
Sea lion	*Phocarctos hookeri*	-	-	-	-	7	1
Sea Mammal		34	-	-	-	194	-
Unidentified		49	-	96	-	345	-
Total		**104**	**5**	**130**	**4**	**604**	**6**

Most of the mammal bone derives from Layer 5b (71.91 per cent). New Zealand fur seal (*Arctocephalus forsteri*) possessed the highest NISP of 31, but only an MNI of 1, followed by

Polynesian rat (*Rattus exulans*) (NISP 8, MNI 3). New Zealand sea lion (*Phocarctus hookeri*) is represented by a NISP of 7 and an MNI of 1, while dog has a NISP of 6 and MNI of 1. These low figures suggest that no particular species was being targeted, although the sample size is too small to provide more than an indication. Finally, several pig bones were identified from Layer 3a.

Fish

Over 7500 fish bones were present in the sample. Many of these were small and fragmentary, and it was only possible to confidently identify 536 of these to element. The majority of the fish bone is from Layer 5 with only 50 bones from Layer 3. It has been standard practice in New Zealand archaeology to identify only the five major mouth bones (dentary, maxilla, premaxilla, quadrate and articular) and distinctive special bones (Leach, 1997), but in this instance as many elements as possible were identified. This approach served to increase the identified NISP of several species, although it would not be expected to alter MNI values by much. The value of this method is that it gives a comprehensive picture of the structure of an assemblage, which provides confidence when comparing assemblages between sites. The bones were then identified to the lowest taxon possible, resulting in eleven species and two families of bony fish. Cartilaginous fish are more difficult to identify to species, but one spine has been attributed to stingray (*Dasyatis* sp.) and two vertebrae may be from spiny dogfish (*Squalus acanthus*).

Most of the fish bone is from Layer 5a. The fish species are dominated by wrasses (Labridae) and tarakihi (*Nemadactylus macropterus*) both with a NISP of 132. Other species are present but occur in much lower numbers including red gurnard (*Cheilodonichthys kumu*) (NISP = 17), red cod (*Pseudophycis bachus*) (NISP = 11), greenbone (*Odax pullus*) (NISP = 9), jack mackerel (Carangidae) (NISP = 7), barracouta (*Thyrsites atun*) (NISP =6), and leatherjacket (*Parika scaber*) (NISP = 5). In Layer 5b wrasses and tarakihi are also the dominant species but are present in much smaller numbers. Table 9 contains all of the identified species with NISP and MNI data.

Most of the fish species represented here are caught inshore in reasonably shallow water usually by baited hook. Greenbone feeds on kelp, however, and it is more likely that this species was caught by netting.

Table 9. NISP and MNI of fish taxa from Layer 3 and Layer 5.

Taxon		Layer 3		Layer 5a		Layer 5b	
		NISP	MNI	NISP	MNI	NISP	MNI
Barracouta	*Thyrsites atun*	-	-	6	1	1	1
Blue cod	*Parapercis colias*	-	-	2	1	-	-
Blue Moki	*Latridopsis ciliaris*	-	-	2	1	4	1
Jack Mackerel	Carangidae	-	-	7	2	3	1
Cf Blue moki		-	-	-	-	1	1
Cf Carangidae		-	-	4	1	1	-
Cf Kahawai	*Arripis trutta*	-	-	-	-	3	1
Cf Labridae		-	-	1	1	-	-
Cf Red Gurnard	*Cheilidonichthys kumu*	-	-	-	-	1	1
Cf Sea Perch	Serranidae	-	-	-	-	1	1
Cf Snapper		-	-	1	-	-	-
Cf Stingray	*Dasayatis* sp.	-	-	-	-	1	1
Cf Tarakihi	*Nemadactylus macropterus*	-	-	11	4	4	1
Conger Eel	*Conger verreauxi*	-	-	1	1	-	-
Shark/ray	Elasmobranchii	3	-	15	-	6	-
Greenbone	*Odax pullus*	-	-	9	3	2	2
Wrasses	Labridae	-	-	132	26	35	3
Leatherjacket	*Parika scaber*	-	-	5	2	4	2
Red Cod	*Pseudophycis bachus*	-	-	11	3	2	1
Red Gurnard		1	1	17	4	2	2
Sea Perch		-	-	1	1	2	1
Snapper		2	1	1	-	1	1
Spiny Dogfish	*Squalus acanthus*	-	-	-	-	2	-
Tarakihi		5	1	132	17	10	3
Unidentified		39	-	5516	-	1459	-
Total		**50**	**3**	**5874**	**68**	**1573**	**24**

Reptile

Two left dentaries of tuatara (*Sphenodon punctatus*) were recovered from Layer 5b.

