Archaeology of the MacKays to Peka Peka Expressway

Volume 2: Technical and monitoring reports

Report to New Zealand Transport Agency and Heritage New Zealand Pouhere Taonga

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Contents

This is the second volume reporting on the archaeological programme of the MacKays to Peka Peka Expressway, constructed on the Kapiti Coast between 2013 and 2017.

The first volume details and analyses the archaeological work undertaken.

This second volume contains contextual reports associated with the project:

- The archaeological research strategy
- The report on the "high level" archaeological investigations undertaken by Southern Pacific Archaeological Research
- The report on the faunal analysis undertaken for the M2PP archaeological programme, authored by Yolanda Vogel
- A report on archaeological monitoring for construction of the Otaihanga Roundabout, authored by Mary O'Keeffe. This work was not part of the M2PP project, but was undertaken to facilitate traffic flows on the coast in association with M2PP.
- A report on work undertaken by Andy Dodd monitoring earthworks between the Waikanae River and Waimeha River, as part of the M2PP construction programme

Archaeological Research Strategy for the MacKays to Peka Peka Expressway Project

Chris Jacomb and Mary O'Keeffe

September 2012

Introduction

The New Zealand Transport Agency (NZTA) proposes to build an expressway on the Kapiti Coast, between MacKays Crossing, south of Raumati, and Peka Peka Rd, north of Waikanae. The M2PP Expressway will be a 16 km four-lane highway with an up to 100 m wide development footprint (**Error! Reference source not found.**). T he expressway itself will include berms and either integrated or separate cycleways and walkways (further construction detail available in project application to EPA Board of Enquiry: at http://www.nzta.govt.nz/projects/mackays-to-peka-peka-application/).

The alignment of the proposed expressway is shown in **Error! Reference source not found.**

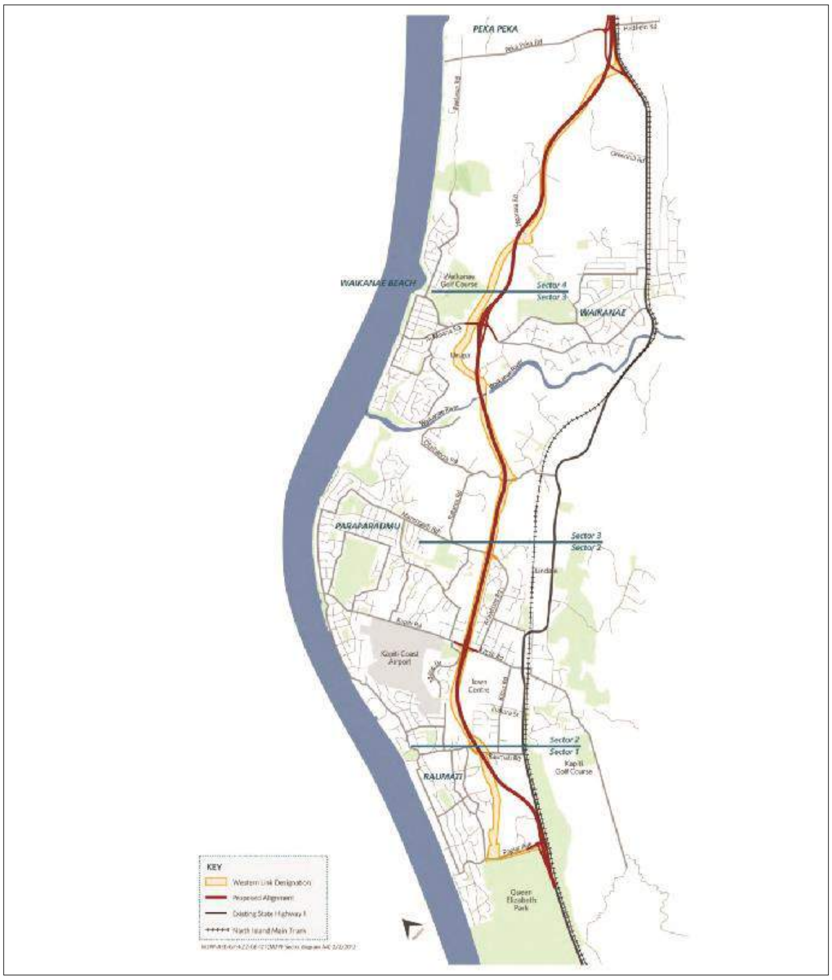

Figure 1: Kapiti Coast showing approximate alignment of proposed MacKays to Pekapeka Expressway (Expressway alignment shown in red, Western Link Designation shown in yellow).

Because road construction is likely to have a significant impact on the archaeology of the Kapiti coast, NZTA will apply to NZHPT for authorities to modify, damage or destroy archaeological sites. The range of site types affected is likely to be relatively small. Predictive modelling suggests that a significant number of sites could be affected with most being small shell middens, some with associated terraces and pits, the remainder being mainly ovens/hearths, burials and historic sites.

There are two times during the development work where archaeological sites may need to be dealt with:

1. prior to the construction phase where there will be investigation of archaeological sites that were discovered during the archaeological surveys and any additional sites found during intensive survey and trenching following vegetation clearance;
2. during the construction phase where new sites discovered during monitoring will be investigated.

Each of these requires a different approach. A set of mitigation recommendations has been supplied for the known sites (see assessments attached to authority applications). Mitigation for any new sites discovered during monitoring will be decided upon at the time of discovery after consultation between the project archaeologist, Te Ati Awa Ki Whakarongotai or the Takamore Trustees, and the New Zealand Historic Places Trust. At a minimum all sites encountered will be recorded, measured and sampled according to current archaeological practice. However, some sites discovered during construction may warrant more extensive investigations. The research strategy will be used to guide all archaeological work carried out under the s12 authorities.

Archaeological background

2.1. Archaeology of the Kapiti Coast

The archaeological background and context of the M2PP Project is described in documents already completed for the project, namely the overarching scoping report[1] and the sector assessments[2].

A summary is presented here for context.

Recording of archaeological sites on the Kapiti Coast has taken place for much of the 20th century, but observations commenced in the 19th century. Adkin is a key source of data, as he recorded sites and spoke with Maori in the early part of the 20th century.

[1] O'Keeffe, 2011
[2] O'Keeffe, 2012, a-f

Formal archaeological surveying and investigations have been fairly sporadic, and usually have been driven by development, so have been limited in scope and research outcomes.

A key project that has had significant outcome for the M2PP expressway was the proposed Western Link Road (WLR). This road alignment largely followed a corridor designated since the middle of the 20th century, and forms the basis of the proposed route of the M2PP expressway for most of its length. Archaeological investigations for the WLR include a survey of the route by O'Keeffe3, and specific investigations, including trenching undertaken by Jacomb and Walter4.

2.2. Key aspects of the archaeology of the Kapiti Coast

Full descriptions of the archaeology of the Kapiti Coast, include historic and contemporary recording and investigations, are contained in the archaeological scoping report.

Distinctive aspects of the archaeology of the Kapiti Coast contribute to the development of a research strategy and investigation methodology. These aspects are:

- The coastal lowlands of the Kapiti Coast are all shifting dune sands and intervening wetlands, which have important implications for site identification and survival.
- The dune sands mean sites are not usually visible
- The predominant site type is middens, followed by ovens
- Another reasonably common site type is burials;, mainly individual burials at the base of dunes, but also larger groups on dune tops
- Earthworks sites, that is, pits, terraces, platforms, do not feature as major site types. The reasons for this are a major research theme
- The subsistence economy of the coast appears to be based on kaimoana, mainly shellfish. Degree of exploitation of forest and wetland resources is another major research theme

The sites found in the district in the past allow some predictions to be made about the most likely types of site that might be encountered during the road construction.

[3] O'Keeffe, n.d

[4] Jacomb and Walter, 2008

There were 54 sites recorded within about a kilometre of the corridor before the current work (**Error! Reference source not found.**). Of these around eighty per cent a re shell middens, most of which are small, single species deposits. A small number of burials are recorded, although a number of further burials were exposed at a subdivision near Mazengarb Road. Two oven sites are recorded, although at least one of the sites recorded as a midden also contains an oven. There are also records of a stone wall, a hearth and a "village".

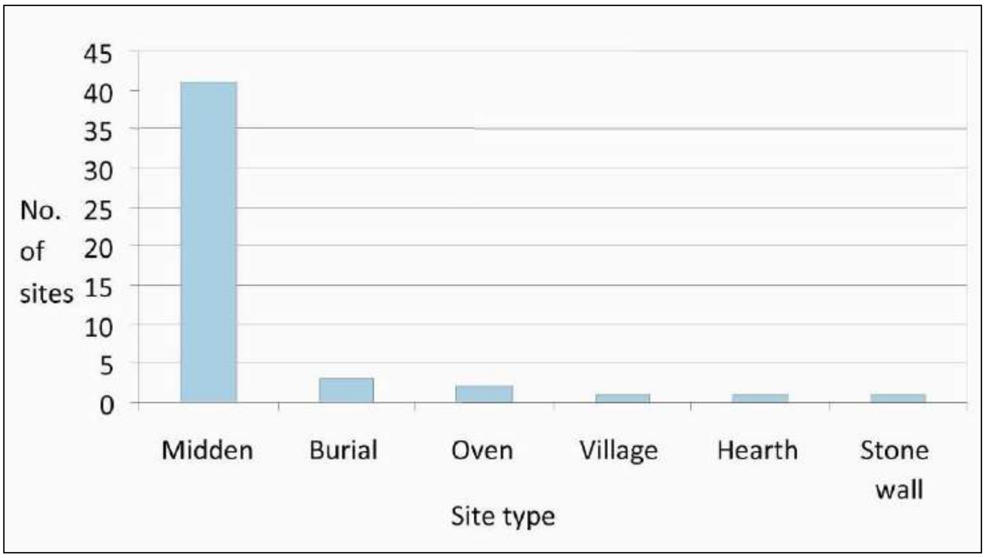

Figure 2: Previously recorded archaeological sites within 1 km of Expressway designation (from WLR study).

It is clear that the archaeological landscape is dominated by relatively small, single-species shell middens. However, recent work has shown that there may be more variety in the middens than a reading of the site record forms suggests. The excavation of a midden at Raumati yielded several fish species including kahawai (*Arripis trutta*), hoki (*Macruronus novaezelandiae*), red cod (*Pseudophycis bachus*) and flounder (*Rhombosolea* sp.), in an assemblage that, although dominated by tuatua, contained several other mollusc species including rocky shore species. Karen Greig (personal communication) has recently excavated a toheroa (*Paphies ventricosa*) midden with some fish bone at Waikanae and, near Pekapeka Road; Kiri Peterson (personal communication) has excavated a stratified midden with some fish bone. Indeed, monospecies middens have the potential to contribute significant information about prehistoric economy and environmental impact (e.g. Jacomb et al. 2010)

The archaeological survey carried out for the Western Link Road project resulted in a range of sites being identified that are generally larger and more complex than is the norm for the Kapiti Coast. It is clear that the archaeological landscape of the district is more varied and diverse than the impression given by the preponderance of small shell middens identified in the NZAA Site Recording Scheme. The ovens and hearths, burials, village site and so on suggest that a potentially wide range of archaeological data may be encountered during this project, which will allow many of the research questions in the following section to be investigated.

Research strategy

Research context

There has been little archaeological research carried out in the Kapiti Coast District that there is no existing research framework to use as a point of reference in developing a research design.

The Expressway (red line on **Error! Reference source not found.**) is a major project a nd one which has the potential to yield significant new archaeological information about the prehistory of the Kapiti Coast. Its construction will result in the destruction of a number of the district's archaeological sites; it is therefore vital that the maximum amount of information is salvaged from them before or during the road construction phase.

Several themes relevant to the Kapiti Coast region have been identified from which more specific questions could be developed in a targeted archaeological research programme. Because any mitigation work flowing out of the M2PP Expressway development will be restricted to the road corridor itself, the ability to develop such a programme is somewhat limited.

A series of local research themes have been developed which archaeological work for the M2PP expressway could contribute to answering or developing.

These are:

- What is the nature of middens along the coast, in terms of age and constituent species? Is there evidence for a suggested early and late dichotomy of middens?
- What is the spatial distribution of middens, by size and apparent function?

- Is there clear function of middens as postulated: localised scatterings, deposits from larger residential groups, and "factory floors"?
- Is there any difference in the nature of middens north or south of the river? If so, what are the implications of these differences?
- Is there variation in the nature of middens on the older and younger sand dunes? What can such variations tell us about the changing environment, and the changing lifestyles of the people on the coast?
- Is there any apparent difference in species present in middens over time? Can any conclusions on changing environments, and the causes of these changes, be made?
- What is the nature of the utilisation of the environment? Were all types of sand dunes in different areas used in the same way, seen in similar types of sites found on them?
- What was the nature of the subsistence economy of the people living on the coast? What was the range of food they were eating? How, and in what proportions, is this represented in the archaeological record?
- Did the reliance on a particular food source increase or decrease over time? What are the environmental implications of this?
- Is there evidence for earthworks sites south of the river? What does this evidence look like in the ground?
- What is the archaeological evidence for gardening? Is gardening more widespread through the area than the current state of evidence may suggest?
- Were people living in permanent villages, or seasonal resource gathering camps? What is the archaeological evidence for this?
- What geomorphological information is revealed by stratigraphic sections through the sand dunes? What evidence on the changing natural environment does such information present? What might be the causes of such changes?
- Is there different geomorphological history and sequences north and south of the river?
- Is there geomorphological evidence for seismic events? What does this look like? How can such information be used to guide current settlement and planning on the coast?
- What is the age and duration of occupation on the coast?
- How does the nature of the lifestyle on the Kāpiti Coast compare or contrast with similar other coastal environments, such as the Bay of Plenty?
- Can dates from archaeological deposits relative to dune stratigraphy be used to tighten geological sequences which can then improve relative dating of archaeological deposits elsewhere on the Kāpiti Coast?
- Is there archaeological evidence of warfare prominent in early nineteenth century historical accounts? What does this look like?
- Is there archaeological evidence of large scale migration and population displacement prominent in early nineteenth century historical accounts? What does this look like?

- Can the nature, extent and distribution of sites encountered as a result of earthworks from the construction of the MacKays to Peka Peka Expressway provide additional information relevant to a predictive model which can assist with the protection and preservation of archaeological sites elsewhere on the Kāpiti Coast?

An overarching theme that sits above all of these themes is the implications of all of this for the human populations of the Coast. How were people living? What was their nature and quality of life? Did this change over time, and if so, how and why?

In turn these local research themes have the potential to contribute to research themes or issues that have been identified by the authors as being important in a national and regional context. These are listed as follows:

- *Archaic Phase occupation in the region*

  Important Archaic phase sites are known to the north and to the south of the study area. On environmental grounds (presence of resources, climate, topography and hydrology) evidence of Archaic phase habitation would be expected along this stretch of coastline as well. Given the poverty of knowledge of adaptation it is important to fill in regional gaps such as this, and to test, for example, Adkin's (1948) claim for an early/late dichotomy in site type and distribution.

  This theme can probably not be developed much further at this point since Archaic deposits are very rare on the Kapiti coast and, in any case, tend to be focussed on coastlines and thus are unlikely to be present in the M2PP Expressway corridor.

- *Transport and exchange*

  The Kapiti Coast is known historically to be a critical region within Maori transport and exchange systems. Specifically, the Kapiti Coast was a major access point between the North and South Islands, with movement south of North Island stone, and movement north of South Island stone, especially greenstone.

  The role of the Kapiti Coast in this north-south movement, and its ability to contribute to a new model for changes in patterns and modes of lithic transport and exchange in New Zealand prehistory[5] is an important national theme.

- *Regional prehistory*

[5] Walter *et al*. 2004

The Kapiti Coast played a central role in major social and political dynamics of the early historic period, partly due to its strategic location as a corridor between major tribal areas and geographic. Using a settlement pattern approach supported by a rigorous dating programme the proposition that the broad patterns of social change characterised by the late period historical and oral accounts is an accurate model of Kapiti Coast social history over the longer period would be tested. The hypothesis that prehistoric settlement patterns on the Kapiti Coast were dominated by an extremely fluid movement of small groups who occasionally came together to form larger short-term aggregations would be tested. The larger settlements, such as the pa of the early nineteenth century, may all relate to specific events and the region may never have supported long-term stable settlements. This is an unusual and specific settlement pattern that relates to the unique dune-wetland environment combined with a strategically located offshore island.

- *Tribal change and political relationships in the historic period*

  The arrival of Europeans in New Zealand had dramatic effects on traditional Maori politics. We have a very good record of this in the form of historic documents and oral history from various parts of New Zealand, including the Bay of Islands, the Foveaux Strait, and the Kapiti Coast. But these records provide almost no information about the critical social, technological and economic changes that took place within the affected communities. Many of the key sites relating to this period of massive culture change are still preserved at Kapiti, and could provide a unique record of how life changed at the domestic and community level during this formative period of Maori and New Zealand history.

  Areal excavation methods would be used to provide information on the size and internal layout of settlements including, where possible, of household units. Spatial archaeology method and theory will be used to move from the spatial data to an understanding of the social unit. We are interested in testing the idea that changes brought on by wider political events on the Kapiti Coast were accompanied by changes in basic social and community organisation.

- *Patterns of settlement within the Kapiti District*

  Patterning in the distribution of archaeological sites and site types within a landscape can provide very useful insights into such areas of human behaviour as economy, ideology and socio-political organisation and may reflect kinship-based rules of residence and landscape use.

Historical and ethnographic accounts, plus some existing site data, suggest a very unusual environmental adaptation along the Kapiti and Horowhenua Coasts. We would test the idea that the pre-European Kapiti Coast was essentially a wetland environment and that the economic adaptation was focussed on wetland exploitation. This may have extended into the early historic era with intensive exploitation of flax. Whether this represents a deliberate settlement strategy or is an artefact of geomorphic processes obscuring sites in parts of the study area is a research question that may be able to be investigated during study.

- *Economic patterns and subsistence change within the Kapiti District*

The most common site type along the Kapiti Coast is the shell midden (**Error! Reference source not found.**). For the most part these are small and contain only a single species. Middens are the main sources of archaeological information about prehistoric economy and subsistence practice and the relatively high density of midden sites means that this will be one of the main areas of research focus during this project.

The archaeological data are strongest in the area of prehistoric economy and subsistence practice and it is in this area that we can expect to have the most success in answering specific research questions. The nature, distribution, size, content, chronology and function of middens will be primary focuses of the research. Differential use of the younger and older dunes will be helpful in determining a broad chronology, which will be refined where appropriate using AMS (accelerator mass spectrometry) and sclerochronology. This in turn should allow an improved understanding of the chronology of other sites in similarly aged dune systems elsewhere on the Kapiti and Horowhenua coasts.

Middens are important sources of information about environmental change over time. Some species fall out of the economy or become locally or nationally extinct (e.g., approximately 40 species of bird including the moa), while others can become more important. The midden sites should allow us to test hypotheses about subsistence patterns and economic and environmental change on several fronts.

- *The role of the Kapiti Coast in the prehistory, contact period and early European period history of New Zealand*

  The known archaeology of the Kapiti Coast paints an enigmatic picture of settlement – at least on the mainland. Before the Western Link Road archaeological survey there had been no large or complex sites recorded in the Site Recording Scheme, and yet there is a relatively high density of sites, especially in the vicinity of the Waikanae River estuary and further north. The density of sites – predominantly small middens – suggests that there was sustained use of the area by substantial numbers of people. The questions arise of what the attractors were to this district and what was its principal economic base.

  Drawing on the anthropology of globalisation and using a combination of ethnographic accounts, primary historical research and settlement pattern archaeology, we would test the hypothesis that there were fundamental changes in Maori settlement patterns in the early nineteenth century that relate specifically to Maori engagement in the new global economy. In particular, we would trace changes in settlement, political organisation and aspects of spatial patterning that relate to flax trade and early commercial activity in the Cook Strait (including whaling). We would also test the hypothesis that nineteenth century change in the Maori politics of the Kapiti Coast was related to the development of new Maori exchange and communication networks. This work will rely heavily on the development of a GIS framework for storage and analysis of archaeological and historical data.

- *Role of island bases in the political economics of historic Maori-European interaction*

  Several Maori leaders who were the most effective players in the politics of Maori-European interactions of the early nineteenth century operated from island bases which in turn were centrally located within both indigenous communication and expanding European trading systems. In the south, Tuhawaiki was the most powerful and influential political and economic leader of the early nineteenth century. He operated from a base on Ruapuke Island in Foveaux Strait. Te Rauparaha controlled commerce across Cook Strait from a base on Kapiti Island. Tuhawaiki was one of the only successful opponents of Te Rauparaha. Other island bases were strategically important at this time, including Mana Island which is near the Kapiti Coast. The role of offshore islands in indigenous political economics is something that has been widely investigated internationally and the New Zealand perspective is invaluable.

In areas of New Zealand where there was very early contact with Europeans, strategic economic bases were often developed on offshore islands. Such places were important not only in terms of trade systems, but also in relation to changing regional political systems and economic practices (the introduction of the potato and the changing role of mutton birding in both the North and South Islands for example). There is only a limited possibility of developing this theme given the restricted footprint of the M2PP Expressway project, however.

- *Cultural resource management*

  Finally, the knowledge gained from the current research will allow predictive models for site distribution, type and density to be refined for the district, thus contributing significantly to improved management of the archaeological resource in the wider Kapiti-Horowhenua region. Archaeological site management on the Kapiti Coast is challenging for a variety of reasons and the current work provides opportunities to improve an understanding of how local and national agencies can carry out their statutory and regulatory duties.

  The extent to which any of these themes can be investigated is contingent upon the nature of the archaeological data that are encountered during the investigation and monitoring phases.

On-site Investigations

The following sectors are identified by O'Keeffe (2011: 63), and each will be the subject of a separate archaeological authority application:

Sector 1	QE Park to Kapiti Road
Sector 2	Kapiti Road to Mazengarb Road
Sector 3	Mazengarb Road to Waikanae River
Sector 4	Waikanae River to Te Moana Road
Sector 5	Te Moana Road to Ngarara Road
Sector 6	Ngarara Road to Peka Peka Road

The archaeological work will be of two types – high level detailed investigations prior to the construction phase, and monitoring of earthworks during the construction phase. Different sectors require different types of archaeology, depending on the presence of recorded sites and the likelihood of further unrecorded sites, as determined by the scoping report's predictive model[6].

Sector	Type of archaeology
Sector 1	Monitoring
Sector 2	High level investigations Monitoring
Sector 3	High level investigations Monitoring
Sector 4	High level investigations Monitoring
Sector 5	High level investigations Monitoring
Sector 6	Monitoring

High level investigations methodology

Our proposed methodology involves intensive field survey following vegetation clearance of specific areas, machine trenching and hand excavation. Field survey involves the systematic inspection of the ground surface in areas that have not previously been visible. It will require the prior removal of vegetation (e.g., by mulching). Machine trenching involves the use of a 20 tonne hydraulic excavator with a 2 m cleaning bucket. The archaeologists direct and monitor the use of this equipment to remove soils in order to carefully expose underlying cultural layers. If such deposits are encountered they are then investigated by hand. Hand excavation involves a combination of trowel and spade work, with sampling of any deposits (such as shell midden) for later laboratory analysis. Measured drawings are made of all excavated surfaces (plans and sections), with keyed descriptions of different soil types and archaeological features. All finds (artefacts, lithic samples, and so on) are bagged and labelled after being recorded with a robotic electronic total station. SPAR uses an electronic recording system it has developed for labelling the bags and

[6] O'Keeffe, 2011: 65

simultaneously logging the bag information in a computer database. Analysis of all excavated material and samples is undertaken in the Otago Archaeological Laboratories (OAL) in the Department of Anthropology and Archaeology at the University of Otago. Samples of appropriate material are recovered from secure contexts such as hearths for radiocarbon dating. These are sent to an external agency for dating.

The project archaeologists have visited, or recorded, all of the sites known to be affected by the construction of the expressway and our methodology is based on a good understanding of the sites. We also have a strong awareness of the need for further detailed investigations of areas of potential risk within these sectors.

Sector 1 outcome archaeology

Since Sector 1 does not contain any recorded sites and the predictive model suggests that there is a relatively low likelihood that sites will be encountered there, a combination of an ADP and monitoring of earth moving will be employed in this sector to provide for any archaeological sites or material that may be present.

Sector 2 outcome archaeology

Sector 2 runs between Kapiti and Mazengarb Roads and passes through an environment that contains both wetland and high dunes.

A series of trenches will be excavated with a hydraulic excavator at intervals of 10-20 m along the length of the dune. This will require the use of two 20 tonne excavators and two archaeologists for five days. Any archaeological sites encountered during this work will be investigated by hand in accordance with accepted international practice.

Sector 3 outcome archaeology

Sector 3 runs between Mazengarb Road and the Waikanae River and passes through a zone of dunes interspersed with wetlands. There are several archaeological sites recorded in this sector, three of which (R26/369, 370 and 455) require archaeological investigation (note that R26/409, identified in O'Keeffe 2011, was recorded as destroyed during the expansion of the landfill according to its site record form, but the archaeologists will check that there is no residue of this site remaining in situ).

Each of these sites will be excavated by hand using a field crew of five people over a period of five days.

A systematic investigation of selected dune ridges and crests north of Otaihanga Road will be carried out. This will be achieved through the use of a hydraulic excavator and will require the use of two 20-tonne excavators and two archaeologists for four days who will employ a methodology similar to that described for Sector 2.

The residue of land not subject to high level investigations will be managed by monitoring during construction.

Sector 4 outcome archaeology

Sector 4 runs from the Waikanae River to Te Moana Road and passes close to the Maketu Tree, the Takamore Waahi Tapu Area and Tuku Rakau Village. It has been designed in such a way that it does not have a direct impact on the Maketu tree or Tuku Rakau Village, and a minimal impact on the registered wahi tapu area (it is noted the previous WLR route ran through the middle of the registered wahi tapu area). Previous investigations including geotech test pits, geophysical surveys, test trenching and systematic ground survey, indicate that intact archaeological deposits are relatively unlikely in this area, except, possibly, at the NE spur of the crescent-shaped ridge on which the Takamore Urupa is situated. In addition much of the ground of sector 4 has been substantially modified by trenching for the Kapuni gas pipeline and for market gardening. For these reasons it is proposed that the majority of Sector 4 be dealt with through monitoring except for the small section at the NE end of the crescent-shaped spur which will be investigated by systematic trenching prior to the construction phase.

Sector 5 outcome archaeology

Sector 5 runs between Te Moana Road and Ngarara Road and passes through a combination of drained wetland and high dunes. There are seven archaeological sites recorded in and around the high dunes and form part of an unusual site complex. The archaeological features here represent rare types on the Kapiti Coast and require detailed archaeological investigation.

Each of the identified sites will be excavated by hand using a field crew of five people over a period of seventeen days.

A systematic investigation of the dunes will also be carried out. This will require the removal of vegetation which will be followed by an intensive archaeological survey by a team of four archaeologists. This will be followed by systematic trenching using two 20-tonne excavators over four days monitored by two archaeologists.

Sector 6 outcome archaeology

Sector 6 runs from Ngarara Road to Peka Peka Road and passes through high rolling dunes, low dunes and drained wetlands. There are six archaeological sites recorded in or near the road boundary but they have not been identified for pre-construction archaeological investigation. In this sector only an investigation of the high dunes immediately adjacent to Ngarara Road is required. The residue of land will be managed by monitoring.

The investigation of the dunes will be achieved through an intensive archaeological survey on foot carried out by three archaeologists following vegetation clearance for one day. The survey will be supplemented by trenching with a hydraulic excavator that will be monitored by two archaeologists over three days.

Koiwi

A specific protocol will be written to manage the possibility of koiwi being revealed during archaeological investigations, or at any time during the expressway construction programme. Such a protocol will be contributed to, and agreed to, by Te Ati Awa ki Whakarongotai and the Takamore Trustees.

The protocol will include agreed procedures for:

- Notification of discovery;
- Designated people with responsibility for decision making;
- Appropriate protocols for handling of koiwi;
- Agreed procedures for on-site ceremonies;
- Agreed research outcomes such as the possibility of C14 or DNA analysis;
- Agreed protocols for reinterment.

This protocol will also be included in archaeological management plans that are likely to be written for the M2PP project.

Analysis

All excavated archaeological material will be returned to the Otago Archaeology Laboratories (OAL) in the Department of Anthropology and Archaeology at the University of Otago for analysis.

Faunal samples will be washed, sorted according to class, and then identified to element and the lowest possible taxonomic level using the large reference collections in the OAL.

All artefacts will be notified to the Ministry of Culture and Heritage as required by the *Protected Objects Act* 1975. They will be photographed and all metric attributes will be recorded in accordance with international practice. All stone flake material will be measured and weighed and analysed for use-wear in accordance with protocols that we have established here at the University. Lithic material suitable for potential sourcing studies (such as obsidian) will be analysed through the use of a non-destructive portable x-ray fluorescence machine.

Charcoal recovered during the excavations will be washed and sent to an external expert for identification. Samples suitable for radiocarbon dating will be retrieved. At least three radiocarbon samples will be obtained for each excavated site as appropriate. If suitable charcoal is obtained this will be used but marine shell samples will also be collected.

A palynologist will be consulted about the possibility of taking pollen cores. The suitability of specific environments along the M2PP expressway route and the possibility of yielding useful pollen data will be confirmed. If deemed suitable, a number of pollen cores will be taken and analysed.

Further specialist laboratory analysis may be required but this is dependent on the type of archaeological material that is recovered. We have access to an ancient DNA laboratory within the department and can outsource other analysis such as pollen and microfossil analysis as required.

Research methodology

The actual research methodology will be determined on the basis of the archaeological data recovered and, by extension, which of the questions above can be developed into a full research programme. Whatever the outcome of this is, any archaeological research on the Kapiti Coast should involve the following methods of investigation:

- Documentary research of historical records including Maori Land Court minutes, survey plans and field books, and archives
- Analysis of previous work in the district including historical works, archaeological excavations and relevant studies of the local environment
- Study of public and private artefact collections from the study area
- Detailed mapping of individual sites as relevant using an electronic total station and differential GPS
- Subsurface investigation by hand of all sites directly affected by the project that have the potential to yield information about New Zealand’s past

- Sampling, measuring and recording of all remaining archaeological deposits encountered in line with current international practice

Laboratory analysis of excavated material should include identification of faunal remains using the faunal reference collections at the (OAL), identification of plant fossils including pollen from sedimentary cores, artefact studies, and radiocarbon dating. A large number of radiocarbon dates will be required to allow a meaningful chronology of settlement in Kapiti District as represented by the sites in the Expressway design footprint to be developed (minimum number of dates anticipated is 25).

Curation of Archaeological Material

All archaeological material recovered from the sites will be retained or discarded according to a protocol that will be developed at the completion of the field work in consultation with the nearest appropriate repository and with local iwi. The most likely repository is Te Papa Tongarewa but it may be that the outcome of this consultation is that the material is deposited in a closer museum. Such arrangements will be constrained to some extent by the provisions of the Protected Objects Act whereby Maori artefacts are the property of the Crown until determined otherwise and historic artefacts are the property of the land owner.

Reporting

The following reports and other deliverables are proposed:

1. Brief interim report within 20 working days of the completion of the pre-construction archaeological investigations in each sector. This will inform the NZHPT that the field work has been completed and will include a general summary of material and features encountered and recovered.
2. Brief interim reports within 20 working days of the completion of the construction-phase monitoring in each sector. This will inform the NZHPT of the completion of the construction-phase monitoring and of the completion of any investigations of sites encountered during the construction phase.
3. Preliminary final reports within 12 months of the completion of the pre-construction archaeological investigations in each sector. This will include plans and section drawings; inventories of material recovered, and so on, but may not include all analyses or detailed discussions and conclusions.

4. Preliminary final reports within 12 months of the completion of the construction-phase monitoring and of the completion of any investigations of sites encountered during the construction phase. This will include plans and section drawings; inventories of material recovered, and so on, but may not include all analyses or detailed discussions and conclusions.
5. A final overarching report that combines all of the results of the work in a single volume, within 2 years of the completion of the archaeological work on the entire project.
6. A presentation to local iwi on the outcomes of the archaeological work.
7. A presentation to the local community on the outcomes of the archaeological work.
8. At least one publication on the results of the research to be submitted to a peer-reviewed international journal.

Personnel

The high level investigations field work will be directed by Chris Jacomb and Richard Walter, directors of Southern Pacific Archaeological Research, Department of Anthropology and Archaeology, University of Otago. The SPAR site manager will be Emma Brooks, and the field crew will be drawn from a combination of recent graduates and people currently working at an appropriate level in New Zealand archaeology. Emma will also manage the analysis of faunal samples collected during the investigations. Outside consultants will be used where appropriate (e.g. Rod Wallace, University of Auckland, for charcoal identification, Janet Wilmshurst, Landcare, Christchurch, for palynology and microfossil analysis, Morten Allentoft, Centre for Geogenetics, Copenhagen, for ancient DNA). Mary O'Keeffe will contribute as required.

Mary O'Keeffe will undertake monitoring during the construction phase, with assistance from locally based archaeologists as required. Any excavations of sites discovered during the monitoring phase that require a larger team will be carried out with the involvement of SPAR.

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Final report on pre-construction archaeological investigations, MacKays to Peka Peka Expressway, Kapiti Coast

Prepared for

M2PP Alliance and Heritage New Zealand By

Southern Pacific Archaeological Research

April 2016

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

This report was prepared by Emma Brooks, Chris Jacomb and Richard Walter. This report was reviewed by Karen Greig (April 2016).

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1 INTRODUCTION

The MacKays to Peka Peka Expressway (M2PP) is an 18 km long four-lane expressway between Raumati and Peka Peka Road on the Kapiti Coast (Figure 1). The expressway follows a route that is on land in the coastal dune belt that had been designated for several decades and as such had remained largely unmodified by residential development. The likelihood of encountering archaeological sites along the expressway was therefore extremely high and an archaeological programme was developed to generate archaeological information to mitigate the loss of these sites as a result of the road construction.

The archaeological fieldwork associated with the construction of the M2PP Expressway was done in two phases during May and September 2013, involving high- level investigations carried out in advance of construction, followed by monitoring of earthworks during construction. Southern Pacific Archaeological Research (SPAR) was engaged by the M2PP Alliance to undertake the detailed archaeological investigations and Mary O'Keeffe was engaged separately to carry out the monitoring of the construction earthworks.

Figure 1. Overview of M2PP route (http://www.nzta.govt.nz/projects/wellington-northern- corridor/mackays-to-peka-peka/).

Separate archaeological authorities were issued for the high-level investigations in each sector of expressway construction that required such investigations (Figure 2):

Sector 2 Kapiti Rd-Mazengarb Rd Authority No. 2013/222

Sector 3 Mazengarb Rd-Waikanae River Authority No. 2013/385

Sector 4 Waikanae River-Te Moana Rd Authority No. 2013/639

Sector 5 Te Moana Rd-Ngarara Rd Authority No. 2013/60

Sector 6 Ngarara Rd-Peka Peka Rd Authority No. 2013/381

The pre-construction work involved both the excavation of trenches (in areas where predictive modelling suggested that there was some likelihood of finding new sites) and the investigation of previously recorded sites.

The purpose of the archaeological investigation was to undertake a comprehensive study of the archaeological landscape ahead of earthworks for the road construction.

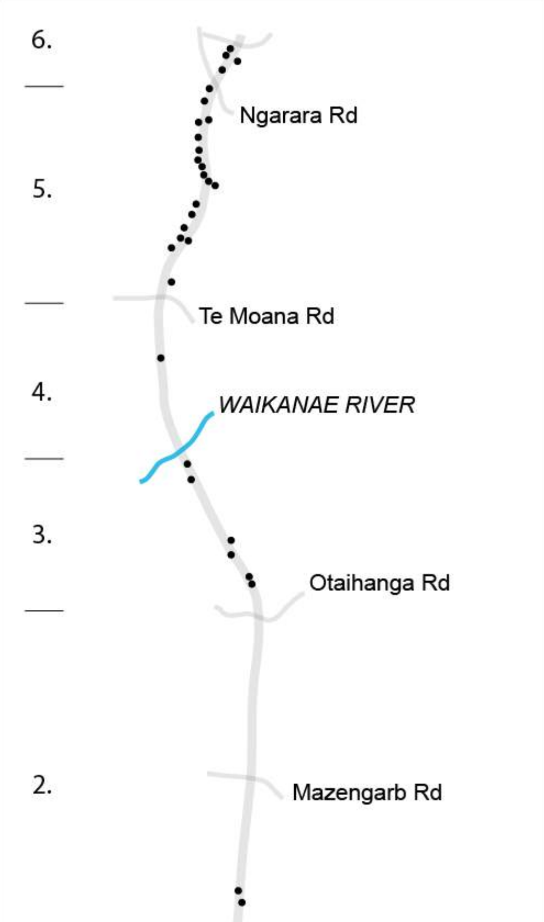

Figure 2. Overview of the M2PP Expressway between Kapiti Road and Ngarara Road showing the sectors described in this report. The black dots show the locations of archaeological sites that were investigated during this project.

Previous archaeological work on the Kapiti Coast has largely been ad hoc and focused on small zones during subdivision development. The M2PP Expressway provided the rare opportunity to carry out research in a relatively intact landscape over a length of 18 km. Cultural monitors Danny and Les Mullens of Te Atiawa ki Whakarongotai were present during all investigations. The work was carried out under a research strategy approved by Heritage New Zealand (HNZ).

This report presents the results of the archaeological investigations. It begins with a description of the physical setting followed by a synopsis of the known history of the area and the archaeological record. The results of the investigations are presented by Sector where each site is described and the results of the faunal analysis are provided. We then interpret the results of the investigations in terms of fauna, material culture, chronology and palaeoenvironment.

This report does not include any data from the archaeological monitoring phase during construction. Information from the two different aspects of the project will be combined into a single final report at the completion of all of the archaeological work for the M2PP Expressway project.

2 PHYSICAL SETTING

The M2PP Expressway runs through the dune belt of the Kapiti Coast between Raumati and Peka Peka. This is an extensive belt that runs for some 65 km between Paekakariki and the Manawatu River. The following description of the dunes is drawn from McFadgen's (1997) review of the archaeology of the Kapiti Coast.

There are four main phases of dune building that have been identified along the coast. The dunes derive from riverine sand that was blown inland by the prevailing northwesterly winds. The oldest are the Foxton dunes which form the innermost belt. These began accumulating approximately 65oo BP. There is variation between north and south in terms of the subsequent dune building periods. However, the dunes from the four main phases are as follows:

1 Foxton – began forming about 6500 BP.

2 Motuiti – these have a high content of Taupo Pumice lapilli indicating that they were accumulating at the time of the Taupo Pumice Eruption ca. 1720 BP. By 900 BP they were advancing over the Foxton dunes.

3 Older Waitarere – these dunes were advancing inland over the Moutiti dunes by about 400 BP.

4 Younger Waitarere – these are very recent, post-European settlement in age.

The dune sequence around Waikanae, however, is not particularly clear (Figure 3). The main dune dates to the Taupo Pumice Eruption but it is not easy to distinguish between the Motuiti and Older Waitarere dunes here. McFadgen (1997: 8) suggests that Older Waiterere sand overlies the Motuiti dunce sands and shell middens just north of the Waikanae River but that there are also middens on top of this sand. Further south towards Paekakariki, Old Waitarere dunes overlie Foxton dunes and there are shell middens between these two dune sequences. He believes that the dune building phases should be distinguished by a build-up of topsoil prior to the deposition of the subsequent dune development phase.

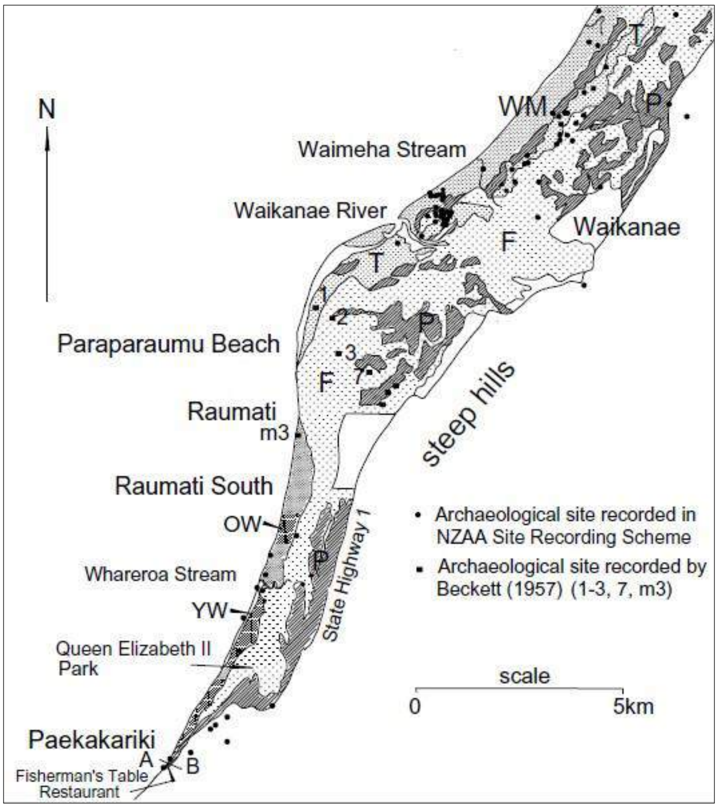

Figure 3. Sketch map of southern end of dune belt showing five deposits of windblown sand: YW = Younger Waitarere, OW = Older Waitarere, WM = Waitarere/Motuiti (not separately distinguished), T = Taupo, F = Foxton, P = peat swamp (McFadgen 1997: fig. 3).

One of the aims of the research programme was to investigate the relationship between geomorphology and the location of archaeological sites and whether the dune sequence could be used to refine the dating of sites.

What is missing from the landscape today are the many swamps and lagoons that would have previously been interspersed among the dunes. Many of these have been infilled or drained as a result of farming activities and residential development. Carkeek (1966) gives the names of some of the larger swamps north of the Waikanae River and he provides an indication of just how extensive some of the wetland systems may have been (Figure 4). These wetlands would have played an important role in the early human history of the area for transportation, food gathering and also the collection of materials for weaving and other activities.

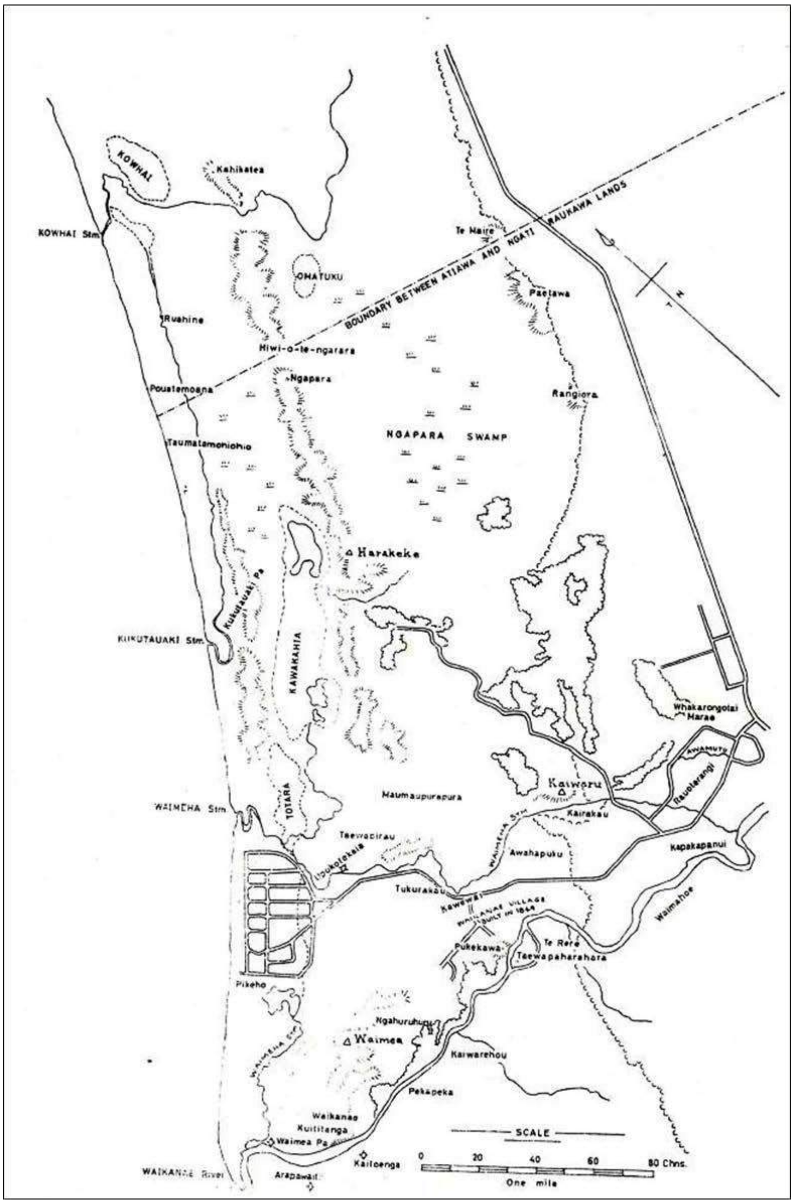

Figure 4. Map of place names including swamps and waterways in the late nineteenth and early twentieth centuries between the Waikanae River and Kowhai Stream (Carkeek 1966: Map 4).

3 THE HISTORICAL RECORD

It is unrealistic to expect patterns of long-term historical land use to conform in any meaningful way to arbitrary modern land divisions such as a road corridor or even a local authority district. Yet these long-term histories affect the way in which modern iwi think about and value the smaller, discrete land units over which they exercise a mana whenua role. For this reason it is important to understand the broad sweep of Maori history within the wider region.