Material Culture

Fish hooks

Fish hooks were the most common artefacts found during the excavations at Cooks Cove. They included seven one-piece examples, plus a tab fragment of an unfinished one-piece hook (Figure 12:a-g, k) minnow-lure point of bone (Figure 12: h), and two points from two-piece composite fish hooks (Figure 12:i-j, l), again with what appears to be an unfinished perform (Table 10). The numbers found are too small for meaningful statistical analysis; however, even this small collection can be used to draw some inferences, both about the site and about its place in the wider context of New Zealand prehistory. Although Cooks Cove is a North Island site, all of the fish hooks can be typed using Hjarno's (1967) classification of fish hooks from southern New Zealand. This uses a combination of morphological and, to a lesser extent, functional attributes to classify fish hooks into three broad categories: one-piece (Type D), two-piece (Type C), and lure hook points (Types A, B). These are further subdivided according to presence or absence of notches or serrations, the location of any barbs present, and the general shape of the hook. The numbers of each type found and their provenance within the site are as follows:

Table 10. Fish hooks recovered from Cooks Cove.

Provenance	Type	Material	Figure 12 reference
O11-S-5-iv	D1	Moa bone	a
O11-B-5-ii	D1	Moa bone	b
O11-T-5-iv	D1	Moa bone	c
O12-O-5-iii	D1	Moa bone	d
O11-A-5-ii	D1	Moa bone	e
O12-D-5-iv	D1	Shell	f
O11-P-5-ii	D1	Shell	g
O11-Q-5-i	B1	Bone	h
O11-G-3-ii	C3b	Moa bone	i
O11-G-3-ii	C3b	Moa bone	j
O11-S-5-iv	D1	Moa bone	k
O11-G-3-ii	Type C preform?	Bone	l

Two-piece barbed composite bait hook points: Two examples were found, both of which appear to be made of moa bone. One is a Hjarno Type C3a (two-piece point with inner barb) and one is a Type C3b (two-piece point with external barb). Both were found in Layer 3a.

One-piece fish hooks: A total of eight fragments of one-piece fish hooks were found in the site, counting the preform. Six were made of bone – probably moa bone – and two were of shell (*Cookia sulcata*). Although no complete examples were found, all appear to be Hjarno Type D1. All were found in Layer 5.

Figure 12. Fish hooks from Cooks Cove (a-e: 1-piece fish hooks, bone; f,g: 1-piece fish hooks, shell; h: minnow-lure point; i,j: composite 2-piece fish hook points, bone; k: i-piece fish hook preform, bone; l: possible preform of composite 2-piece fish hook point.

Minnow lure points: One example of this type was found, a Hjarno Type B1 (barbless, with very curved point and one or two perforations at base), in Layer 5, the lowest cultural layer.

Although there are no absolute dates for the hooks, the relative sequence is consistent with earlier models. The moa bone one-piece fishhooks from Layer 5 are in forms that Golson (1959) placed within his Archaic Phase assemblage, while those from Layer 3 are recognised as belonging to, or at least having grown "tremendously" in popularity during, his Classic Phase (Golson, 1959: 62). The composite bait hooks are likely to be intrusive in Layer 3, which also contained historic material, but the fact that these were found in a separate context from the other fish hooks, all of which were of types firmly ascribed to Golson's Archaic, suggests that there was some passage of time before they were developed.

The fish hooks are currently held by Tairawhiti Museum in Gisborne.

Stone tools

In addition to the flake material found at the site (below) ten stone artefacts were found, all in Layer 5 (Figure 13). Included were three retouched flakes, two of chert and one of obsidian (see Figure 13: a-c); two oval cobbles (see Figure 13: d-e) and four files or abraders (see Figure 13: f-i). The obsidian is green in transmitted light, suggesting a Mayor Island source. The sources of the chert are unknown. The size of the three flake tools makes butchery of large animals such as moa or sea mammals a likely function. The oval sandstone cobbles appear to have been selected – and possibly shaped – for a specific purpose. Their function is not known, although they may have been used as line or net sinkers of some sort. The four files, also of sandstone, are of types often found in association with fish hook manufacturing evidence, for example at Wairau Bar (Duff, 1950). Their presence at Cooks Cove is consistent with the evidence for manufacturing fish hooks described in the fish hook discussion, above.