Some sort of division based on chronology or key events is useful and the distinction between "prehistory" and "history" is sometimes used where the former term refers to the period before writing and the latter to the period for which written accounts are available. In New Zealand, prehistory is deemed to end in the 1790s from which time the European and Maori worlds were increasingly intertwined and the written record becomes a major source of information. We know of prehistory from two sources: from the archaeological record and from Maori oral histories which, since the 1860s and earlier in many places, are often recorded in written accounts. But the division between prehistory and history is not sharp in New Zealand and nowhere is this clearer than the Kapiti Coast. The major and best understood political events on the Kapiti Coast are those associated with the movements of Ngati Toa and allies from the north. These Maori historical events are associated with the complex playing out of traditional indigenous political, social, ideological and economic processes in a distinctly Maori world. Yet it would be misleading to deny any European agency in this. The arrival of missions, muskets and potatoes in the north certainly helped precipitate events to the south, and the history of the Kapiti region at a smaller scale documents both the dynamic, inter-connectedness of Maori tribal politics, and the robust manner in which the traditional world of the Maori incorporated and dealt with new political and economic realities arising from European arrival.

This section begins with an overview of the historical sources consulted during the project. An historical summary is then presented in three parts. These parts reflect historical patterns but are determined in the first instance by the nature of the primary sources of information available.

There is considerable overlap between the sections, which reflects the complexity of the history of the region.

1. Maori tribal movements and political history to the mid-nineteenth century
2. Land transactions of the mid to late nineteenth century
3. Colonial history to c 1900

The section concludes with a summary of survey maps and plans utilised to investigate the historical patterns of land use in the study area.

3.1 Historical sources

The most useful summary resources about the Maori history of the region are the District 12 Report to the Waitangi Tribunal in the Rangahaua Whanui series (Anderson and Pickens 1996) and the evidence prepared by Bruce Stirling for the New Zealand Historic Places Trust in relation to the Takamore hearings over the proposed Western Link Road. The former work is one of a series of historical surveys commissioned by the Waitangi Tribunal in order to advance claim inquiries. The reports are comprehensive, drawing on all the major known resources, and they go through a rigorous refereeing and feedback process. Their scope is broad so they do not deal with the minutiae of historical events, although they do provide a good historical overview of movements and political interactions amongst iwi in the context of the land. The latter report is much more directly focused on the land in Sector 4, specifically the use of the Takamore Wahi Tapu Area.

Stirling's evidence does not include the archaeological record in any depth.

Ethnographic sources pertaining to the Kapiti Coast include Elsdon Best (1917, 1918a, b, c), Percy Smith (1910) and Shand (1892). Works on Te Rauparaha such as Buick (1976), Burns (1980), Butler (1980) and Travers (1975) contain good accounts of the movements of Ngati Toa and their allies into the Kapiti Coast and their subsequent activities there. Unfortunately, the upheavals of the 1820s to 1840s have had the effect of obscuring, to some extent, the previous Maori history of the region. Several works contain material on this period including McEwen (1986) and Ballara (1990, 1991). Carkeek (1966) contains an excellent overview of the Maori history of the Kapiti Coast which draws extensively on published and unpublished documents, especially Maori Land Court (MLC) documents, plus oral accounts from key informants.

In addition to the works listed above, there is a large corpus of unpublished reports, letters and journals which are relevant to an understanding of the Maori history of the Kapiti Coast and the best entry to these sources is via the bibliographies in the above works.

Because of the quality of the documentary resources available it is necessary to treat the history of iwi movements in the Kapiti Coast and environs in relation to the Ngati Toa migration of the 1820s. The pre-migration history, despite its longer time depth, is simply not as well documented.

There are good general accounts of the historical period of European settlement on the Kapiti Coast, including Carkeek (1966) and McLean (1999).

3.2 Maori tribal movements

Among the earliest inhabitants of this part of the island, and ancestral to most of the groups encountered by the northern migrants of the ninenteenth century, were the descendants of the great Polynesian navigator, Whatonga. Whatonga was a son or grandson of Toi. Whatonga had a son, Tara, to his wife Hotuwaipara who was taken with his father from their base in the Hawkes Bay to explore the southern parts of the North Island. Tara settled somewhere in the Wellington region where the harbour took his name – Te Whanga-nui-a-Tara (the great harbour of Tara). Tara was the eponymous ancestor of the Ngai Tara people and Ngai Tara spread around the shores of the harbour, to the Hutt and north to about the area of Pukerua Bay.

Meanwhile Whatonga established his other son Tautoki (to his wife Reretua) in the Paekakariki area and set out a boundary for the descendants of Tautoki. According to Carkeek's informants (Carkeek 1966:2) this boundary extended from the southern tip of Kapiti Island, across the mainland to the east coast. It was known as "Te Waewae Kapiti o Tara raua ko Rangitane". This is because Tautoki's people were known by the name of his son – Rangitane.

In the Wellington region Ngai Tara were joined by Ngati Ira from the East Coast and they seem to have remained closely interconnected. The situation before the arrival of Te Rauparaha can be loosely summarised as Ngai Tara and Ngati Ira occupying the area from

Te Whanga-nui-a-Tara to Wainui and Paekakariki with Rangitane territory lying to the north. Later Muaupoko became dominant in the northern parts of the coast, and especially in the Lake Horowhenua district. They were one of the main groups encountered by Ngati Toa during their migrations, and during the battles that established them as part of the dominant iwi alliance on the Kapiti Coast.

The origin of Muaupoko is complex. According to their web site (http://www.muaupoko.iwi.nz) Muaupoko "…are also called Ngai Tara after their eponymous (naming) ancestor Tara". But Carkeek's informants (Carkeek 1966: 4) refers to them as a sub-tribe of Rangitane. Indeed, this is not entirely contradictory as both groups are descendants of Whatonga with close and longstanding kinship links (Ballara 1991). According to Ballara (1991) Tara's descendants took on the name of Rangitane in the Wairarapa and became assimilated as Ngati Ira in the Te Whanga-nui- a-Tara region.

Muaupoko, with a number of sub-tribes, were in occupation of the area from at least Otaki to Paekakariki at the beginning of the nineteenth century. Their first encounter with Ngati Toa was probably in 1819 when Ngati Toa, including Te Rauparaha and Te Rangihaeata, took part in a raiding party that was mainly of Nga Puhi (with Waka Nene and Patuone) and Te Roroa (with Tuwhare and Te Rore). This party came into conflict with Muaupoko at Lake Horowhenua and elsewhere in the district. They also came into conflict with Ngati Apa, a group which was focussed in the Rangitikei area although with settlements at least as far south as Te Whanga-nui-a-Tara. It was during this expedition that Rangihaeata took a Ngati Apa wife, Pikanga, who may have been captured by Rangihaeata during a raid. This marriage and the resulting ceremonies at Awamate Pa served to cement peace between Ngati Toa and Ngati Apa, although that peace did not last very long.

The main migration of Ngati Toa and allies south continued over a period of years in the early 1820s. The reason for the southward movement of Ngati Toa out of Kawhia had to do with wider national politics: shifts of power and changing alliances that in turn, may have been influenced by European activity in the far north. The specific events that took Ngati Toa south were increasingly dangerous encounters with the Waikato tribes including those led by the powerful leader Te Wherowhero.

As Ngati Toa moved through Taranaki they were joined by various allies including groups of Te Ati Awa. They encountered Ngati Apa, probably around the Foxton area, but the peace, established through the marriage of Te Rangihaeata and Pikanga, seems to have held. Ngati Apa gave Ngati Toa a cautious welcome but, allied with Muaupoko and Rangitane, they did instruct Ngati Toa to avoid precipitating any conflicts with these groups as they moved to the south.

Whatever Ngati Toa intentions were, it did not take long before conflict broke out between Ngati Toa and Muaupoko. In a series of attacks by Te Rauparaha's forces the main body of Muaupoko were scattered, but they remained active and influential in the region for years to come. By 1822 Ngati Toa, with Te Ati Awa allies, were well established in the region, but were still engaging with Ngati Apa, Muaupoko and other groups who were threatened by their expansion. While Te Ruaparaha was engaged in actions in the Horowhenua district one of the Ngati Toa chiefs, Te Pehi Kupe, led a successful raid on Kapiti Island. Soon a large body of Ngati Toa and new arrivals shifted to the island where they were better able to defend and consolidate their forces. But the capture of the island in itself, did not seriously enhance the safety and security of Ngati Toa. For one thing, Kapiti was a major prize not to be relinquished lightly. It was also necessary for Ngati Toa to leave the security of the island to pursue their subsistence activities on the mainland. The political situation came to a head in 1824 when a force including members of Ngati Ruanui, Whanganui, Ngati Apa, Muaupoko, Ngati Ira, Ngati Kahungunu, and Ngati Kuia attempted to regain control over Kapiti Island. The battle was close but the defenders, who included a number of Ngati Toa allies and sub-tribes, were successful and this had the effect of establishing Ngati Toa dominance along the Kapiti Coast and into northern Cook Strait. Ngati Toa appear to count this battle (known as Waiorua) as establishing their formal authority over the area and claim that it was this success that precipitated the major migrations of their allies to the Kapiti Coast, including Te Ati Awa, Ngati Raukawa and Ngati Tama, in the north. Follow-up raids were directed against the defeated groups including the first Ngati Toa incursions into the south Island in pursuit of Rangitane.

While it is true that after the battle of Waiorua more groups moved in from the north, the exact political relationships between these groups and Te Rauparaha's people is complex. Some arrived as allies of Ngati Toa and cite their involvement in Waiorua as enabling their acquisition of land and rights in the Kapiti area. Indeed in some cases Te Rauparaha allocated land and defined boundaries himself. But other groups migrating into the area, including large numbers of Te Ati Awa emphasise their independence from Te Rauparaha. But whether Te Rauparaha and Ngati Toa were actively engaged in encouraging migration from Taranaki, they certainly welcomed the new arrivals as allies in the still volatile region.

From 1825 large numbers of Ngati Raukawa arrived in the Kapiti, Manawatu and Horowhenua regions. This, and attempts by other groups to claim land, put a great deal of pressure on the region and increasingly conflicts broke out between the newly arrived peoples. Later the complexity of arrivals, displacements and battles of this period dominated Land Court proceedings. The most serious of these conflicts took place between Te Ati Awa and Raukawa.

This resulted in the battle of Haowhenua at Otaki in which Te Rauparaha was involved; on the side of Raukawa (because of the strong kinship connections through his mother Parekohatu).

A series of skirmishes arose around the Otaki region over competing claims to garden land. Te Ati Awa reacted by bringing a party up to Otaki from Waikanae and besieging Ngati Raukawa, with Te Rauparaha, in their pa; probably Rangiuru. Waikato tribes became involved at the bidding of Te Rauparaha and Te Ati Awa forces withdrew to Pakakutu Pa to the north. Fighting continued with heavy losses until Te Ati Awa withdrew to their important pa of Haowhenua south of the Otaki River. Significant forces were rallied to besiege Haowhenua pa, including sections of Ngati Toa.

The first attacks were not successful so the attention of the attacking forces was turned south, to the Te Ati Awa pa of Kenakena at the mouth of the Waikanae River. There is some confusion about the actual outcome of the battle of Haowhenua and subsequent events, but Te Ati Awa see this as a battle, along with Te Kuititanga in 1839, that helped establish their independent mana on the coast. In both these events Te Ati Awa were opposed to forces aligned with Te Rauparaha.

After these battles Te Ati Awa and Ngati Raukawa established the border of their territories at the Kukutauaki Stream.

3.3 Colonial history to 1900

European settlement began in the 1820s with the arrival of whalers and the visitations of flax trading ships (Prickett 2002). A number of whaling stations were established on Kapiti Island and at around 1840 at least 80 Europeans were living there, although with the signing of the Treaty of Waitangi and a flu epidemic scare most Maori had abandoned the island by then for the mainland. The whaling industry boomed through the early to mid-1830s then declined dramatically with serious over-exploitation of the Cook Strait stocks. Although whaling continued into the early 1840s many of the whalers, with their Maori wives, left to establish such businesses as inns and accommodation houses at Paekakariki, Waikanae and elsewhere along the increasingly important route between Wellington and Wanganui.

In 1839, the first formal European land purchase was signed. This was the “Kapiti Deed” and it was not without problems. On 16 October 1839, Lieutenant-Colonel William Wakefield arrived at Kapiti on board the New Zealand Company ship, the *Tory* (Heaphy 1879). A Deed of Purchase was signed at Kenakena Pa, with signatories consisting of Te Rauparaha, eight Ngati Toa chiefs and members of the New Zealand Land Company. Guns, blankets and other goods were exchanged. The Kapiti deed was signed with the intention of acquiring considerable land between Taranaki and the Kapiti coast. The extent of land that was sold would later become a matter of dispute when Te Rauparaha insisted that he had only agreed to selling areas of land at Whakatu and Te Taitapu in Nelson and Golden Bay, not the Kapiti Coast. This would certainly be consistent with the fact that at the time of signing, Ngati Toa had only recently and at considerable cost, taken possession of the districts of Waiorua and Kapiti. To pass the land on at this point would be economically questionable, and might also be seen as insulting to the memory of the dead warriors who fought and died establishing Ngati Toa mana.

Following the land purchases in Te Whanga-nui a Tara by the New Zealand Company, the British Crown became concerned about the methods of purchase employed by Colonel Wakefield. They established an enquiry under the Land Claims Ordinance Act (1841). Commissioner William Spain was instructed to oversee the enquiry which became known as the Spain Commission. The purpose of the Spain Commission was to investigate the purchase of land in the Wellington region. William Spain reported that certain transactions of the New Zealand Company, including the Port Nicholson Purchase and those on the Kapiti Coast, had no legal effect due to the non-payment of purchase monies to the original land owners. In 1843 the Commission suggested a process of arbitration and mediation, and certain compensation payments were made as a result.

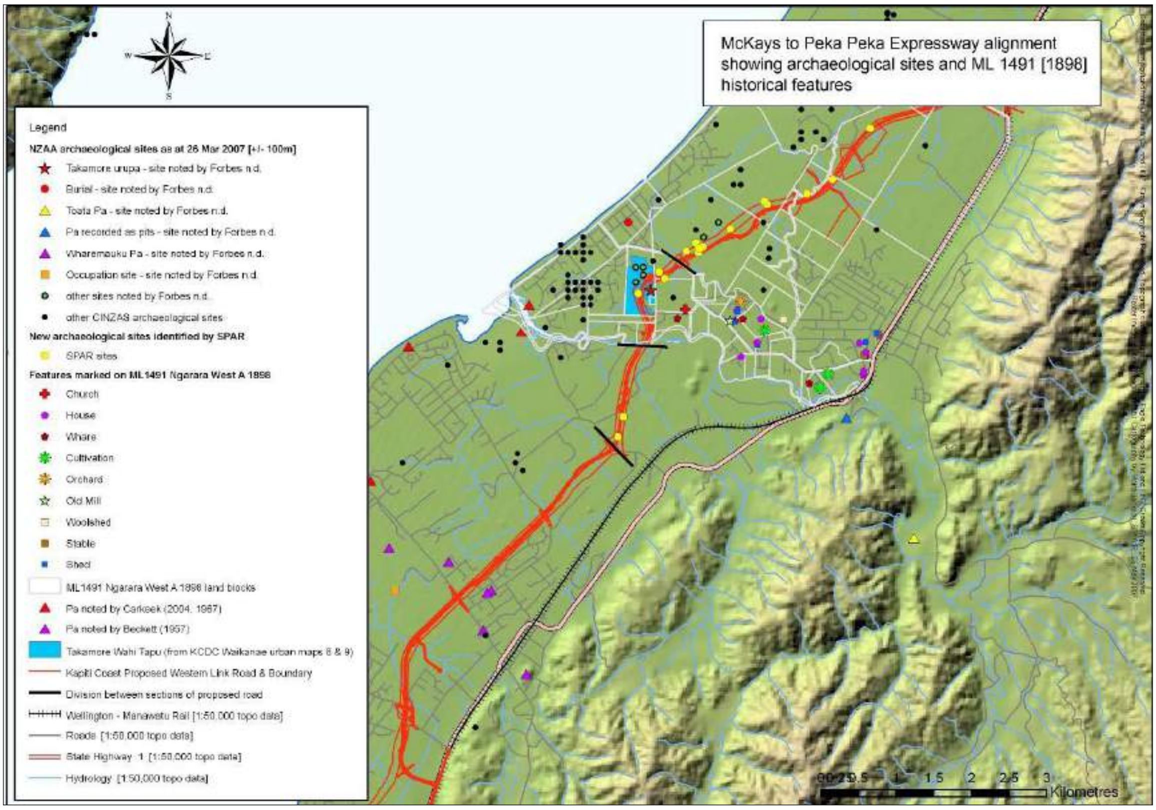

Figure 5. M2PP Expressway showing archaeological sites and ML 1491 (1898) historical features prior to the commencement of the archaeological work.

In the same year that the Kapiti Deed was signed, Te Rauparaha's son Tamihana and nephew, Matene Te Whi Whi travelled to the Bay of Plenty seeking a missionary for the Kapiti area.

Reverend Octavious Hadfield was the first missionary to be ordained in New Zealand, and on their request, he arrived on the Kapiti Coast on 7 November. With the assistance of Te Rauparaha, Hadfield built two churches, one at Kenakena in 1843 and one at Otaki in 1844. The Pa and Church at Kenakena were destroyed in an earthquake in 1848 (Grapes 2001).

During the 1840s the settlements at Wanganui and Wellington grew and coastal links were established resulting in increasing overland travel between these centres. In 1842 an overland mail service between Wellington and Wanganui was opened and European influence in the area increased. In 1846 the Kapiti Coast became involved in disputes over land sales. An attack on European troops had occurred at Almon Boulcott's farm in the Hutt Valley as part of the Maori resistance to settlement and land claims in the Hutt and Porirua area (Murray 2006). Following this, George Grey, then governor of New Zealand, decided to silence and arrest Te Rauparaha. He ordered the ship *Driver* to sail past Te Rauparaha's pa in Plimmerton to give the impression that it was travelling north to Wanganui. In the early hours of July 23 1846, the ship returned unannounced with 200 soldiers. Te Rauparaha and several Ngati Toa leaders were arrested (Burns 1980: 239–243, Oliver 2002). Te Rauparaha was illegally detained without trial for 18 months, some of which time was spent on a prison ship moored off the Kapiti Coast in order to demonstrate Grey's power to the people of Kapiti. Te Rauparaha was finally allowed to return to Otaki in 1848. At about the same time as Te Rauparaha's release many Te Ati Awa returned en masse to their ancestral lands to the north travelling both by land and sea (McLean 1999: 153). This was the last stage of a gradual migration back to Taranaki that had commenced towards the end of the 1830s. By the early 1850s the main pa at the Waikanae River mouth was all but abandoned and in

1854 the Reverend Richard Taylor reported the Kenakena settlement including Hadfield's church was in a highly deteriorated condition (Taylor cited in McLean 1999: 153).

During the time of Te Rauparaha's imprisonment, large areas of Maori land were negotiated over and purchased. Police were stationed at Waikanae (Major Durie) and Paekakariki Hill road was constructed by troops. After the brief period of unrest associated with the land disputes in the Hutt Valley and Te Rauparaha's arrest, European encroachment into the Kapiti Coast continued. From the 1850s through to the 1880s farming increased with new arrivals of European farmers as well as an expansion of Maori farming and other commercial activity. Railway land was purchased and a link between Wellington and the Manawatu was opened in 1886.

3.4 Maori Land Court transactions

The Native Land Court was established in 1865 and records of the Land Court contain invaluable historical accounts of Maori land use. The records of these transactions include most of the primary accounts of pre-European life upon which we have relied, via secondary and sometimes tertiary sources, for the tribal accounts presented above. They also provide an account of changing land use including the passing of land into European control during the historic period. In addition to the Land Court Records themselves, Land Information New Zealand (LINZ) contains an archive of the survey maps and plans that were associated with land purchases. These visual records contain an abundance of information on land use that is often never recorded in written form. In the following sections we provide a brief account of the major land transactions in the study area then list the maps and plans from the LINZ archive that contain information on land use in the study area during the mid to late nineteenth century.

The records of the Maori Land Court were consulted on microfilm in the Hocken Library, Dunedin. The two key blocks of land within the research area are Muaupoko and Ngarara; both are land blocks with titles investigated through the Maori Land Court. A third block, Paraparaumu is a small Maori Land block that is within the boundaries of the Ngarara Block. There are also plans for two small blocks – Arapawaiti No. 1 and No. 2 (1873) that fall within the 1880 Ngarara Block but are not shown on the plan for Ngarara. It may be that no title was issued and further research would be useful to confirm this.

One of the most important land transactions in terms of the history of Waikanae and of Ngati Awa status in the region was the Ngarara Block settlement. Unfortunately, it is also one of the most complicated. The Ngarara block was originally around 45,000 acres located south of the Kukutauaki Stream. It first reached notice of the courts in 1873, under the name "Te Ngarara and Waikanae, at Waikanae". The court decision was firmly in the favour of Te Ati Awa but a series of claims and counter claims were brought before the courts until at least 1904. The most significant decision, however, was in 1890. By this time all the Ngarara land had been divided with Wi Parata emerging as the largest single landowner. Wi Parata was descended from Ngati Toa and Te Ati Awa and became the most influential Te Ati Awa leader of the late nineteenth century. By the 1870s he was the largest landowner and one of the most important famers in the area and in 1871 he was elected as a member of Western Maori eventually to become the first Maori member of Cabinet. Out of the Ngarara Block Wi Parata developed the Parata Township from which the modern Waikanae township grew. As part of the Parata Township development Parata established the site of the present marae of Whakarongotai, and provided land for St Luke's Church. The rest of the Ngarara Block became, "…a patchwork: dozens of subdivisions; hundreds of different sized shares; scores of individual owners" (Anderson and Pickens 1996: 309). Figure 5 shows the distribution of some of the features mentioned here and the recorded archaeological sites in relation to the proposed road.

An earlier (1858) Crown Purchase, the Wainui Block, lies to the south of the above Maori Land blocks. This Crown Purchase is complex; the purchase began as the Waikanae Crown Purchase (Deed 23) and was finally transacted as the Wainui Crown Purchase (Deed 23a). The main difference between the former and the latter is the northern boundary line. The boundary line described in Deed 23 is further north than that finally agreed to in Deed 23a. The latter northern boundary (of the Wainui Block) extends from coastal Whareroa in the west to Paparauponga in the east (Tararua Ranges) whilst the original boundary would have been the southern boundary of what became the Ngarara Block (ML 504) (see Figure 6).

There is an area between the two blocks (i.e. Ngarara and Wainui) that is problematic; it appears to have been a Crown Purchase or similar predating the establishment of the Native Land Court in 1865.

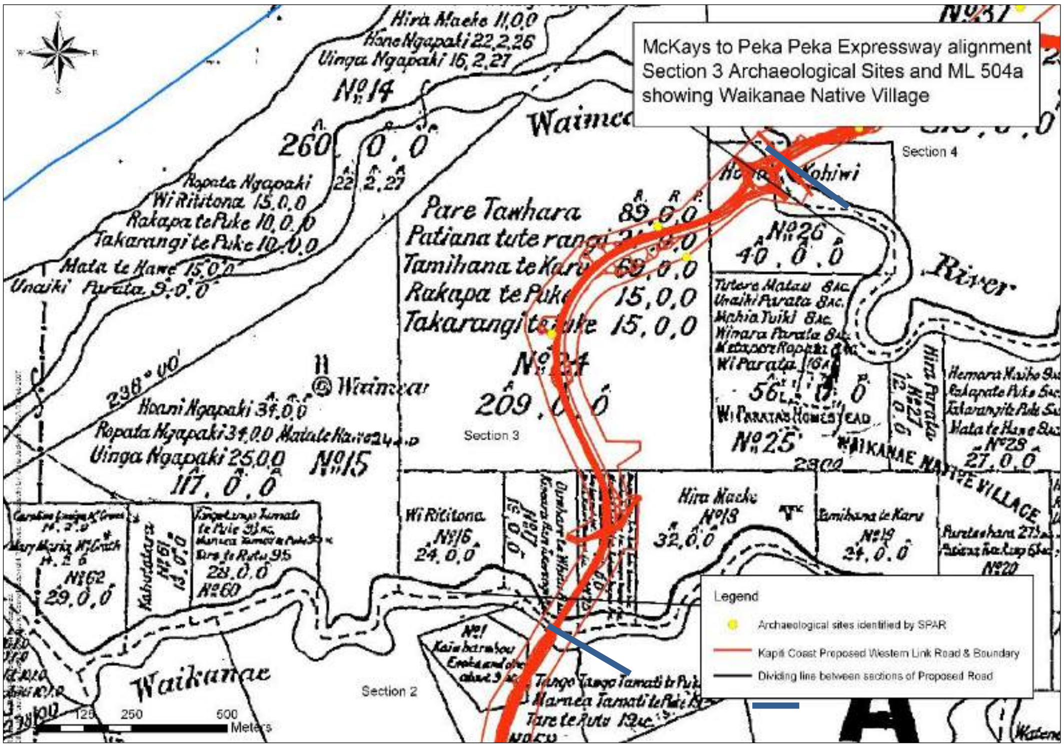

Figure 6. M2PP Expressway (Sector 4) in relation to historical data from ML 504a (note Waikanae Native Village (Tuku Rakau) and Wi Parata’s house, middle right) and archaeological sites discovered during SPAR’s initial site survey for the original Western Link Road.

3.5 Survey plans and maps

Using GIS and cadastral data the historical survey plans in the wider research area were identified and reviewed. Key plans were identified and some were georeferenced to the New Zealand Map Grid and integrated within a Geographic Information System (GIS) to check whether any recorded historical land use fell within the boundaries of the M2PP Expressway. Table 1, below, identifies a subset of the plans reviewed. These plans were selected for inclusion in the table if they showed features that were useful in understanding historical land use (such as the location of cultivations, buildings, fences, tracks or roads), or they could be used to identify or assist in the positioning of other plans. In fact, the only historical feature identified through this process that had the potential to be affected was the "Waikanae Native Village", Tuku Rakau. Its location and extent are impossible to know with any certainty from the historical records, and all indications are that it did not lie within the design footprint. Field examination of the part of the design footprint that passed closest to the indicated location of Tuku Rakau did not encounter any archaeological features.

Table 1. Key survey maps and plans for the Kapiti Coast region (all from LINZ). Plans marked with an asterisk have been georeferenced and added to our GIS.

Plan No.	Plan Date	Location/Parent Block	Description
A333	1892	Ngarara Block	Ngarara West A No. 44 'Rau-o-te-Rangi' 28.2.00 (a.r.p.) Nicoll's Special Grant Notes house, whare, gardens, fences and track Surveyor: Douglas Surveyed for: Mere Makirangi
A1067	1900	Muaupoko Block	Plan of Subdivisions 1,2,3,4,5 & 6 Muaupoko A No.2 Sec 2 Notes O'Donahoo's Flag [sic], railway, road, fence, gate, hydrology Surveyor: Douglas
B401*		Pt Ngarara Block and Pt Muaupoko Block	Ngarara Settlement: Sub Secs 12, 67, 68, 69, 70, 71 & Pts 8,9,10,11 & 72 of Ngarara West A and Pt Muaupoko A No1 Notes 3 structures – 2 enclosed by fences or similar. West of Wellington-Manawatu Railway Surveyor: not stated
DP463	1888	Muaupoko Block	Plan of Pt Muaupoko Block – Paraparaumu Suburban Shows sections, swamps and sand ridges Surveyor: Martin and Carkeek
DP669	1894	Pt Ngarara Block , Pt Muaupoko Block and south of these blocks	Pt Muaupoko, Pt. Ngarara West and Pt land to south of these blocks (Akatarawa District) Surveyor: Carkeek
DP1031*	1897	Ngarara Block	Parata Township NB east of railway by Rikiorangi Road Church, Waihi [sic] Tapu, Native Reserve with fences, building and woolshed; School Reserve, Reserve for Public Purposes, Water right – pipe track Surveyor: Martin
DP2391	1907	South of and adjacent to Ngarara Block	Plan of Suburban Sections Raumati Estate Notes Wharemouku [sic] Stream Surveyor: Davis and Porteous Surveyed for: Raumati Estate Company
DP2767	1907	South of and adjacent to Ngarara Block	Plan of Raumati Township Extension No.1 Notes 'Old Coach Route Wellington to Foxton' along beach Surveyor: Davis and Porteous Surveyed for: Raumati Estate Company
DP4106	1913	South of, Ngarara Block	Plan of Subdivisions in Raumati Beach area. Notes 'Old Coach Route Wellington to Foxton' along beach Surveyor: Davis and Porteous

			Surveyed for: Raumati Estate Company
DP17617	1954	Ngarara Block	Plan of Pts 24A and 24B Ngarara Notes Puriri Road; 24C as Maori Cemetery Surveyor: Truebridge and Callendar
ML46	1873	pre-Ngarara Block	Arapawaiti No 2 Notes Crown Land Ferry Reserve, Waikanae Hotel and surrounding fence, 2 other buildings, other fences Surveyor: Wyles Claimed by Manahi Maniapoto
ML47	1873	pre-Ngarara Block	Arapawaiti No1 Notes Crown Land Ferry Reserve, Waikanae Hotel and surrounding fence, 2 other buildings, other fences Surveyor: Wyles Claimed by Tamihana Te Kohika
ML376*	1879	Muaupoko Block	Plan of Muaupoko and 1000 acres Purchased by Government Shows 'Practicable Road Line', Woods Fence, various place names Surveyor: Henry Field
ML504*	1880	Ngarara Block	Plan of Ngarara Block Shows Maunganui Crown Purchase, Muaupoko Block, Paraparaumu Block, Wi Parata's Homestead, Field's homestead, Waikanae Native Village, Nicol's Special Claim, Wood's Fence, Proposed Road, Road in Course of Formation, various named streams and rivers, Ngarara Swamp, Muaupoko Range Surveyor: Climie, Field, Carkeek
ML504a*	1890	Ngarara Block	Sketch Map of Ngarara Block Western Portion of Block Notes many subdivisions with acreages and owners' names, Waikanae Native Village, Road to Hutt, Wellington and Manawatu Railway Surveyor: Bristed
ML820	1887	Muaupoko Block	Subdivision of Muaupoko Block No.1 Notes Muaupoko B Block, Karaitiana Te Tupe Surveyor: Henry Field
ML962	1889	Muaupoko Block	Plan of Muaupoko A No.1 Notes Tautini [?] Swamp Surveyor: Henry Field Surveyed for: NLC Order in favour of Hannah Field
ML963	1889	Muaupoko Block	Plan of Muaupoko A No.3 Notes Wellington – Manawatu Rly Line to West of Block, Swamp Surveyor: Henry Field Surveyed for: NLC Order in favour of Hannah Field
ML999	1890	Muaupoko Block	Plan of Muaupoko A Blocks Nos. 7,8 & 9 Notes Wellington – Manawatu Rly Line to West of Block Surveyor: Henry Field Surveyed for: Orders in favour of Mr H.S. Hadfield

ML1122	1892?	Ngarara Block	Ngarara West A Subdivisions Nos. 13, 63, 64, 65, 66, 72, 73, 74 Coastal, south of Waikanae River including river mouth. Shows a house on section 63 (same area as Arapawaiti No's 1 and 2), owners' names, lagoon, swamp areas and sand drifts, also Kenakena Trig. Surveyor: not stated
ML1130	n.d.	Ngarara Block	Part of Ngarara West C Map damaged – shows topography and hydrology and trigs Surveyor: not stated
ML1491*	1898	Ngarara Block	Two sheets Plan of part of Ngarara West A North of Waikanae River Church, houses (including Wi Parata's), several whare, sheds, cultivations, orchard Surveyor: Chalmers
ML1771	1903	Ngarara and Paraparaumu Blocks	Plan of Section1 West B Block Ngarara Mainly east of railway line Shows unnamed Paraparaumu Block (owner Mary Cameron) bisected by Wellington and Manawatu Railway; a potato field, ploughed land, fences, structures (houses? And sheds?). Surveyor: Beere Surveyed for: Subdivisions
ML1886	1905	Ngarara and Paraparaumu Blocks	Plan of Ngarara West B Mainly west of railway line Shows Cemetery Reserve Ngarara West B10 near mouth of Tikotu Stream. Surveyor: Beere
ML3104	1873	Paraparaumu Block	Paraparaumu Claimed by Mere Kamarana Oldest plan for this block 2 (a.r.p.) Surveyor: Wyles and Buck
ML4075	1928	Ngarara Block	Plan of Ngarara West A Sections 63A & 63B Southern bank of Waikanae River House (probably Wi Parata's) shown on Sec 63B; notes sandhills in lupin and grass. Surveyor: McKenzie Surveyed for: Native Owners
ML4489	1951	Ngarara Block	Plan of Ngarara West A 78a Shows 'Meeting House (timber)', 'irregular fence and trees', 'C.I Bldg' and 'Track to homestead'. Surveyor: Martin and Dyett
ML4533	1953	Ngarara Block	Plan of Ngarara West A Block Sec's 80A, 80B, 80C, 80D, & 80E & 80F Shows Cemetery, shallow lagoon, mouth of Waikanae River. Surveyor: Martin and Dyett Surveyed for: renaming of Blocks
ML4604*	1956	Ngarara Block	Plan of Ngarara West A78E1 to A78E17 Shows Old single storey Wooden House (on Sec 78E8) several outbuildings on this and surrounding sections NB Sec 78E8 adjoins Sec 78A with a Meeting House as shown on ML4489 Surveyor: Martin and Dyett

SO10187	n.d.	Ngarara Block	3 Sheets (F1- F4) Untitled undated composite plan of Ngarara Block and blocks to the north (Kukutauaki, Ngawhakangutu, Ngakaroro); includes owners' names Surveyor: not stated
SO10193	n.d. (Sheet 1) 1881 (Sheet 4)	Ngarara Block/ Muaupoko Block/ Paraparaumu Block	Sheet 1 (F1) Island of Kapiti Includes off-shore islands and coastal sections of Ngarara Block. Land blocks with owners' names. Surveyor: Wyles and Buck NB Sheet 2 (F2) has same information as Sheet 1. Sheet 3 has notbeen located Sheet 4 C.GR. Record Map, Kapiti Compiled by E.V. Briscoe. Includes Muaupoko Block, Paraparaumu Block and Pt Ngarara Block. [C. Gr. = Crown Grant?] Sheet 5 covers part of Sheet 4 Sheet 6 Kapiti Island only
SO11036	n.d.	Ngarara Block	Sheets 1 & 2 (F1 and F2) Untitled old plan covering area that became Ngarara Block. Notes hotel south side of beginning of Waikanae River, place names, lagoons, some topography including swamps Surveyor: not stated
SO11089	1874	Wainui and Whareroa Blocks	4 Sheets Wainui and Whareora Blocks West Coast Sheet 1 Adjoins southern coastal boundary of the later Ngarara Block Sheets 2 &3 further south Surveyor: not stated
SO11791	1881	Ngarara Block	Plan of Nicol's Claim Shows garden and associated structure Surveyor: Field
SO11881	1881	Ngarara Block	Untitled Notes Tutere's Clearing, an unnamed clearing with a structure and Rikiorangi Clearing. A bush track is shown linking the 3 clearings. Topography shown includes swamps, streams and ridges as well as 'Probably best route for road.' Surveyor: ?Wilson Surveyed for: Road
SO13200	1895?	Ngarara Block	Untitled – PW act Road taking Shows Wi Parata House and H Parata Gardens immediately west of road and railway Surveyor: ?Bennett Surveyed for: not stated
SO13278	1891	Ngarara Block	Plan of Crown Land in the Ngarara West C Block Shows 200 acre 'Reserve for Tamihana Te Karu' Surveyor: Haszard Surveyed for: Crown purchase
SO13529	1893	Ngarara Block	Ngarara West C – Land Selected by the Wellington fruit Growers Association Notes Factory and Mill on Section 2 adjoining Waikanae River. NB This is the same Block as shown on SO13278 Surveyor: Haszard and Dunnage

SO14102	1897	Ngarara Block	Plan of Land to be Taken under the Public Works Act for part of the Horowhenua County Road, Section No.78 Te Ngarara Block Horowhenua County Shows road taking though section where H Parata, a structure (house?) and garden are noted Surveyor: Bennett Surveyed for: PW Act taking
SO14639*	1900	Ngarara Block	Crown Grant Record Map Parata Township Notes Post Office Reserve, School Reserve, Public Buildings Reserve, a Water Right, Railway Line and several roads including Rikiorangi Road. Surveyor: not stated Plan drawn by Caldwell
SO15832	1908	Muaupoko Block	Plan of Subn. Pt Muaupoko A No.2 Notes Mr Warrilow's House (A No.2 Lot 1), an old orchard (A No 3), wire fences, an 'Old STAB fence' Surveyor: Lowe Surveyed for: Exchange Purposes

4 ARCHAEOLOGICAL RECORD

The most useful overview of the archaeology of the Kapiti Coast is McFadgen (1997) which contains a comprehensive bibliography. Carkeek (1966) also discusses midden sites in the region and McLean (1996) provides some additional detail. Most recently, archaeological mitigation work carried out by Kiri Peterson has resulted in a greatly expanded corpus of radiocarbon dates for the wider study area (reports accessible through the Heritage New Zealand digital library, http://www.heritage.org.nz/protecting-heritage/archaeology/digital-library).

Prior to the commencement of the current project very little archaeological research has been reported in the Kapiti Coast District – although a large number of small-scale development driven excavations have been carried out. The few exceptions are a site-recording exercise in the 1960s by Teachers' College students supervised by Colin Smart (1962) and a recent analysis by Janet Davidson and Foss Leach (Leach *et al.* 2000) of a grab sample salvaged from a disturbed midden at Raumati South. Consequently, the Kapiti Coast is one of the most poorly known archaeological landscapes in New Zealand. This is particularly regrettable since the district is very well known historically having featured heavily in important tribal movements and political events of the first decades of the nineteenth century (as summarised above). In particular it is associated with the southward movement of groups that included Ngati Toa, Te Ati Awa and Ngati Raukawa, led by Te Rauparaha. These events changed the political landscape of the lower North Island and the northern South Island and yet we know almost nothing about them in terms of the archaeological evidence. Even less is known of the period before these tribal migrations, although there is at least one site that appears to date to the Archaic or inital colonisation era. The Kapiti Coast was also the scene of lengthy, largely peaceful encounters between Maori and European in the decades leading up to the Treaty of Waitangi, including flax trading and shore whaling, followed by European settlement on both Kapiti Island and the mainland.

Archaeologists in New Zealand generally describe the New Zealand prehistoric sequence in terms of an Archaic Phase (characterised by a range of material culture types usually associated with sites of moa-hunting times) followed by a Classic Phase (characterised by a range of material culture as observed by the first European explorers) (see Golson 1959). This division is slowly giving way to analytical treatments of chronology which are more regional in focus, but it is a useful shorthand that we will use here in the interests of simplicity. New Zealand was settled from tropical East Polynesia in the late thirteenth or early fourteenth century AD (Jacomb *et al*. 2014).

While there are a small number of archaeologists who argue for earlier settlement, the evidence is thin and we consider it unlikely that there was any settlement in this country prior to the last decades of the thirteenth century. By the mid-fourteenth century settlements had been established throughout New Zealand, as evidenced by archaeological sites of this period. Many contain evidence of moa hunting, and their material culture is much more similar to that found in contemporary sites in tropical East Polynesia (the Cook Islands and Tahiti for example) than to that of the Maori settlements of the early European contact era. Problematically, there is no well- established cut-off point between Archaic and Classic but most sites that are accepted as Archaic date to before AD1450 and most that are accepted as Classic date to later than this time.

Archaic phase settlements are extremely rare along the west coast of the lower North Island although the area contains a few reasonably well-documented sites of this period. The best studied Archaic site in the region is a midden site at Foxton (McFadgen 1972). There is one recorded Archaic site at Paremata (Davidson 1978) and another at Paekakariki (Davidson 1988) but very little is recorded so far between there and Otaki. The data from these Archaic sites paints a picture of intermittent coastal settlement of a well-forested sand dune environment with resources taken from lakes, lagoons, forest and seashore. This is a somewhat cursory interpretation and there is certainly room for an expanded understanding of early settlement around the Kapiti Coast.

Adkin (1948) argues from historic and ethnographic accounts, and demonstrates in site distributions, the importance of the wetlands in late prehistoric and early historic settlement patterns and economic practices in the Horowhenua District, immediately north of the study area. There, pa are located on water courses close to the boundary of the sand dune belt where occupants could access swamps, lakes and forest. There were also pa located on the lakes – indeed several of these occupied by Muaupoko suffered at the hands of the northern war parties of 1819 (see above). The type of settlement pattern reconstructed for Horowhenua is also likely to have been in place along the Kapiti Coast which has a very similar landscape of wetlands and undulating dune country.

The archaeological sites along the Kapiti Coast, recorded in the national inventory of archaeological sites (New Zealand Archaeological Association Site Recording Scheme), are dominated by small, loose scatters of shellfish midden, often apparently of a single species - tuatua (*Paphies subtriangulatum*). Such sites are scattered along the coastal fringe and on the older dune soils up to at least 3 kilometres inland. In the higher areas there are also isolated pits and terraces and some small clusters of these types of feature. Maori burials have been located in the dune soils both on the coastal margins and on the higher dunes. They are also reported from some of the wetlands. Most of the recorded sites probably date to relatively late in the prehistoric period and carry on into the contact and early historic periods. They probably relate to a late prehistoric and early historic settlement pattern in which small fairly mobile groups maintained gardens on the higher dune lands and moved between wetlands, forest and shore to gather seasonal resources. A few larger settlement sites were probably situated in key places such as river mouths and high dunes adjacent to navigable water courses because of the ready availability of resources, and because they were easily defendable.

5 AIMS

As we noted above, with a few exceptions there has been little formal archaeological research carried out on the Kapiti Coast. The aims of our investigation programme were to systematically survey and identify all archaeological sites in Sectors 2, 3, 5 and part of Sector 6 of the Expressway and then to undertake comprehensive data recovery investigations of these sites prior to their loss through road construction.

The M2PP Expressway project provided the opportunity to address several research themes at both a regional and national level. The major themes identified in the research strategy (Jacomb and O'Keeffe 2012) are summarised as follows:

1. Archaic Phase occupation in the region

Very few Archaic period sites are known on the Kapiti Coast but those known sites occur to the north and south of the study area. We wanted to establish whether this gap was a matter of site recording bias or whether there is a very limited distribution of early sites on the coast.

2. Transport and exchange

The Kapiti Coast appears to lie on an important route within transport and exchange systems particularly in relation to stone resources, with movement south of North Island stone such as obsidian, and movement north of South Island stone such as argillite and greenstone.

3. Settlement patterns

Patterning in the distribution of archaeological sites and site types within a landscape can provide very useful insights into such areas of human behaviour as economy, ideology and socio-political organisation and may reflect kinship-based rules of residence and landscape use.

4. Economic patterns

The most common site type along the Kapiti Coast is the shell midden. Middens are the main sources of archaeological information about prehistoric economy and subsistence practice and the relatively high density of midden sites means that the nature, distribution, size, content, chronology and function of the middens would be primary focuses of the research.

5. Tribal change and political relationships in the historic period

The arrival of Europeans in New Zealand had dramatic effects on traditional Maori politics. We have a very good record of this in the form of historic documents and oral history from various parts of New Zealand, including the Bay of Islands, the Foveaux Strait, and the Kapiti Coast. But these records provide almost no information about the critical social, technological and economic changes that took place within the affected communities. Many of the key sites relating to this period of massive culture change may still be preserved at Kapiti, and could provide a unique record of how life changed at the domestic and community level during this formative period of Maori and New Zealand history.

6 METHODS

The archaeological investigations were carried out in two stages in May and September 2013. We used a range of field and analytical techniques that included machine and hand excavation, radiocarbon dating, palaeovegetation analysis, midden analysis, ancient DNA sequencing, lithic analysis and geochemical sourcing. New site records and site updates were submitted to ArchSite (the New Zealand Archaeological Association Site Recording Scheme) for all sites encountered.

We describe below the field methods used during each of these stages along with our sampling strategy. This section concludes with a description of the faunal analysis methodology.

6.1 Stage One investigation – May 2013

Stage One involved the excavation of test trenches using mechanical excavators where predictive modelling suggested there was some likelihood of finding new sites and for the purposes of investigation of previously recorded sites. The location of all sites was established out using a Leica TPS 1200 total station and Trimble hand-held differential GPS units (sub-metre accuracy). All spatial data was stored and managed in a GIS created specifically for this project.

Each site was assessed as to its nature, extent and condition and whether further archaeological investigation was appropriate. Sites south of the Waikanae River (Sectors 2 and 3) were investigated in full because they were all small in size and contained no complex stratigraphy. The sites north of Te Moana Road (Sectors 5 and 6) appeared to be larger and more complex than those south of the river and so were identified and marked with geotechnical textile and wooden posts prior to being reburied until the Stage Two investigations took place. Little or no investigation of the Sector 5 sites occurred during Stage One.

6.2 Stage Two investigation – September 2013

Stage Two was the detailed archaeological investigation of sites located during the Stage One trenching. These detailed investigations involved the use of both hydraulic excavators and standard hand excavation techniques. Recording was carried out with both the Leica TPS 1200 total station and Trimble hand-held differential GPS units. Stratigraphic sections were drawn as appropriate. All spatial data was stored and managed in the project GIS.

6.3 Sampling

Because of the anticipated volume of midden from the sites we developed a sampling strategy for the field. For small middens (up to 2 m radius) a minimum of a 10 litre bucket was collected. For medium-sized sites (2 m to 5 m radius) we ensured that at least a 5 per cent sample was obtained (up to 200 litres) from each midden feature. For large sites (greater than 5 m radius) a similar strategy was used except that the total amount collected was up to 1000 litres. The midden- containing sediments were wet-sieved through 3.2 mm screens in the field to minimise the amount of material to be transported to the laboratory for analysis (Figure 7).

6.4 Laboratory Analysis

All of the material sampled from the sites was returned to the Otago Archaeology Laboratories (OAL) at the University of Otago in Dunedin and the analyses was carried out in 2014 and 2015. Each bag was assigned a catalogue number which was generated using the site name followed by a sequentially numbered suffix, e.g., R26/373-1. This data was recorded on an Excel spreadsheet. All of the subsequent faunal analysis used this catalogue and sub-bags were created against each of the catalogue numbers. A total of 421 bags were catalogued weighing 1597.385 kg prior to processing.