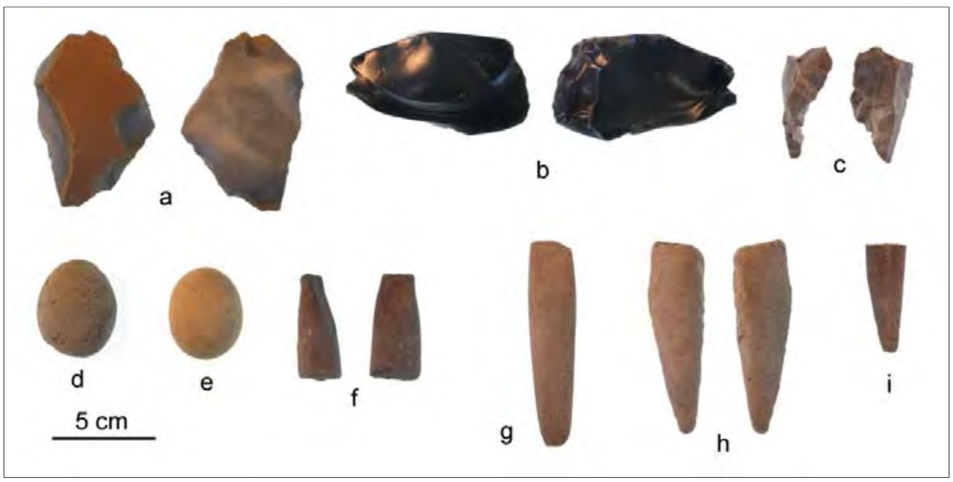

Figure 13. Stone artefacts from Cooks Cove (a. retouched flake, grey-green chert with brown cortex, O11-S-5-v; b. retouched flake, greenish obsidian, O11-N-5-v; c. retouched flake, grey chert, O12-I-5-iii; d. oval cobble, sandstone, O11-E-5-iii; e. oval cobble, sandstone, O11-E-5-ii; f. file, sandstone, O11-J-5-iv; g. file, sandstone, O11-S-5-ii; h. file, sandstone, O11-S-5-iv; i. file, sandstone, O11-E-5-iv).

Flake material

A total of 137 flakes of obsidian and chert were recovered from three stratigraphic units (Layers 3, 5a and 5b) (Table 11). All the obsidian had an olive-green colouring in transmitted light which is usually taken to indicate an origin on Mayor Island in the Bay of Plenty (Moore n.d.). So far, there has been only limited success in assigning archaeological chert specimens to geological source in New Zealand, and the origin of the Cooks Cove specimens is uncertain. Obsidian was only found in Layer 5, and its absence in Layer 3 is unusual and assumed to be a sample size issue, given that Mayor Island obsidian was in widespread use throughout this part of the North Island in late prehistory (Seelenfreund-Hirsch 1985; Walter *et al*. 2010).

Table 11. Quantity of flaked stone artefacts recovered from Layer 3 and Layer 5.

	Material		
Layer	*Chert*	*Obsidian*	*Sub-total*
3	12	-	12
5a	49	38	87
5b	16	22	38
Total	**77**	**60**	**137**

The artefacts were sorted into primary artefact classes using a method based on Andrefsky (1998) that focuses on two variables, artefact type and condition of the edge. These two variables generate a total of six potential classes that relate to simple aspects of artefact function (Table 12).

Table 12. Variables and attributes used to sort the flaked stone.

Variable	Attribute	Definition
Artefact type	Core	Object has been used as a source of flakes. It contains multiple flake scars as evidence of flake removal.
	Flake	Artefact was generated deliberately as the result of a single flaking event. Artefact contains striking platform and bulb of percussion. If the object is broken it may contain only part of these features.
	Debitage	Waste or by-product material generated during a flaking event. Debitage does not contain a bulb of percussion or striking platform, although some pieces may contain traces of these features as a result of an earlier flaking event.
Edge Condition	Worked	Object contains micro-scarring as a result of either deliberate edge modification or use wear.
	Unworked	No evidence or micro-scarring that would indicated that the object has been used

Table 13. Flaked stone tool assemblage showing number of tools with evidence of use across the three main tool classes.