Because of the volume of material a laboratory sampling strategy was devised to ensure that a representative sample of the material was analysed. For many of the sites this involved a total sample of the excavated material recovered from the field. However, for the larger samples subsampling was carried out, for example, from R26/373 which comprised 243 bags a sample of 84 bags from five 1 x 1 m test pits were selected. This sample weighed 342,732 g from a total of 684,329 g. Much of the material had been wet-sieved (Figure 7) through 3.2 mm screens in the field, however, we washed all of the midden samples to remove any remaining sand or soil residue before the laboratory analysis.

Figure 7. Wet sieving station set up to process midden from R26/373.

The fauna was initially sorted to primary class: shell and bone. It was then identified to lowest taxonomic class using the OAL reference collection. Specimens containing unique quantifiable attributes were removed for quantification. For shells these were hinges for bivalves and for gastropods apices, apertures and opercula were used.

The standard methodology for the identification of fish bone from New Zealand archaeological sites was developed by Leach (1986) and is based on the identification of five paired mouth parts (dentary, maxilla, premaxilla, quadrate and articular) along with ‘special’ bones that are characteristic to certain species. SPAR’s methodology builds on this approach, and involves the identification of all elements where possible. This removes much of the bias against those species whose mouthparts do not necessarily preserve well or where there may be taphonomic or cultural factors (such as butchery) affecting the range of elements present in a site.

Quantification was carried out using standard zooarchaeological methods of Number of Identified Specimens (NISP), Minimum Number of Elements (MNE) and the derived Minimum Number of Individuals (MNI) (Grayson 1984; Reitz and Wing 1998). These figures were calculated on a per site basis rather than by individual stratigraphic units or features. This methodology provides a conservative estimate of MNI but because we were interested in relative abundance this is not an issue. For the purposes of statistical analyses any species present in a site for which no quantifiable attributes were identified were given an MNI of one. This is likely to under-represent certain species which tend to be highly fragmentary such as limpets (*Cellana* sp.) or paua (*Haliotis* sp.) but it ensures that they are included in any data analysis.

Charcoal was removed during the midden analysis and sent to Dr Rod Wallace at the University of Auckland for identification to species for the palaeovegetation study and to facilitate the selection of samples suitable for radiocarbon dating.

7 RESULTS

The results of the archaeological work are presented by sector (see Figure 2). Each site is described and the results of the faunal analysis are presented. We also note any artefacts found in each site but a more detailed discussion of the material culture is provided in Section 10.

7.1 Sector 2

Sector 2 (Authority No. 2013/222) includes the stretch of dunes that runs between Kapiti Road and Mazengarb Road. We used two 7 tonne hydraulic excavators to dig 843 lineal metres of trench using a 1.6 m cleaning bucket all of which were monitored by an archaeologist. No sites had been recorded in this sector prior to the commencement of our investigation.

The locations of the trenches are shown in Figures 8 and 9. The majority of the trenches were excavated on the dunes as this is the most common location for recorded sites, although some trenches were located on the low ground for comparison. Two previously unrecorded small exposures of shell midden were found in this sector (see Figs 10, 11) and recorded as R26/467 and R26/468. We did not find any buried topsoils in this sector apart from one small area that was actually just the current topsoil with a small-scale cover of windblown sand.

Figure 8. Aerial photo showing location of trenches and archaeological sites at the southern end of Sector 2. The blue lines represent the road footprint data provided to us at the time of the investigations.

R26/467 & R26/468

These sites are both small midden exposures from which total samples were recovered and analysed (Figures 10 and 12). The results of the midden analysis are presented in Table 2 and Table 3. The amount of midden obtained was very small. Three species of surf clam were identified; tuatua (*Paphies subtriangulata*), ringed dosinia (*Dosinia anus*) and triangle shell (*Spisula aequilatera*) although triangle shell was not present at all in the R26/467 sample. Somewhat unusually for the Kapiti coast, tuatua and ringed dosinia were present in almost equal amounts in R26/468 but the small size of the sample means that not too much can be read into this. No bone was recovered from either of these sites.

Figure 9. Aerial view of northern section of Sector 2 showing location of trenches. The blue lines indicate the proposed cut and fill for the construction of the road.

Table 2. Results of analysis of marine shell sample from R26/467.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Dosinia anus			1	25	4.79
Paphies subtriangulata	5	5	3	75	23.77
Total	5	5	4	100	28.56

Table 3. Results of analysis of marine shell sample from R26/468.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Dosinia anus	33	33	17	50	185.69
Paphies subtriangulata	31	31	16	47	73.9
Spisula aequilatera	1	1	1	3	1.45
Unidentified					178.5
Total	65	65	34	100	439.54

Figure 10. Small shell midden scatter recorded as R26/467 (scale in 20 cm increments).

Figure 11. Shell midden recorded as R26/468 (scale = 1 m).

7.2 Sector 3

Sector 3 (Authority No. 2013/385) comprises the development footprint that lies in the stretch of dunes that runs between Otaihanga Rd and the Waikanae River. For ease of navigation in this report we have divided this sector into three parts (Sub-sectors 3A, 3B and 3C) (Figure 12).

The locations of the trenches are shown in Figure 12 and subsequent figures. Three previously recorded sites (R26/369, 370 and 455) were investigated and four new sites (R26/487-490) were found and investigated.

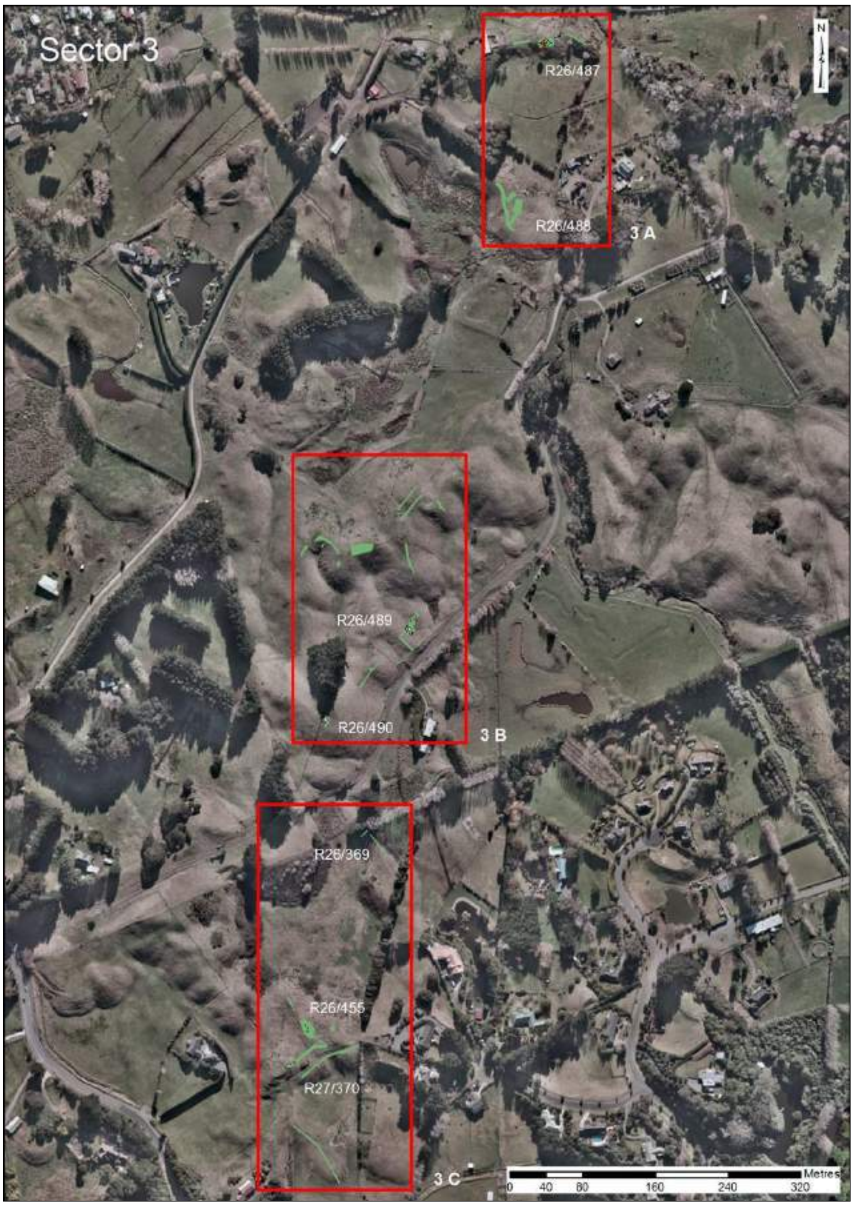

Figure 12. Aerial view of Sector 3 showing locations of excavation trenches and recorded (existing and new) archaeological sites. Red squares indicate boundaries of the sub-sectors.

Sub-Sector 3A

Sub-sector 3A contained two areas of high dunes that were investigated by machine trenching. Each of the two contained archaeological features, although these were relatively small in scale. The northern of the two was recorded as R26/487 and the southern as R26/488 (Figure 13).

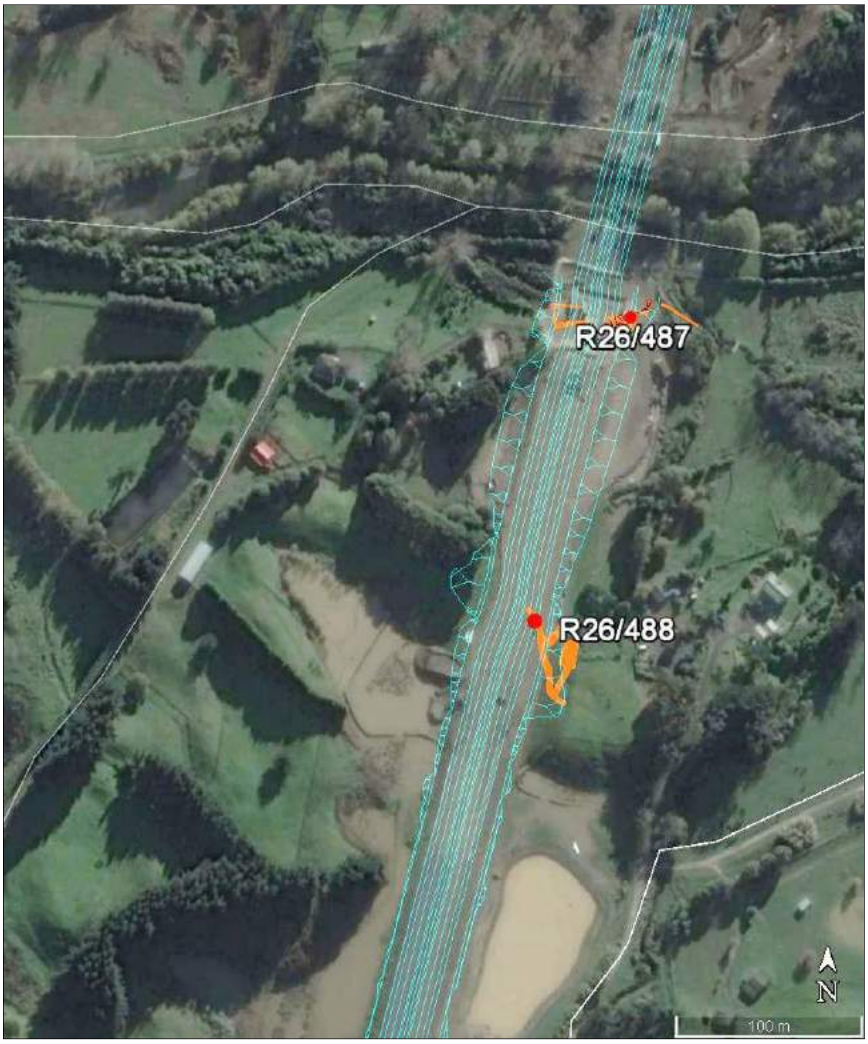

Figure 13. Northern part of Sector 3 (Sub-sector 3A) showing location of archaeological sites R26/487 and R26/488 identified and investigated during this study. The blue lines represent the road footprint data provided to us at the time of the investigations.

R26/487

This was a relatively level area on the crest of a dune ridge overlooking the Waikanae River in which we dug exploratory trenches with a hydraulic excavator. As for all of the other work on this project, we began by removing the topsoil, at which point several areas of very dark soil became visible as well as a few shells. We opened up a wider area and found a large number of amorphous dark patches (Figure 14). They were all charcoal-stained and had the occasional small fragment of charcoal. Almost all of these "amorphous stains" turned out to be shallow and otherwise uninteresting. Numerous similar features were encountered during the trenching exercise carried out for the wider project. They were only very rarely found in direct association with any cultural remains such as midden or fire-cracked rock and in the absence of such remains have been interpreted by us as being evidence of burning associated with vegetation clearance for the creation of pasture for farming.

A single post hole visible in Figure 15 turned out to have wire at its base so is of nineteenth or twentieth century origin.

Two of the charcoal-stained features turned out to be more substantial, and one of them contained fire-cracked rocks (Figure 15). A small shell midden deposit was found (Table 4) which only contained tuatua with an MNI of three. A fragment of a clay tobacco pipe was found near the midden.

All other features that were excavated at this site were of recent origin and included buried metal rubbish and the skeletal remains of several alpaca.

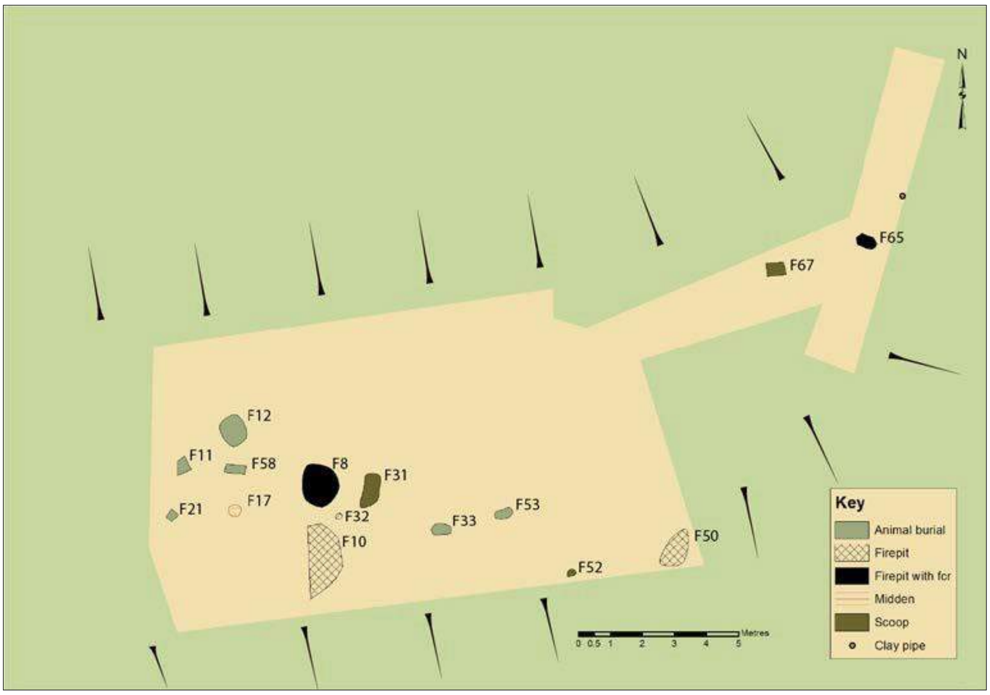

Figure 14. Site R26/487 showing locations of excavated features, and the extent of the trenching (yellow).

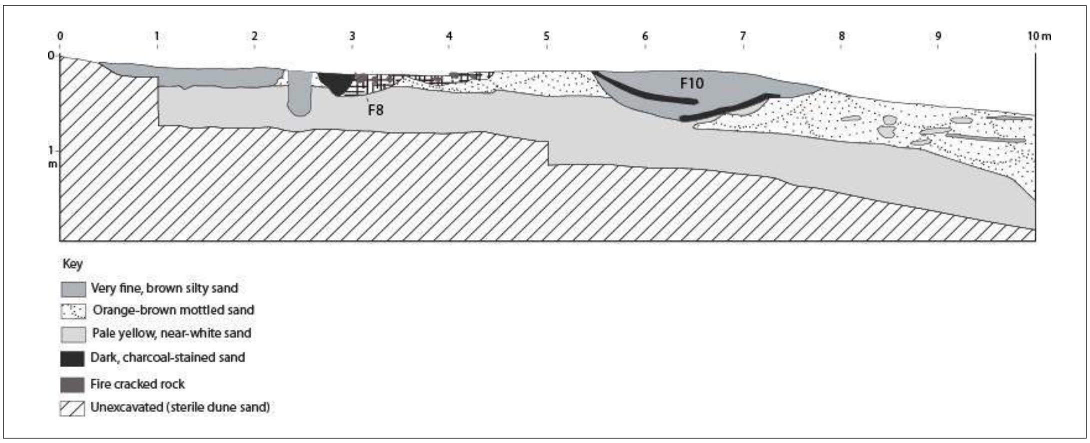

Figure 15. Stratigraphic drawing of eastern baulk of trench that bisected features 8 and 10. Note that the turf had been stripped off before the section was drawn so no turf layer is shown.

Table 4. Results of analysis of marine shell sample from R26/487.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Paphies subtriangulata	5	5	3	100	26.46

R26/488

This was a series of two small shell midden deposits and a small fire scoop (Figure 16) in the southern part of Sector 3A. There were several areas of ground disturbance found in other parts of this area of trenching but all of these turned out upon investigation to be of modern origin, as evidenced by the presence of late twentieth-century rubbish (Figure 17).

Faunal and charcoal samples were recovered from the three prehistoric deposits and were returned to the OAL for analysis. The midden sample was very small, with tuatua and ringed dosinia having an MNI of one each.

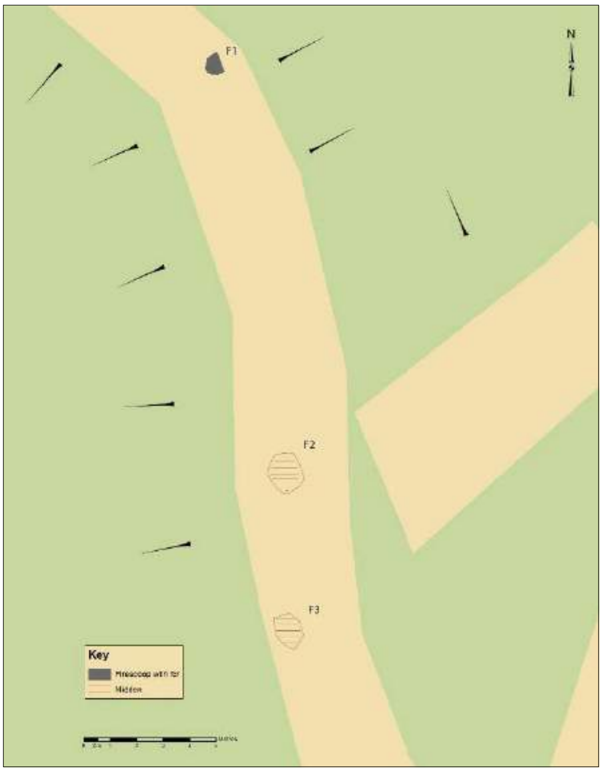

Figure 16. R26/488 showing locations of excavated features, within area of trenching (yellow).

Figure 17. Modern rubbish deposit associated with R26/488 (scales in 20 cm increments).

Sub-Sector 3B

Sub-sector 3B (Figure 18) was the middle part of Sector 3 and contained two archaeological sites (R26/489 and R26/490). Both were discovered during the Stage 1 pre-construction trench survey.

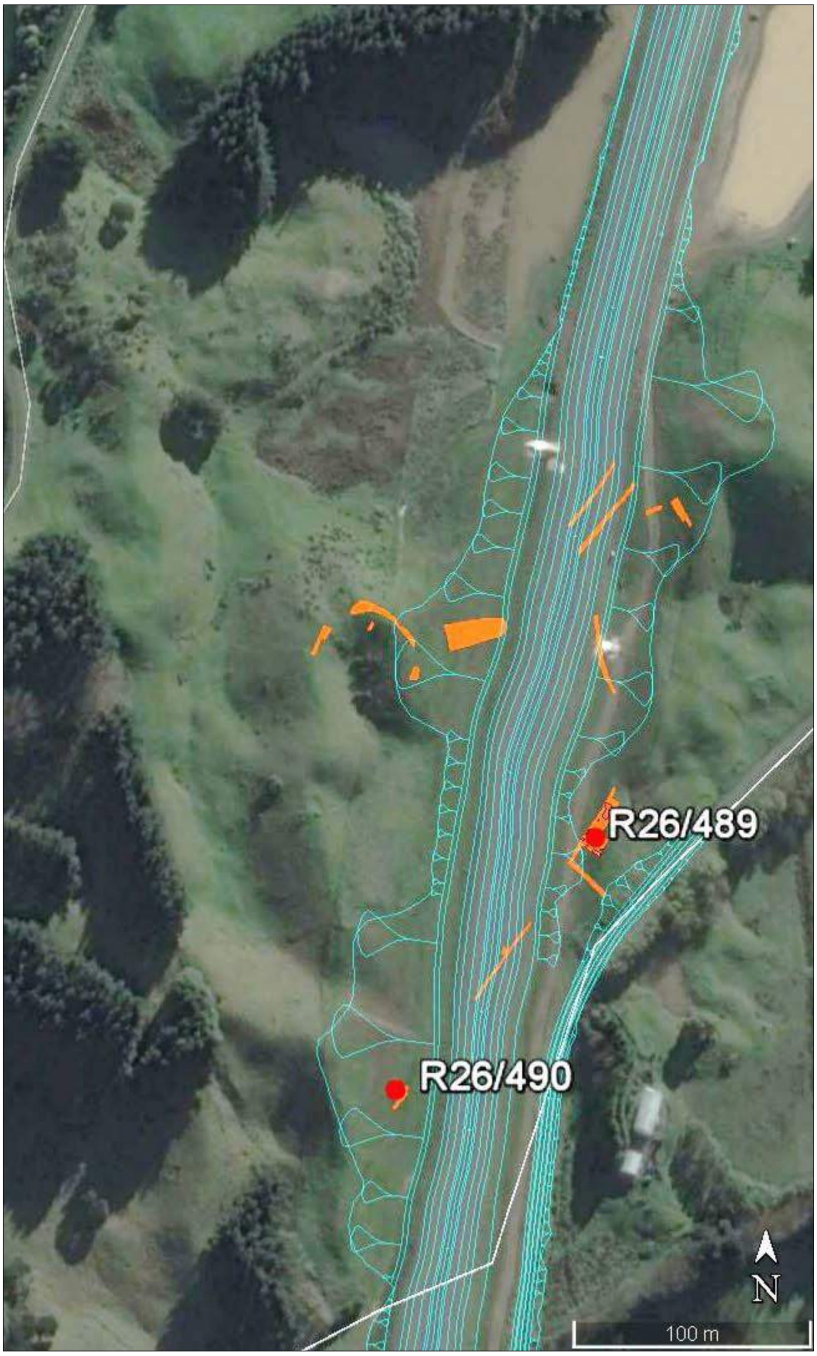

Figure 18. Aerial view of Sector 3B showing locations of trenches and archaeological sites R26/489 and R26/490 discovered during Stage 1.

R26/489

Site R26/489 was a small firescoop and a small shell midden (Figure 19 and Figure 20) found in a relatively level area at the base of the main dune ridge in the middle part of Sector 3 (Sector 3B, see Figure 12 and Figure 18). All material recovered from the site (shell midden and dating samples) was returned to the OAL for analysis. The midden (Table 5) had a total MNI of four (three ringed dosinia and one tuatua).

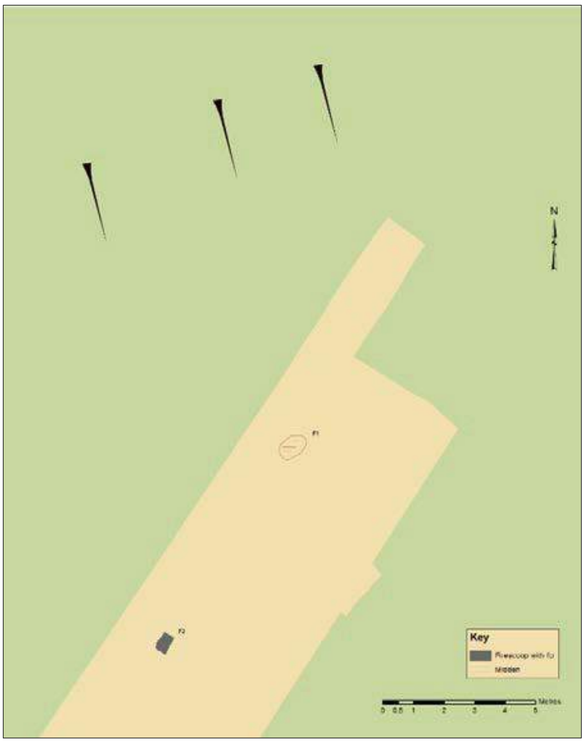

Figure 19. Site R26/489 showing location of firescoop and shell midden deposit, within extent of trench (yellow).

Figure 20. Small fire feature looking north after it was half-sectioned (scale in 20 cm increments).

Table 5. Results of analysis of marine shell sample from R26/489.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Dosinia anus	6	6	3	75	40.1
Paphies subtriangulata	1	1	1	25	4.8
Total	7	7	4	100	44.9

R26/490

This site comprised a small area of charcoal-stained soil with sparse concentrations of shell midden (Figure 21, 22). Samples of charcoal and shell were retained for analysis. All visible archaeological deposits were excavated, although it is possible that further material may be found in the adjacent paddock, to which we did not have access during the investigation.

This site provided the largest faunal sample of any of the Sector Three sites but comprised only shell (Table 6). It was dominated by tuatua (99.59% of total MNI) with only a single triangle shell and two ringed dosinias also identified, along with a single specimen of a volute (*Alcithoe arabica*). Figure 23 shows the results of the shell analysis in comparison to those for the entire study area.

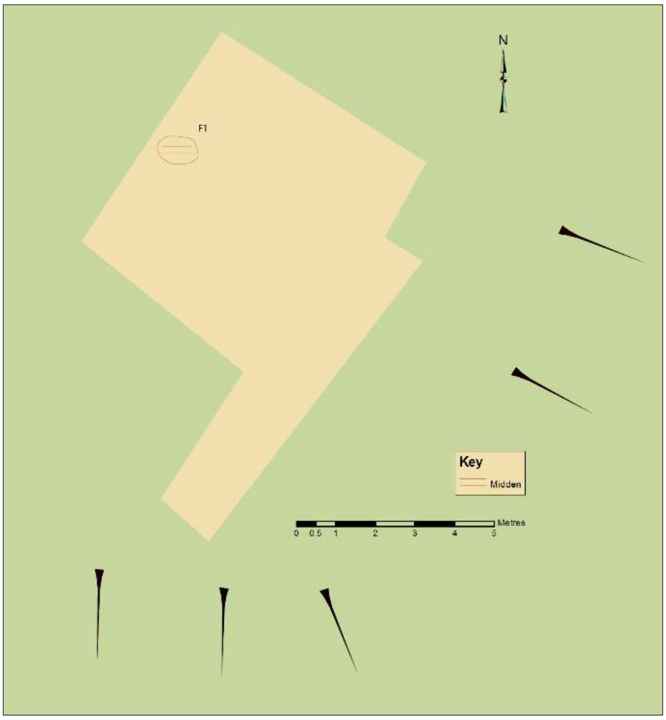

Figure 21. Site R26/490 showing location of sparse midden deposit, within area of trenching (yellow).

Figure 22. Photo of charcoal staining below turf at R26/490 looking south (scale = 2 m). This staining was frequently encountered in the sector between Otaihanga Road and the Waikanae River, and probably relates to burning associated with forest clearance.

Table 6. Results of analysis of marine shell sample from R26/490.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	1		1	0.10	11.62
Dosinia anus	4	4	2	0.21	24.37
Paphies subtriangulata	1,926	1,926	963	99.59	6,868.12
Spisula aequilatera	2	2	1	0.10	2.34
Total	1,933	1,932	967	100	6,906.45

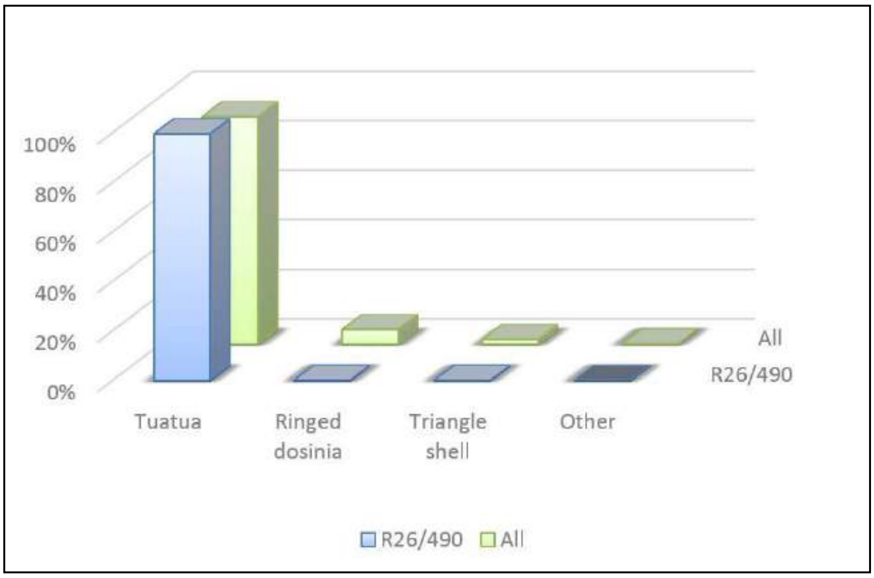

Figure 23. Relative abundance of main shellfish species in comparison to the combined data across all sites.

Sub-Sector 3C

The southern part of Sub-sector 3 (Sector 3C) contained three recorded sites (Figure 24). Only one (R26/370) showed clear evidence of occupation, in the form of a sparse scatter of crushed shell exposed in a sheep track. The other two (R26/369 – a possible pit and associated possible terrace, and R26/455 – a possible terrace) were recorded on the basic of earthworks features.

The results of the investigations of these sites are summarised as follows:

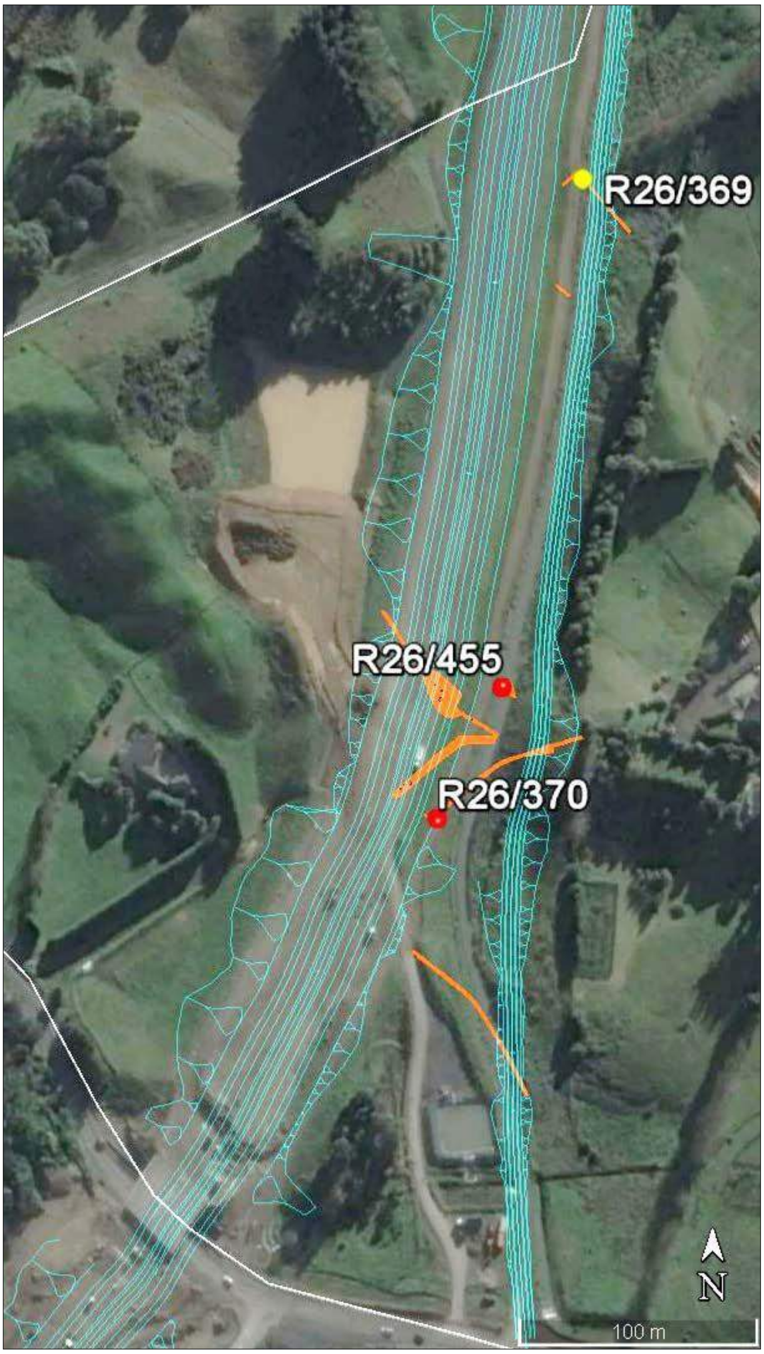

Figure 24. Aerial view of Sector 3C showing locations of trenches and previously recorded archaeological sites R26/369, R26/370 and R26/455.

R26/369

This was a circular depression with a slightly level area some 50 m away to the south of the depression, in the mid-southern portion of this sector (see Figure 12 and Figure 24). These two features were interpreted as a possible pit and a possible terrace which are common in agricultural field systems and settlement patterns of many parts of the North Island. We investigated the possible pit by hand and found no evidence that it was actually a pre-European kumara storage pit. It is more likely to be some sort of small pit, dug by a farmer to obtain fill. We investigated a wide area, including the possible terrace nearby, exposing some 300 m^2 of subsoil but found nothing to suggest the presence of archaeological material, either historic or prehistoric in origin.

R26/370

This site was visible as a small exposure of sparse, crushed shell midden in a stock track. There were several vaguely level areas in the vicinity, one of which was subsequently recorded by Mary O'Keeffe and given the site number R26/455. The shell midden turned out to have been part of a small, redeposited midden that had been extensively disturbed during the formation of the adjacent farm track, and was contained within the spoil from the track formation.

R26/455

This was a slightly level area recorded as a possible terrace site and its investigation yielded no evidence of cultural activity. Approximately 15 m south and west were a single, very small fire scoop and two square post holes that were likely to have been for nineteenth or twentieth century fence posts (Figure 25, 26). A charcoal sample was recovered from the fire scoop for dating and palaeobotanical analysis.

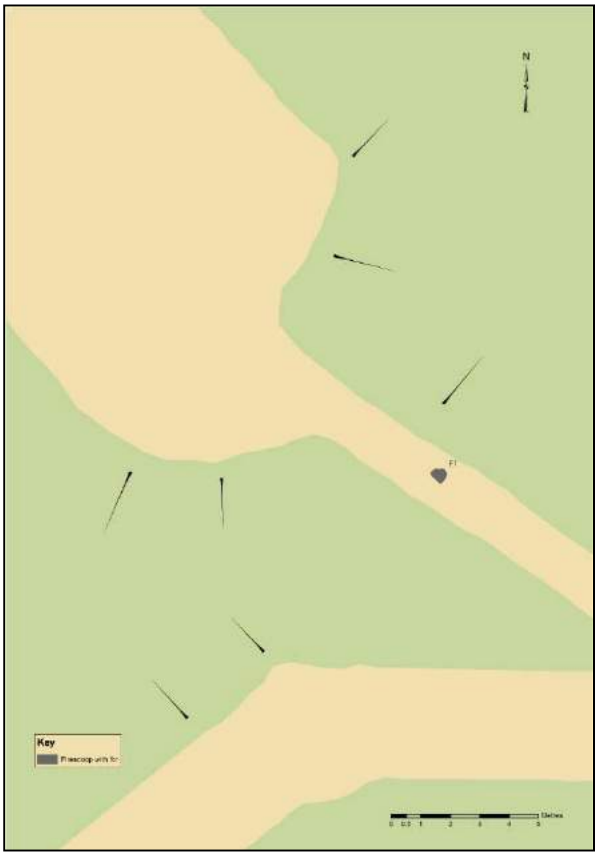

Figure 25. Site R26/455 showing location of firescoop, within trenched area (yellow).

Figure 26. Small fire scoop visible in the south baulk of the trench (lower part of baulk, scale in 20 cm increments), of site R26/455. The dark lens midway up the section may be evidence of later burning that accumulated in a hollow formed by the original fire scoop.

7.3 Sector 4

Sector 4 (Waikanae River to Te Moana Road, Authority No. 2013/639) was not part of the original brief for the pre-construction archaeological investigations. However, we were asked while we were in the field if we could undertake some preliminary test trenches on the crescent shaped ridge north of the Takamore Urupa (Figure 27). In the process of this work a small midden site was encountered. This was subsequently recorded as R26/497. The results of the faunal analysis are presented below (Table 7, Table 8), followed by a comparison with the results for the whole study area (Figure 28).

Figure 27. Aerial view of Sector 4 showing locations of trenches and recorded archaeological site R26/497.

R26/497

Table 7. Results of analysis of marine shell sample from R26/497.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	1		1	0.061	1.26
Austrofusus glans	15	15	15	0.920	17.73
Dosinia anus	264	264	132	8.098	1,622.94
Paphies subtriangulata	2,936	2,936	1468	90.061	2,474.93
Spisula aequilatera	27	27	14	0.859	17.41
Total	3,243	3,242	1630	100.000	4,134.27

Table 8. Results of analysis of vertebrate faunal assemblage sample from R26/497.

Class	Species	NISP	MNE	MNI
Fish	Carangidae	1	1	1
	Unidentified	25		
Total		26		
Bird	Unidentified	1		

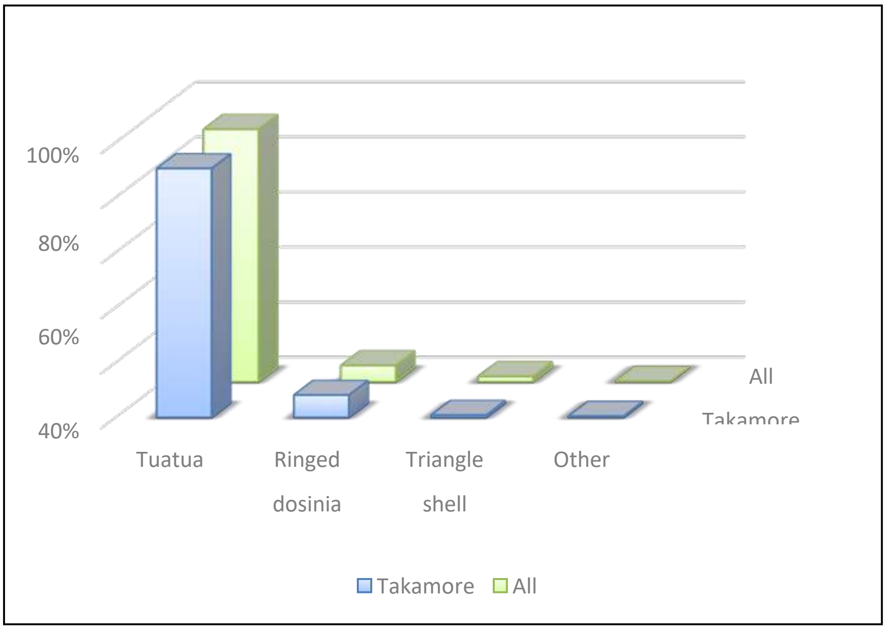

Figure 28. Bar graph showing the relative abundance (MNI) of the main species of shellfish from R26/497 (n = 1,631) in comparison to the combined abundance across all sites (n = 106,373).

Tuatua was the dominant shellfish species in the midden, comprising over 90 per cent of the total sample. Ringed dosinia was the next most common at eight per cent. There was a small amount of fish bone but only a single bone from a fish from the Carangidae family could be positively identified.

7.4 Sector 5

Sector 5 comprises that part of the development footprint that lies in the stretch of dunes that runs between Te Moana Road and Ngarara Road. The locations of the trenches are shown in Figure 29 and Figure 30. Five previously recorded sites (R26/38, 39, 430, 433 and 462) were located in the section and sixteen new sites (R26/472-486) were identified and investigated.

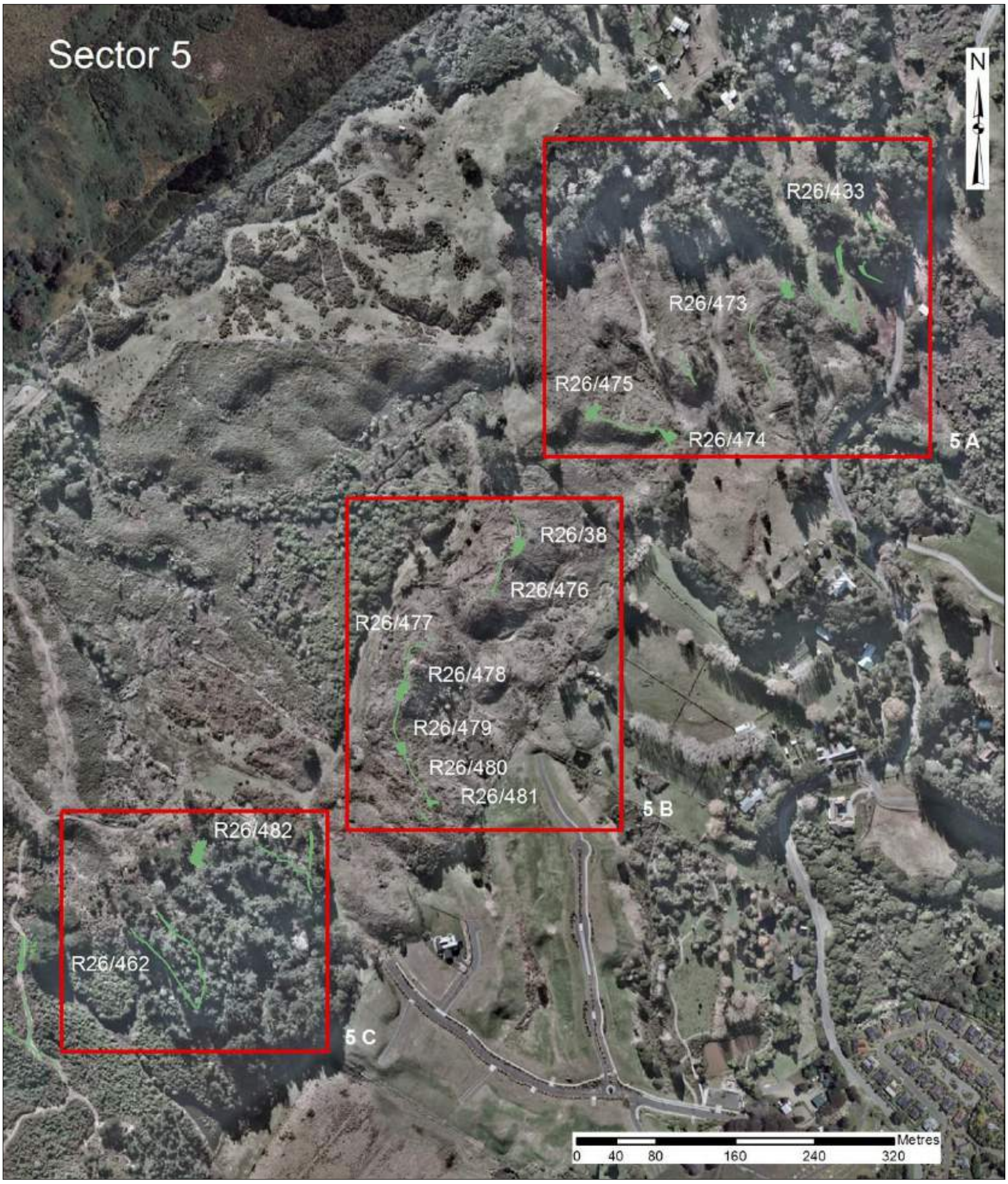

Figure 29. Aerial view of Sector 5 showing locations of excavation trenches and recorded (existing and new) archaeological sites. Red squares indicate boundaries of sub-sectors discussed in text.

Figure 30. Aerial view of northern part of Sector 5 (5A) showing locations of excavation trenches and recorded (existing and new) archaeological sites.

The land between Te Moana and Ngarara Roads was largely covered in thick gorse which was mulched prior to the trenching investigations. Because of this and the steepness of the dune slopes our trenches were largely concentrated on the dune ridges where the mulcher could safely clear the gorse. Where possible we extended our investigations down the dune slopes but this was dictated by safety constraints for the machine operators. For the presentation of the results we have divided Sector 5 into three sub-sectors, 5A, 5B and 5C.

Sub-Sector 5A

Sub-sector 5A was dominated by high dunes that were investigated by machine trenching and contained five archaeological sites (R26/433 and 472-475).

R26/433

This was a large site that contained fire scoops, ovens, shell middens and several possible terraces (Figure 31 to Figure 33). A small adze of Nelson Mineral Belt argillite (Figure 34) was found 80 m south of the centre of the site during the trenching phase. Some of the most substantial and diverse midden deposits were found on this site. It was one of the most challenging sites to excavate because it was under mature pines and contained a dense mat of tree roots just below the surface. Because of the size of the site, several long trenches were excavated to allow the recording of detailed section drawings (Figure 32).

Prior to the commencement of the investigation it appeared that a number of terraces were present on the small hill where R26/433 was recorded. Our investigations determined that all of these apparent terraces were natural in origin and there was no correlation between archaeological remains and the terraces themselves.

Faunal remains sampled from this site were dominated by shellfish but fish, bird and mammal bone was also recovered (Tables 9, 10 and Figure 35). Thirteen species of invertebrates were identified (12 shellfish and one echinoderm) but over 94 per cent of the sample comprised tuatua with the remaining surf clams comprising only 5.63 per cent. The echinoderm, known as cake urchin or sand dollar (*Fellaster zelandiae*), is common along the Kapiti Coast. It may have become incorporated into the midden as by-catch from the harvesting of the surf clams.

Three fragments of crustacean claw were recovered from this site. This is most likely from paddle (or swimming) crab (*Ovalipes catharus*).

Twelve fish species were present albeit in low numbers. Blue cod (*Parapercis colias*) which was the most common only had an MNI of four and wrasses (Labridae) were the next most frequent with an MNI of three. The presence of these species along with blue moki (*Latridopsis ciliaris*) and conger eel (*Conger verreauxi*) implies that fishing was taking place off the rocky shore, the nearest of which is around Kapiti Island.

Bird bone was very fragmentary but it was possible to identify kereru (Hemiphaga novaeseelandiae), tui (Prosthemadera novaeseelandiae), and a prion (Pachyptila sp.). The only mammal present in the site was rat with an MNI of five.

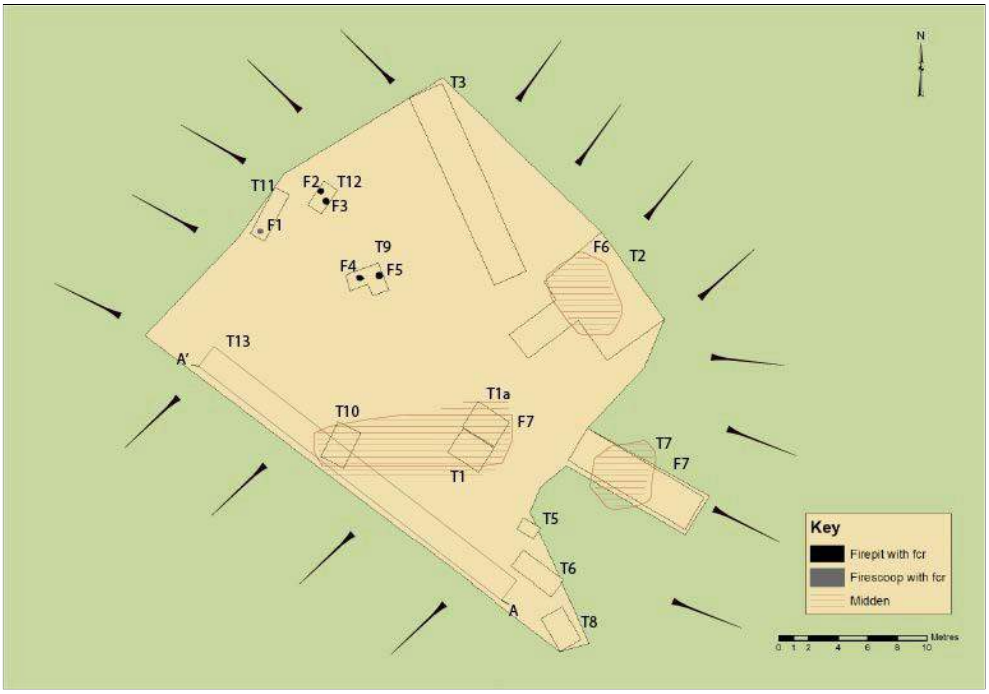

Figure 31. Site R26/433 showing excavated area (yellow) and locations of excavated features. Areas excavated by hand are outlined. The location of the section drawing in Figure 32 is marked by A and A'.

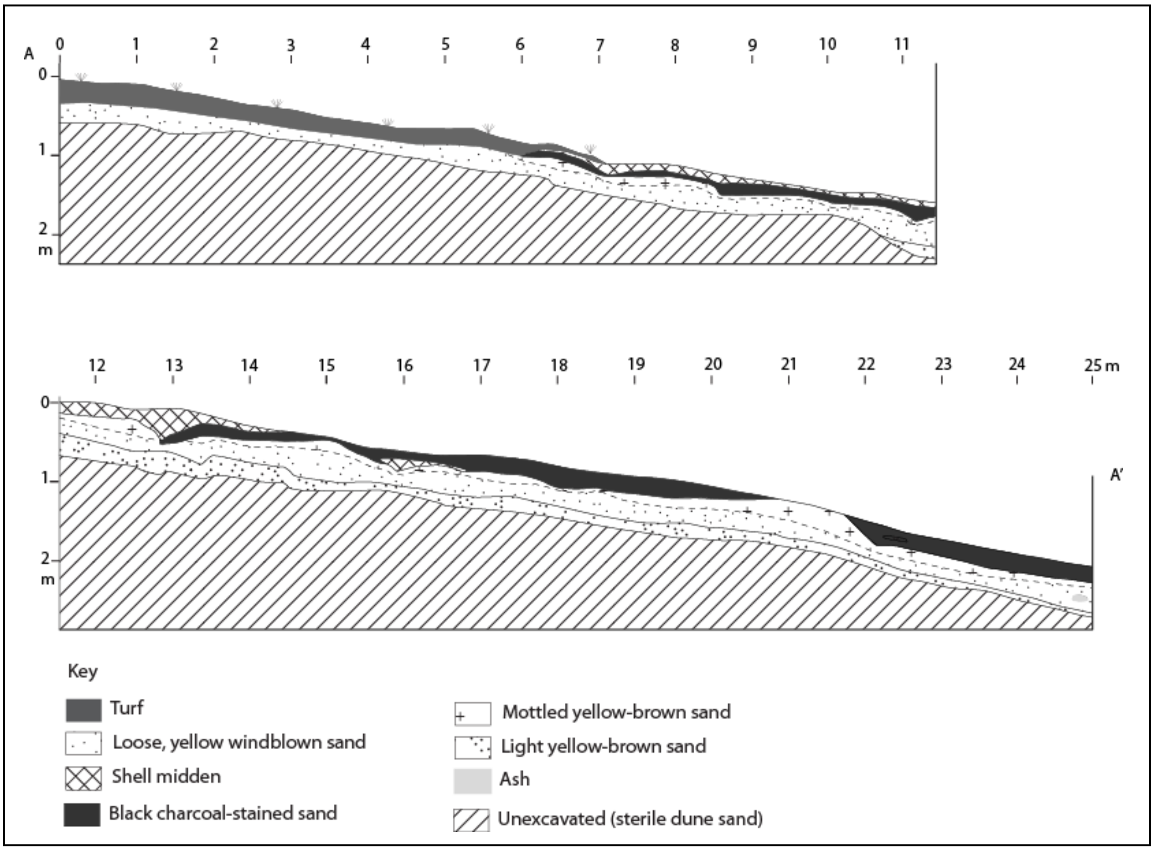

Figure 32. Section drawing of south baulk of Trench 13 showing basic stratigraphy of R26/433.

Figure 33. North baulk of Trench 10 showing deep, densely packed midden deposit (scale in 20 cm increments).

Figure 34. Small adze head of Nelson Mineral Belt argillite found near site R26/433.

Table 9. Results of analysis of marine shell sample from R26/433.

Species	**NISP**	**MNE**	**MNI**	**% MNI**	**Weight (g)**
Alcithoe arabica	3		1	0.01	78.47
Austrofusus glans	50	20	20	0.18	76.13
Bassina yatei	1	1	1	0.01	2.77
Calliostoma selectum	1	1	1	0.01	5.58
Dosinia anus	668	667	334	3.01	7,682.02
Fellaster zelandiae			1	0.01	43.74
Haliotis australis			1	0.01	1.31
?Hyridella menziesii			1	0.01	1.81
Mactra discors	4	4	2	0.02	14.26
Mactra murchisoni	6	6	3	0.03	6.98
Paphies subtriangulata	23,511	20,870	10,435	94.13	39,362.42
Peronaea gaimardi	3	3	2	0.02	5.63
Spisula aequilatera	568	568	284	2.56	1,706.67
Unidentified					8,681.13
Total	24,815	22,140	11,086	100.00	57,668.92

Table 10. Results of analysis of vertebrate faunal assemblage sample from R26/433.

Class	**Species**	**NISP**	**MNE**	**MNI**
Fish	Barracouta	6	5	1
	Blue cod	29	29	4

	Blue moki	1	1	1
	Conger eel	4	4	1
	Dogfish	1		
	Hapuku	1	1	1
	Kahawai	4	4	1
	Labridae	7	7	3
	Red cod	8	8	2
	Red gurnard	1	1	1
	Snapper	29	6	2
	Tarakihi	5	5	1
	Unidentified	825	13	
	Total	921	84	18
Bird	Kereru	3	3	1
	Prion	1	1	1
	Tui	1	1	1
	Unidentified	15	1	
	Total	20	6	3
Mammal	Rat	37	19	5
Total		1919	199	42

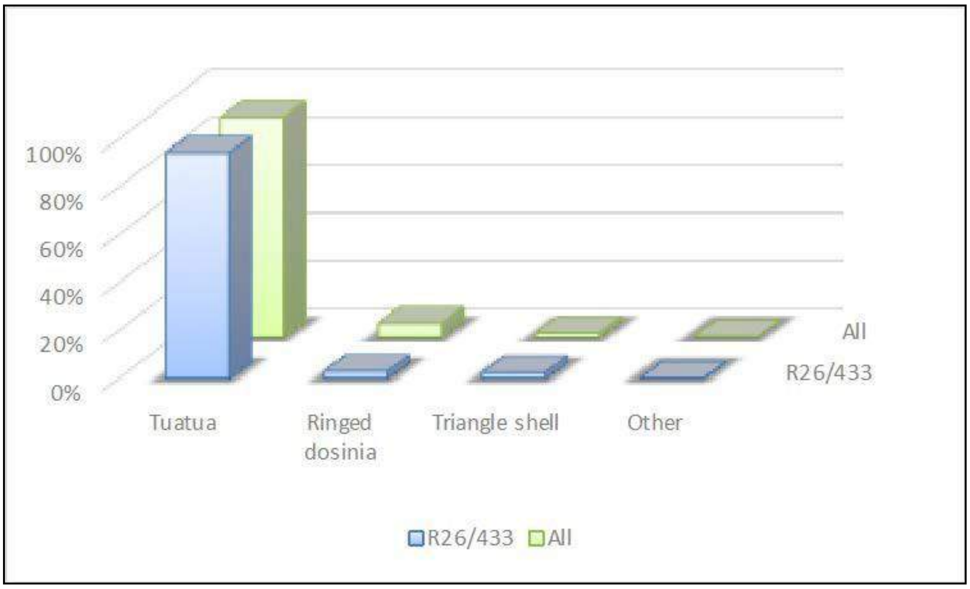

Figure 35. Relative abundance (MNI) of the main shellfish species from R26/433 (n = 12,418) in comparison to the combined abundance across all sites (n = 106, 373).

R26/472

This site comprised a midden scatter on a dune ridge that also spilled over the southern slope of the dune (Figure 36). No fire features were found here. However, a small sandstone grindstone or hoanga (Figure 37) was found on the top of the dune near the centre of the site.

Tuatua was the dominant species in the midden (Table 12) comprising over 93 per cent of the shell sample with the other surf clam species making up the remainder although there was a small amount of cake urchin. Five fish species were present (Table 13) although in the case of Elasmobranch this class comprises cartilaginous sharks and rays which were not identifiable to species. Only two fragments of bird bone were present which were not identifiable to species (Figure 38).

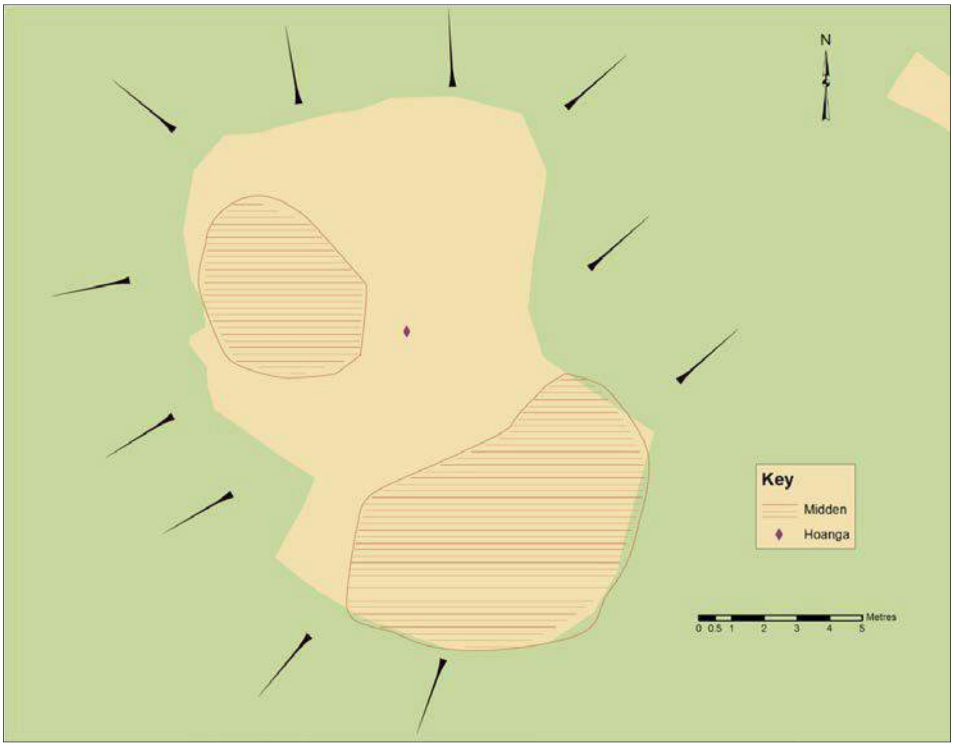

Figure 36. Plan of R26/472 showing area excavated (yellow) and locations of midden scatters and hoanga findspot.

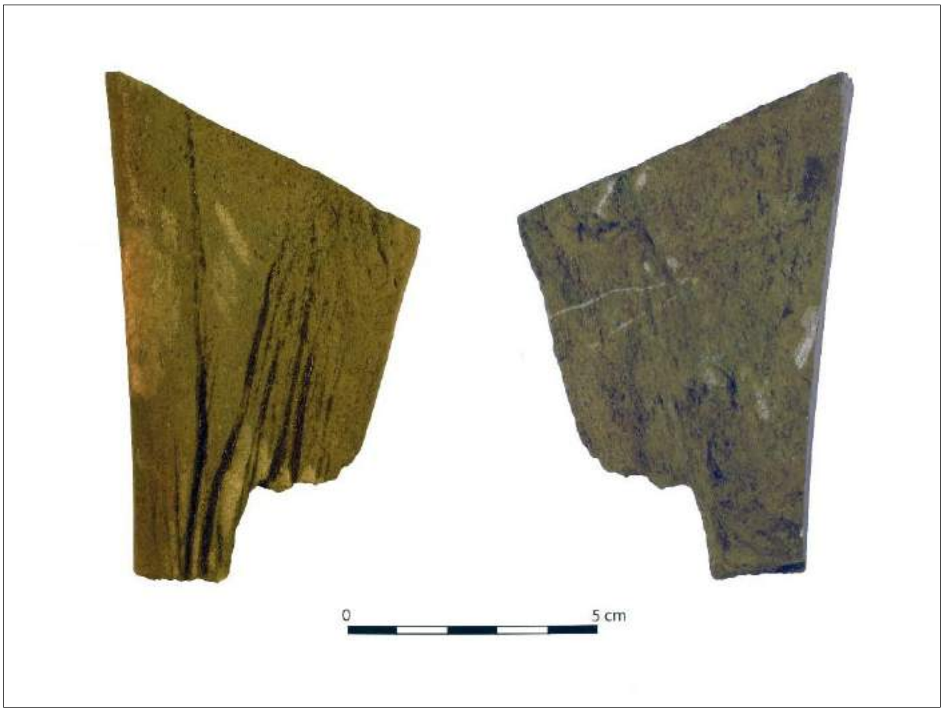

Figure 37. Grindstone or hoanga found at site R26/472.

Table 12. Results of analysis of marine shell sample from R26/472.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Dosinia anus	256	256	128	5.89	1,397.13
Fellaster zelandiae	14		1	0.05	1.84
Paphies subtriangulata	4,067	4,067	2,034	93.60	6,188.28
Spisula aequilatera	20	20	10	0.46	62.15
Unidentified	2				5,395.2
Total	4,359	4,343	2,173	100.00	13,044.6

Table 13. Results of analysis of vertebrate faunal assemblage sample from R26/433.

Class	Species	NISP	MNE	MNI
Fish	Blue cod	1	1	1
	Elasmobranch	4		
	Labridae	5	5	1
	Red cod	5	2	1
	Tarakihi	2	2	1
	Unidentified	151		
Bird	Unidentified	2		
Total		171	10	4

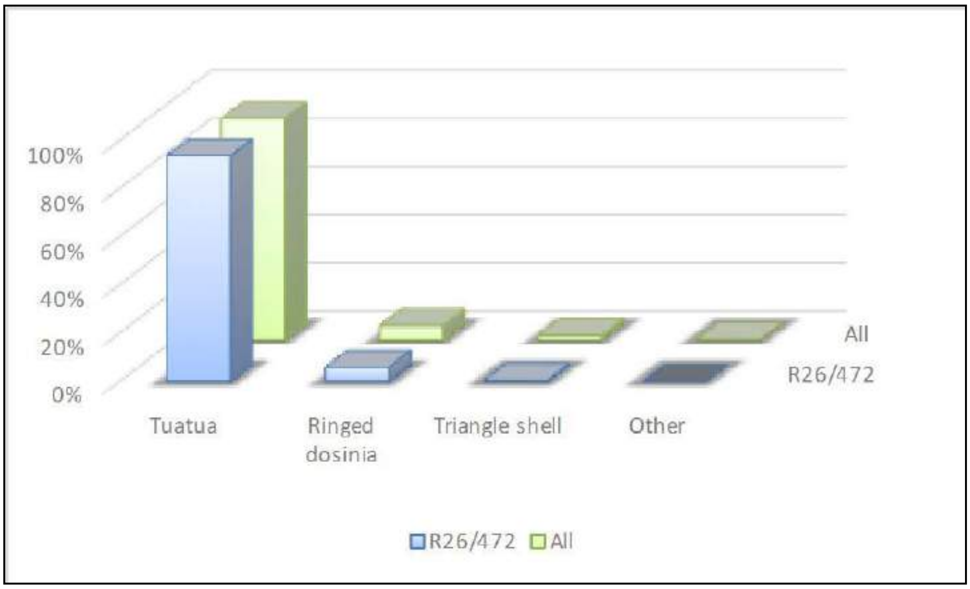

Figure 38. Relative abundance of main shellfish species (MNI) from R26/472 (n = 2, 172) in comparison to the combined abundance across all sites (n = 106, 373).

R26/473

This was a very sparse midden scatter on the end of a dune ridge (Figure 39). No faunal samples or other material were recovered from this site.

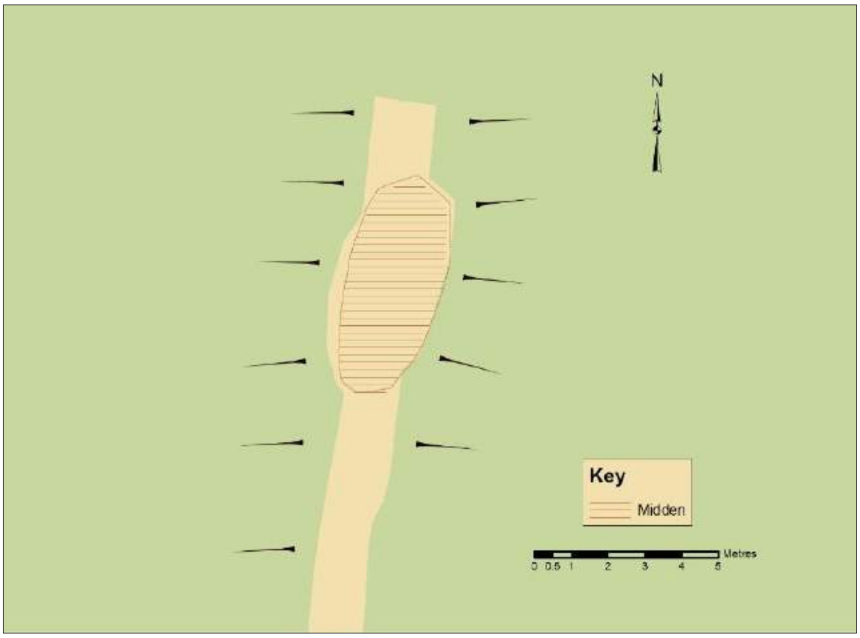

Figure 39. Plan of R26/473 showing area excavated (yellow) and locations of midden scatter. The green area was unexcavated.

R26/474

This site comprised several small areas of charcoal stained soil and midden (Figures 40, 41). For the most part these were small and ephemeral but there was one more extensive deposit that was distributed down the northwest slope of the dune and was more than a metre deep in places. A large trench was excavated down the face of the dune to allow a section to be recorded and to allow midden samples to be taken from a controlled stratigraphic profile.

Because of the size of the midden, approximately half of the midden was sampled and taken to the OAL for analysis. The remaining portion was left intact but will be destroyed by the Expressway construction.

Tuatua was the dominant shell species (Table 13) although less so than in the majority of sites described in this report (Figure 42). Six species of fish were identified (Table 16) although in very low numbers.

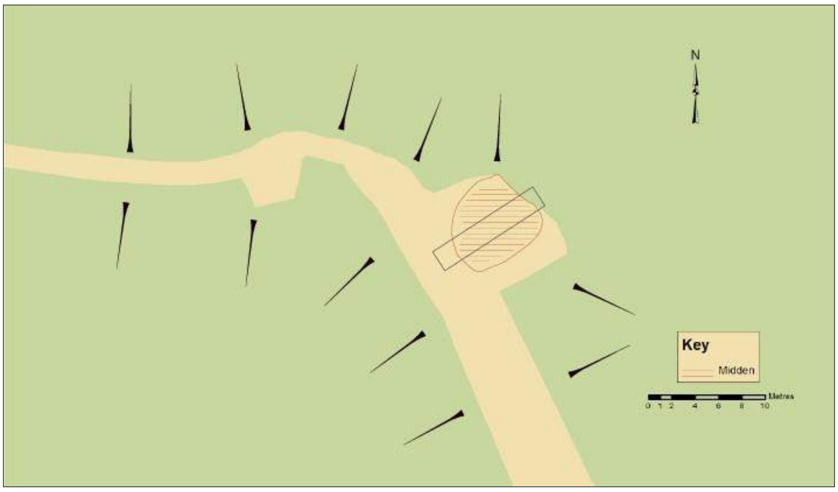

Figure 40. Plan of R26/474 showing area investigated (yellow) including the trench shown in Figure 41 and locations of midden scatter.

Figure 41. Section through R27/474 looking south east (scale = 2 m). The midden sample came from the small trench in the centre.

Table 13. Results of analysis of marine shell sample from R26/474.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	3	3	3	0.1	7.48
Bassina yatei	1	1	1	0.0	6.65
Dosinia anus	1,765	1,765	883	22.0	8,056.7
Fellaster zelandiae	17		1	0.0	1.71
?Hyridella menziesii			1	0.0	11.11
Paphies subtriangulata	6,207	6,207	3,104	77.5	10,353.47
Spisula aequilatera	28	28	14	0.3	87.3
Unidentified	6				21,134.68
Total	8,027	8,004	4,007	100	39,659.1

Table 16. Results of analysis of vertebrate faunal assemblage sample from R26/474.

Class	Species	NISP	MNE	MNI
Fish	Barracouta	3	3	1
	Elasmobranch	3		
	Labridae	3	3	1
	Leatherjacket	1	1	1
	Snapper	5	1	1
	Unidentified	27	1	
	Total	42	9	4

Mammal	Rat	3	2	1
Total		87	20	9

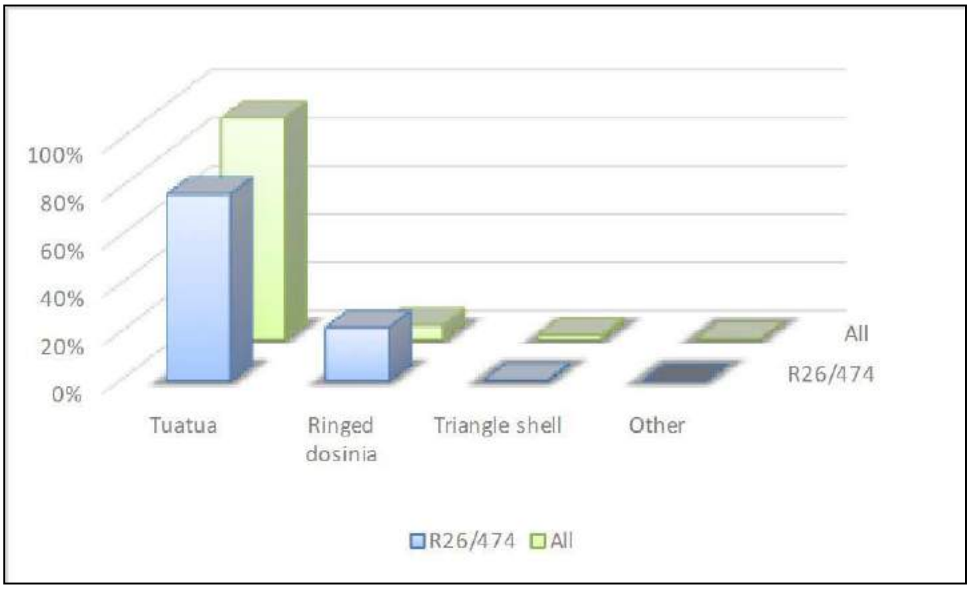

Figure 42. Relative abundance of main shellfish species (MNI) in R26/474 (n = 3, 993) in comparison to the combined abundance across all sites (n = 106, 373).

R26/475

This was a relatively small midden deposit scattered down the north slope of the same dune ridge as R26/474 (Figure 43, 44 and 45). It is possible that some parts of the site remain intact to the north outside of the current proposed cut line.

Surf clams were the dominant shellfish species in the midden with tuatua (84.07 per cent) and ringed dosinia (12.3 per cent) making up a little over 96 per cent of the total shellfish. At least two rocky shore species (radiate limpet and paua) were identified albeit in very low numbers suggesting a foraging strategy that was not solely limited to the sandy shore (Figure 46). The use of the rocky shore, probably around Kapiti Island, is confirmed by some of the fish species from this site that include blue moki, blue cod and greenbone which all prefer rocky habitats.

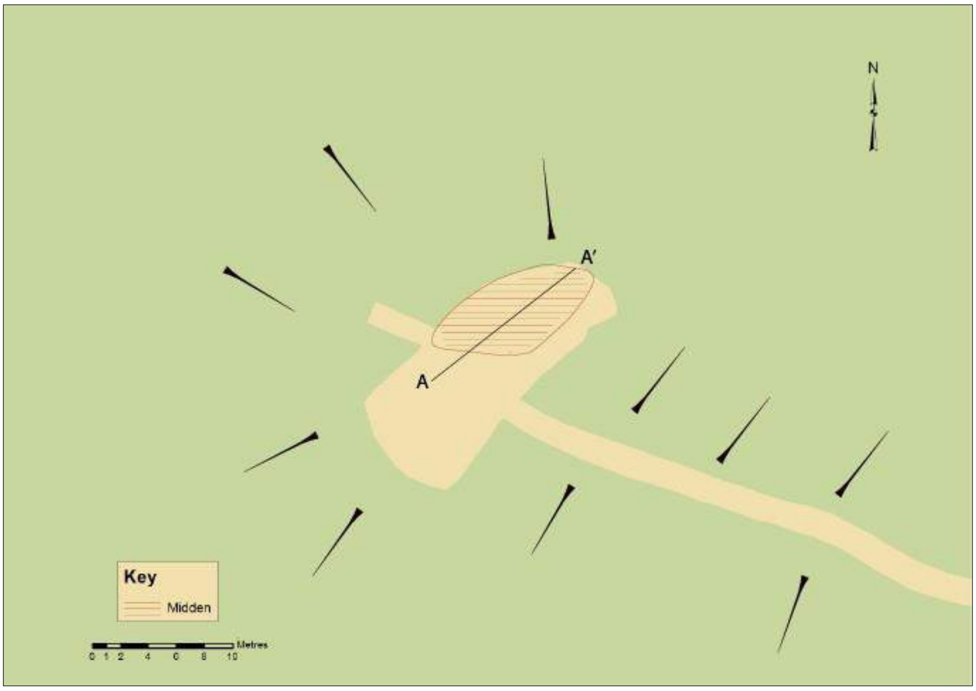

Figure 43. Plan of R26/475 showing area investigated (yellow) and location of midden. The location of the section drawing in Figure 45 is shown.

Figure 44. Section through R26/373 looking west (scale in 20 cm increments).

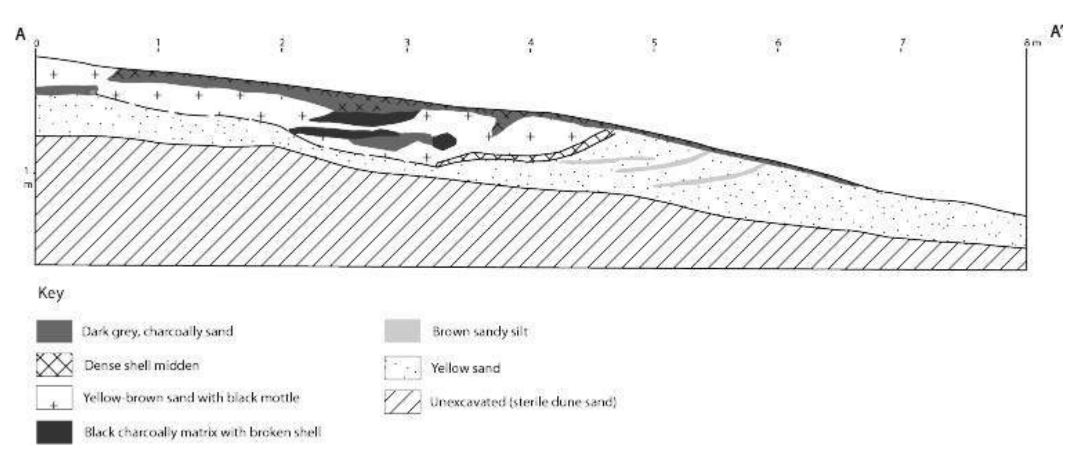

Figure 45. Section drawing of western face of trench through R26/475.

Table 17. Results of analysis of marine shell sample from R26/475.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	33	17	17	0.41	42.63
Austrovenus stutchburyi	1	1	1	0.02	0.15
Cellana radians	1	1	1	0.02	9.32
Cookia sulcata	5	3	3	0.07	2.78
Dosinia anus	1,015	1,015	508	12.30	8,118.19
Fellaster zelandiae			1	0.02	178.63
Haliotis australis	6	4	4	0.10	78.91
?Hyridella menziesii	2	2	1	0.02	2.2
Paphies subtriangulata	6,945	6,945	3,473	84.07	17,925.11
Spisula aequilatera	197	244	122	2.95	277.07
Unidentified	2				20,942.98
Total	8,207	8,232	4,131	100.00	47,577.97

Table 18. Results of analysis of vertebrate faunal assemblage sample from R26/475.

Class	Species	NISP	MNE	MNI
Fish	Barracouta	24	15	3
	Blue cod	3	3	1
	Blue moki	3	3	1
	cf Snapper	1	1	1
	Greenbone	3	3	1
	Labridae	25	24	5
	Red cod	29	24	6
	Red gurnard	1		
	Tarakihi	4	4	1

	Unidentified	1,550	12	
	Total	1,643		
Bird	Unidentified	3	89	19
Mammal	Rat	19	10	3

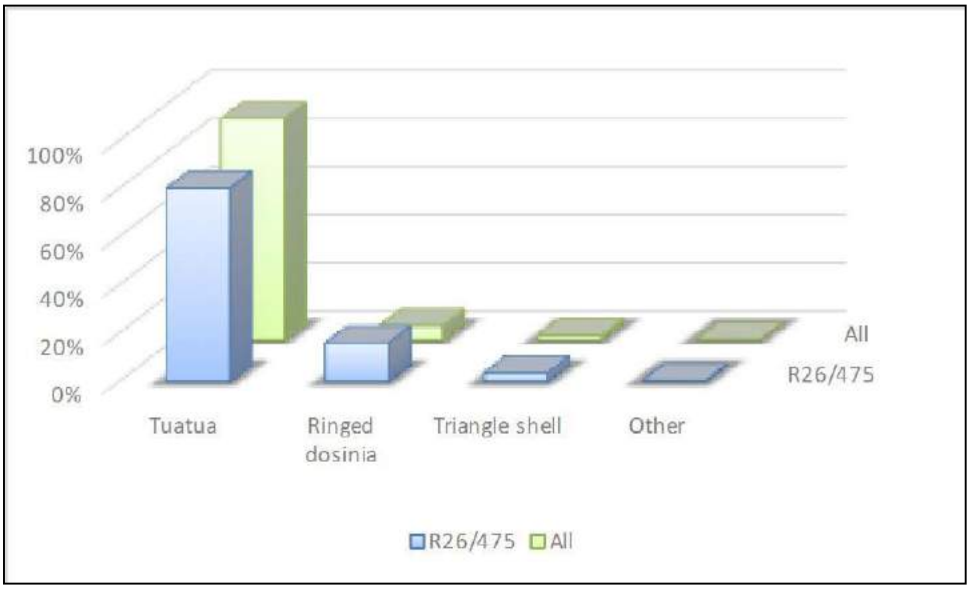

Figure 46. Relative abundance of main shellfish species (MNI) in R26/475 (n = 3, 159) in comparison to the combined abundance across all sites (n = 106, 373).

Sub-Sector 5B

Sub-sector 5B is the second of five sub-sectors in Sector 5 and is situated immediately south of Sub-sector 5A (see Figure 2 and Figure 47). This sub-sector contained two recorded sites (R26/38 and 39) and six that were discovered during the trenching investigations (R26/475-481). Although we are not certain that we have relocated either site R26/38 or R26/39, these were originally

recorded as two midden sites with grid references that put them very close to a cluster of middens and fire features that were found during the trenching, and R26/38 and 39 are recorded as being only about 30 m apart. For this reason we assigned one of the site numbers (R26/38) to the new site and considered that, for the purposes of this work, R26/39 could not be found. The area has been in forestry since the 1960s when these sites were first recorded and it is possible that one or both have been badly damaged or destroyed.

Figure 47. Sub-sector 5B showing locations of excavation trenches and archaeological sites.

R26/38

This site comprised a number of small fire features and midden deposits scattered over approximately 20 m of dune ridge (Figure 48). The midden deposits were very small and shallow, and faunal samples from each were recovered (Figure 49). Four of the fire features were relatively shallow (<100 mm deep) fire scoops with fire-cracked rocks within. They were smaller than would normally be called ovens, and were simply recorded as “hearths”. Three of the fire features were deeper than 100 mm and we recorded these as “ovens”.

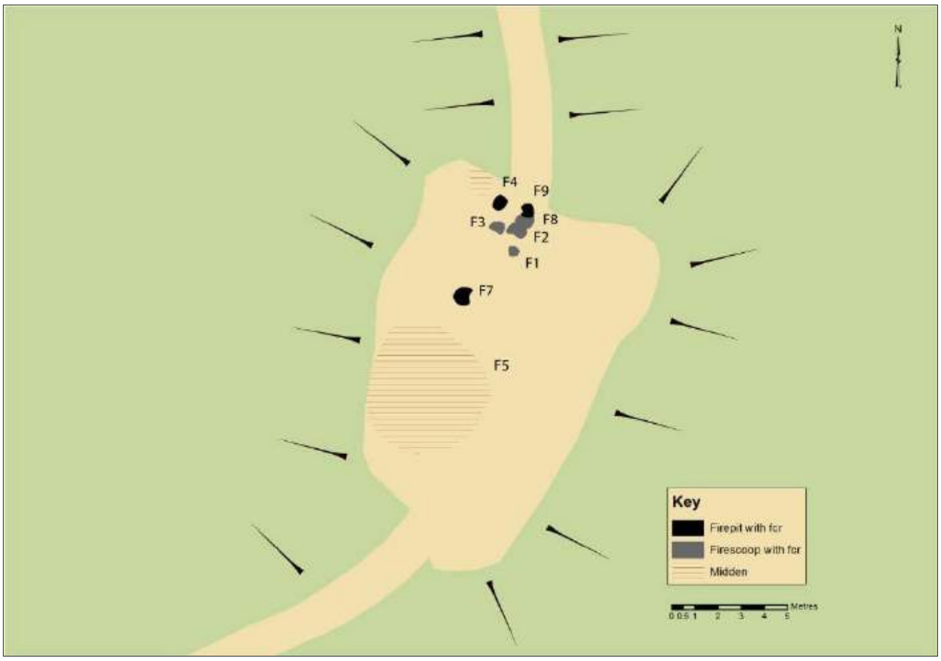

Figure 48. Plan of R26/38 showing area investigated (yellow) and locations of excavated features.

Figure 49. Cluster of hearths after they were half-sectioned, looking west (scale = 2 m). Orange areas are the remains of tree roots.

Unlike most of the middens described in this report tuatua and ringed dosinia were almost equally represented (Figure 50) although tuatua was slightly more common (52.51 per cent) (Table 19). A small amount of fish bone comprising four species was identified and no bird or mammal bone was present. The fish species are typical of those described for the other assemblages.

Figure 50. Relative abundance of main shell species (MNI) from R26/477 (n = 419) in comparison to the combined abundance across all sites (n = 106, 373).

Table 19. Results of analysis of marine shell sample from R26/38.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	2	2	2	0.48	0.20
Dosinia anus	381	381	191	45.58	649.61
Fellaster zelandiae	8		1	0.24	1.21
Paphies subtriangulata	439	439	220	52.51	881.71
Semicassis pyrum	2	1	1	0.24	4.64
Spisula aequilatera	8	8	4	0.95	6.70
Unidentified					3,205.90
Total	840	831	419	100.00	4,749.97

Table 20. Results of analysis of vertebrate faunal assemblage sample from R26/38.

Species	NISP	MNE	MNI
Barracouta	1	1	1
cf Kahawai	1	1	1
Labridae	4	4	3
Snapper	1	1	
Unidentified	71		

R26/476

This site number was assigned to an area of charcoal-stained soil found during the trenching phase of work. However, later excavation showed that it was in fact an ephemeral layer of dark-stained soil that most likely relates to vegetation clearance and burning, either in European times or earlier.

R26/477

This site comprised a group of two midden concentrations and four fire features on the top and on the western slope of a small knoll (Figure 51). The site was completely excavated and samples of fauna and charcoal were taken to the OAL for analysis. The fire features did not contain any fire cracked rock but they contained a lens (particularly F2 and F5) of "baked" silty matrix that appeared to have been subjected to high heat (Figure 52 to 54). This baked matrix lens did not contain any charcoal but there were charcoal rich lenses both above and below it.

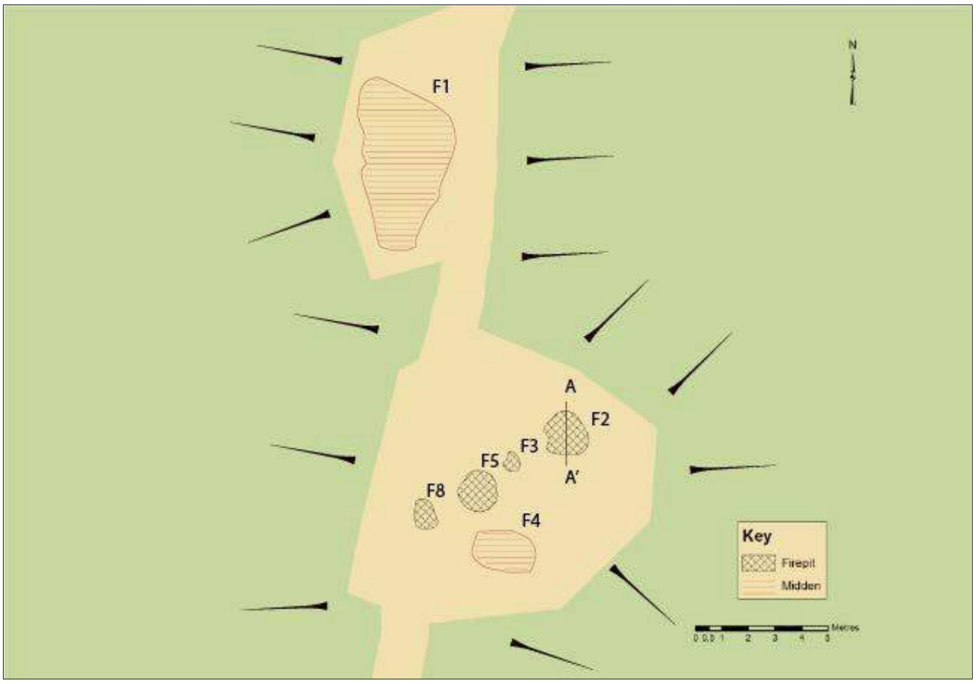

Figure 51. Plan of R26/477 showing area investigated (yellow) and locations of excavated features. The location of the section drawing in Figure 54 is shown.

Figure 52. Features 2 (top), 3 and 5 (bottom) looking east following half-sectioning (horizontal scale = 2 m, vertical scale = 30 cm).

Figure 53. Feature 5 looking east after it was half-sectioned (horizontal scale = 2 m, vertical scale = 40 cm). The feature only contained charcoal and burnt sand. There was no fire cracked rock present.

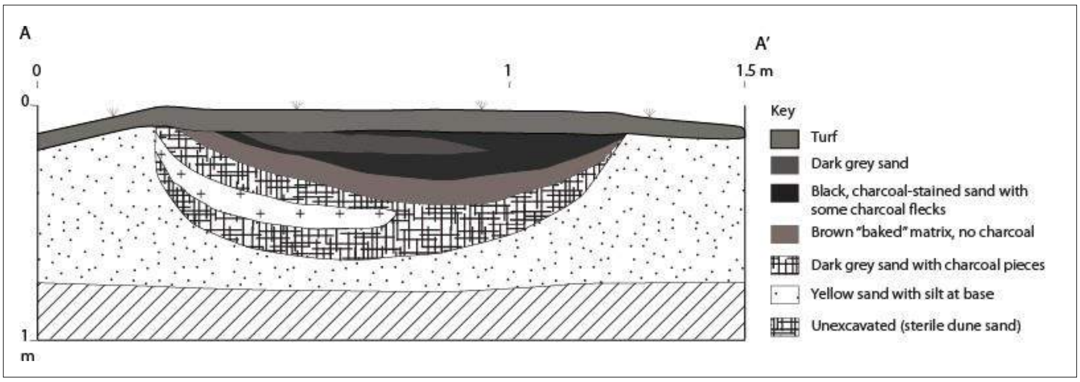

Figure 54. Stratigraphic drawing of eastern section through Feature 2.

Surf clams dominated the shellfish assemblage and there was a single rocky shore species (paua, *Haliotis iris*) (Table 21, Figure 55). A small amount of fish bone was recovered including a tooth plate for an eagle ray (*Myliobatus tenuicaudatus*) along with a single fragment of unidentifiable bird bone (Table 22).

Table 21. Results of analysis of marine shell sample from R26/477.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	15	2	2	0.13	4.06
Bassina yatei	7	1	1	0.07	6.07
Calliostoma selectum			1	0.07	0.96
Dosinia anus	655	653	327	21.87	5,880.71
Fellaster zelandiae			1	0.07	19.20
Haliotis iris			1	0.07	0.18
Paphies subtriangulata	2,311	2,310	1,155	77.26	5,007.14
Spisula aequilatera	21	14	7	0.47	46.55
Unidentified	6				3,726.50
Total	3,015	2,980	1,495	100.00	14,691.37

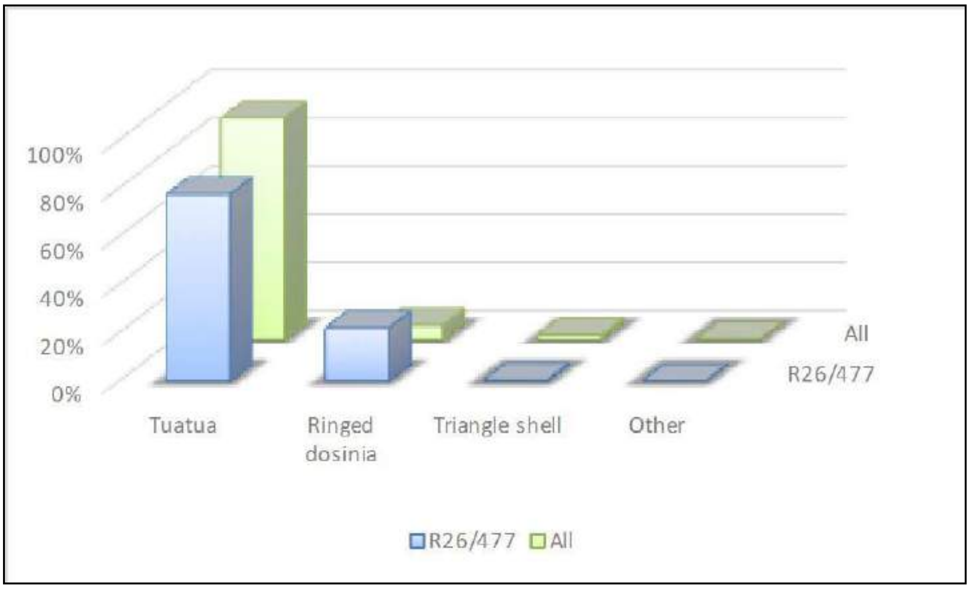

Figure 55. Relative abundance of main shell species (MNI) from R26/477 (n = 1, 492) in comparison to the combined abundance across all sites (n = 106, 373).