		Artefact type		
Material	**Edge**	*Core*	*Debitage*	*Flake*
Chert	*Unworked*	3	47	23
	Worked	1	2	1
Obsidian	*Unworked*	1	21	30
	Worked	-	-	8
Total		**5**	**70**	**62**

As Table 13 shows, only 3 per of the chert artefacts and 6 per cent of the obsidian artefacts showed any evidence of having been used. This is an unusually low ratio. For example at the late prehistoric pa site of Omaio located in the Eastern bay of Plenty an identical analysis was carried out on the flaked obsidian from a similar sized assemblage (n=220) (Walter *et al*. n.d.). At Omaio 25 per cent of the material was recorded as displaying wear marks indicating use as tools. A possible explanation for the difference is that at Cooks Cove the assemblage may have largely derived from areas where obsidian was being flaked for tool production, rather than from places where the obsidian tools were being actually used.

The dimensions of the flakes (length, width, thickness and weight) were measured using standard methods outlined in Andrefsky (1998:97-100, Appendix 2). No significant difference was noted in the size of chert flakes (as measured by length and weight) between Layers 5 and 2 such as might be expected if there was any change in access to sources between the early and later periods (length, t= -0.28, p= 0.781, df = 22, weight, t = -0.26, p=0.795, DF=22). There is, however, a marked decline in the length of obsidian flakes between Layers 5b and 5a, which might signal either differences in access through time or changes in the function of the tools (t= -2.67, p= 0.011, df = 36). Unfortunately, the sample size is too small to draw any larger conclusions.

7. DISCUSSION

Cooks Cove is a rare example of a site with a discernable stratigraphy that spans the full duration of the New Zealand prehistoric sequence. The investigations at Cooks Cove were designed to take advantage of this to look at questions of change in material culture, subsistence and local use of the environment.

The Cooks Cove sequence

The first settlement of New Zealand occurred around the mid- to late-thirteenth century AD with the arrival of one or more voyaging canoes from tropical East Polynesia. These canoes bore colonists who possessed a material culture developed in the island homelands and a tropically adapted subsistence economy and lifestyle. Not much more than a century and a half after first landfall, major changes are visible in the New Zealand archaeological record, which herald the emergence of new patterns of life. These changes include the extinction of moa (Holdaway and Jacomb 2000), the abandonment of vast areas of the South Island (Jacomb *et al*. n.d.), loss of certain artefact forms and the adoption of others (Davidson 1984), the contraction of exchange networks (Walter *et al*. 2010) and first construction of fortified villages (Davidson 1984; Schmidt 1996). Sites like Cooks Cove which, as well as spanning the whole of the prehistoric period, also include multiple horizons within the first few centuries of settlement in New Zealand, provide important information about what happened during this 'colonisation' phase.

The stratigraphic position of the fish hooks is consistent with expectations based on existing models for the developmental sequence of fishing technology in prehistoric New Zealand (e.g., Golson 1959; Hjarno 1967). These see one-piece fish hooks and minnow lure points, of the varieties described here, as being typically early. Golson includes both types in his Archaic Phase, for example, and they are the overwhelmingly predominant fish hook types found at Wairau Bar (Duff 1950). The radiocarbon dates for Layer 5 place it firmly in the early part of the New Zealand sequence.

Similarly, these models see composite two-piece fish hooks as being a later development, and the most common types found in sites of the late prehistoric (Golson's "Classic Phase"). Although it was not possible to obtain suitable material with which to date Layer 3, the source of the two two-piece points at Cooks Cove, it did not yield any early type hooks. The two that were found were typologically late. However, both were made of moa bone – a material that would have been relatively scarce within a century or so of the mid-fifteenth century extinction of the moa (Holdaway and Jacomb 2000).

The first inhabitants of Cooks Cove utilised a broad range of faunal resources, including moa, seal, dog, tuatara, marine and forest birds, and a variety of fish and shellfish. Most of the large faunal resources seem to have been locally extirpated very quickly, with a resulting shift to a diet more dependent on the local marine resources probably in association with horticultural crops. The loss of forest bird species would probably have occurred quickly through a combination of human and rat predation and forest clearance. This rapid loss of the megafauna, and resulting shift from broad-spectrum resource exploitation to a more targeted utilisation of marine resources, is well documented in other sites of the early period (Anderson 1983; Anderson *et al*. 1996; Jacomb *et al*. 2010; Smith 2005). The limited faunal information from the later settlement of the Cove means that inferences about subsistence practices are limited. The Layer 3 material contained a mix of crushed shell, a small amount of fish, bird and mammal bone, a fragment of moa, and pig and chicken which are both clearly historical in origin.

8. CONCLUSION

Cooks Cove one of very few examples of a deeply stratified archaeological site spanning the duration of the New Zealand sequence. In addition to its archaeological significance, the site has played a major role in defining the Holocene stratigraphic record through the work of Harold Wellman (1962). Wellman's work was innovative in that his interpretations were drawn from a consideration of both cultural and natural strata. One of the objectives of the recent excavations was to revisit the Wellman sequence in light of contemporary models of prehistory. For example, Wellman had his "upper occupation" sandwiched between Loisels pumice below, and what was tentatively identified as Kaharoa ash above. Kaharoa ash is now well dated to AD 1314 ± 12 (Hogg *et al*. 2003), but it is still debated as to whether any *in situ* cultural deposits are securely sealed by this ash. We were unable to locate any evidence for the Kaharoa ash in the Cooks Cove section, nor could we clearly identify a Loisels-pumice horizon and certainly no lumps "up to 2 inches" in size (Wellman 1962:46). Wellman recorded two discrete cultural events, which are equivalent to our Layers 3 and 5. At the time of Wellman's visit, his "upper occupation" (here Layer 3) extended the full length of his 230 m profile, while it is now only visible for a third of that distance. Similarly, his "lower occupation" (here Layer 5) extended for about 130 m, but is also only exposed for a third of that distance today. It is interesting to note that Wellman did not describe Layer 4, the erosion event, which is visible in the modern beach profile. This indicates that the slump did not extend as far as the 1958 beach line. It also highlights the fact that the beach front is actively eroding, and that the section Wellman observed and profiled is long gone.

It was our intention that the work at Cooks Cove contribute to a wider research programme that seeks to address problems in New Zealand culture change stemming from recent revisions in the general culture history sequence. This refers to the "short chronology" model that has developed over the last 15 years as a result of refinements to radiocarbon dating (Anderson 1991; Higham *et al*. 1999; Higham and Jones 2004). The most radical implication of this revision is that a distinctly Maori way of life must have emerged not after 600 years of gradual adaptation, as classic models imply, but as a rapid cultural transformation within a century or so of landfall. Ironically, the shortened sequence highlights the limits of radiocarbon dating in New Zealand. Current methods simply cannot resolve change at the resolution required, especially given New Zealand's position in a particularly "wiggly" portion of the radiocarbon curve. One way to address the problem of setting out models of change in the context of a shortened sequence is to turn to relative dating methods. Sites with rare stratigraphic sequences (i.e., those that span the transition from first settlement to classic Maori society), such as Cooks Cove, offer opportunities for developing and testing such methods. While the 2007 sample was small, the results illustrate the value of reinvesting in material culture studies and applying relative dating approaches to studies of New Zealand chronology.

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APPENDIX 1. SOIL PROFILES ALONG THE EAST BEACH TERRACE OF COOKS COVE (NOVEMBER 2007)