Table 22. Results of analysis of vertebrate faunal assemblage sample from R26/477.

Class	Species		NISP	MNE	MNI
Fish	Eagle ray	*Myliobatus tenuicaudatus*	1		
	Tarakihi		1	1	1
	Unidentified		67	1	
	Total		69	2	1
Bird	Unidentified		1		

R26/478

This site comprised a group of four fire features and a midden deposit (Figure 56). One of the fire features was considerably larger than any of the others found during the investigation, being just over 2 m in diameter and 300 mm deep, and was completely filled with fire cracked rocks (Figure 57 and Figure 58). Midden and charcoal samples were taken to the OAL for analysis.

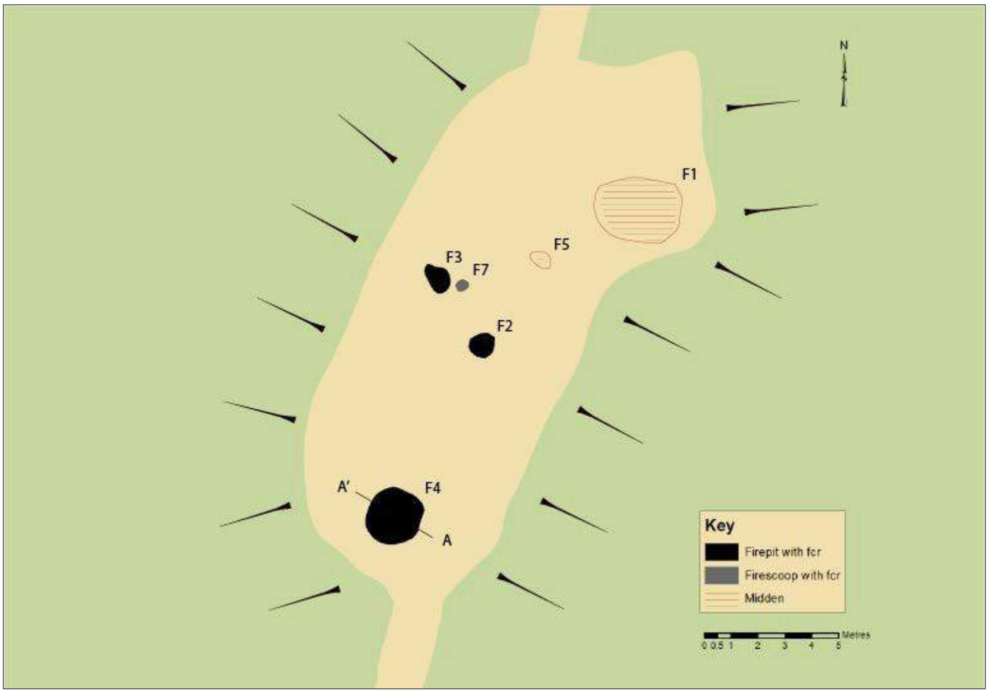

Figure 56. Plan of R26/478 showing area investigated (yellow) and locations of excavated features. The stratigraphic section through F4 in Figure 58 is labelled as A and A'.

Figure 57. Large fire feature (looking south) after it was half-sectioned (scale = 2 m). This was the largest fire feature that we found in any of the sites.

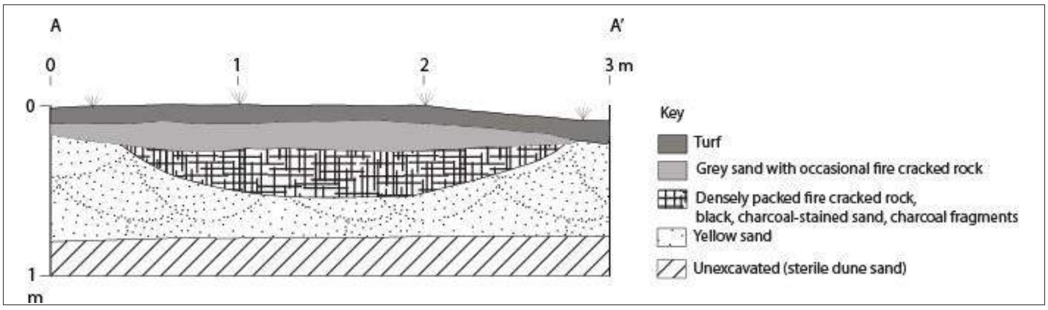

Figure 58. Stratigraphic drawing of southern section through Feature 4.

Tuatua comprised 99.35 per cent of the shell assemblage with very minor contributions from the other surf clam species and two gastropods (Table 23, Figure 59). A small amount of fish bone was present and only a single wrasse was identifiable. One rat mandible was also present (Table 24).

Table 23. Results of analysis of marine shell sample from R26/478.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica			1	0.02	0.35
Austrofusus glans	1	1	1	0.02	6.59
Dosinia anus	42	39	20	0.46	265.73
Fellaster zelandiae	14		1	0.02	1.80
Paphies subtriangulata	8,606	8,606	4,303	99.35	4,768.56
Spisula aequilatera	12	9	5	0.12	25.38
Unidentified					970.87
Total	8,675	8,655	4,331	100	6,039.28

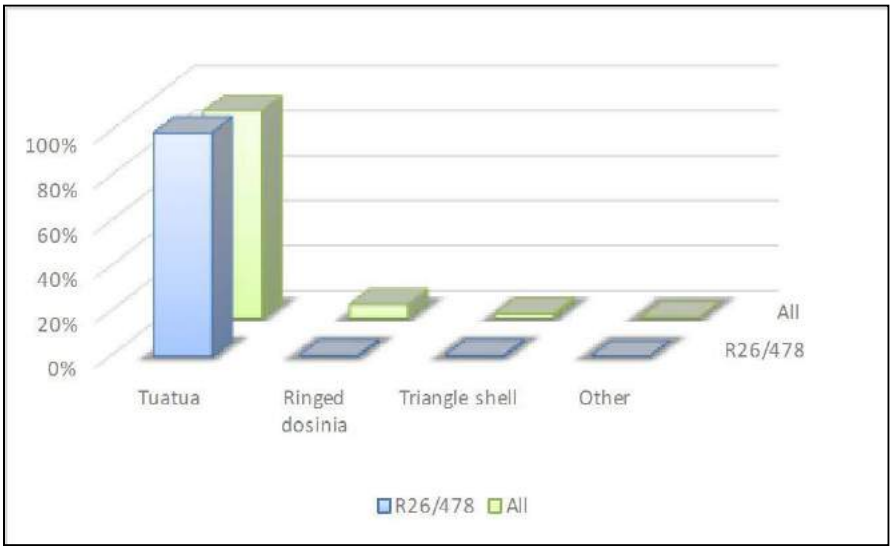

Figure 59. Relative abundance of main shell species (MNI) from R26/478 (n = 4, 330) in comparison to the combined abundance across all sites (n = 106, 373).

Table 24. Results of analysis of vertebrate faunal assemblage sample from R26/478.

Class	Species	NISP	MNE	MNI
Fish	Labridae	2	1	1
	Unidentified	11		
	Total	13	1	1
Mammal	Rat	1	1	1

R26/479

This site comprised two midden scatters and three fire features (Figures 60 and 61). Samples of midden and charcoal were returned to the OAL for analysis.

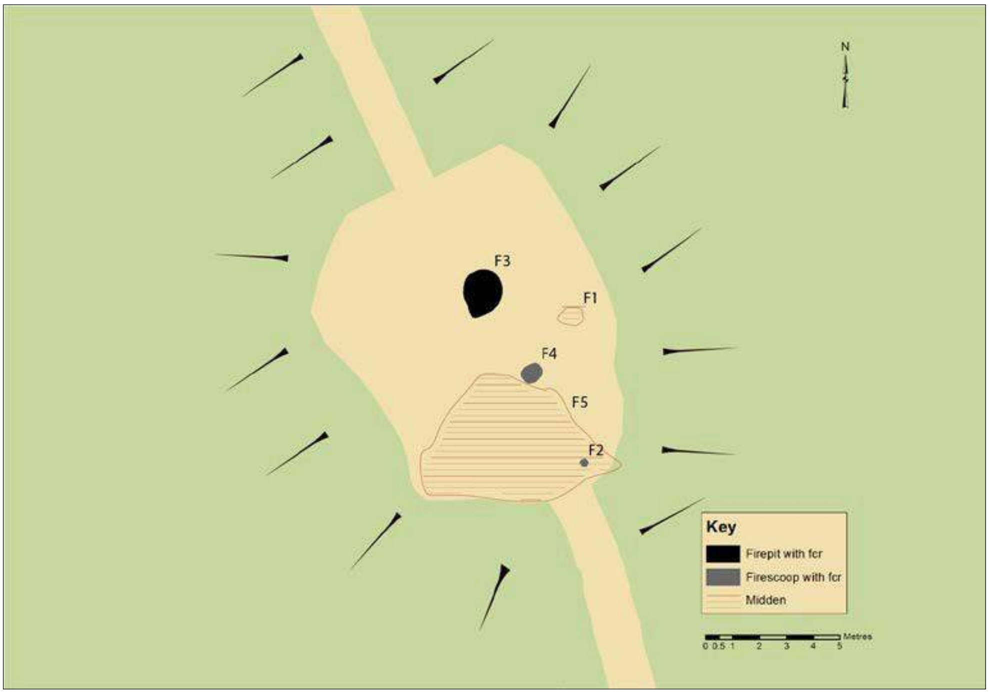

Figure 60. Plan of R26/479 showing area investigated (yellow) and locations of excavated features.

Figure 61. Half-section of small fire feature.

The composition of the shellfish assemblage was typical of the majority of sites in this study (Table 25, Figure 62) – it was dominated by tuatua (94.07 per cent). Two species of fish (dog fish and red cod) were present along with a single parakeet (Cyanoramphus sp.) and rat (Table 26).

Table 25. Results of analysis of marine shell sample from R26/479.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	1	1	1	0.20	3.15
Dosinia anus	41	41	21	4.29	279.27
Paphies subtriangulata	932	920	460	94.07	2,173.81
Spisula aequilatera	20	14	7	1.43	10.97
Unidentified	5				2,668.10
Total	999	976	489	100.00	5,135.30

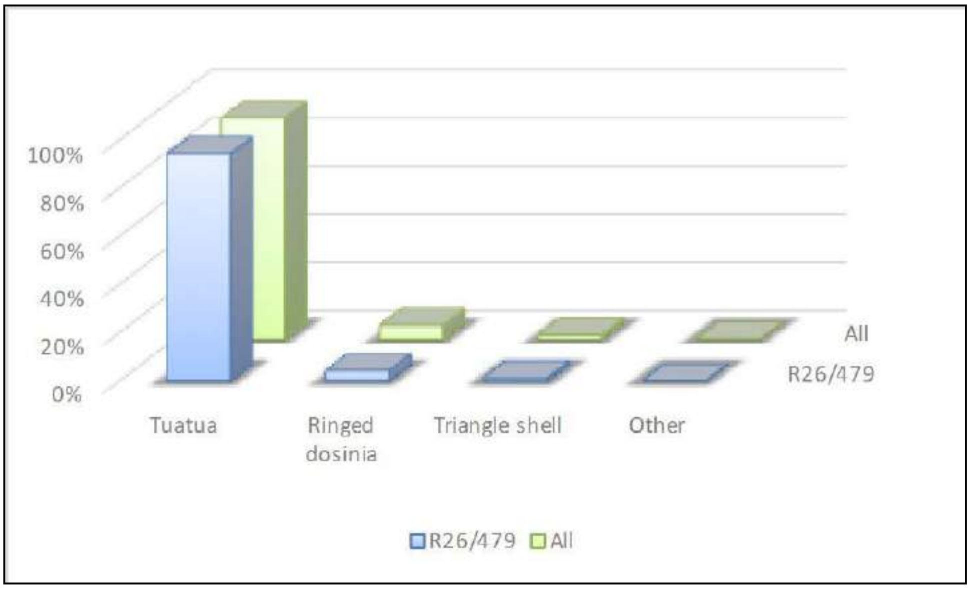

Figure 62. Relative abundance of main shell species (MNI) from R26/479 (n = 491) in comparison to the combined abundance across all sites (n = 106,373).

Table 26. Results of analysis of vertebrate faunal assemblage from R26/479.

Class		NISP	MNE	MNI
Fish	Dogfish	1		
	Red cod	1	1	1
	Unidentified	8		
Bird	Parakeet	1	1	1
Mammal	Rat	1	1	1

R26/480

This site comprised two fire features and a midden deposit (Figures 63 to 66). One of the fire features contained very black charcoal rich sand and fire cracked rock and was surrounded by a zone of grey charcoal-stained sand and fire cracked rock (Figure 66). Samples of fauna and charcoal were returned to the OAL for analysis.

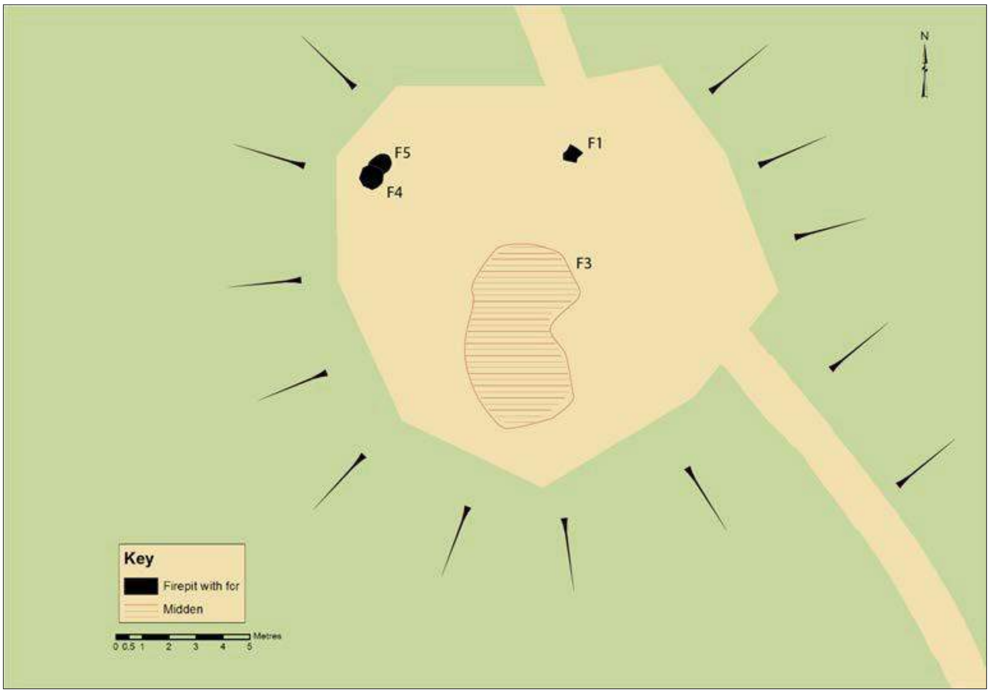

Figure 63. Plan of R26/480 showing area investigated (yellow) and locations of excavated features.

Figure 64. View looking SE towards R26/481 showing the general ground conditions. Feature 1 is visible to the left and the midden recorded as Feature 3 is on the right (scale = 2 m). Due to the shallow nature of many of the archaeological deposits the roots from the gorse and the pine trees previously growing on the site have caused disturbance to some features.

Figure 65. Small fire cracked rock filled feature (F1) looking north.

Figure 66. Large fire feature (F4) looking north (Scale = 1 m). The large zone of charcoal stained sand and fire cracked rock that was recorded as F5.

The relative abundance of shellfish taxa in R26/480 is largely typical of the other sites analysed in the project area (Table 27, Figure 67). Tuatua dominated making up over 86 per cent of the total sample. Five species of fish were identified but there was also a large amount (NISP = 1675) of unidentified fish bone (Table 28). This is much more fish bone than in many of the sites but it was highly fragmentary and three of the fish species (barracouta, carangidae and snapper) were not represented by any quantifiable elements. The most common species was kahawai with a NISP of 23 representing an MNI of four. The other distinctive feature of this assemblage is the number of dog bones (NISP = 16). Together the bones only represent one dog and are mostly teeth and jaw fragments although a tibia was also recovered. This is one of only three sites within the project area which contained dog bone.

Table 27. Results of analysis of marine shell sample from R26/480.

Species	**NISP**	**MNE**	**MNI**	**% MNI**	**Weight (g)**
Alcithoe arabica	8		1	0.06	13.88
Austrofusus glans	8	8	8	0.46	28.26
Dosinia anus	332	332	166	9.57	1,430.29
?*Haliotis* sp.	10		1	0.06	0.13
Paphies subtriangulata	2,998	2,997	1,499	86.45	9,923.57
Spisula aequilatera	117	116	58	3.34	820.46
Tonna cerevesina	2	1	1	0.06	0.72
Unidentified					6151.35
Total	3,475	3,454	1,734	100.00	18,368.66

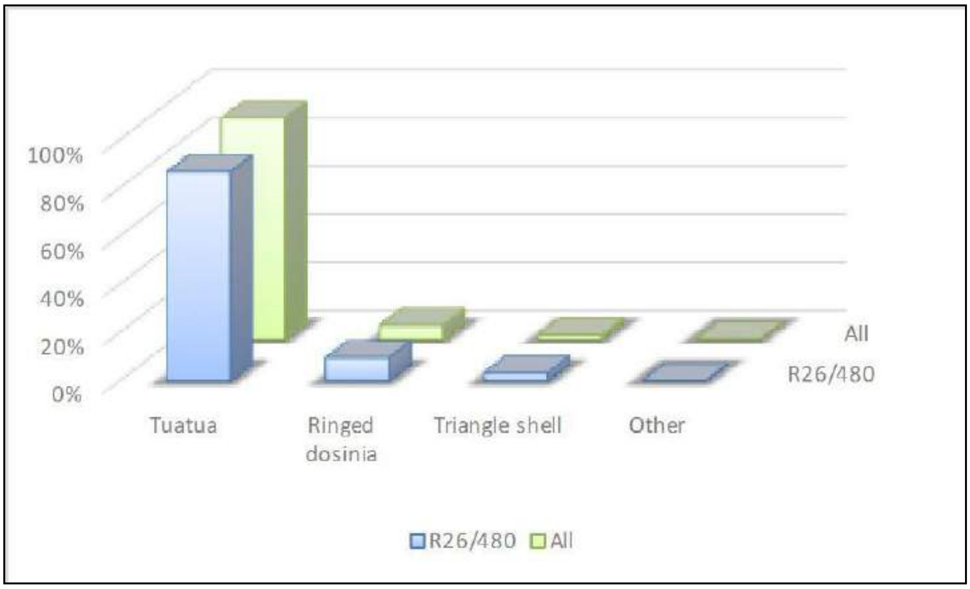

Figure 67. Relative abundance of main shell species (MNI) from R26/480 (n = 1, 732), in comparison to the combined abundance across all sites.

Table 28. Results of analysis of vertebrate faunal assemblage sample from R26/480.

Class	**Species**	**NISP**	**MNE**	**MNI**
Fish	Barracouta	1		
	cf Carangidae	2		
	Kahawai	23	20	4
	Snapper	6		

	Tarakihi	1	1	1
	Unidentified	1,675		
	Total	1,708	21	5
Bird	Fluttering shearwater	1	1	1
	Parakeet	3	3	2
	Shearwater	1	1	1
	Unidentified	7		
	Total	12	5	3
Mammal	Dog	16	7	1
	Rat	19	10	2
	Unidentified	6		
	Total	41	17	3

R26/481

This site comprised four concentrations of midden, one of which rested on a deep fire pit that contained fire-cracked rocks (Figures 68 to 70). Samples of fauna and charcoal were taken to the OAL for analysis and the site was completely excavated.

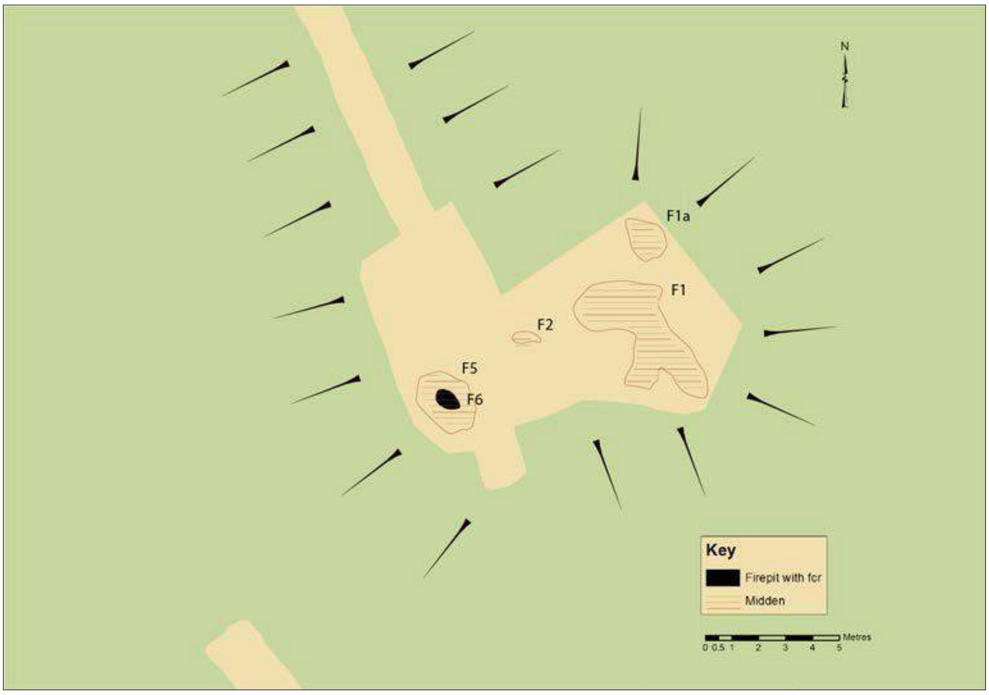

Figure 68. Plan of R26/481 showing area investigated (yellow) and locations of excavated features.

Figure 69. Features exposed at R26/481 looking east (scale = 2 m).

Figure 70. Section through ovens and midden looking west (scale in 20 cm increments).

Eleven species of shellfish were identified at R26/481 which is unusual but what is more unusual is the relative proportion of the surf clam species at this site (Table 29, Figure 71). In most of the middens tuatua comprised over 90 per cent of the total shell but in this site made up only 60.5 percent with ringed dosinia and triangle shell making up higher proportions at 19.11 and 18.82 per cent respectively. All of the other shellfish species were present in quantities of less than 1 per cent each (Table 29).

Table 29. Results of analysis of marine shell sample from R26/481.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	1		1	0.05	18.83
Austrofusus glans	30	15	15	0.73	86.75
Calliostoma selectum	17	10	10	0.49	7.30
Diloma subrostrata	1	1	1	0.05	1.53
Dosinia anus	786	786	393	19.11	3,968.28
Fellaster zelandiae	34		1	0.05	29.14
Haliotis australis	3		1	0.05	3.81
Maoricolpus roseus	1		1	0.05	0.95
Paphies subtriangulata	2,488	2,488	1,244	60.51	11,604.59
Semicassis pyrum	1	1	1	0.05	
Spisula aequilatera	773	773	387	18.82	1,893.04
Unidentified	7				4,488.47
Zeacumantus lutulentus	1		1	0.05	0.29
Total	4,143	4,074	2,056	100.00	22,102.98

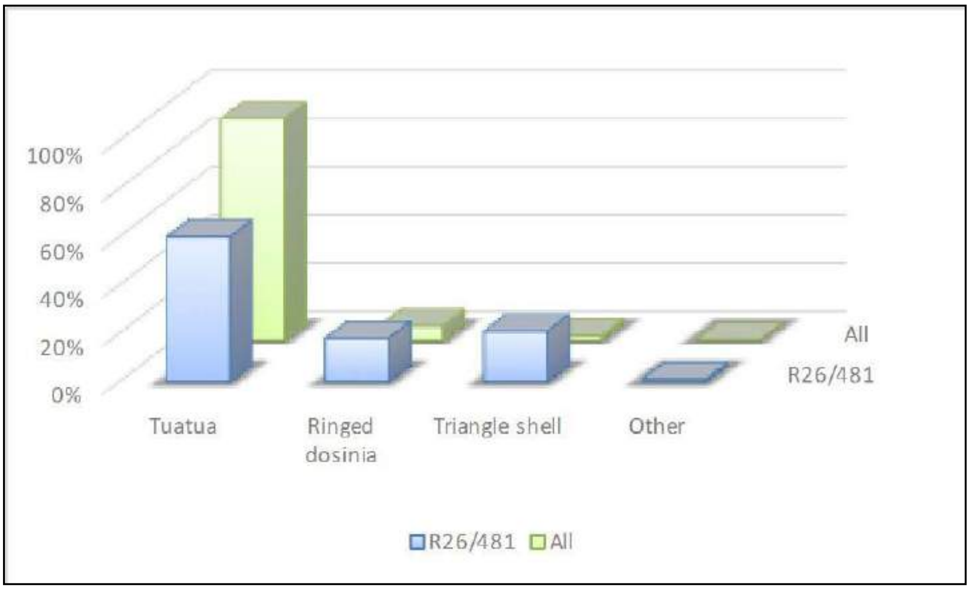

Figure 71. Relative abundance of main shell species (MNI) from R26/481 (n = 1,868) in comparison to the combined abundance across all sites (n = 106,373).

Table 30. Results of analysis of vertebrate faunal assemblage sample from R26/481.

Class	Species	NISP	MNE	MNI
Fish	cf Blue mackerel	1	1	1
	cf Warehou	1	1	1

	Labridae	1	1	1
	Snapper	1		
	Unidentified	53		
	Total	57	3	3
Bird	Common diving petrel	1	1	1
	Parakeet	4	4	1
	Unidentified	7		
	Total	12	5	2
Mammal	Rat	13	9	2
	Unidentified	2		
	Total	15	9	2

Four species of fish were identified although snapper was included on the basis of a single tooth only (Table 30). Two of these species, blue mackerel (*Scomber australsicus*) and blue warehou (*Seriolella brama*), were not identified in any of the other sites within the project area.

Twelve fragments of bird bone included a common diving petrel (*Pelecanoides urinatrix*) (NISP = 1) and a parakeet (*Cyanoramphus novaeseelandiae*) (NISP = 4). It was not possible to tell whether the parakeet was a red or yellow-crowned variety. Two rats were also present (Table 30).

Sub-Sector 5C

This sub-sector yielded very little during the initial trenching phase. Sites R26/462 and R26/430 had been previously recorded, and R26/482 was not within the design footprint during the trenching phase and so was not tested although shell midden was visible lying on the ground surface. By the time of the Stage 2 investigations a revision of the expressway design meant that the area that encompasses R26/482 was inside the construction footprint, so the site was duly investigated.

Four further new sites (R26/483 to 486) were revealed during the trenching of the higher ground (Figure 72).

Figure 72. Sector 5C showing locations of trenches and archaeological sites. The trench associated with R26/486 was well outside the road alignment but in an area where gas pipelines were being relocated.

R26/482

This site contained a dense concentration of features that included eleven fire features and eight discrete midden deposits (Figure 73). The site yielded a relatively large volume of midden and a representative sample was returned to the OAL for analysis, along with charcoal samples from each of the fire features. A small adze of Nelson mineral belt argillite was found near the centre of this site (Figure 74).

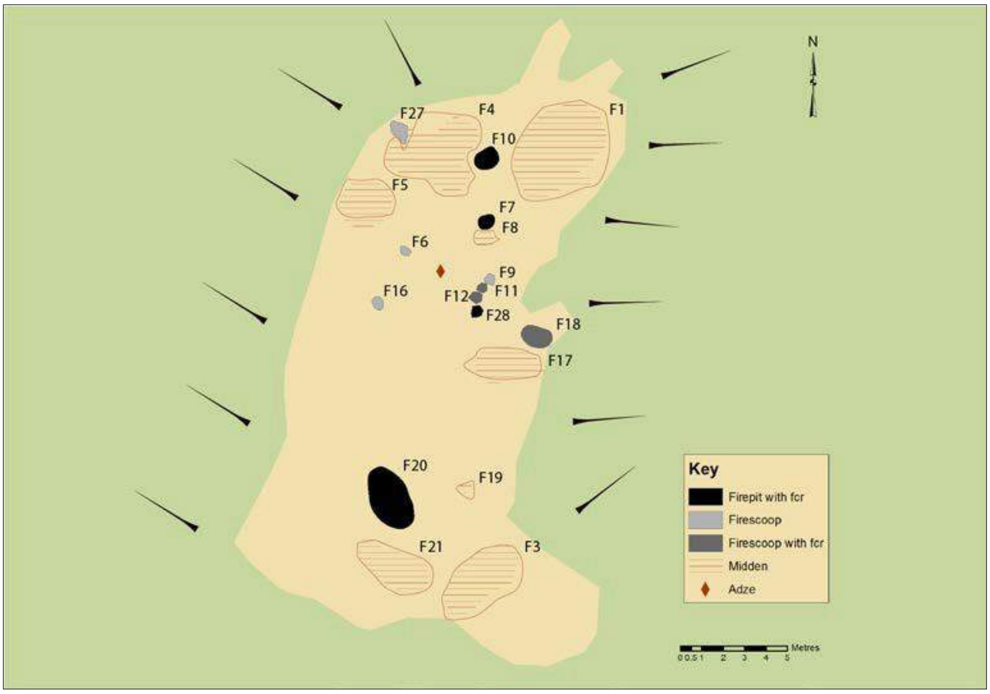

Figure 73. Plan of R26/482 showing area investigated (yellow) and locations of excavated features.

Figure 74. Adze head found at R26/482.

The shellfish assemblage from this site is unusual (Table 1, Figure 75). Tuatua comprised only 34.91 per cent by MNI of the species composition while ringed dosinia comprised over 50 per cent.

Triangle shell was also more common than in the other sites. The relative abundance of the sub- tidal surf clam species suggests harvesting after a major storm event.

Table 31. Results of analysis of marine shell sample from R26/482.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	1	1	1	0.08	51.00
Austrofusus glans	17	17	17	1.34	38.21
Austrovenus stutchburyi	2	2	1	0.08	1.03
Calliostoma selectum	1	1	1	0.08	4.95
Dosinia anus	1,304	1,304	652	51.50	5,771.26
Paphies subtriangulata	884	884	442	34.91	2,054.58
Peronaea gaimardi	2	2	1	0.08	3.59
Semicassis pyrum	1	1	1	0.08	2.42
Spisula aequilatera	299	299	150	11.85	485.73
Unidentified					5685.44
Total	2,511	2,511	1,266	100.00	14,098.21

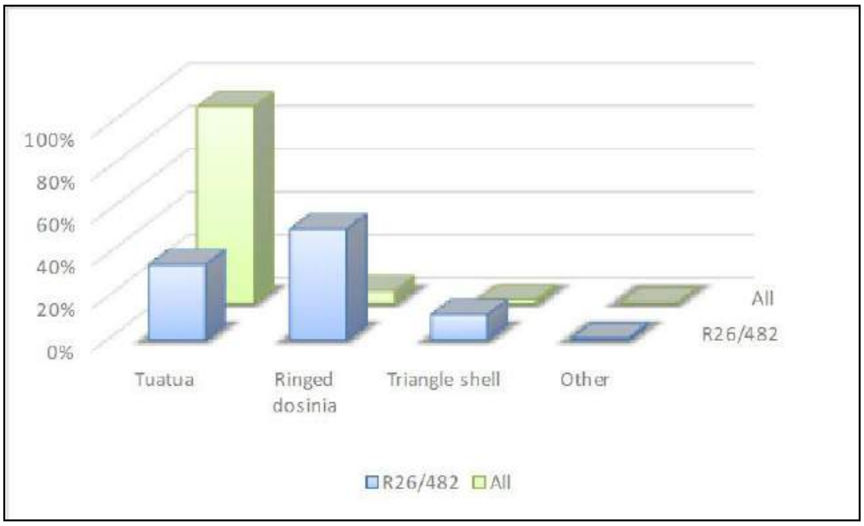

Figure 75. Relative abundance of main shell species (MNI) from R26/482 (n = 1,272) in comparison to the combined abundance across all sites (n = 106, 373).

Table 32. Results of analysis of vertebrate faunal assemblage sample from R26/482.

Class	Species	NISP	MNE	MNI
Fish	Dogfish	3		
	Labridae	3	3	1
	Red cod	1	1	1
	Snapper	1		
	Unidentified	84	2	
	Total	92	6	2
Bird	Fairy prion	4	4	1
	Parakeet	1	1	1
	Unidentified	3		
	Total	8	5	2

Mammal	Dog	3	2	1
	Unidentified	1	3	1
	Total	1	3	1

A total of 92 fish bones were recovered, the majority of which were unidentifiable to species (Table 32). A single red cod and wrasse could be quantified but it was also possible to identify dogfish on the basis of a distinctive vertebra, and snapper from a tooth.

R26/462

Site R26/462 was a relatively small scatter of midden visible in an area that had been disturbed by forestry activities (Figure 76). The midden was measured and recorded, and a faunal sample taken.

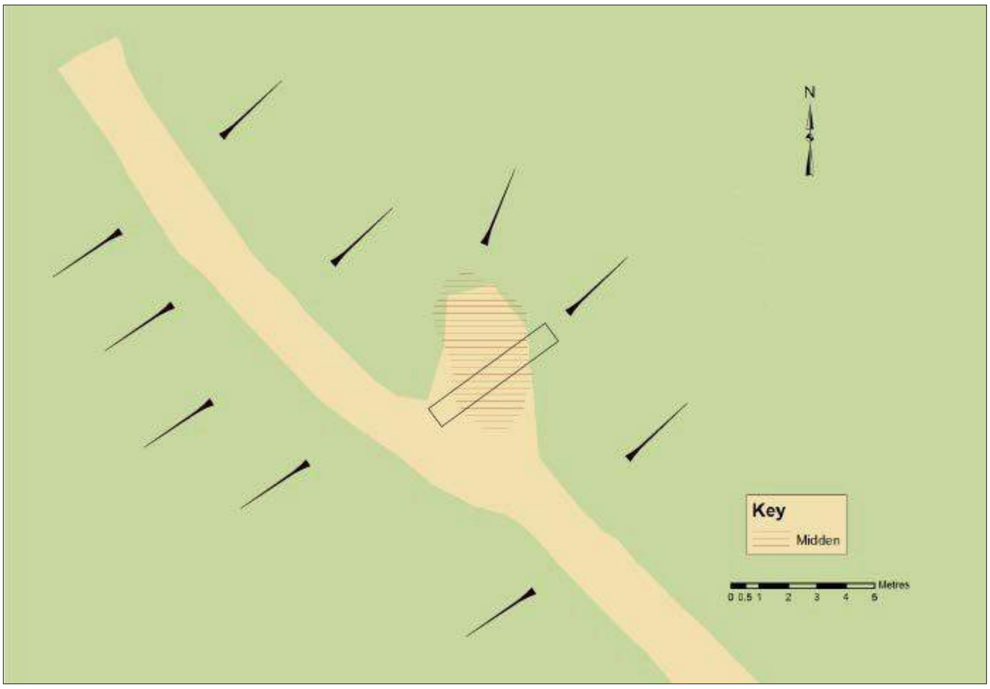

Figure 76. Plan of R26/462 showing area investigated (yellow) and locations of excavated features including the trench through the site for the purposes of obtaining a midden sample.

Table 33. Results of analysis of marine shell sample from R26/462.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	2		1	0.04	64.10
Austrofusus glans	96	86	86	3.07	377.45
Bassina yatei	2		1	0.04	3.63
Dosinia anus	380	380	190	6.79	4,424.53
Fellaster zelandiae	5		1	0.04	0.16
Haliotis australis	6	1	1	0.04	1.40
Paphies subtriangulata	4,490	4,490	2,245	80.24	8,147.15
Spisula aequilatera	546	546	273	9.76	2,445.25

Unidentified					10,075.68
Total	5,527	5,503	2,798	100.00	25,539.35

Tuatua comprised 80 per cent by MNI of the total shellfish sample (Table 33, Figure 77). Just over 16 per cent of the sample comprised the other two main surf clam species. Of note is the presence of paua which as a rocky shore species comes from a completely different environmental niche to the other shellfish species.

Sixty four fragments of fish bone were recovered but only snapper and wrasse could be identified. Two unidentifiable fragments of bird bone were also present (Table 34).

A bone bird-spear point fragment was also found within the midden sample (Figure 78).

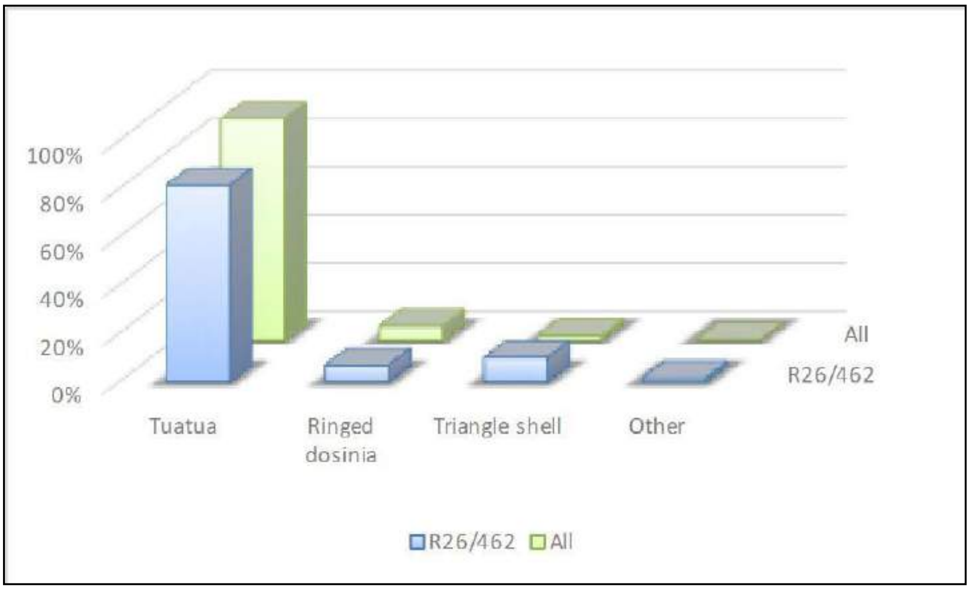

Figure 77. Relative abundance of main shell species (MNI) from R26/462 (n = 2, 799) in comparison to the combined abundance across all sites (n = 106, 373).

Table 34. Results of analysis of vertebrate faunal assemblage sample from R26/462.

Class	Species	NISP	MNE	MNI
Fish	Snapper	1	1	1
	Labridae	2	2	1
	Unidentified	64		
	Total			
Bird	Unidentified	2		

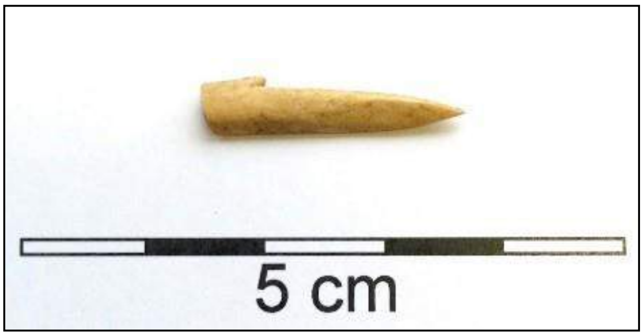

Figure 78. Bone bird-spear point fragment.

R26/430

This was one of only two sites in the whole Expressway project area to have what initially appeared to be evidence of underground storage pits. Once the topsoil had been stripped using the hydraulic excavator the site was shown to cover a large area and to comprise six discrete midden deposits, three fire features (two with fire cracked rocks) and the two possible storage pits (Figure 79). Upon excavation, these latter features turned out to be simply shallow, bowl- shaped depressions with dark-stained soil near the base (Figures 80 to 82). They did not show any signs of having been either storage pits or cooking features and it is most likely that they were natural hollows in the sand dunes that were used as fire sites for burning cleared vegetation or similar. One of the rare finds of artefacts on this project was made here, in the form of a lump of pumice that had been hollowed out to form a container (Figure 83). Larger examples are known to have been used for transporting coals from one location to another.

Faunal samples were taken from each of the middens and along with charcoal samples from the fire features were sent to the OAL for analysis. Relative abundances are shown in Tables 35 and 36, and Figure 84. All visible archaeological remains were investigated although it is possible that the site extends further towards the north, outside of the current design footprint.

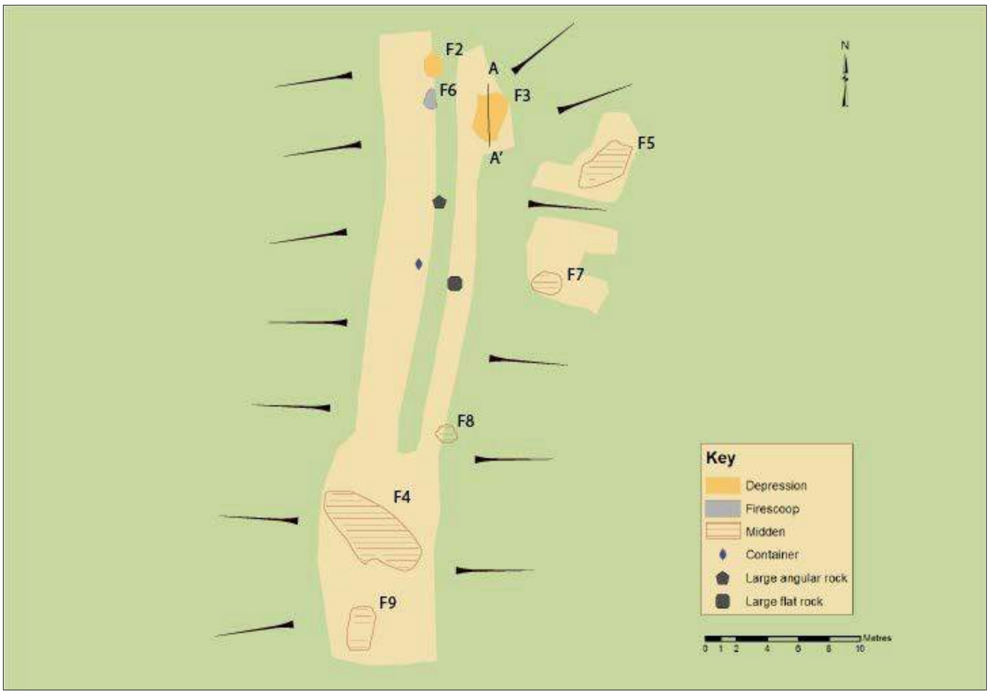

Figure 79. Plan of R26/430 showing area investigated (yellow) and locations of excavated features. The location of the section drawing in Figure 81 is shown as A and A'.

Figure 80. Eastern section of pit feature (scale = 2 m).

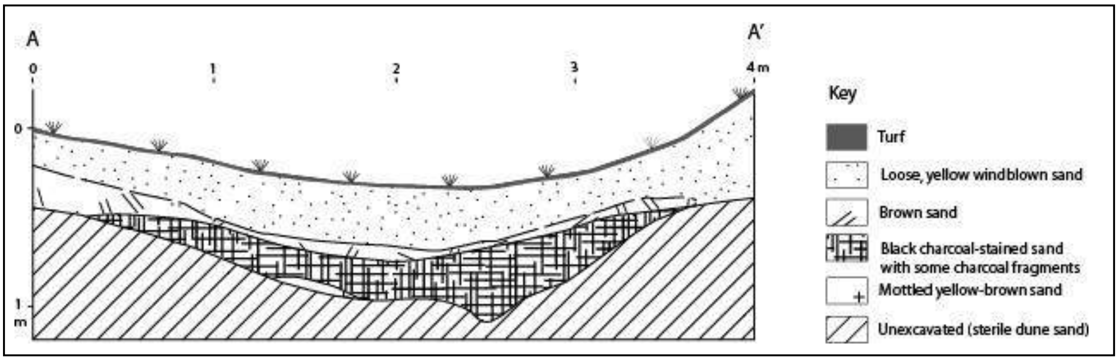

Figure 81. Stratigraphic drawing of eastern section of pit feature (F3).

Figure 82. Western section through midden on slope to south of pit feature F3 (scale = 2 m).

Figure 83. Pumice bowl or container found at site R26/430 (scale = 5 cm).

Table 35. Results of analysis of marine shell sample from R26/430.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	16	3	3	0.15	38.04
Bassina yatei	2	2	1	0.05	5.68
Calliostoma selectum			1	0.05	7.93
Dosinia anus	485	335	168	8.54	1,707.46
Fellaster zelandiae			1	0.05	0.80
Melagraphia aethiops	4		1	0.05	0.33
Paphies subtriangulata	3,451	3,374	1,687	85.72	10,055.55
Spisula aequilatera	211	211	106	5.39	1,500.04
Unidentified	110				4,291.40
Total	4,279	3,925	1,968	100.00	17,607.23

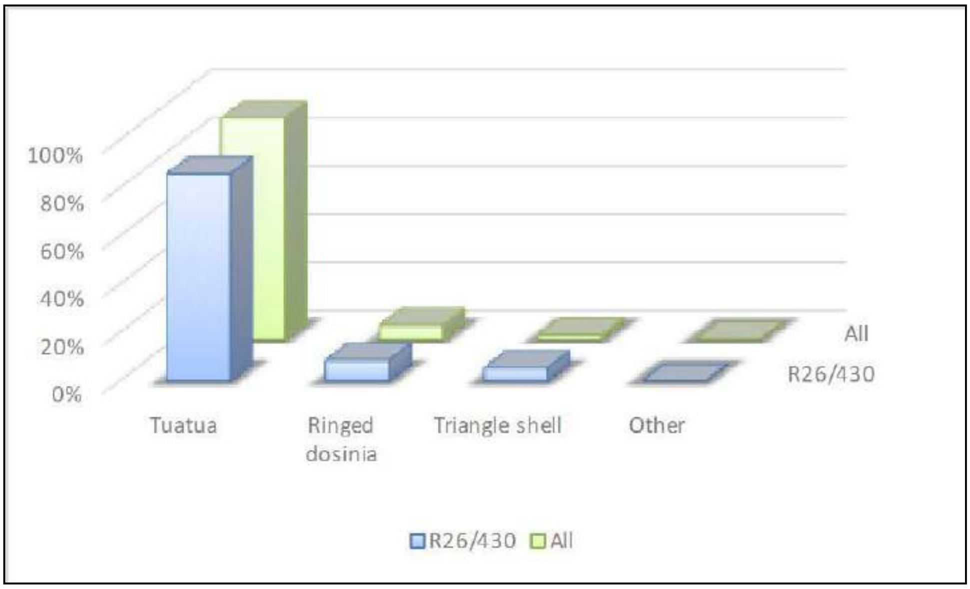

Figure 84. Relative abundance of main shell species (MNI) from R26/430 (n = 1, 968) in comparison to the combined abundance across all sites.

Table 36. Results of analysis of vertebrate faunal assemblage sample from R26/430.

Class	Species	NISP	MNE	MNI
Fish	cf Kahawai	1	1	1
	cf Red cod	1	1	1
	Kahawai	1	1	1
	Unidentified	114		
	Total	117	3	3
Bird	Unidentified	20		
Mammal	Dog	2	2	1
	Rat	18	8	2
	Total	20	10	3

R26/483

This was a small midden scatter associated with two small fire features (Figure 85). The archaeological features were badly disturbed by previous activities and were only mapped using a Trimble hand-held differential GPS. No samples were taken.

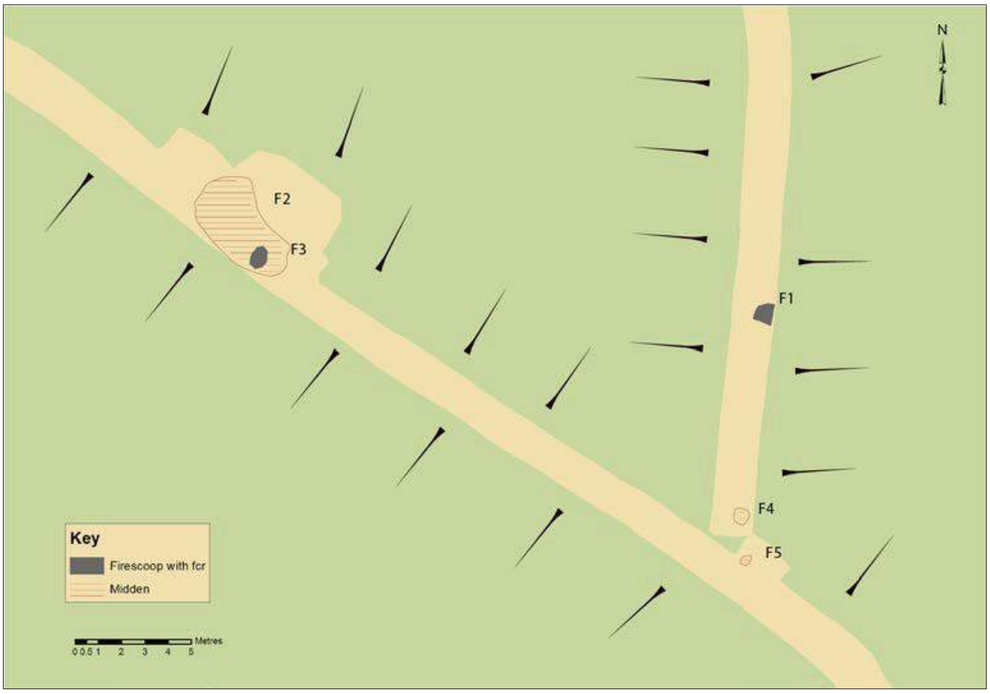

Figure 85. Plan of R26/483 showing area investigated (yellow) and locations of excavated features.

R26/484

This was a shallow midden deposit that had been completely disturbed by forestry activities (Figure 86). This deposit was mapped using a Trimble hand-held differential GPS. No samples were taken.

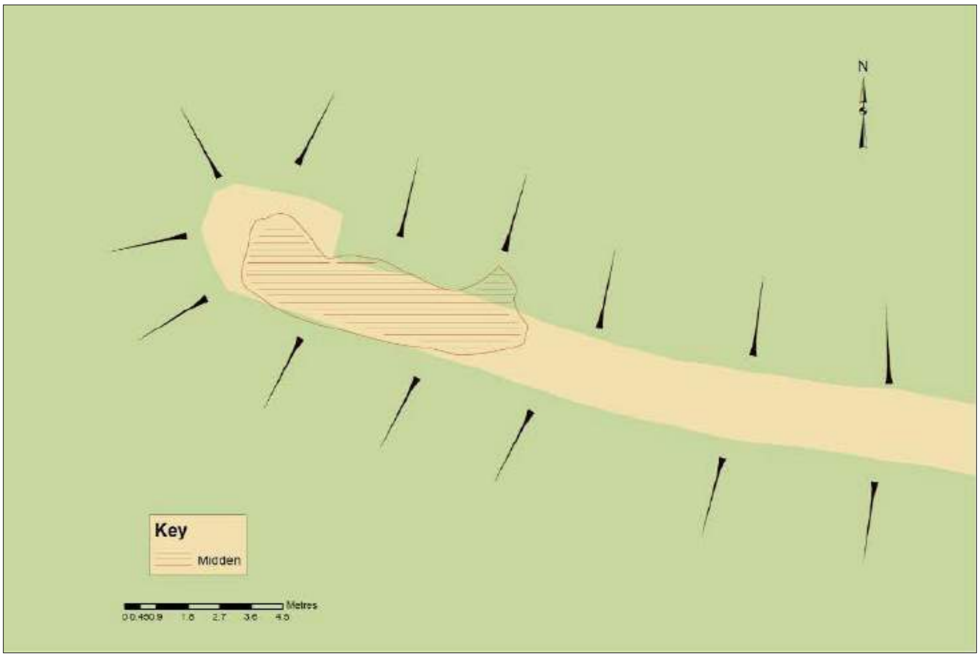

Figure 86. Plan of R26/484 showing area investigated (yellow) and locations of excavated features.

R26/485

This was a small midden deposit exposed in a trench close to the low-lying ground (Figure 87). A sample of the midden was sent to the OAL for analysis and the site was completely excavated (Table 37 and Figure 88).

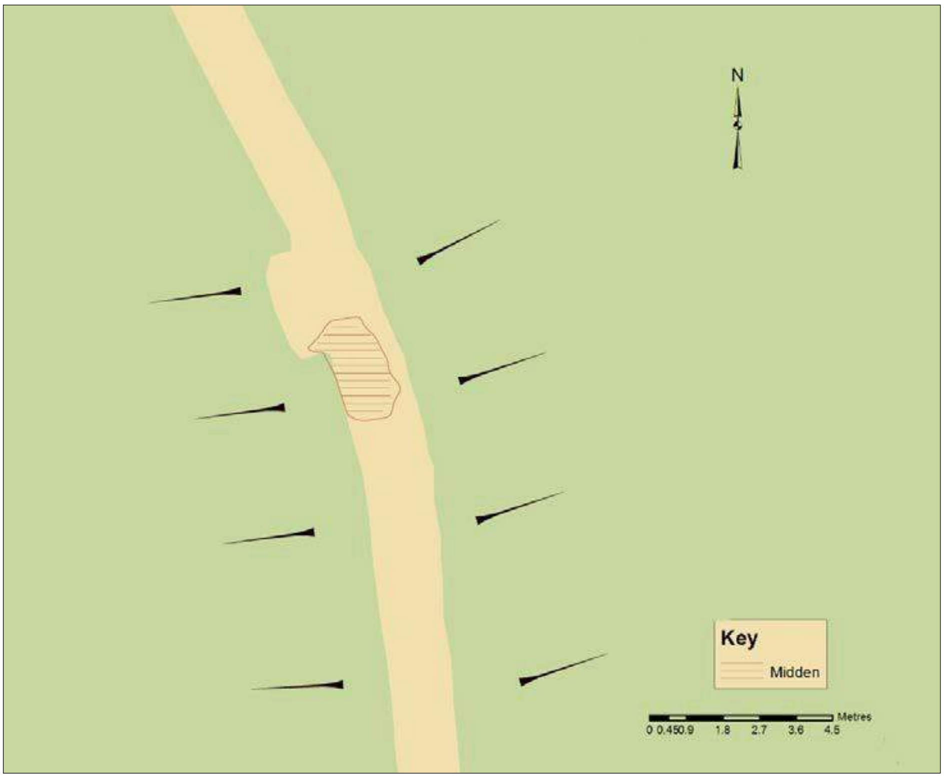

Figure 87. Plan of R26/485 showing area excavated and locations of excavated features. The green area was unexcavated.

Table 37. Results of analysis of marine shell sample from R26/485.

Species	NISP	MNE	MNI		Weight (g)
Dosinia anus	188	18	9	2.05	188.31
Limpet?	1	1	1	0.23	6.28
Paphies subtriangulata	855	855	428	97.49	758.28
Spisula aequilatera	2	2	1	0.23	7.31
Total	1,046	876	439	100.00	960.18

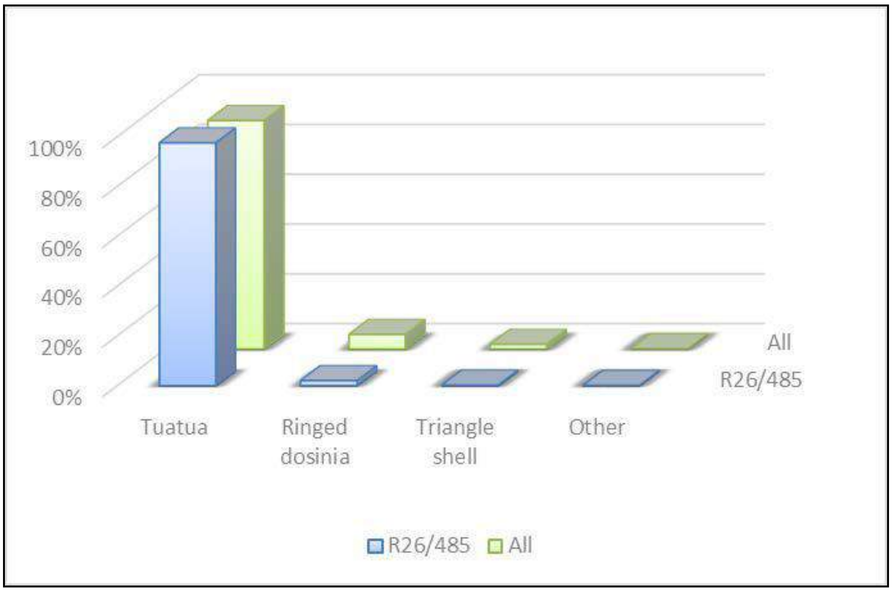

Figure 88. Relative abundance of main shell species (MNI) from R26/485 (n = 439) in comparison to the combined abundance across all sites.

R26/486

This site is located in an area that was not affected by the earlier design footprint. It was subsequently determined that it would be affected by construction works so was investigated during Stage 2. It was found to be one of the larger sites investigated, with nine discrete midden deposits and five fire features (Figure 89 and Figure 90). Four obsidian flakes were found here as well, within a small area (Figures 91 to 95). Samples from all of the middens and fire features were returned to the OAL for analysis. All visible archaeological features were excavated.

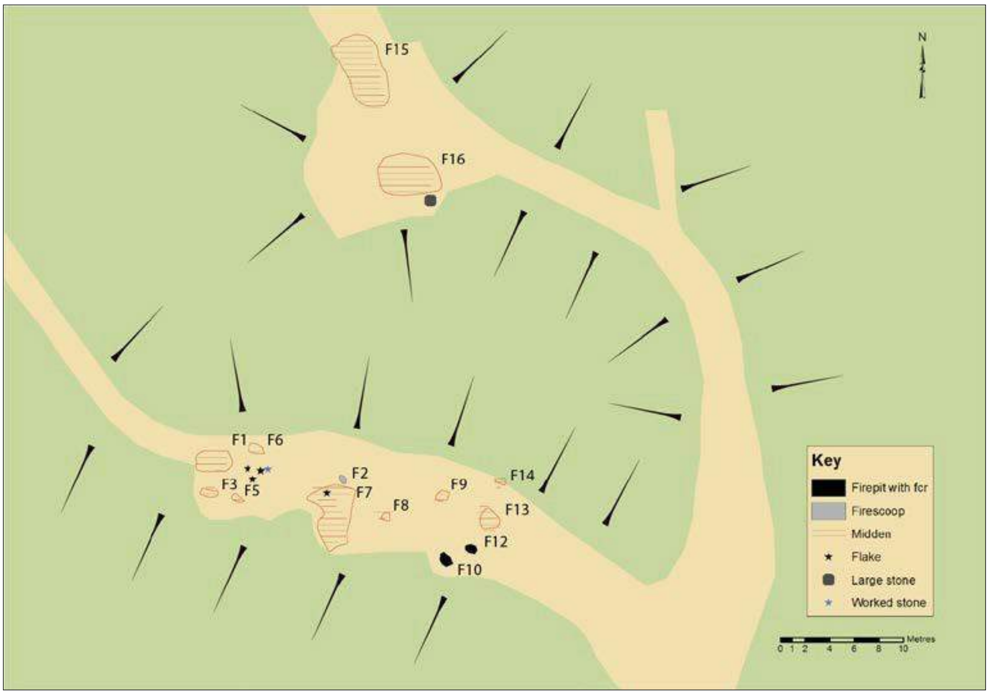

Figure 89. Plan of R26/486 showing area investigated (yellow) and locations of excavated features.

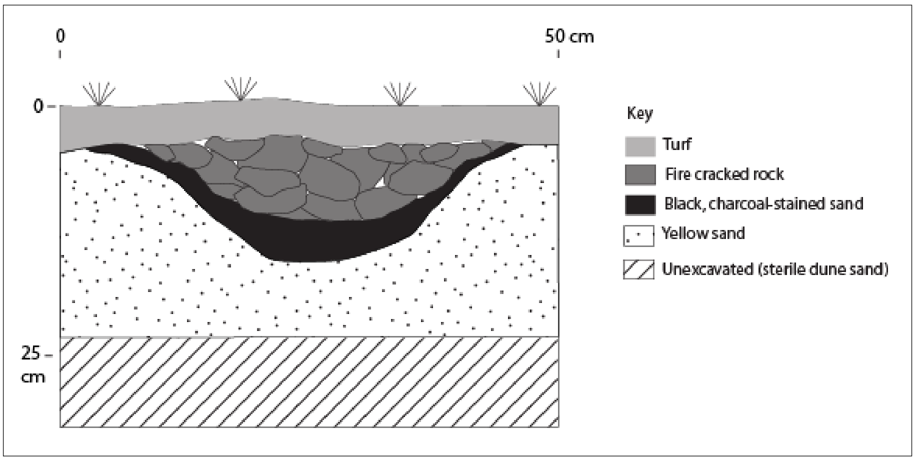

Figure 90. Cross-section through F10 which is typical of the small fire features encountered during the investigations.

Figure 91. Obsidian flake from R26/486 with steep unifacial retouch along the top edge.

Figure 92. Obsidian flake from R26/486.

Figure 93. Obsidian flake from R26/486.

Figure 94. Small obsidian flake from R26/486.

Figure 95. Small obsidian flake from R26/486.

Several shellfish species were identified in the midden sample but the assemblage was dominated by tuatua (88.13 %) with the next most common species (ringed dosinia) only making up 9.66% of the total MNI. Although the dosinia proportion is low it is still higher than in most of the sites in this study (Figure 96).

Table 38. Results of analysis of marine shell sample from R26/486.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	1		1	0.02	13.28
Amphibola crenata	32	14	14	0.34	11.62
Austrofusus glans	11	4	4	0.10	7.99
Austrovenus stutchburyi	15	8	4	0.10	4.59
Dosinia anus	787	787	394	9.66	3,361.36
Fellaster zelandiae	120		1	0.02	312.51
Limpet?	1	1	1	0.02	0.67
Macomona liliana	3	3	2	0.05	0.95
Paphies subtriangulata	7,189	7,189	3,595	88.13	12,561.93
Semicassis pyrum	5		1	0.02	6.69
Spisula aequilatera	121	121	61	1.50	450.21
Turbo smaragdus	8	1	1	0.02	9.16
Unidentified	12				14,676.78
Total	8,305	8,128	4,079	100	31,417.74

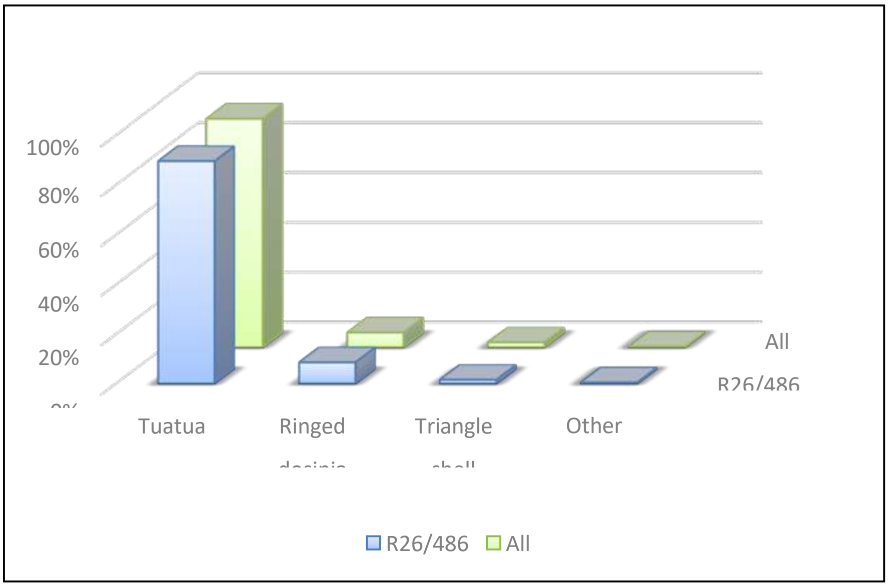

Figure 96. Relative abundance of main shell species (MNI) from R26/486 (n = 4079) in comparison to the combined data across all sites (n = 106, 373).

Eight fish species were able to be identified although the MNIs for all species are low with only snapper having an MNI greater than one (MNI = 2) (Table 39). There were 252 unidentified fragments of fish bone.

There was a small amount of very fragmentary bird bone identified, which was too badly damaged to identify to species. Rat was represented by only two bones.

Table 39. Results of analysis of vertebrate faunal assemblage sample from R26/486.

Class	Species	NISP	MNE	MNI
Fish	Barracouta	4	1	1
	Blue cod	1	1	1
	cf Red gurnard	1	1	1
	Elasmobranch	1		
	Kahawai	1		
	Labridae	1	1	1
	Snapper	11	6	2
	Tarakihi	1	1	1
	Unidentified	253		
Bird	Unidentified	9	2	
Mammal	Rat	2	1	1

7.5 Sector 6

Sector 6 comprises the construction footprint that lies in the stretch of dunes that runs between Ngarara Road and Peka Peka Road.

Figure 97. Aerial photo of Sector 6 showing location of investigation trenches and archaeological sites.

The locations of the trenches are shown in Figure 97. The majority of the trenches were situated on the high dunes as this is where the majority of sites have been previously recorded, although some trenches were located on the low ground for comparison. Two previously recorded sites (R26/373 and 377) were investigated and three new sites (R26/469-471) were found and investigated. The results of the investigations are presented below from north to south as follows:

R26/377

R26/377 was recorded in the low dunes north of the access road to the Nga Manu Nature Reserve, initially as a possible kumara storage pit based on the presence of an irregularity in the ground surface. Upon investigation, however, it turned out to be a natural depression in the ground that may have been the result of a tree throw or similar. The wider area was trenched as part of the systematic trenching survey but no sites were found anywhere in the zone north of the access road.

R26/471

This site was discovered during the trenching and appeared as a small area of charcoal staining on the surface of the subsoil on the dune ridge and a second area of charcoal staining in a large depression in the SE face of the dune ridge (Figure 98). The ridge-top feature turned out to be a shallow firescoop without fire-cracked rocks (Figure 99). Excavation of the depression revealed a relatively level area with signs of a possible pit having been excavated in it; only one edge and part of the base of the possible pit was discernible in the stratigraphy. Near the eastern edge of this level area a relatively large oven was found (a deep fire pit with fire-cracked rocks).

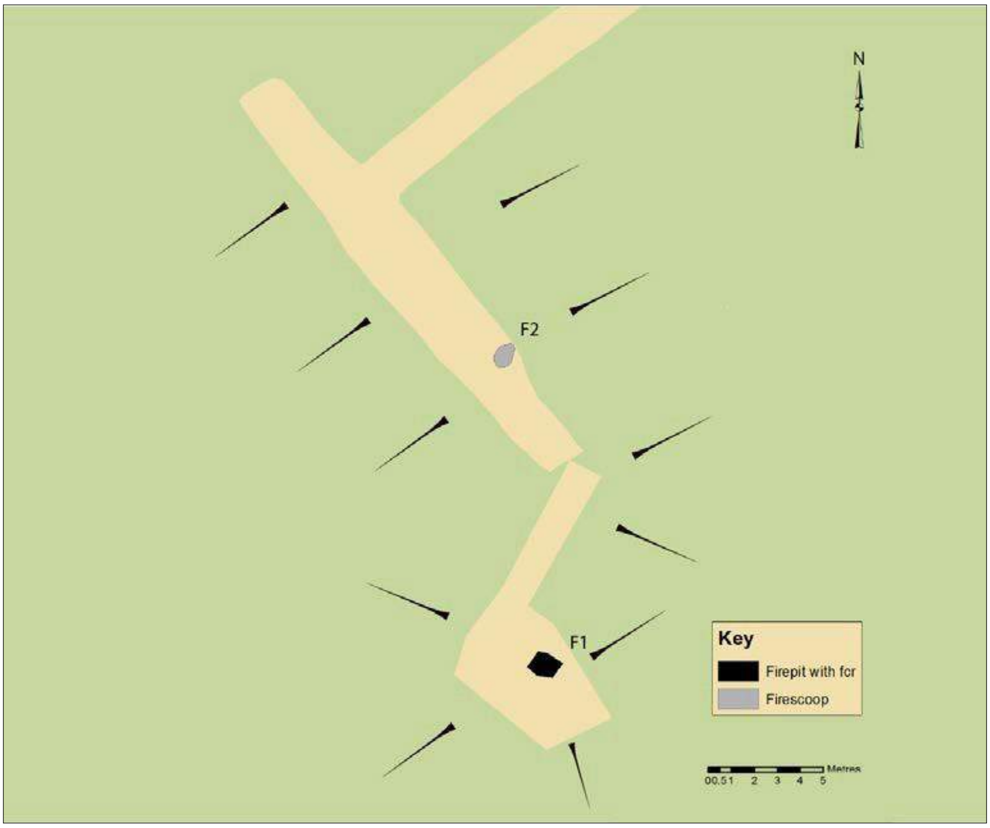

Figure 98. Plan of R26/471 showing trench (yellow) and location of archaeological features.

Figure 99. Small fire feature on dune slope (scale in 20 cm increments).

R26/470

This site comprised a small firescoop and a relatively shallow scatter of midden. Charcoal and faunal samples were taken for analysis (Figure 100).

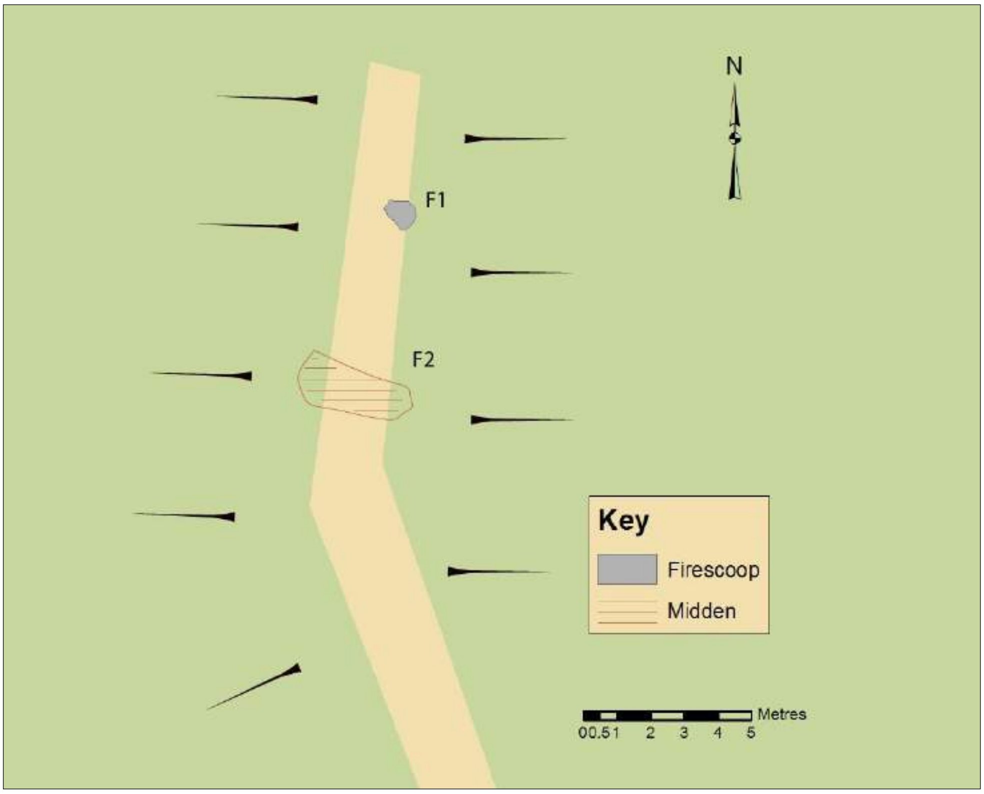

Figure 100. Plan of R26/470 showing trench (yellow) and location of archaeological features.

R26/469

This site comprised three midden deposits and a small fire scoop with fire-cracked rock (Figure 101). Samples of charcoal and midden were taken for analysis. All archaeological features were fully investigated.

Immediately south and west of the site a number of irregularities in the ground surface which were suggestive of occupation features such as terraces and pits had been recorded as potentially part of the site. Two of these were investigated but were found to be of natural origin. On this basis, all of the others could also be natural. Nonetheless, the presence of known sites in close proximity (R26/373, 469 and 470) means that a cultural origin for these features cannot be discounted. The interim report recommended that investigation of these features should occur if any use of this dune for stockpiling or vehicle movements was proposed.

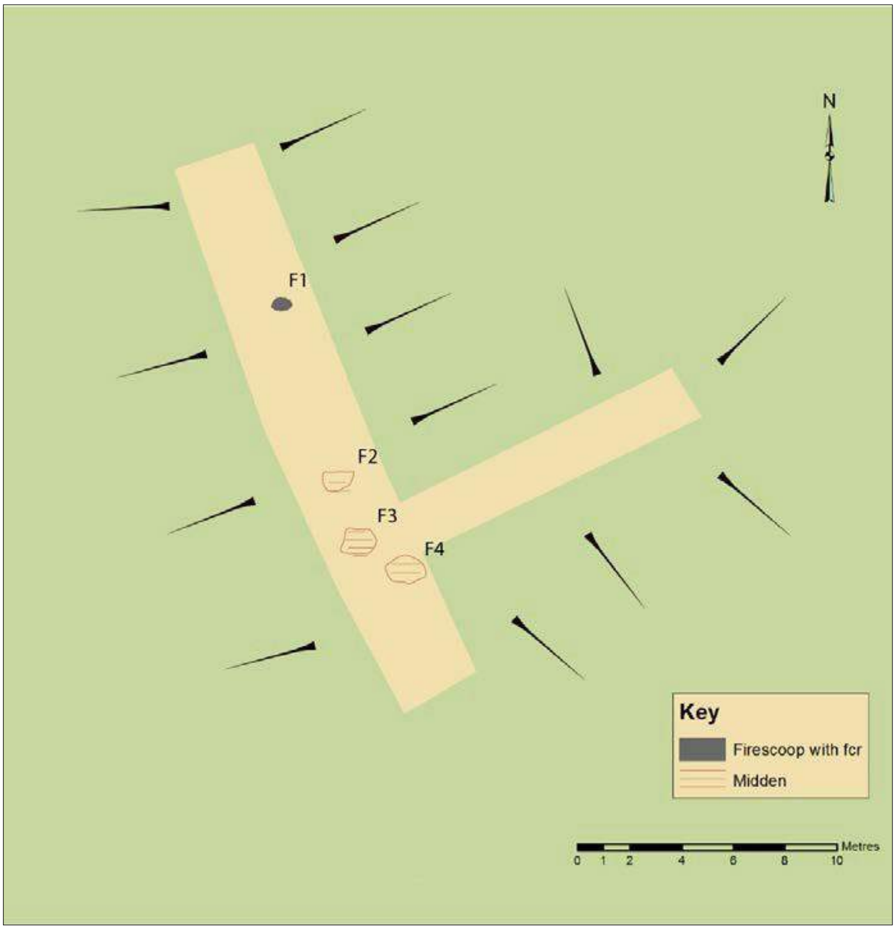

Figure 101. Plan of site R26/469 showing trench (yellow) and location of excavated features.

No bone was recovered from this site, and tuatua was the main shellfish species (93.89 per cent) (Table 40, Figure 102).

Table 40. Results of analysis of marine shell sample from R26/469.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Austrofusus glans	12	1	1	0.03	1.62
Dosinia anus	368	368	184	5.25	2,551.90
Fellaster zelandiae			1	0.03	2.58
Paphies subtriangulata	6,581	6,581	3,291	93.89	7,054.54
Semicassis pyrum	1		1	0.03	0.40
Spisula aequilatera	53	53	27	0.77	148.05
Total	7,015	7,003	3,505	100.00	9,759.09

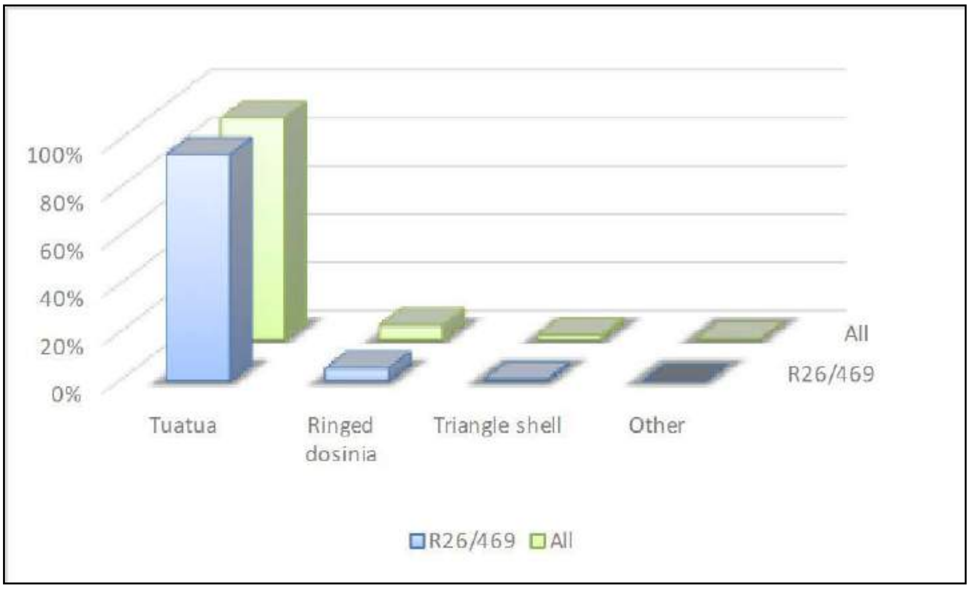

Figure 102. Relative abundance of main shell species (MNI) from R26/469 (n = 3, 505) in comparison to the combined data across all sites (n = 136, 373).

R26/373

This was the largest and most complex site encountered during pre-construction archaeological investigations on the Expressway. It covered approximately 250 square metres and the features excavated included thirteen fire features, four middens, one of which was very extensive and up to a metre deep (Figure 103), as well as fifteen stone flakes of obsidian and chert (Figure 104 to Figure 111), some of them with evidence of use wear. The midden was stratified in places, although it was not possible to determine on site whether the layers represented significant time depth or simply re-use of the site over a short period, with wind-blown sand creating an impression of time depth. Nearly all of the fire features were small, shallow depressions containing charcoal stained sand but fire cracked rock (Figure 112).

Faunal samples from the middens and charcoal samples from the fire features were taken to the OAL for analysis.

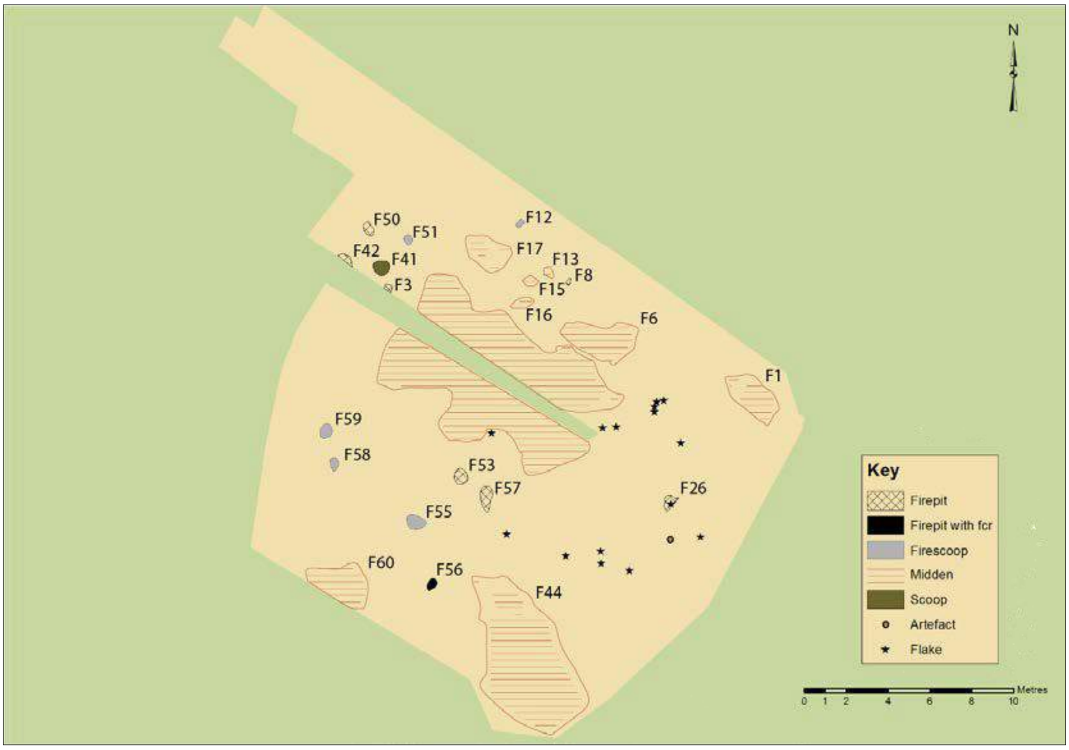

Figure 103. Plan of R26/373 showing extent of excavation (yellow) and location of excavated features and artefacts.

Figure 104. One piece bone fish hook from R26/373.

Figure 105. Obsidian fragment from R26/373.

Figure 106. Obsidian flake from R26/373.

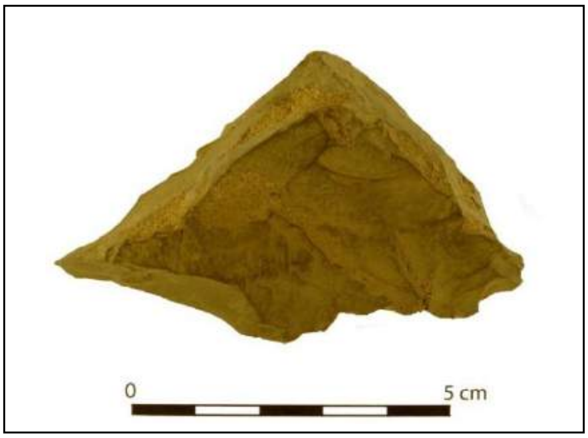

Figure 107. Stone flake from R26/373.

Figure 108. Stone flake from R26/373 with ochre staining.

Figure 109. Stone flake from R26/373.

Figure 110. Chert fragment from R26/373.

Figure 111. Chert flake from R26/373.

Figure 112. Representative example of the fire features found at R26/373. They were all small shallow features with charcoal-stained sand and little or no fire cracked rock (scale in 10 cm increments).

Table 41. Results of analysis of marine shell sample from R26/373.

Species	NISP	MNE	MNI	% MNI	Weight (g)
Alcithoe arabica	2		1	0.002	2.16
Amphibola crenata?	1		1	0.002	0.63
Austrofusus glans	175	72	72	0.125	263.14
Bassina yatei	2	1	1	0.002	2.68
Calliostoma sp.	3	3	3	0.005	11.67
Cookia sulcata	3	1	1	0.002	24.43

Dosinia anus	3,292	3,292	1,646	2.859	31,241.12
Dosinia zelandica	1		1	0.002	4.1
Fellaster zelandiae	425		1	0.002	1,065.04
Haliotidae			1	0.002	0.75
Hyridella menziesii?	3	3	2	0.005	0.33
Mactra discors	21	21	11	0.019	98.06
Mactra murchisoni	9	9	5	0.009	12.65
Mactridae	1	1	1	0.002	312.27
Maoricolpus roseus	1	1	1	0.002	0.71
Paphies subtriangulata	110,579	110,555	55,278	96.010	135,175.7
Pectinidae	1	1	1	0.002	0.02
Peronaea gaimardi	9	9	5	0.009	2.81
Semicassis pyrum	34	4	4	0.007	34.65
Spisula aequilatera	1,074	1,074	537	0.933	4,266.01
Struthiolariidae	2		1	0.002	3.92
Unidentified	3				38,353.38
Total	115,641	115,047	57,574	100	210,876.23

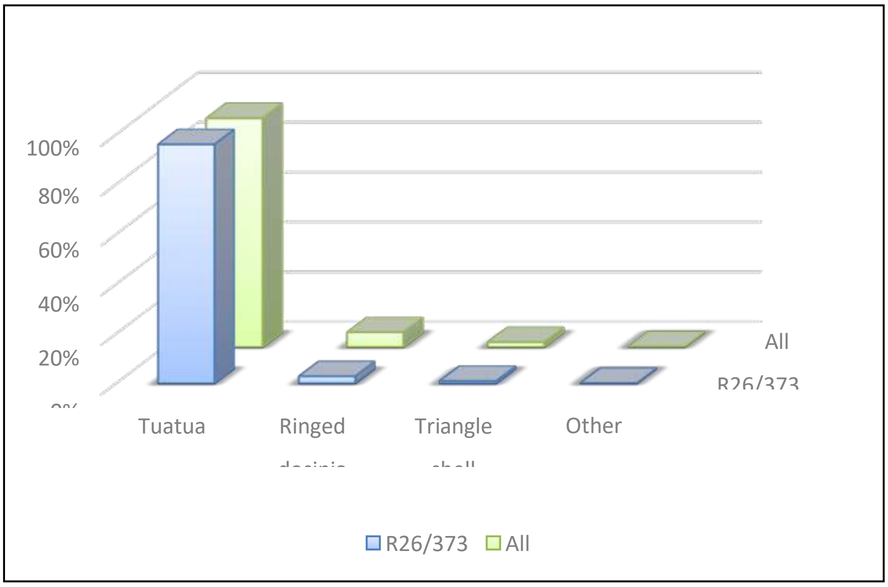

Figure 113. Relative abundance of main shell species (MNI) from R26/373 (n = 57, 574) in comparison to the combined data across all sites (n = 106, 373).

Twenty one species of shellfish were identified from R26/373 although tuatua was still the main species by a considerable margin (96 per cent, Table 41, Figure 113). The majority of the species are from the sandy shore and probably represent by-catches during the targeted harvesting of surf clams. In fact, only three of the 21 species are from rocky shores (paua (Haliotidae), Cooks turban (*Cookia sulcata*) and a top shell (*Calliostoma* sp.)) and only comprise five individuals. A paddle crab claw fragment was also present.

The range of fish species in this site was also diverse, with species from both open water and rocky shore habitats able to be identified. Wrasses were the most common (MNI = 5) with barracouta, blue cod and kahawai all having an MNI of two.

Much of the bird bone was very fragmentary and it was only possible to identify two species (kaka and prion).

Table 42. Results of analysis of vertebrate faunal assemblage sample from R26/373.

Class	Species	NISP	MNE	MNI
Fish	Barracouta	18	5	2
	Blue cod	3	3	2
	Blue moki	4	4	1
	Conger eel	1	1	1
	Greenbone	1	1	1
	Hapuku	1	1	1
	Kahawai	10	10	2
	Labridae	31	29	5
	Leatherjacket	1	1	1
	Red cod	4	4	1
	Scorpionfish	5	5	1
	Snapper	3	1	1
	Tarakihi	2	2	1
	Unidentified	2,378	6	
	Total	2,462	73	20
Bird	Kaka	5	4	2
	Prion	1	1	1
	Unidentified	141	1	
	Total	147	6	3
Mammal	Rat	51	19	7

8 SITE TYPES AND FEATURES

The site types and feature types represented in the study area make up a very unusual archaeological landscape. Whereas it might reasonably be expected that there would be a wide range of site types and features, including village sites, specialist fowling or fishing sites, stone- working sites and defensive sites, among others, the study area is distinctive in only having one basic site type present – shellfish processing sites. Indeed, it is not even possible to refer to the sites as camps, since they do not contain evidence for even temporary dwellings – not a single post hole – or for any activities of any importance beyond shellfish processing. This reflects a pattern that has been observed previously by archaeologists who have worked in the district – where the land is informally described as being dominated by single-species midden scatters.

Although this means that, individually, the sites are not capable of yielding a significant amount of new information a more useful picture should emerge when considered at the scale of the larger landscape.

9 FAUNA

The faunal record of the Kapiti Coast is generally characterised as mono-species (tuatua) shell middens with little vertebrate fauna. In stark contrast to the volume of shell in the middens, bone makes up a very small proportion of the faunal assemblages. Most of the historic heritage management and archaeological work on the Kapiti Coast has recovered small amounts of bone generally amounting to one or two examples of a limited range of fish species (usually red cod, barracouta and snapper), rat and, very rarely, dog. Much of the bone, particularly bird and fish bone, is very fragmentary which suggests that taphonomic processes may be playing a role in this apparent paucity.

Despite the amount of archaeological work on the Kapiti Coast in recent years carried out as a result of residential development there has been little progress towards an explanation for this distinctive pattern of faunal resource exploitation in the region. The archaeological investigations ahead of the M2PP Expressway construction provided a unique opportunity to obtain well- provenanced, systematically sampled midden assemblages across the Kapiti landscape that could be used to illuminate subsistence practices by the communities living here. We carried out standard counts of individual taxa (the basic faunal data for each site has been provided above) and supplemented this with a small-scale study of mollusc shell size variability within and between five key sites (R26/373, R26/430, R26/485, R26/486 and R26/490). In this section we draw together this information and interpret it in the context of the landscape.

9.1 Shellfish

All of the middens are dominated by marine mollusc shells. Without question tuatua is the dominant shellfish species making up over 90 per cent of the total shellfish recovered during our investigations. There are two species of tuatua that occur on the Kapiti Coast. The main species *Paphies subtriangulata* is inter-tidal and is easily collected from the beaches while the other, *Paphies donacina* occurs at depths of between two to four metres. The other main surf clam species on this coast (triangle shell, *Spisula aequilatera*, trough shells, *Mactra murchisoni* and *M. discors*, ringed dosinia, *Dosinia anus*, fine dosinia, *D. subrosea*, and frilled venus shell, *Bassina yatei*) all occur in depths of water of 3 metres or more. The surf zone in which these species occur is highly productive (similar to areas of coastal upwelling) and the biomass of these species on the Kapiti Coast is high (Cranfield and Michael 2001). Surf clams, however, are highly sedentary and the mix of species and biomass fluctuates as a result of variable recruitment and high mortality, particularly after severe storms. However, the surf clams appear to reproduce quickly to recolonise beaches after major losses (Cranfield and Michael 2001: 3).

This ability to rapidly recolonise beaches perhaps goes someway to explaining the sheer numbers of tuatua that are present in the Kapiti Coast middens. Ordinarily, it would be expected that sedentary shellfish stocks would be significantly depleted or locally extirpated which would be reflected in changing compositions in the archaeological middens. There is very little apparent variation, however, in sites along the Kapiti Coast. The quantity of other surf clams varies slightly but this variation may be the result of individual storm events washing up some of the deeper surf clam species followed by opportunistic harvesting.

Given the depths at which these species occur, it is unlikely that there was ever a deliberate, sustained harvest of them as can been seen with tuatua.

Carkeek (1966: 103) suggested that at least in the recent past much of the tuatua was probably collected and dried for later use and this is supported by some ethnographic evidence provided by Best (1929: 70). According to one of his informants shellfish were dried in earth ovens before being threaded on strings of fibre (such as flax, *Phormium tenax*) for hanging and drying after which they were stored until needed. They would be softened for consumption by steaming (Best 1929: 70).

There is a very small amount of rocky shore shellfish in the middens, notable paua (*Haliotis* sp.) and limpet (*Cellana* sp.). The coastline immediately adjoining the sites is sandy beach with no suitable habitats for these taxa. The rocky shore species are most likely to have come from Kapiti Island or one of the smaller offshore islands during fishing or fowling trips. There is also rocky coastline further to the south (south of Paekakariki) which could also have been the source of these few individuals. Whatever their source, it is clear that rocky shore shellfish species were never a focus of collecting strategies on the Kapiti Coast.

A very small amount of freshwater mussel (*Hyridella menziesii*) was tentatively identified in some of the sites. This did not occur in any large numbers and it is very rarely recorded in middens on the coast. Carkeek (2004: 147) noted that freshwater mussel was found in middens at Harakeke (a dune ridge north of Waimeha Stream approximately one kilometre inland) in front of which was a large lagoon.