Point 1. 5 m South	This is the point at which cultural material is first visible in section. About 80 cm of slumped soil lies directly on the underlying sandstone platform. The base 60 cm of this is a dark, charcoal rich band that is most likely derived from the Layer 3 occupation phase.
Point 2. 10 m South	Between about 8 and 12 m south the profile is most similar to the composite profile shown in Wellman (1962 fig. 7) and between 10 m and 18 m the two occupation layers closely match Wellman's description.
0 – 3 cm	Light grey topsoil.
3 – 22 cm	Dark grey-brown, charcoal enriched soil with shell fragments and occasional whole shells [Layer 3].
22 – 85 cm	Fine, light brown ashy soil with shell fragments. This is finer, lighter in colour and contains fewer charcoal fragments but is probably equivalent to Layer 4 in the type profile.
85 – 118 cm	Fine, dark grey soil with fragments of shell, charcoal. [Layer 5].
118 – 125 cm	Fine light grey ashy sand.
125 – 150 cm	Sandstone cobbles mixed with shelly sand.
Point 3. 15 m South	Here the upper cultural band [Layer 3] is much lighter in colour.
0 – 20 cm	Light grey topsoil with some pockets of yellow-brown clayey soil.
20 – 45 cm	Grey soil with shell inclusions [Layer 3].
45 – 90 cm	Fine, light brown ashy soil with shell fragments. [Layer 4].
90 – 110 cm	Fine, dark grey soil with fragments of shell, charcoal. [Layer 5].
110 – 118 cm	Fine light grey ashy sand.
118 cm	Section ends on a sandstone cobble beach.
Point 4. 20 m South	
0 – 5 cm	Yellow-brown clayey silt, Cyclone Bola deposit.
5 – 25 cm	Brown soil with some shell inclusions [Layer 3].
25 – 30 cm	Fine, light grey soil with high density of shell fragments.
30 – 95 cm	Fine, light brown ashy soil with shell fragments. Dark grey from 70 cm [Layer 4].
95 – 115 cm	Fine, dark grey soil with fragments of shell, charcoal. [Layer 5].
115 – 150 cm	Sandstone cobbles mixed with shelly sand.
150 cm	Section ends on a sandstone cobble beach.
Point 5. 25 m South	
0 – 5 cm	Light grey topsoil.
5 – 25 cm	Brown soil with some shell inclusions [Layer 3a].

25 – 30 cm	Fine, light grey soil with high density of shell fragments [Layer 3c].
30 – 75 cm	Fine, light brown ashy soil. This contains less charcoal inclusions than equivalent horizon to the north [Layer 4].
75 – 92 cm	Fine, dark grey soil with many whole bivalves and shell fragments, charcoal [Layer 5].
92 – 120 cm	Sandstone cobbles mixed with shelly sand.
120 cm	Section ends on a sandstone cobble beach.
Point 6. 30 m South	
0 – 5 cm	Light grey topsoil.
5 – 30 cm	Dark grey soil with shell inclusions [Layer 3].
30 – 75 cm	Fine, grey-brown silt with occasional sandstone cobbles.
75 – 95 cm	Fine, medium grey soil with shell fragments [Layer 5].
95 – 110 cm	Sandstone cobbles mixed with shelly sand.
110 cm	Section ends on a sandstone cobble beach.
Point 7. 35 m South	Between here and 40 m south the Layer 5 material becomes lighter and disappears entirely.
0 – 5 cm	Light grey topsoil.
5 – 30 cm	Dark grey soil with shell inclusions. A tight, but discontinuous band of fragmented shell at 20 cm [Layer 3].
30 – 70 cm	Fine, grey-brown silt with occasional sandstone cobbles.
70 – 100 cm	Fine, light grey soil with shell fragments [Layer 5].
100 – 100 cm	Sandstone cobbles mixed with shelly sand.
110 cm	Section ends on a sandstone cobble beach.
Point 8. 40 m South	
0 – 5 cm	Light grey topsoil.
5 – 15 cm	Fine, medium grey soil.
15 – 50 cm	Brown-grey sandy silt with shell inclusions.
50 – 100 cm	Fine, grey silt with occasional sandstone cobbles.
100 – 110 cm	Sandstone cobbles mixed with shelly sand.
110 cm	Section ends on a sandstone cobble beach.
Point 9. 45 m South	
0 –5 cm	Fine, medium to dark grey soil. No topsoil evident.
5 – 25 cm	Medium grey soil with crushed shell. [Layer 3].
25 – 100 cm	Brown silt with occasional sandstone cobbles.
100 cm	Sandstone cobbles in brown silt matrix.

Point 10. 50 m South	
0 – 5 cm	Light grey-brown topsoil.
5 – 15 cm	Fine, grey-brown soil [Layer 3b].
15 – 30 cm	Grey sandy soil with shell inclusions [Layer 3c].
30 – 65 cm	Brown silt with occasional sandstone cobbles.
65 – 100 cm	Sandstone cobbles in brown silt matrix.
Point 11. 55 m South	
0 – 25 cm	Fine, medium to dark grey soil. No topsoil evident.
25 – 35 cm	Brown sandy soil with crushed shell.
35 – 50 cm	Light brown silt.
50 – 100 cm	Sandstone cobbles and large boulders in brown silt matrix.
Beyond Point 11	From 60 m south to the head of the bay the top 12 – 20 cm is a mid to dark grey soil, probably as a result of gardening. At a depth of about 30 cm there are intermittent bands of crushed shell, much of which is likely to be natural.