The role of crustaceans in pre-European subsistence practices is not well-understood. Most of the small amount of research that has been carried out has been on the exploitation of crayfish (Leach and Anderson 1979; Leach 1981) and there has been little discussion about crabs (paapaka). The small amount of crab remains in these middens hints at the fact that crabs may only have been collected if they were encountered accidentally (possibly as beach wrecks following storm events) although they do live between the low tide level out to about 10 m (Paul 2000: 155) so may have been collected occasionally during the shellfish harvest. Their shells are fragile and unlikely to survive in archaeological contexts but the claws are robust enough that we should expect to find them if they were being harvested in any numbers.

Shell size distribution study

A sample of complete tuatua shell was taken from five sites for measurement to determine whether there was any change across the landscape in the mean size of tuatua and whether it was possible to detect impacts on shellfish populations as a result of targeted harvesting. As can be seen in the Chronology section below, there is in fact little variation in age of the sites within the study zone which meant that identifying changes through time is more difficult.

The size-frequency distribution of the length (greatest dimension) of tuatua across the five samples shows variation (Figure 114). Using an analysis of variance (ANOVA) the mean shell size was found to be significantly different across the five sites ($F = 222.06$, $df = 4$, $p = 0.000$). The boxplot in Figure 115 also confirms this variance.

The sample from R26/373 (n = 684) had a mean size of 34.29 mm which makes them much smaller than those from the other samples while the sample from R26/430 (n = 391) had a mean size of

47.06 mm. A collection strategy focused on smaller individuals certainly does not fit with popular optimal foraging models where the objective of food gathering is the greatest return for the least effort expended. Under that model we should expect to see more large individuals but (at least for sites R26/430 and R26/490) collecting strategies do not appear to have been discriminating by size and rather mass harvesting techniques appear to have been used.

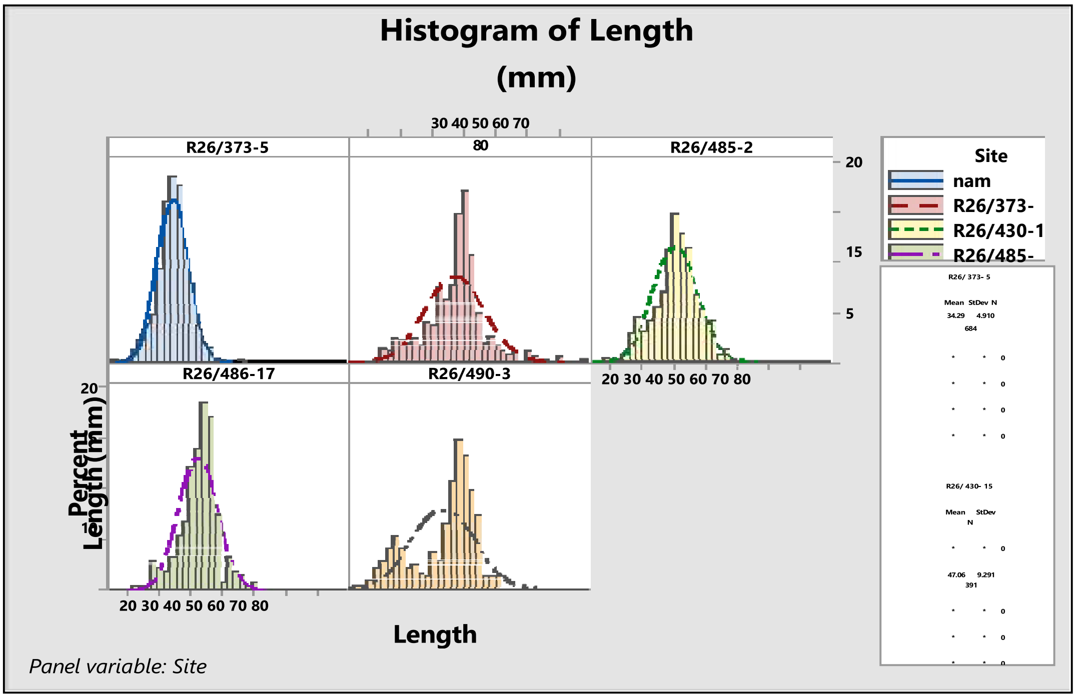

Figure 114. Size-frequency histograms of complete tuatua shells from R26/373 (n=684), R26/430 (n=391), R26/485 (n=588), R26/486 (n=286) and R26/490 (n=243).

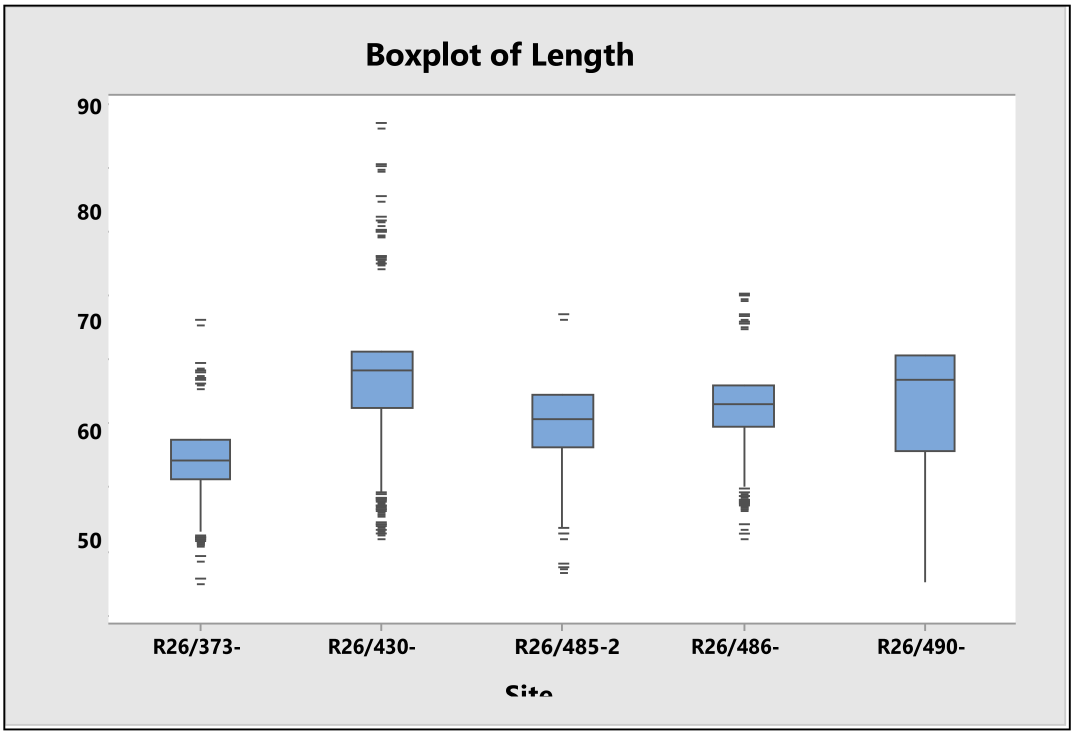

Figure 115. Boxplot of the length of shells from the five sites which confirms the significant variation between the samples.

9.2 Finfish

This study identified fish from seventeen families along with cartilaginous sharks and rays which fall into the class Chondricthyes (Table 43). For the purposes of this discussion we have aggregated the data from all of the sites to provide meaningful data to interpret. Wrasses (Labridae) comprised nearly 25 per cent of the total identifiable species. The relative abundance of the other species varies slightly depending on which unit is used to interpret the data. If the Number of Identified Specimens (NISP) (which includes identifiable but non-quantifiable fragments) is used then snapper, barracouta and red cod each comprise between 13 and 14 per cent of the total sample with kahawai and blue cod the next most common at 9.62 and 9.15 per cent respectively. If MNI data is used (Figure 116), red cod is the second most common species (after wrasses), followed by kahawai at 10.2 per cent. No matter which way the data are considered, however, the same six taxa stand out: wrasses, snapper, barracouta, red cod, kahawai, and blue cod.

The composition of these fish assemblages is typical of pre-European archaeological sites where only a small number of species seem to have had an important role in diet (Leach 2006: 61). Most previously excavated Kapiti Coast assemblages are too small to provide any useful comparative data; the exception is the Raumati midden (R26/291) analysed by Leach *et al.* (2000). At Raumati, fourteen families of fish comprising a total MNI of 86 were present with Arripidae (kahawai) and Moridae (red cod or related species) the most common by a large margin. Unusually they also identified hoki (*Macruronus novaezelandiae*) which is extremely rare in archaeological sites.

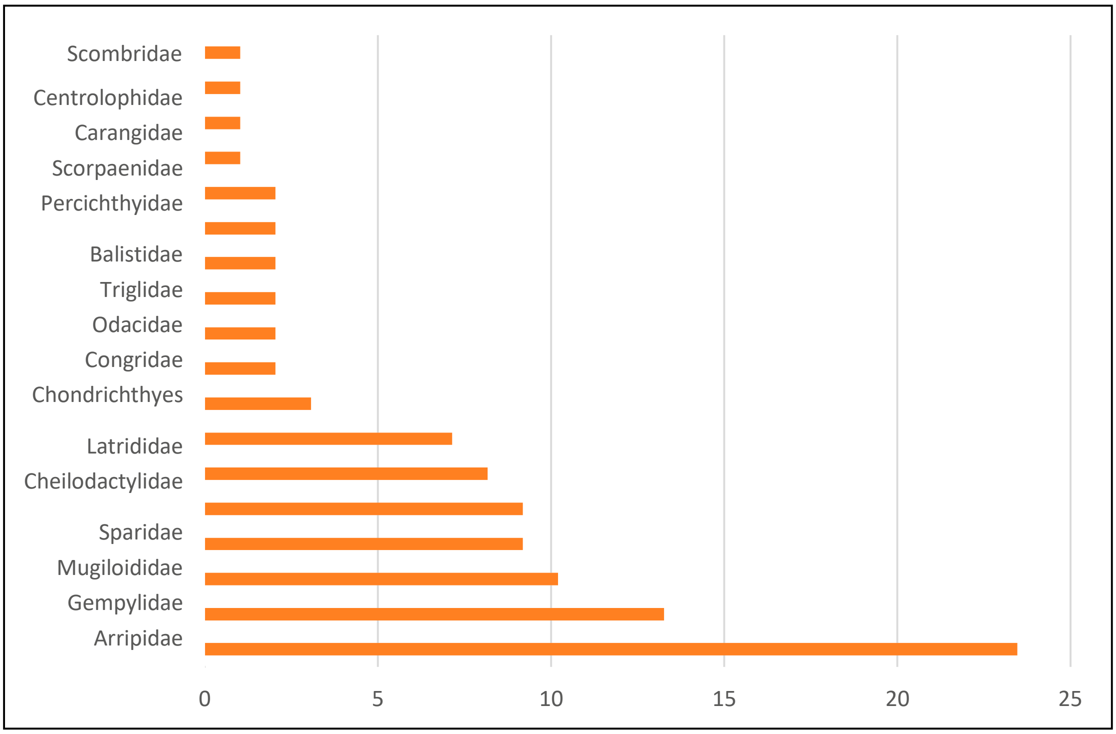

Figure 116. Relative abundance of fish families from all sites within the study area derived from aggregated MNI values across all sites (x-axis values are percentages).

Table 43. Main fish species, by common name and their families

Common Name	Family
Kahawai	Arripidae
Leatherjacket	Balistidae
Jacks, trevallies	Carangidae
Warehou	Centrolophidae
Tarakihi	Cheilodactylidae
Sharks, rays	Chondricthyes
Conger eel	Congridae
Barracouta	Gempylidae
Wrasses	Labridae
Moki	Latrididae
Red cod	Moridae
Blue cod	Mugiloididae
Greenbone	Odacidae
Hapuku	Percichthyidae
Blue mackerel	Scombridae
Scorpionfish	Scorpaenidae
Snapper	Sparidae
Gurnard	Triglidae

Fragmentary bone DNA analysis

Advances in DNA analyses are moving rapidly and one direction that is currently being explored is the use of bulk bone metabarcoding where high-throughput DNA sequencing methodologies are applied to samples of crushed bone (Murray *et al.* 2013). During the course of the faunal analysis we submitted bone samples to our research partners from Curtin University, Western Australia who are experimenting with these metabarcoding analyses. A small sample of approximately 100 bones from R26/486 which were too fragmentary for standard zooarchaeological identification was provided to them. Only preliminary data has been returned but the results suggest that this method will be extremely useful in the identification of fragmentary bone assemblages.

The DNA analysis identified three fish species, red moki (*Cheilodactylus spectabilis*), short fin eel (*Anguilla australis*) and turbot (*Colistium nudipinnis*), that were not otherwise identified in any of the assemblages, and also added bluenose warehou and scorpionfish to the assemblage from R26/486 (Table 44). We do not have any quantifiable data from this study and so have not included the information in any of the detailed analyses. The results, however, are a good reminder that the information recoverable from archaeological sites is only a subset of the original dataset and that we need to be careful to preserve archaeological assemblages because scientific techniques are rapidly changing and new information can be obtained from them.

Table 44. Fish species identified from R26/486 using standard zooarchaeological morphological analyses and DNA metabarcoding (Bunce, Brooks, Walter and Jacomb, unpublished bulk bone metabarcoding data).

Standard analysis	DNA analysis
Barracouta	Barracouta
Blue cod	Blue cod
Kahawai	Kahawai
Snapper	Snapper
Elasmobranch	Scarlet wrasse
Wrasse	Scorpion fish/scarpee
Tarakihi	Red moki
cf Red gurnard	Bluenose warehou
	Short fin eel
	Turbot

The identification of freshwater eel is interesting. There is extensive ethnographic evidence for mass capture of eels by Maori communities in the nineteenth century and eeling is still important in many regions today. The archaeological record, however, is very quiet on pre-European eeling practices. In a recent review of pre-European fishing, Leach (2006) identified only 20 archaeological sites which contained eel bone and with the exception of four sites the MNIs of eel were six or less. The standard explanation for the lack of eel bone in prehistoric archaeological sites is that eel bone is fragile and does not preserve well. This is not in fact the case (Leach 2006: 187), and Marshall (1987) has suggested that the lack of eel bone in archaeological sites may in fact have more to do with the way in which eel was prepared, cooked and consumed. She also argues that eel-weir fishing must have its origins in the pre-European period as otherwise we would expect to see the use of European materials in the earliest forms of eel-weir which is not the case (Marshall 1987: 69). Leach (2006) argues that there may have been a rapid change in cultural beliefs following European settlement that may account for the apparent importance of eeling by the nineteenth century. He notes that there is wide variability across the Pacific in terms of the consumption of eel; on some islands it is common and on others eels are avoided. Leach cites an observation made by Brunner during his time on the West Coast of the South Island in 1846-48 where he noted that there were very specific cleansing rituals around the handling of eels which implies there was a degree of spiritual danger in taking eels for food (Leach 2006: 188). Whether this particular belief and practice was more widespread is unknown. There is still much to learn about the place of eels in pre-European economic practices and if Marshall (1987) is correct, much to learn about the role of eels in socio-political structures and systems.

Fishing technology

The species present represent a range of habitat types as well as fishing techniques. Some, such as red gurnard prefer open sandy bottoms, while others such as conger eel are only found on rocky shorelines. Many of the species occur in deep water but also come inshore at certain times of the year. Only a single fish hook was recovered during the investigations although certain species such as barracouta, blue cod, hapuku, red cod and kahawai were almost certainly caught from canoes using hooks and lines. Some species such as green bone are kelp grazers and would not take a hook and may have been caught by spearing or netting.

9.3 Birds

Over 200 bird bones were recovered from the sites, although the majority of them were too fragmentary to identify. At least seven species were positively identified and comprise small seabirds (common diving petrel, fairy prion and fluttering shearwater) and forest birds (kaka, kereru, parakeet and tui) (Table 45). These species are frequently found in archaeological sites around the country (Worthy 1997: 132). A single bird spear fragment was recovered from R26/462.

Table 45. Aggregated NISP and MNI values of birds across all sites.

Species	NISP	MNI
Common diving petrel	1	1
Fairy prion	4	1
Fluttering shearwater	1	1
Kaka	5	2
Kereru	3	1
Parakeet	9	5
Prion	2	2
Shearwater	1	1
Tui	1	1
Unidentified	211	
Total	**238**	**15**

9.4 Mammals

There are two species of mammal present in the sites; dog or kuri and the Polynesian rat (Table 46). Only three individual dogs were identified from three different sites. Dog is the only domestic animal to have been successfully introduced by the Polynesian colonists in New Zealand. Their function was multi-faceted and they were kept for hunting, and as watch-dogs and companions. They were also a source of food, industrial materials (for instance bone for the manufacture of fish hooks) and their pelts were used to make cloaks (Greig *et al*. 2015). If New Zealand dogs lived in communities in a similar manner to the ways they did in the Polynesian homeland, then they were probably free-ranging, living on the fringes of settlements and scavenging from middens. On very rare occasions dog burials are found suggesting a particularly close relationship between the dog and a person but in most cases dog bone is recovered from general midden contexts. This is certainly the case here.

It is notable how little dog bone was found in any of the Kapiti sites. This appears to conform to a more broadly observed pattern of more dogs in the early period sites than in later sites. The exact reasons for this are unknown. If dogs largely survived through scavenging there may have been more food available before the extinction and extirpation of the large game such as moa and sea mammals. On the Kapiti Coast, if much of the subsistence activity was around collecting and preserving shellfish supplemented by fishing and some fowling there may have been considerably fewer scraps for dogs to scavenge.

Rats were common, occurring in 10 of the study sites. The extent to which they constituted a food source in the study area is uncertain although the numbers represented in the middens suggests their use as food.

Table 46. Aggregated NISP and MNI of mammals across all sites.

Species	NISP	MNI
Dog	16	3
Rat	136	25
Total	152	28

10 MATERIAL CULTURE

There were surprisingly few items of material culture found during the pre-construction investigations. These included two small stone adzes, a fish hook, part of a bird spear, a pumice container and a number of stone flakes (worked and unworked). This section begins by presenting the material culture details in tabular form (Table 47), followed by photographs and brief descriptions, and ends with a discussion of the artefacts and could they contribute to an understanding of pre-European life on the Kapiti Coast and the exchange relationships with other parts of New Zealand.

Table 47. Material culture items found during M2PP pre-construction investigations ordered by site (dimensions in mm, weights in g. If fragmentary then only the greatest dimension is given).

Site No. & *Cat. No.*	**Material**	**L**	**W**	**T**	**Wt**	**Type**	**Description**
R26/373 *(R26/373- 106)*	Obsidian	7.48	9.17	1.44	0.1	Flake	Tiny flake with edge damage that could be natural or could be evidence of use. Source: Taupo Volcanic Zone.
R26/373 *(R26/373-170)* Feature 29	Chert (grey)	26.25	-	-	2.09	Flake	No use wear or retouch. Source unknown.
R26/373 *(R26/373-171)* Trench 2	Chert (grey)	25.52	-	-	2.92	Flake	No use wear or retouch. Source unknown.
R26/373 *(R26/373-172)*	Chert (grey)	14.64	-	-	0.96	Angular fragment	No use wear or retouch. Source unknown.
R26/373 *(R26/373-174)* Trench 5	Argillite (grey)	8.22	14.82	2.55	0.68	Flake	No use wear or retouch. Source: Nelson Mineral Belt.
R26/373	Argillite	57.17	-	-	31.1	Angular	Angular fragment with retouch along

(R26/373-175)	(grey)					fragment	margins. Nelson Mineral Belt.
R26/373 *(R26/373-176)*	Argillite (grey)	69.73	-	-		Angular fragment	Angular fragment with retouch along margins. Nelson Mineral Belt.
R26/373 *(R26/373-177)* Trench 2	Obsidian	25.61	13.89	7.67	2.08	Flake	No retouch and no definite use wear. Source: Taupo Volcanic Zone.
R26/373 *(R26/373-178)* Feature 45	Argillite (grey)	20.56	27.71	3.71	2.33	Flake	Some possible use wear evident on distal margin. Source: Nelson Mineral Belt.
R26/373 *(R26/373-179)* Layer 2	Grey argillite	27.5	40.5	8.3	8.1	Flake	Flake with retouch along three lateral margins. The flake has traces of red ochre on all surfaces especially the striking platform. Source: Nelson Mineral Belt.
R26/373 *(R26/373-180)* Feature 45	Argillite (grey)	4.7	-	-	0.01	Angular fragment	Retouch debitage. Source: Nelson Mineral Belt.
R26/373 *(R26/373-181)* Feature 45	Argillite (grey)	19.76	-	-	0.44	Angular fragment	No use wear or retouch. Source: Nelson Mineral Belt.
R26/373 *(R26/373-182)*	Obsidian	22.01	-	-	3.95	Core	Nuclear tool (retouch present on 3 margins). Source: Taupo Volcanic Zone.
R26/373 *(R26/373-183)*	Obsidian	9.32	-	-	0.18	Flake	Very small flake with retouch along one margin. Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 184)*	Obsidian	13.65	10.57	3.88	0.66	Flake	Scalar retouch present on two margins and use-wear evident. Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 185)*	Obsidian	17.85	29.05	8.5	1.81	Flake	No retouch and no definite use wear. Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 186)*	Obsidian	23.52	-	-	3.16	Core	Nuclear tool (retouch present on two margins). Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 187)*	Obsidian	16.27	-	-	0.26	Flake	Very small flake with possible use wear and retouch that could be natural along one margin. Ochre residue present on dorsal surface. Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 188)*	Obsidian	8.18	5.67	3	0.19	Flake	Very small flake with retouch and use polish along one margin. Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 191)*	Pumice	51	-	-	3.96	Cobble	No signs of modification. Source unknown.

R26/373 *(R26/373-205)* Layer 2	Obsidian	13.85	20.98	11.65	2.85	Flake	Evidence of rotated platform retouch present on three margins). Source: Taupo Volcanic Zone.
R26/373 *(R26/373-29)* Layer 2	Pumice	68	52	36	14.2	Pumice cobble	Lump with signs of abrasion damage but no obvious functional clues. Source unknown.
R26/373 *(R26/373- 32)*	Obsidian	12.36	13.19	2.11	0.12	Flake	Tiny flake with no definite retouch but use wear apparent along one edge. Source: Taupo Volcanic Zone.
R26/373 *(R26/373- 59 & 60)* Bulk midden sample 7	Bone	-	-	-	2.05	Fish hook	One-piece fish hook with internal barb on shank and point. (Found in several pieces, hence multiple catalogue nos.)
R26/430 *(R26/430-1)* Spoil	Pumice	78	76	33	46.8	ainer or lid	Beach-rolled cobble of pumice that has been flattened on one side and then hollowed out to create a sub-hemispherical chamber approximately 35 mm in diameter and 13 mm in depth. A groove that runs from one side of the chamber around the cobble to the opposite side of the chamber may have been used for lashing.
R26/433 *(R26/433-73)* Feature 1-1-ii	Obsidian	20.97	10.67	3.09	0.98	Flake	Bladelet with retouch along one margin.
R26/462 *(R26/462-3)* Bulk midden sample 7	Bone (bird)	22	5	2.3	0.19	rdspear point	Proximal fragment with a single barb present.
R26/475 *(R26/475-20)* Surface of midden	Argillite (grey)		-	-	9.79	Flake	No evidence of use.
R26/481 *(R26/481- 19)*	Obsidian	16.28	-	-	0.57	Angular fragment	Retouched at both ends to form tiny awl. Source: Taupo Volcanic Zone.
R26/482 *(R26/482 adze)* Near Feature 7	Grey argillite	74	35.7	16.2	77.1	Adze	Small, quadrangular adze without tang. Made by flaking, hammer- dressing and grinding. Ground on all surfaces except poll.
R26/486 *(R26/486- 33)*	Obsidian	28.43	18.35	14.08	4.47	Flake	Flake with possible retouch at platform but could be from platform preparation. Source: Mayor Island.
R26/486 *(R26/486- 34)*	Obsidian	19.4	-	5.04	1.94	Flake	Flake with alternating scalar retouch on two margins. Source: Taupo Volcanic Zone.
R26/486 *(R26/486- 35)*	Obsidian	32.8	24.59	8.44	4.41	Flake	Flake with retouch along one edge that may be for prehension. Source: Taupo Volcanic Zone.
R26/486 *(R26/486- 36)*	Obsidian	17.56	38.91	5.09	3.94	Flake	Small area of possible retouch along one margin. Source: Taupo Volcanic Zone.

R26/486 *(R26/486- 38)*	Obsidian	18.24	25.93	4.37	1.03	Flake	No retouch and no definite use wear. Source: Mayor Island.
R26/486 *(R26/486- 39)*	Obsidian	27.19	-	-	2.31	Flake	Three areas of retouch some of which are possibly for prehension and some may have been attempts at flaking. Source: Taupo Volcanic Zone.
R26/487 *(R26/487-1)* Top of Layer 2	Fired clay	37.2	6.6	6.3	2.15	Clay pipe stem fragment	Fragment is worn at one end and snapped at the other. The worn end is not the "factory" mouthpiece, which suggests that the pipe was already broken when last used.
R26/487 *(R26/487-2)* Top of Layer 2	Glass (2 pieces)	-	-	-	-	Bottle base	Pieces of black glass beer bottle - probably 19th century in origin.
Near R26/433 (TM-N CJ Trench 1 abrader) Top of Layer 2	Fine, yellow-brown sandstone	83	60	33	141.5	Grindstone	Tapered, tabular block of sandstone that has been worn to a smooth surface on two faces from use as a grindstone or hoanga. On one of the two worn surfaces there is a series of grooves the function of which is not clear.
Near R26/433 *(TM-N CJ Trench 2 adze)* Top of Layer 2	Grey argillite	75.6	28	15.8	42.58	Adze	Small adze, triangular in cross- section with apex to front, without tang. Adze made by flaking and grinding. No evidence of hammer- dressing. Haft polish is only visible on the back, suggesting that the adze was not hafted in a socketed haft.
Near R26/433 *(TM-N CJ Trench 2 flake)* Top of Layer 2	Green- grey argillite?	45.4	25.3	10.3	8.1	Flake	Small stone flake. No signs of use wear or retouch.
Near R26/489 (R26/489-1)	Basalt (black)	32.97	-	-	8.47	Angular fragment	Some possible retouch along one margin. May not have been used. Source unknown.
Near R26/489 (R26/489-2)	Sedimentary (yellow/ low grade)	19.96	21.64	3.58	1.78	Flake	Probably not an artefact, although some possible retouch present along one margin. Source unknown.

10.1 Adzes

The two stone adzes found during the investigations are both very small and made from grey argillite that is almost certainly from the Nelson Mineral Belt. Both are made by a combination of flaking and grinding; with some hammer-dressing present on the sides of one. Both have a fine cutting edge angle (the angle between the bevel and the front) which suggests that they were used for relatively fine work. The first adze found near R26/433 (Figure 117), is triangular in cross section; while the second, from R26/482 (Figure 118), is of a rounded rectangular section.

Although similar in many ways, including size, at 75.6 and 74 mm in length, respectively, they have features which suggest that they may not have been made in contemporaneous times. One is triangular in cross section with apex to the front (Type 4 in Roger Duff's adze typology) and the other is of a rounded rectangular cross section approximating Duff's Type 2B – the ubiquitous late period adze type of the North Island (Duff 1950). The former is typical of Archaic Phase adze assemblages, which include a range of cross-sectional forms, while the latter is more typical of the later, Classic Phase, many adzes of which are of rounded rectangular cross-section, with at least some finishing on all surfaces. The triangular adze's cross-section is probably fortuitous; a bulb of percussion on the back at the poll end, and an absence of lateral flaking apart from small trimming-flake scars, indicates that the adze was made on a prismatic blade struck from a prepared core. Both adzes have haft polish indicating extensive use, and one (the 2B) has grooves in the front near the cutting edge which suggests use in gritty conditions, possibly for digging.

Figure 117. Stone adze found near R26/433 (TM-N CJ Trench 2 adze) at the top of Layer 2. Material is grey argillite from the Nelson Mineral Belt. Dimensions: 75.6 x 28 x 15.8 mm. Wt: 42.58 g. Small adze, triangular in cross-section with apex to front, without tang. Adze made by flaking and grinding. No evidence of hammer-dressing. Haft polish is only visible on the back, suggesting that the adze was hafted normally rather than in a socketed haft. Edge angle of approximately 64 degrees suggests use for fine work.

Figure 118. Stone adze found at R26/482 (R26/482 adze), adjacent to Feature 7. Dimensions: 74 x 35.7 x 16.2 mm, Wt: 77.1 g. Small, quadrangular-sectioned adze without tang, made by flaking, hammer-dressing and grinding. Ground on all surfaces except poll. Haft polish visible on back, sides front and poll, suggesting that adze was used in a socketed haft. Cutting edge in good condition and relatively sharp. Edge angle of 65 deg suggests that the adze was used for relatively fine work. However, wear grooves in the front of the cutting edge suggest at least some use for agricultural purposes. Alternatively, the grooves may have been caused by use in sandy or gritty conditions.

10.2 Fish hook

A single fish hook was found during the investigations (Figure 119). It is typologically similar to Hjarno's Type D4f (one-piece fish hook with internal barb on shank, Hjarno 1967; Paulin 2012). Although one-piece fish hooks are normally associated with the Archaic Phase (e.g. see Golson 1959), one-piece fish hooks with a shank barb are not typical of that time. The limited studies that have been done suggest that this type did not appear until after the end of the Archaic, when the moa had been hunted to extinction and many other changes occurred to Maori life (Jacomb unpubl. data). Type D4f fish hooks are most commonly found in the east coast of New Zealand from about Gisborne to Banks Peninsula, although some have been collected from a site at the mouth of the Hokio River on the west coast of the North Island, not far from Kapiti (Jacomb unpubl. data) and others are known from Northland and the Nelson region (Paulin 2012). The presence of this example is a significant new indicator of exchange or migration connections between the east coast and the Kapiti district, although sample size limits the strength of any conclusions that can be drawn from this.

Figure 119. One-piece fish hook (R26/373-59 & 60) with remains of internal barb on shank and slightly incurved point, found at site R26/373.

10.3 Bird-spear point

A proximal fragment of a bird-spear point (Figure 120) was found at R26/462 (R26/462-3). Made of bird bone, the fragment included the base (the part that was lashed to a wooden spear) and one of the barbs. The presence of the bird-spear at this site indicates that at least some fowling was practiced in the study area. However, bird bones are not a common feature of the sites in the study area with only an MNI of 15 birds in all of the middens combined.

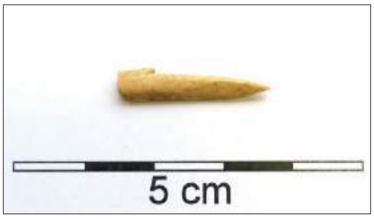

Figure 120. Proximal fragment of a bone bird-spear point (R26/462-3 (sub-bag 10.3)) with single barb present, made of bird bone. Dimensions: 22 x 5 x 2.3 mm. Wt: .

10.4 Pumice

Two pieces of worked pumice and several unworked fragments were found during the investigations (Figures 121 and 122). The two worked pieces comprised a bowl or container (or lid) and a possible polisher.

Figure 121. Pumice bowl or container found at site R26/430 (R26/430 pumice). Dimensions: 78 x 76 x 33 mm. Wt: 46.8 g. Beach-rolled cobble of pumice that has been flattened on one side and then hollowed out to create a sub-hemispherical chamber approximately 35 mm in diameter and 13 mm in depth. A groove that runs from one side of the chamber around the cobble to the opposite side of the chamber was presumably used for lashing to another component.

Figure 122. Pumice cobble (M2PP section 6 CJ pumice) with slightly flattened side and possible signs of working at one end. No definite signs of having been worked or of any use wear but may have been used as a polisher. Dimensions: 87 x 41 x 31 mm. Wt: 15.1 g.

10.5 Sandstone abrader

A sandstone abrader was found 85 m south-east of R26/433 along one of the machine-excavated trenches (Figure 123). There is a wide range of "attrition" tools used in prehistoric New Zealand that includes grindstones, reamers and files. These are assumed to have been used for working bone, stone and shell raw materials into artefacts such as adzes, bird-spear points, fish-hooks and ornaments. As such they can be found at all stages of prehistory and have no particular time implications attached. This particular grindstone can be assumed to be a general-purpose fabrication tool that could have been used for at least part of the manufacturing or maintenance (e.g. tool resharpening) process involved in any of the above artefact classes. It has two smooth, concave grinding surfaces, one of which has numerous shallow, irregular, longitudinal grooves. The presence of the grooves is difficult to explain. They are too irregular to have been used for sharpening pointed objects like spear points and it is considered most likely that they were already present in the raw stone. The generalist nature of this tool means that no specific manufacturing or maintenance activity can be ascribed to it.

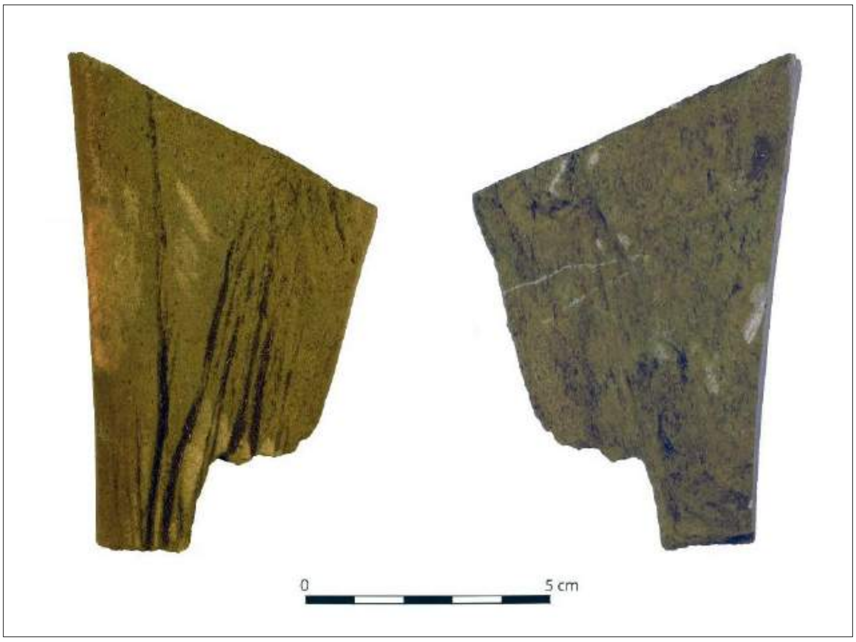

Figure 123. Sandstone abrader (TM-N CJ Trench 1 abrader) found 85 m south-east of R26/433 along trench. Dimensions: 83 x 60 x 33 mm. Wt: 141.5 g. Tapered, tabular block of sandstone that has been worn to a smooth surface on two faces from use as a grindstone or hoanga (one is the face visible in plan view in the left hand image and the other is the concave surface just visible in the right hand image along the right edge of the artefact).

10.6 Lithic material

The most numerous artefact type found was flaked stone, in the form of modified and unmodified flakes, cores and waste fragments (Table 48). Flakes were defined as pieces of stone with a striking platform and bulb of percussion present, and cores were identified as pieces with a preponderance of negative flake scars. A range of different stone types was found including, predominantly, argillite, obsidian and chert.

Table 48. Lithic types according to material.

	Flake		**Core**		**Waste**	**Total**
Material	**Worked**	**Unworked**	**Worked**	**Unworked**	**Angular fragment**	
Argillite	4	3			2	9
Obsidian	13	3	1	1	1	19
Chert		2			1	3

Basalt					1	1
Other	1					1
Total	18	8	1	1	5	**33**

10.6.1 Argillite

Nine pieces of flaked argillite were found during the investigations. These comprised seven flakes, of which four had retouch or other evidence of use, and two angular fragments (Figure 124). The argillite is typical of varieties found in the Nelson Mineral Belt, an area that runs approximately from Brightwater to D'Urville Island at the top of the South Island. This zone contains several outcrops of metasomatised argillite, a hard, tough stone that flakes conchoidally, making it ideal for the manufacture of stone tools including adzes, drill points and flake tools. Adzes made of argillite from the Nelson Mineral Belt were highly valued and have been found in archaeological sites in most areas of New Zealand. Although it was used in the Nelson-Marlborough area throughout prehistory, its use in more distant sites is generally restricted to the Archaic Phase.

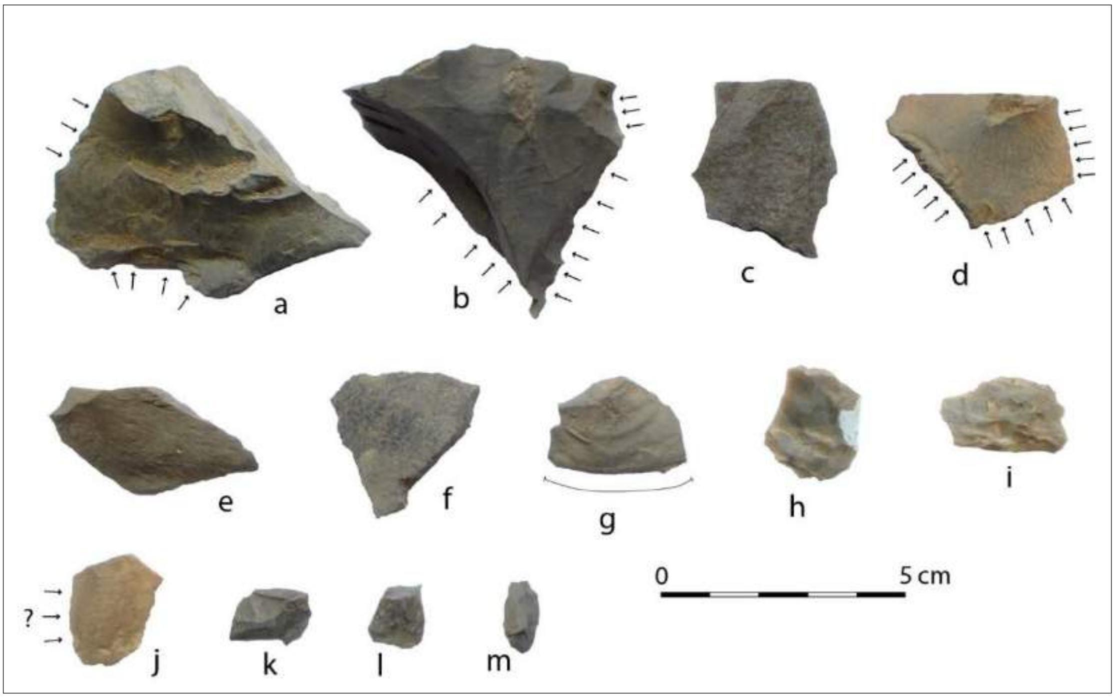

Figure 124. Stone flakes and debitage found at sites R26/373 (a, b, d, g, h, i, k, l, m), R26/475 (c) and in the trenches but not associated with any particular site (e, f, j), see Table 47. Arrows indicate locations where retouch observed. Curved line indicates area of very fine use-wear or retouch. a. R26/373-176, b. R26/373-175, c. R26/475-20, d. R26/373-179, e. M2PP-TM-N-CJ-Trench 2, f. M2PP-O-WR-LS-Trench 2.1, g. R26/373-178, h. R26/373-171, i. R26/373-170, j. M2PP-O-WR-LS-Trench 2.2, k. R26/373-174, l. R26/373-172, m. R26/373-181.

10.6.2 Obsidian

Obsidian, a volcanic glass, is found only in the northern half of the North Island, with source areas in the Taupo Volcanic Zone, the Bay of Plenty (including the important Mayor Island source), Hauraki Gulf including Great Barrier Island, and Northland. There were twenty obsidian artefacts found during the investigations. Of these, fourteen were worked flakes, three were unworked flakes, two were cores (one of which had microflaking as a result of its subsequent use as a tool) and one was an angular fragment that had retouch at both ends to form a tiny, double-ended awl (Figure 125 and 126).

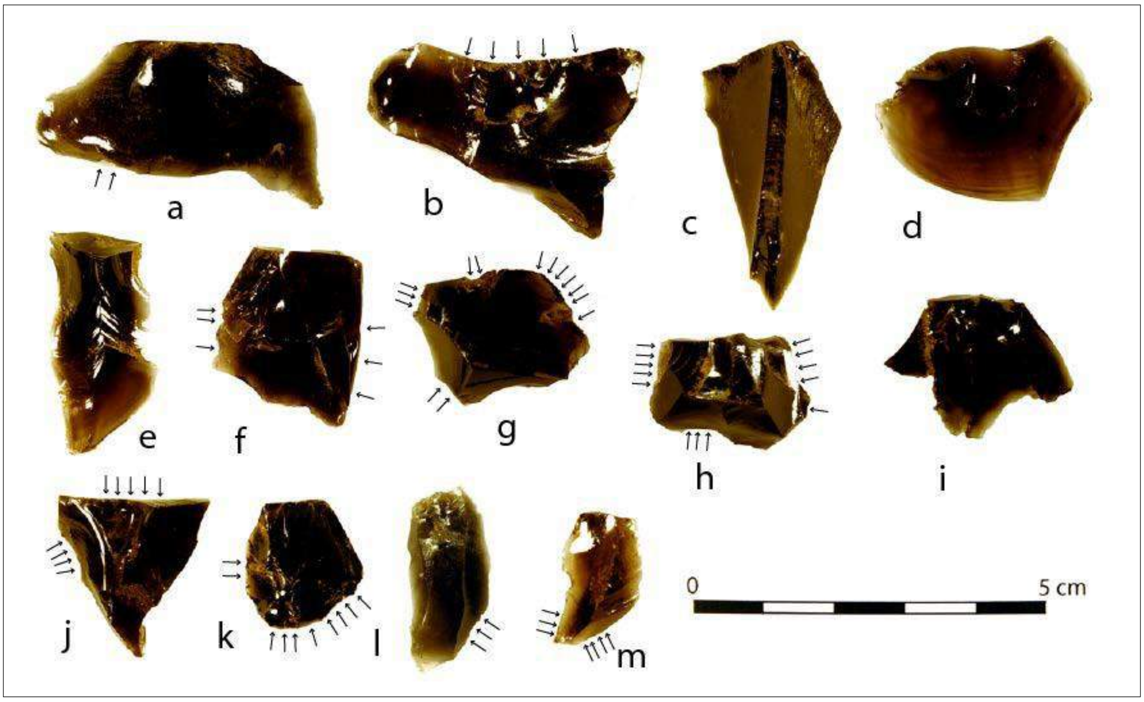

Figure 125. Obsidian flakes and cores found at sites R26/373 (d, e, g, h, j, m), R26/433 (l) and R26/486 (a, b, c, f, k). a. R26/486-36, b. R26/486-35, c. R26/486-33, d. R26/373-185, e. R26/373-177, f. R26/486-39, g. R26/373-205, h. R26/373-182, i. R26/486-38, j. R26/373-186, k. R26/486-34, l. R26/433-73, m. R26/373-184. Arrows indicate locations where retouch was observed. For details see Table 47.

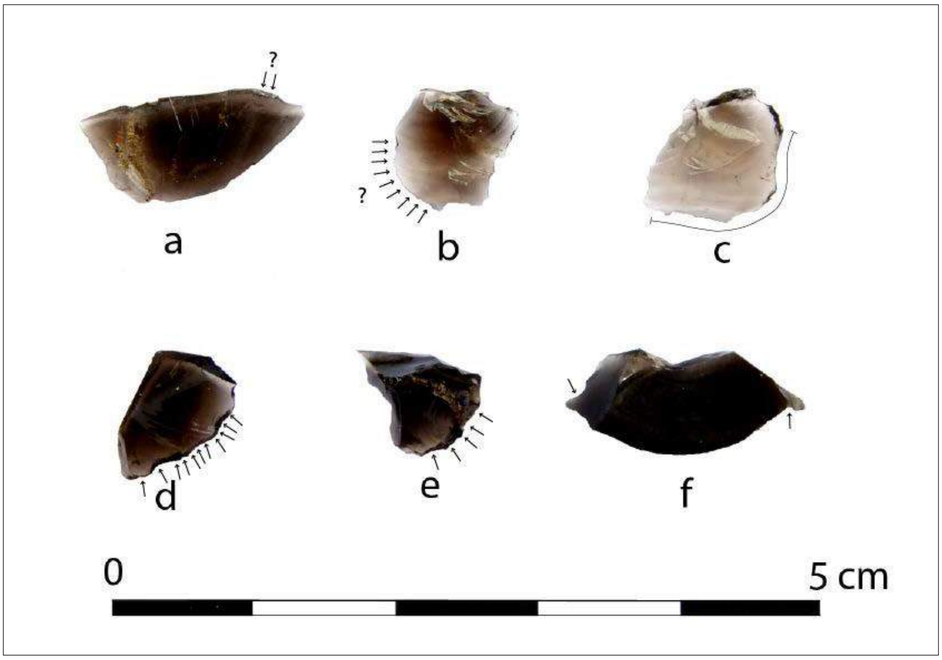

Figure 126. Obsidian flakes found at sites R26/373 (a, b, c, d, e) and R26/481 (f). a. R26/373- 187, b. R26/373-32, c. R26/373-106, d. R26/373-188, e. R26/373-183, f. R26/481-19. Arrows indicate locations where retouch was observed. Curved line indicates zone of damage that indicate possible use wear and breakage. For details see Table 47.

To identify the possible sources of the obsidian found during the M2PP investigations, these artefacts were analysed by X-Ray fluorescence, using a Bruker Tracer III-SD pXRF at the University of Otago Archaeology Laboratories. The machine was optimised to identify mid-Z trace elements (Mn, Fe, Zn, Th, Rb, Sr, Y, Zr, Nb) with green filter settings (40kV per channel, filament ADC=30μA, filter=12milAl+1milTi+6milCu, runtime=300 seconds).

The raw data were calibrated to parts per million (PPM) using both the machine – specific quantification protocols for the Bruker Tracer III-SD #T3S2521, based on 40 known obsidian standards, and a secondary linear transform based on twelve international geological standards. A basalt standard (BHVO-2) was run at the beginning and end of the session as a quality control. The archaeological material was compared to known geological reference samples at the University of Otago (Ward 1972). Two pieces of Kapiti obsidian clearly cluster with the Mayor Island reference material based on a PCA plot of the logged PPM data (Figure 127). These artefacts are visually distinguishable from their green hue, the remaining obsidian being a black or dark grey in colour. This plot also shows that none of the Kapiti artefacts can be attributed to the Kaeo/Waiare and Huruiki sources in Northland, or the Te Ahumata source on Great Barrier Island, and are unlikely to derive from the Waihi source. Note that two flakes under 3 mm in maximum thickness are excluded from the plot and further discussion. Obsidian under this thickness threshold is typically difficult to characterise due to low energy counts, which yield anomalous results (Davis *et al*. 2011).

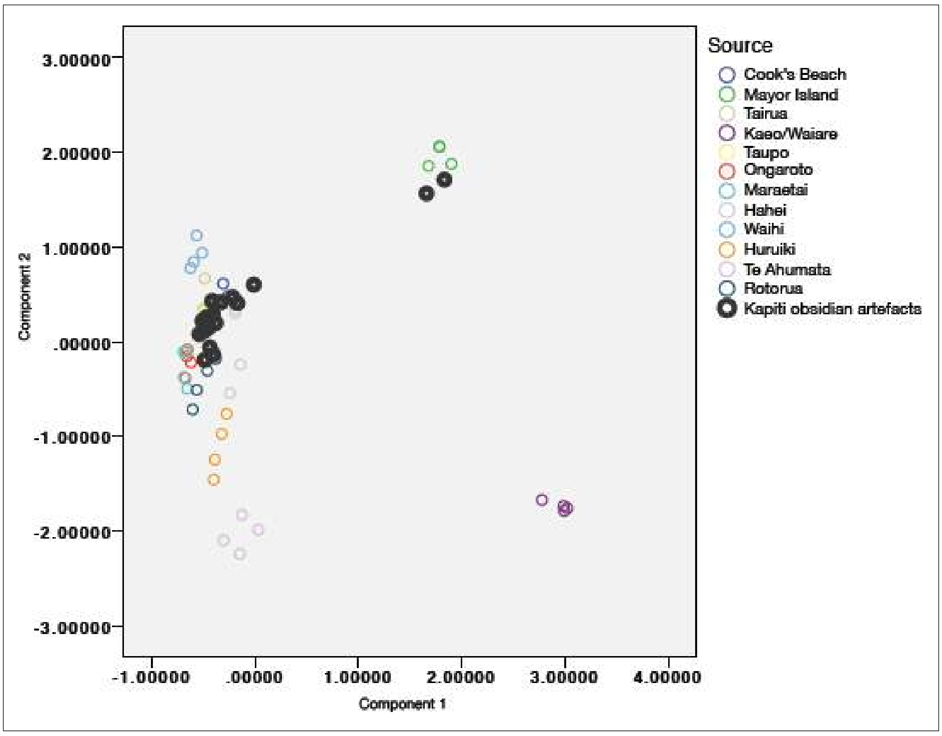

Figure 127. PCA plot showing components 1 and 2. Two Kapiti artefacts cluster closely with the Mayor Island reference material, however the majority cluster with the Central North Island and Coromandel sources.

The results of the PCA analysis show that all the obsidian artefacts could be attributed to two sources, Mayor Island (n=2) and the Taupo Volcanic Zone (n=17).

10.6.3 Other stone

Three fragments of chert were found, of which two were flakes and the third was an angular fragment. None had retouch or definite use-wear. They are likely to be from a local source, although no local sources of chert are known to us.

A single angular fragment of basalt was found, which had no retouch or evidence of use and a flake of low-grade sedimentary stone was found that had some damage that may have been use- wear or retouch but the coarseness of the grain of the material made this impossible to determine with any certainty. It is quite possible that both of these items found their way into the sites in which they were found through accidental means and that they were not artefacts at all.

10.6.4 Stone flakes with ochre residue

Two of the flakes found in the study area had a red pigment adhering to their surface (Figure 129 and Figure 130). This is most likely to be red ochre. This type of residue is very rare and has only been reported previously on one occasion of which the authors are aware (Prickett 1992: 71).

Figure 129. Argillite flake tool (R26/373-179; see Figure 128, above) with traces of red pigment. Pigment is present on all surfaces including striking platform and on one of the retouched edges.

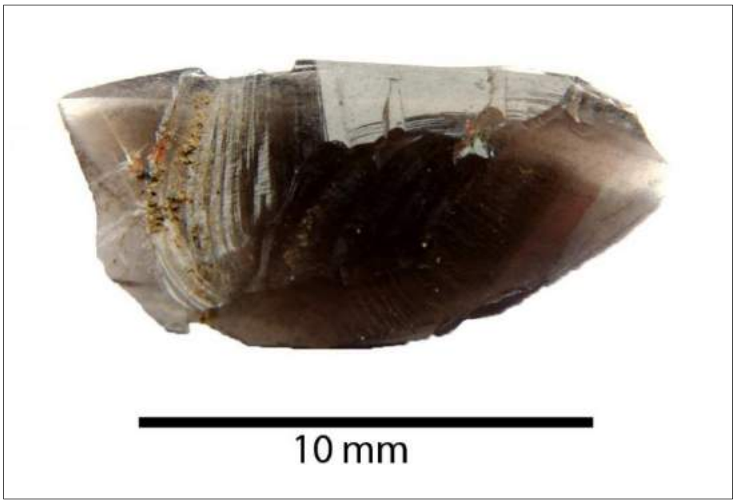

Figure 130. Obsidian flake tool (R26/373-187; see Figure 126, above) with traces of red pigment in hollow at upper mid-left and mid-right locations.

The presence of ochre residue on the two flakes has several possible implications. One is that the flakes might have been used for cutting raw ochre into usable fragments, or powder, as part of the process of preparing red pigment. In this case it would be expected that there would be residue adjacent to the cutting edge. Another is that they might have been used as part of the process of applying the pigment to the surface being decorated. Finally, they might have been used during a process that concurrently involved cutting or scraping (with the flake) and the application of pigment as a separate activity. The only one of these that would have left residue that is at all distinctive is the first. The argillite flake had some residue on one of its three retouched margins suggesting that it could have been used for working raw ochre; however, its absence from either of the other two retouched margins means that it is equally likely that the residue got there by some other means.

In fact, it is entirely possible that the ochre was transferred to the tools accidentally. Ethnographic accounts suggest that ochre – or more specifically, kokowai, the red pigment made from ochre – was used not just for decorating carvings, canoes and other objects, but was used to decorate the body (see extracts below). The ochre could therefore have been transferred during some activity that was completely unrelated to the use or manufacture of the pigment. The use and manufacture of ochre pigments have received little attention in the archaeological literature and it is therefore worth quoting extensively from a 1903 report by Archdeacon P. Walsh.

Of the pigments named, the kokowai was by far the most important. The black and the white were chiefly employed in small quantities for fine work, while the use of the blue was solely confined to personal adornment. But the kokowai was in universal requisition. It formed the general colour of all the painted work on the canoes, the houses, and the more ornamental portions of the palisading surrounding the pas; and it was also extensively used as a personal decoration, it being the very general custom of the chiefs and other people of note to cover their bodies with it. … The raw material from which this favourite pigment was made consisted of a species of red ochre or oxide of iron found in deposits in the ground. This was first roasted in a very hot haangi, or native oven, and afterwards ground to a fine powder on a flat stone by means of a round smooth boulder. [p.5]

Various modes were adopted in the application of the kokowai, each depending on the purpose for which it was required. For the treating of woodwork the mixture was made up into the consistency of ordinary paint and smeared over and rubbed in with a bunch of muka, or flax-fibre. When required for a cosmetic it was used in a more liquid state. Polack, in describing a hahunga, or feast at the ceremonial scraping of the bones of a chief, says, "Red paint was much in requisition. A quantity of the mixture was arranged in a broken calabash, into which some of these antipodal exquisites absolutely dipped the entire head and face" ("Manners and Customs of the New-Zealanders," vol. i., p. 81). In this form it was also used for saturating the clothes, which was sometimes done.

Occasionally it was used in a form of greater consistency. One of the old writers relates that a Maori who was completely covered with kokowai kept a small lump of it in his hand, which he was constantly rubbing on to any portion of his body from which the colour had worn off. [Walsh 1903: 6]

The question has naturally been raised as to the purpose intended by the use of the kokowai as a cosmetic. Dr Shortland remarks that "a reason for some persons painting their body and clothes was that they might leave a mark behind them, that people might know where their sacred bodies had rested" ("Traditions of the New-Zealanders," p. 112). There may be something in this, but that it was not the only reason is evident from the fact that the painting of the body was not confined to chiefs of particular note, but was practised by men generally of the rangatira class. Kokowai was, like the purple of the Romans, a sign of rank, but not reserved exclusively for persons of the highest station.

From Polack's account, already quoted, it will be seen that it was in general request among men of fashion at the feast which he describes; and Bidwell observes that in his time it was impossible to be carried by a native without getting one's clothes soiled by the "red dirt" which had saturated their mats ("Rambles in New Zealand," 1841, p. 35). Though probably certain distinguished individuals kept themselves painted at all times, the minor rangatira appear to have been decorated only on festal and ceremonial occasions, one of which was the starting on a hostile expedition, when the whole party were arrayed in full "war-paint." There is no doubt that one of the principal objects in the application of the kokowai, with its admixture of shark-oil, was at once to protect the body from the changes of temperature and from the annoyance of sand-flies, mosquitoes, and certain parasitic insects which seem to have been very abundant among the old-time Maoris, and afflicted all classes alike (see "Cook's Voyages"). This double purpose would probably be fairly accomplished by the strong-smelling oil alone, but the addition of the earthy matter would doubtless render the application more effective, and at the same time give it an aristocratic appearance. So far as I have been able to learn, this use of the kokowai was exclusively confined to the male sex, women and girls using various pigments derived from the pollen of flowers and other vegetable sources in small spots or patches on their faces. [Walsh 1903: 8-9]

The kokowai met the eye of the Maori at every part of his surroundings during his lifetime, and did not leave him even in death, as it was the custom, after the bones of a chief had been scraped clean at the hahunga, or ceremonial feast held for the purpose, to give them a coating of his favourite colour before they were deposited in their final resting-place. [Walsh 1903: 10]

10.7 Historic artefacts

Two artefacts from the historic period were found, a fragment of a clay pipe stem (Figure 131) and parts of a bottle (Figure 132). These were too small in number for anything to be said except that both are typical of the nineteenth century and early twentieth century indicating some use of the area during this time.

Figure 131. Fragment of clay pipe stem found at R26/487 (R26/487-1). There are no identifying marks or stamps present.

Figure 132. Two fragments from the base of a black glass beer bottle. Such bottles were most often used during the nineteenth century; however, there is too little of this bottle present to make an accurate determination of its age or origin. No use wear or retouch was present to indicate its use as a tool.

10.8 Use of material culture

The most notable thing about the material culture found during the M2PP investigations is that so few artefacts were found at all. Artefacts, especially when found in significant numbers, are a particularly useful source of information about how people lived at the time a particular site or landscape was occupied. Large numbers of fish-hooks, for example, would suggest that line fishing was an important activity; the types of fish-hook present can yield information about the types of fish being sought, and also about the time period during which they were being used. For the whole of the M2PP pre-construction investigations only a single fish-hook was found – and it was of a type that is often assumed to have been used for decorative or ceremonial purposes. The so-called "shank-barbed" fish-hook type, although in the general format of a one-piece bait hook, would be difficult to thread bait onto because of the small gap between the shank barb and the point (which, itself, is often barbed internally). Although this example has a barb on the shank leg, it does not appear to have one on the point leg; the point itself is missing, but the general shape of the hook suggests that it had an incurved point instead.

The pumice artefacts are likely to have been made from pumice that originated in the Taupo Volcanic Zone, although it was most probably just picked up off the beach or amongst the dunes rather than at the source. Pumice artefacts are not common in New Zealand archaeological sites, and pumice containers are particularly rare. They appear to have had a range of functions including use as pigment pots, containers for ritual objects like teeth and hair, and some were even used for carrying coals from place to place to facilitate fire-starting. They have been recorded as having been used in fishing rituals, being taken to sea by a tohunga and gently swung back and forth, suspended on cords, while incantations were recited; and there is a tradition that a similar container was used by the first settlers from Hawaiki into which some earth, sand or ashes or a portion of all three were placed from the sacred umu where the first fish of the year were caught (Skinner 1918: 35-37).

The two adzes are interesting for being small and almost identical in size. The sample size is too small to deduce anything particularly meaningful from the sources represented, although some general trends are apparent. There are two stone types represented in the Kapiti assemblage that can be ascribed definite sources – the argillite from the Nelson

Mineral Belt and the obsidian from Mayor Island and the Taupo Volcanic Zone. The Kapiti Coast is close enough to the Nelson sources that it is not too surprising to find Nelson Mineral Belt argillite in sites investigated as part of the McKays to Peka Peka project. Although it is normally associated with Archaic Phase sites beyond the immediate Nelson-Marlborough region, it was important throughout prehistory close to the source zone. Lithic material in argillite from the Nelson Mineral Belt comprised seven flakes, four of which were worked, and two unworked angular fragments. None of the worked flakes were in the form of a recognised type such as a drill point, blade or scraper, although some of them could have been used for scraping activities. For the most part they appear to be opportunistic cutting tools of no specific function.

The obsidian is more informative. The sample size is larger and the sources are much further away, making a knowledge of the sources more significant. The closest obsidian source to the study area is the Taupo source zone. All but two of the nineteen obsidian artefacts are from this source. The remaining two are from Mayor Island. Obsidian from Mayor Island in the Bay of Plenty is the most important of more than 20 obsidian sources located in the northern North Island (Sheppard 2004). In an earlier study of MIO distribution Seelenfreund (1985) demonstrated that when the relative abundance of MIO is considered by weight, there is an apparent increase in relative abundance with distance. Seelenfreund noted that "…it could be argued that the increased percentage of Mayor Island obsidian is related to its higher value in areas further removed from the source" (Seelenfreund 1985: 123). Seelenfreund also pointed out that the general distance decay trend is essentially linear which implies direct procurement from the Mayor Island source.

In terms of exchange relationships with other parts of New Zealand, the lithic remains suggest the presence of some sort of relationship with Mayor Island, Taupo and Nelson; although whether this was in the form of trade relationships, direct procurement or something else is difficult to ascertain given the small sample size.

11 CHRONOLOGY

The material evidence encountered during the investigations provides very little indication of the likely time of occupation of the sites. The absence of taxa that disappeared early in the prehistoric sequence or Archaic artefact types suggests that the sites were generally late (Classic phase).

Given this absence, radiocarbon dating becomes the principal tool for establishing a chronological framework. Normally a large number of dates from individual sites are used to date particular settlements. Since this study involved a large number of very similar sites, it made more sense to take a "landscape" approach and date as many sites as possible, but with fewer dates per site.

A total of 33 samples from 23 sites were submitted for radiocarbon dating. All charcoal samples were identified before submission to ensure that only seeds or charcoal from short-lived tree or shrub species were dated. The remaining samples were all tuatua shell. The samples were dated using radiometric methods where sample size was large enough and AMS (accelerator mass spectrometry) for smaller samples.

All samples were submitted to the Waikato Radiocarbon Laboratory at the University of Waikato for dating analysis. Pretreatment protocols were as follows: Charcoal samples were washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried. Marine samples were cleaned, washed in an ultrasonic bath and tested for recrystallisation before being acid washed in 2

M dil. HCl for 120 seconds, rinsed and dried. The raw dates were calibrated in OxCal 4.2.4 (Bronk-Ramsay 2013) using the Southern Hemisphere terrestrial calibration curve SHCal13 (Hogg *et al*. 2013). For marine mollusc dates the Marine13 marine curve (Reimer *et al*. 2013) was used with Delta R set to -7 ± 45 according to Waikato Radiocarbon Dating Lab protocols. The results of the analysis are presented in both tabular (Table 49) and graphical form (Figure 133).

Table 49. Radiocarbon dates from McKays to Peka Peka archaeological sites.

Lab No.	Provenance	Species	CRA	Error	d13C ‰	Cal 1 sigma	Cal 2 sigma
Wk-41522	(R26/471)	Coprosma	401	20	*	1480AD (39.0%) 1501AD	1462AD (57.6%) 1504AD
	N-PP North Trench F1					1595AD (29.2%) 1612AD	1590AD (37.8%) 1616AD
Wk-41518	(R26/373)	Mapou	347	20	-24.7 ± 0.2	1511AD (45.3%) 1550AD	1507AD (82.3%) 1584AD
	Trench 2					1558AD (15.5%) 1574AD	1619AD (13.1%) 1633AD
	F29					1622AD (7.5%) 1629AD	
Wk-42238	(R26/373)	Tuatua	1054	26	1.4 ± 0.2	1282AD (61.4%) 1358AD	1252AD (95.4%) 1414AD
	Trench 5, column sample 70, NW quad					1371AD (6.8%) 1384AD	
Wk-41521	(R26/469)	Hinau	371	20	*	1501AD (12.7%) 1512AD	1496AD (19.1%) 1522AD
	N-PP EB T2	seed				1548AD (14.1%) 1563AD	1536AD (76.3%) 1626AD
	F2					1570AD (28.8%) 1594AD	
						1612AD (12.7%) 1623AD	
Wk-41520	(R26/433)	Mahoe	361	20	*	1506AD (9.1%) 1515AD	1502AD (84.2%) 1592AD
	Trench 11a					1541AD (51.7%) 1588AD	1615AD (11.2%) 1628AD
	F3					1618AD (7.4%) 1625AD	
Wk-42240	(R26/433) Trench 11a F3	Tuatua	747	27	1.7 ± 0.2	1502AD (68.2%) 1616AD	1470AD (95.4%) 1655AD
Wk-41524	(R26/475)	Ngaio	395	20	*	1485AD (29.1%) 1502AD	1462AD (45.9%) 1508AD
	F2 fire scoop					1592AD (39.1%) 1614AD	1585AD (49.5%) 1620AD
Wk-42243	(R26/475) F2 fire scoop	Tuatua	763	26	1.7 ± 0.2	1480AD (68.2%) 1590AD	1462AD (95.4%) 1646AD
Wk-41523	(R26/474)	Ngaio,	375	20	*	1499AD (15.4%) 1511AD	1494AD (19.9%) 1518AD
	F1-3 lens 2	mahoe				1550AD (6.1%) 1558AD	1538AD (75.5%) 1625AD
						1574AD (30.5%) 1598AD	
						1610AD (16.3%) 1622AD	
Wk-41516	(R26/38)	Five	388	20	*	1495AD (17.0%) 1506AD	1477AD (32.8%) 1512AD
	F4	finger				1588AD (51.2%) 1617AD	1548AD (1.9%) 1558AD
							1574AD (60.8%) 1624AD
Wk-41525	(R26/477)	Hinau	416	20	*	1461AD (68.2%) 1494AD	1456AD (84.0%) 1500AD
	F2	seed					1597AD (11.4%) 1610AD
Wk-41526	(R26/478)	Tawa	390	20	*	1492AD (19.6%) 1504AD	1464AD (36.9%) 1510AD
	F4	Small stem				1589AD (48.6%) 1616AD	1576AD (58.5%) 1623AD
Wk-42244	(R26/478)	Tuatua	758	20	1.5 ± 0.2	1487AD (65.0%) 1594AD	1464AD (95.4%) 1649AD
	F1					1606AD (3.2%) 1614AD	

Wk-41527	(R26/479) F3	Hebe	361	20	*	1506AD (9.1%) 1515AD 1541AD (51.7%) 1588AD 1618AD (7.4%) 1625AD	1502AD (84.2%) 1592AD 1615AD (11.2%) 1628AD
Wk-42245	(R26/479) F2	Tuatua	740	20	1.2 ± 0.2	1511AD (68.2%) 1621AD	1476AD (95.4%) 1658AD
Wk-41528	(R26/480) F4	Five finger	413	20	*	1462AD (68.2%) 1495AD	1458AD (80.1%) 1500AD 1596AD (15.3%) 1612AD
Wk-42246	(R26/480) F3	Tuatua	749	27	1.6 ± 0.2	1500AD (62.7%) 1595AD 1605AD (5.5%) 1615AD	1470AD (95.4%) 1654AD
Wk-41529	(R26/481) F1a second lens	Hinau seed case	322	20	*	1520AD (15.6%) 1535AD 1626AD (52.6%) 1644AD	1511AD (31.6%) 1549AD 1622AD (63.8%) 1649AD
Wk-42247	(R26/481) F1a second lens	Tuatua	716	27	1.6 ± 0.2	1534AD (68.2%) 1639AD	1492AD (95.4%) 1671AD
Wk-41530	(R26/482) F3	Hinau seed case	353	20	*	1510AD (14.8%) 1524AD 1535AD (48.3%) 1578AD 1622AD (5.1%) 1626AD	1506AD (83.9%) 1588AD 1616AD (11.5%) 1630AD
Wk-42248	(R26/482) F23	Tuatua	693	27	1.5 ± 0.2	1552AD (68.2%) 1656AD	1504AD (95.4%) 1684AD
Wk-41519	(R26/430) F3	Vine sp 1 cm	227	20	*	1668AD (5.5%) 1672AD 1744AD (30.0%) 1758AD 1779AD (32.8%) 1797AD	1665AD (10.1%) 1674AD 1737AD (85.3%) 1799AD
Wk-42239	(R26/430) F3	Tuatua	744	26	1.5 ± 0.2	1506AD (68.2%) 1619AD	1474AD (95.4%) 1655AD
Wk-42241	(R26/462) Column sample 1	Tuatua	691	26	1.1 ± 0.2	1554AD (68.2%) 1657AD	1506AD (95.4%) 1686AD
Wk-42249	(R26/485) F1	Tuatua	750	27	1.5 ± 0.2	1498AD (62.8%) 1595AD 1605AD (5.4%) 1615AD	1470AD (95.4%) 1652AD
Wk-41531	(R26/486) F8 L2 sp i	Five finger	390	20	*	1492AD (19.6%) 1504AD 1589AD (48.6%) 1616AD	1464AD (36.9%) 1510AD 1576AD (58.5%) 1623AD
Wk-42250	(R26/486) F15	Tuatua	773	27	1.5 ± 0.2	1472AD (68.2%) 1578AD	1456AD (95.4%) 1642AD
Wk-42252	(R26/497) F1	Tuatua	719	29	1.3 ± 0.2	1532AD (68.2%) 1638AD	1490AD (95.4%) 1670AD
Wk-41532	(R26/487) O-WR DT T4.1 F8	Mahoe	215	27	-25.3 ± 0.2	1673AD (3.8%) 1676AD 1738AD (15.1%) 1747AD 1756AD (49.3%) 1782AD	1668AD (11.9%) 1678AD 1734AD (79.6%) 1784AD 1793AD (4.0%) 1798AD
Wk-41533	(R26/489) Trench 3 F1	Hebe	372	20	*	1501AD (13.5%) 1512AD 1549AD (11.4%) 1560AD 1572AD (29.7%) 1595AD 1612AD (13.6%) 1622AD	1496AD (19.0%) 1520AD 1537AD (76.4%) 1626AD
Wk-42251	(R26/490) F1 midden	Tuatua	697	28	2.2 ± 0.2	1549AD (68.2%) 1652AD	1503AD (95.4%) 1682AD
Wk-41517	(R26/370) Trench 1 F1	Mapou	364	20	*	1504AD (9.5%) 1514AD 1544AD (51.2%) 1589AD 1616AD (7.5%) 1624AD	1500AD (82.5%) 1594AD 1612AD (12.9%) 1628AD
Wk-42242	(R26/468) F1	Tuatua	770	26	1.7 ± 0.2	1474AD (68.2%) 1580AD	1458AD (95.4%) 1642AD

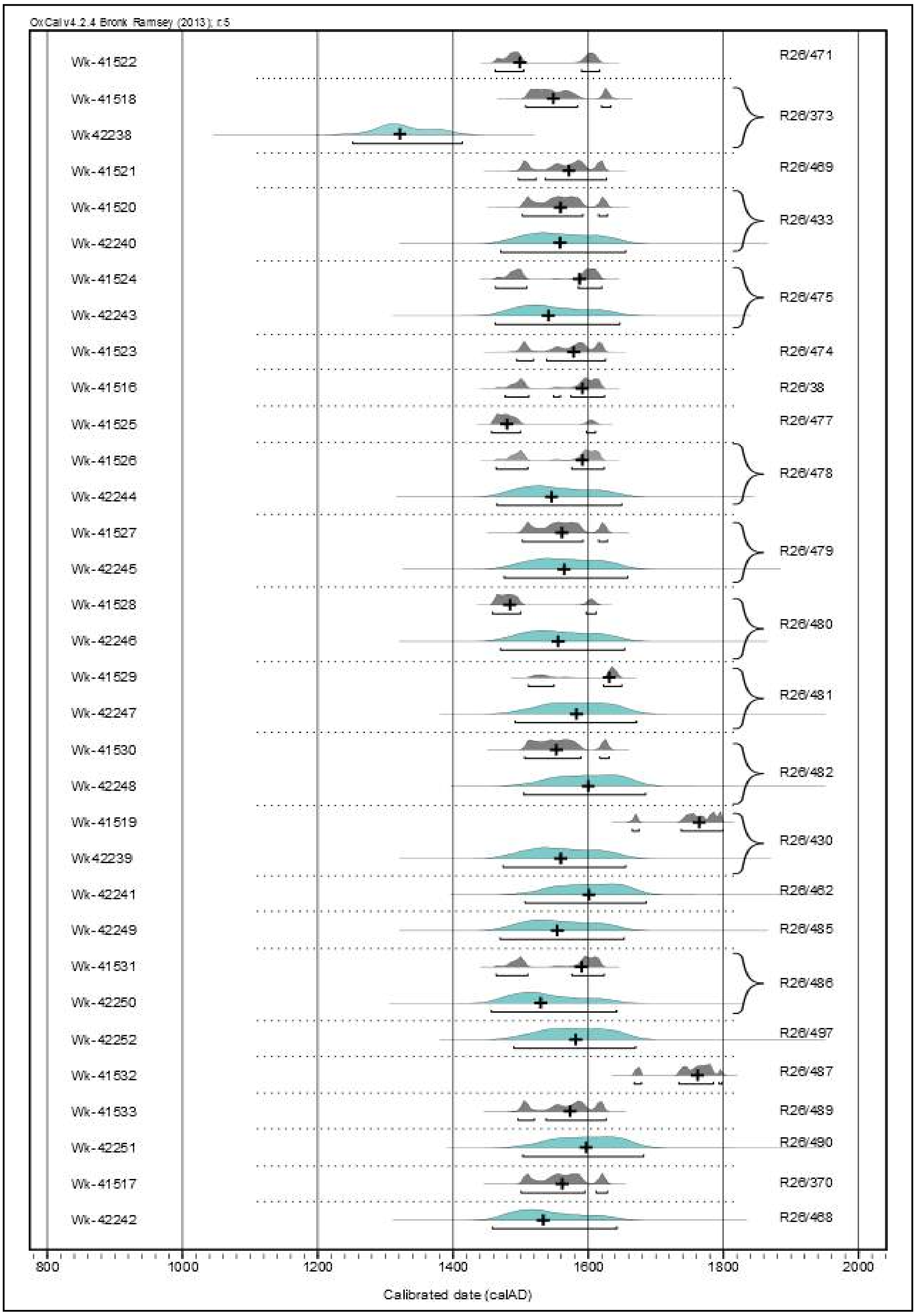

Figure 133. Calibrated radiocarbon dates for M2PP sites (north to south). The grey shaded dates are charcoal of identified short-lived species or seeds, the blue shaded ones are marine shell (tuatua) calibrated using a delta R value of -7 ± 45. The crosses mark the median age of each date.

The radiocarbon dating results are remarkable for their consistency and for their relatively tight likelihood spans. Apart from three of the dates, all of the medians lie within a band centred on the sixteenth century. The three "outliers" are interesting, as two of them are from sites that lie within the sixteenth century band. Date Wk-42238, from site R26/373, has a median age of about AD1300. This is about the time New Zealand was first being colonised by Polynesians, and is about 200 years earlier than the majority of the other dates. The same site has a sixteenth-century charcoal date (Wk-41518). There is no reason to think that there is anything wrong with the earlier of the two dates; it is on a very reliable substrate (marine mollusc shell), and the laboratory protocols will have minimised the possibility of contamination with old carbon. It is too far from the sea for it to have been present in the site as a fossil deposit and is unlikely to have been brought to the site accidentally as long-dead by-catch shells. The only reasonable explanation for this early date in an archaeological landscape that otherwise is almost entirely sixteenth century in age is that there was at least some small-scale use of the site by some of the earliest Polynesian settlers, and that it was used again in the sixteenth century.

The other two outliers (Wk-41519 and Wk-41532), both on short-lived charcoal, are all but identical to one another with medians approximately 200 years later than the sixteenth-century band.

Again, the dates are almost certainly reliable; the lab pretreatment protocols will have minimised any possibility of contamination with recent carbon (e.g. humic residues). The only reasonable explanation for these two late dates is that they represent a brief, small-scale use of the landscape in the last century of the pre-European period – about AD1700-1800.

The very consistent spread of all of the remaining dates, which include 30 dates on 22 sites, clearly shows that principal use of the expressway landscape occurred in the sixteenth century, with brief visits during the fourteenth and eighteenth centuries.

12 PALAEOENVIRONMENT

Charcoal samples from 20 sites were submitted to Dr Rod Wallace at the University of Auckland for identification. The purpose of this was two-fold; first, to obtain samples suitable for radiocarbon dating and, second, to gather information about vegetation cover at the time these sites were occupied. The results are provided in Table 50. To the best of our knowledge this is the only detailed analysis of charcoal from archaeological sites on the Kapiti Coast.

Table 50. Summary of tree and shrub species from the M2PP sites (Wallace n.d).

Species	**Botanical Name**	**Plant Type**	**# Samples**	**# Pieces**	**%**
Bracken	*Pteridium esculentum*	Bracken Fern	18	91	12%
Tutu	*Coriaria* sp.		2	2	
Hebe	Several possible *Hebe*s pecies		3	11	
Coprosma	Several possible *Coprosma* species		10	50	
Pseudopanax	Several possible *Pseudopanax* species		16	36	
Mingimingi	*Melicope ternata*	Shrubs and scrub species	7	12	20%
Mapou	*Myrsine australis*		7	13	
Akeake	*Dodonaea viscosa*		3	10	
Wharangi	*Melicope ternata*		1	1	
Rangiora	*Brachyglottis repanda*		1	3	
Ngaio	*Myporum laetum*		2	2	

Pittosporum	Several possible *Pittosporum* species		1	1	
Putaputaweta (marbleleaf)	*Carpodetus serratus*		1	1	
Porokaiwhiri (pigeonwood)	*Hedycarya arborea*)		1	3	
Manuka	*Leptospermum scoparium*		2	2	
Kanuka	*Kunzia ericoides*		1	2	
Hinau	*Elaeocarpus dentatus*		1	1	
Titoki	*Alectryon excelsus*		1	1	
Karaka?	*Corynocarpus laevigatus*		1	1	
Beech	*Nothofagus* sp.		1	3	
Pukatea	*Laurelia novae-zelandiae*	r broadleaf trees	3	6	
Maire	*Nestegis* sp.		5	5	33%
Rewarewa	*Knightia excelsa*		2	7	
Mahoe	*Melicytus ramiflorus*		36	109	
Rata	*Metrosideros robusta*		11	21	
Kohekohe	*Dysoxylum spectabile*		12	31	
Tawa	*Beilschmiedia tawa*		14	61	
Kahikatea	*Dacrycarpus dacrydioides*	Conifers	4	7	34.5%
Matai	*Prumnopitys taxifolia*		45	249	
Totals			67	742	

Sixty-seven per cent of the samples comprised forest tree species, the majority of which were broadleaf (at least eleven species) and two conifers (matai (Prumnopitys taxifolia), and to a lesser extent kahikatea (Dacrycarpus dacrydioides)). Twenty per cent of the samples comprised shrub and scrub species that are typical of post-forest clearance regeneration. These include hebe, coprosma, pseudopanax, mingimingi (Leucopogon fasciculatus), akeake (Dodonaea viscosa), and mapou (Myrsine australis). The remaining twelve percent of the sample was bracken charcoal, indicating fernland vegetation.

It is important to note that a charcoal assemblage from an archaeological site largely represents dry deadwood collected by people for firewood. It does not necessarily reflect the living treescape at the time of human occupation. This may explain why matai appears to be superabundant in the charcoal assemblage. It can grow to such a size that trunks and stumps can survive as deadwood on landscapes for many, many decades after the actual tree fell. Furthermore, in mobile dune environments charcoal from forest burnoffs can enter archaeological sites many decades after abandonment of a site and serve to provide a false picture of the vegetation at the time of occupation. This may explain the presence of bracken fern and some of the smaller shrub species which are unlikely to have been used as firewood.

Notwithstanding these issues, there are three possible interpretations of the charcoal assemblage, as follows:

1. If forest clearance occurred prior to the occupation of these sites the charcoal may indicate the local vegetation that was dominated by bracken and secondary woody trees and shrubs but containing the logs and stumps left from the former forest.

2. There may have been a mosaic of forest stands set in bracken and secondary woody vegetation.

3. The landscape may have been covered in matai-dominant broadleaf forest with the sites located in clearings that hosted bracken and shrubs soon after clearance. This is the interpretation favoured by Dr Wallace.

13 DISCUSSION AND CONCLUSIONS

This study involved the excavation of some 2,335 m of trenches up to 15 m wide. The total area investigated in this way was approximately 10,000 m^2. Archaeological surveys before and during the lead-up to the investigations resulted in the identification of sixteen archaeological sites within or near the design footprint. The trenching investigations resulted in the identification of a further 21 sites. The high-level investigations reported on in this study involved only those sites in Sectors 2, 3, 4, 5 and the southernmost part of Sector 6 – a total of 34 sites. Of these, three turned out upon investigation to have been natural or modern features. The investigation used a range of field and analytical techniques that included machine and hand excavation, radiocarbon dating, palaeovegetation analysis, midden analysis, ancient DNA sequencing, lithic analysis and geochemical sourcing.

The sites are all in rolling dune country situated between 1.5 and 3 km from the coast. Extensive inland waterways, now largely drained, would have provided accessways for canoe travel as well as a source of fresh water. The palaeovegetation results suggest that the dunes were covered in Matai-dominated broadleaf forest and that the sites themselves may have been situated in recently cleared areas. There was essentially only a single site type found in the study area – shell middens with evidence of cooking or smoking fires. The sites ranged from very small middens only a metre or so across up to relatively large middens with many cubic metres of shell.

The almost mono-species nature of the middens on the Kapiti Coast fits well with the classic resource depression model that has been developed to explain significant changes over time in the New Zealand faunal record. Early period sites such as Wairau Bar, Shag River Mouth, Papatowai and Houhora are exemplified by the diverse range of high-value faunal species (e.g. moa and sea mammal) that they contain. By the late prehistoric period this faunal diversity had contracted to the point that many middens are almost entirely composed of a single shellfish species such as pipi or cockle (Anderson and McGlone 1992: 232). Recent work on the West Coast of the South Island (Jacomb *et al* 2010) has demonstrated that this shift occurred rapidly following the depletion of the mega-faunal resources and that within a century of Polynesian settlement foraging strategies had changed to focus on apparently "low-value" species. This pattern of rapid change has also been observed at Moncks Cave in Canterbury (Jacomb 2008). By the late fifteenth century a similar pattern of targeted foraging can be observed in the Nelson region (Barber 1996; Brooks 2002) and it was clearly well-established on the Kapiti Coast by the sixteenth century. In tandem with the drop in diversity of exploited species was a decrease in shellfish size over time which is attributed to over-exploitation (e.g. Anderson 1981; Rowland 1976; Davidson 2011). We do not have enough time depth to investigate such an effect on the shellfish populations in the Kapiti Coast sites. Certainly, there is no evidence for the targeting of large individuals over smaller ones. Rather, the impression is one of mass indiscriminate harvesting of all of the shellfish within a particular shellfish bed.

The material culture sample size is too small to provide any real indication of either the types of activities that took place in the study area beyond shellfish processing or of exchange relationships with other parts of New Zealand. The small lithic sample, however, provided some tentative conclusions in relation to exchange patterns. There were nine items of argillite from the Nelson Mineral Belt and these were very likely obtained by direct access to the sources. The 19 items of obsidian suggest some sort of contact with the Taupo Volcanic Zone and Mayor Island, either through direct access or trade.

The radiocarbon dating results were very unexpected. In any given archaeological landscape, standard models of human settlement and population growth predict that we should see a small number of early sites, with the number of sites increasing over time. The M2PP results, on the other hand, show that the only time the expressway study area had any importance was during a brief section of the prehistoric period – from about AD1500 to AD1600. The very small number of dates earlier or later than this time suggests only very minor use in the 1300s and 1700s. The pattern is not unique to the study area sites. Twenty-three other sites in the wider area have been dated with a total of 49 dates and, with the exception of three in the late eighteenth to early nineteenth centuries, all have medians that lie between about 1450 and 1600 (above). The reason that the Kapiti Coast was only important for a brief period of prehistory cannot easily be explained and this presents a very interesting avenue for further research.

The MacKays to Peka Peka Expressway project provided a unique opportunity to systematically investigate a large sample of what, for many years, has been recognised as an unusual archaeological landscape characterised by numerous small to medium-sized shell midden scatters. In a landscape that was permanently occupied for any length of time it would be expected that a much wider range of site types would be present, including terraces, artefact manufacturing floors, dwellings and defended pa. The sites investigated during this study were, in fact, almost all small to medium-sized shell middens, with none of the key indicators of permanent settlement.

The area is also unusual in a New Zealand context. It appears to have only been important for a very brief period – perhaps less than a century – in the 1500s. It also appears to have had an extremely specialised use – the processing of shellfish, very likely a process that involved preservation, by drying or smoking, for later consumption. The most reasonable conclusion to be drawn from the available evidence is that the project area and, by extension, the Kapiti Coast dune environment, was a specialised part of a resource network that was used, perhaps seasonally, by people living outside the area.

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APPENDIX 1 SPECIES AND COMMON NAMES OF FAUNA

		Species	Common Name
Invertebrates	Shellfish	*Alcithoe arabica*	Arabic volute
		Amphibola crenata?	Mud snail
		Austrofusus glans	Knobbed whelk
		Austrovenus stutchburyi	New Zealand cockle
		Bassina yatei	Frilled venus shell
		Calliostoma sp.	Top snail
		Cellana radians	Radiate limpet
		Cellana sp.	Limpet
		Cookia sulcata	Cooks turban
		Dosinia anus	Ringed dosinia
		Dosinia zelandica	Coarse dosinia
		Haliotidae	Paua
		Haliotis australis	Queen paua
		Haliotis iris	Blackfoot paua
		Hyridella menziesii?	Freshwater mussel
		Macomona liliana	Large wedge shell
		Mactra discors	Trough shell
		Mactra murchisoni	Large trough shell
		Mactridae	Trough shell
		Melagraphia aethiops	Spotted top shell
		Maoricolpus roseus	New Zealand screwshell
		Paphies subtriangulata	Tuatua
		Pectinidae	Scallop
		Peronaea gaimardi	Angled wedge shell
		Semicassis pyrum	Pear bonnet/Common helmet
		Spisula aequilatera	Triangle shell
		Struthiolariidae	Ostrich foot
		Tonna cerevisina	Cask shell
		Turbo smaragdus	Cat's eye
		Zeacumantus lutulentus	Large horn shell
	Sea urchin	*Fellaster zelandiae*	Sand dollar
	Crab	*Cantharides ovalipes*	Swimming crab
Vertebrates	Fish	*Arripis trutta*	Kahawai
		Carangidae	Mackerel
		Cheilodactylus macropterus	Red gurnard
		Conger verreauxi	Conger eel
		Elasmobranchii	Sharks and rays

	Labridae	Wrasse
	Latridopsis ciliaris	Blue moki
	Myliobtus tenuicaudatus	Eagle ray
	Nemadactylus macropterus	Tarakihi
	Odax pullus	Greenbone
	Pagrus auratus	Snapper
	Parika scaber	Leatherjacket
	Parapercis colias	Blue cod
	Polyprion oxygeneios	Hapuku
	Pseudophycis bachus	Red cod
	Scomber australiscus	Blue mackerel
	Scorpaena sp.	Scorpionfish
	Serilllela brama	Blue warehou
	Squalis acanthis	Dogfish
	Thyrsites atun	Barracouta
Bird	*Cyanoramphys novaeseelandiae*	Parakeet
	Hemiphaga novaeseelandiae	Kereru
	Nestor meridionalis	Kaka
	Pachyptila sp.	Prion
	Pachyptila turtur	Fairy prion
	Pelecaonoides urinatrix	Common diving petrel
	Prosthemadera novaeseelandiae	Tui
	Puffinus gavia	Fluttering shearwater
	Puffinus sp.	Shearwater
Dog	*Canis familiaris*	Kuri
Rat	*Rattus exulans*	Polynesian rat

MacKays to Peka Peka:

Archaeological Monitoring Phase Faunal Analysis

Report to Mary O'Keeffe

Yolanda Vogel 2018

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Introduction

This report presents the results of analysis from a large number of midden samples collected as part of archaeological monitoring of earthworks undertaken during construction of the MacKays to Peka Peka (M2PP) Expressway on the Kapiti Coast. It does not include analysis of midden samples gathered during the "high level" phase of investigations undertaken for the M2PP archaeological programme; this material was analysed and reported on by SPAR (Brooks, Jacomb, and Walter, 2016).

This report details the methods used in the sorting, identification and quantification of faunal material gathered during the earthworks monitoring, results of the analysis of each sample, and a discussion of those results, including comparison with the results of previous faunal analyses from the Kapiti Coast. This report should be read in conjunction with the full project report (O'Keeffe, in press).

Analysis of the faunal remains aimed to address the following questions:

- What was the nature of the subsistence economy of the people living on the coast? What was the range of food they were eating? How, and in what proportions, is this represented in the archaeological record?
- What is the nature of middens along the coast, in terms of age and constituent species? Is there evidence for a suggested early and late dichotomy of middens?
- Is there clear function of middens as postulated: localised scatterings, deposits from larger residential groups, and "factory floors"?
- Is there any difference in the nature of middens north or south of the river? If so, what are the implications of these differences?
- How far were people travelling to obtain resources?
- How were people processing, packaging food?
- Was food being consumed on site or carried away?
- Is there any apparent difference in species present in middens over time? Can any conclusions on changing environments, and the causes of these changes, be made?

Methods

Bulk samples collected during fieldwork were allowed to dry completely prior to analysis, and were then dry sieved through 2mm sieves. Due to the sand matrix passing easily through the sieves, the majority of the samples were very clean following sieving, and only a small number required washing. The material from each provenance was sorted and identified using the methods outlined below.

Faunal material was first sorted to class: shell, other invertebrates, and bone, by the author and Mary O'Keeffe. Invertebrate identification and quantification was undertaken immediately following the primary sorting of each sample, while bone was re-bagged and put aside for further analysis by the author following completion of all primary sorting and invertebrate identification.

Identification and quantification of shellfish remains were undertaken following the methods set out in Heritage New Zealand *Pouhere Taonga's* 'Guidelines for Midden Sampling and Analysis' (2014) with the aid of the author's personal reference collection and reference publications (Cook 2010). Diagnostic portions of shells were first placed into separate trays according to species. For bivalves the diagnostic portion used was the presence of more than half of the hinge. The more common bivalves were not sorted to side, however this was undertaken for the less common species to ensure accurate MNI (Minimum Number of Individuals) counts were obtained. A wider range of non-repetitive elements than usual was used for gastropods due to differing patterns of breakage, following Harris *et al.* (2015). For cake urchin, both test and peristomial teeth were retained, with the test weighed and the teeth counted. Crab claws were also retained. Where no countable portions of shell species were present, fragments were retained and the NISP (Number of Identified Specimens) recorded to show presence/absence of these species. Remaining non-diagnostic material was weighed.

Vertebrate material was then sorted to element and side where possible, and identified to lowest taxonomic unit. Bird and fish bone were identified using the collections at Te Papa Tongarewa, Museum of New Zealand, with rat identified using the author's reference specimen. Analysis of the fish bone aimed to identify a wider range of elements to taxon than is used in the method outlined by Leach (1986), which focuses on the five paired mouth parts (dentary, premaxilla, maxilla, articular, and quadrate) along with a small number of 'special' bones characteristic of particular species. Unfortunately the Te Papa collection is not set up for this, and the full set of bones was not available for most species, with considerable variability between taxa on which bones other than the five paired mouth parts were available. This resulted in a fairly large number of bones being identified to element, but not to taxa.

Once identified, material was quantified using standard methods (Grayson 1984; Reitz and Wing 2008) and re-bagged according to provenance, species, element and side (if applicable), and this information entered into an Excel spreadsheet along with NISP and MNE (Minimum Number of Elements) values. MNE values were then used to calculate MNI. Quantitative information was generally calculated by sample/deposit in order to assess intra-site variability, though where multiple samples were taken from different areas of a continuous deposit results for vertebrates were aggregated to avoid artificially inflating MNIs. For the purposes of this report, NISP has only been used for invertebrates where no countable portions of a species were present, with the species then given an MNI of one.

Scientific and common names for all identified taxa are provided in Appendix 1.

Results

The results of the faunal analysis are presented by zone, following the final report for the project. This section is largely descriptive, but also contains some commentary on the composition of each midden in terms of potential explanations for species diversity and proportions, and habitats exploited. This information will then be drawn together in the discussion section.

The three zones observed and analysed in this report are:

- Southern zone: extending from the project's southern boundary at Poplar Ave south of Raumati, north to Kapiti Rd (Figure 3)
- Central Zone south: extending from Kapiti Rd north to the Waikanae River (Figure 4)
- Northern Zone: extending from the Waikanae River to the project's northern boundary at Peka Peka Rd (Figure 5)

Figure 3: Map showing extent of Southern zone and sites included in faunal analysis

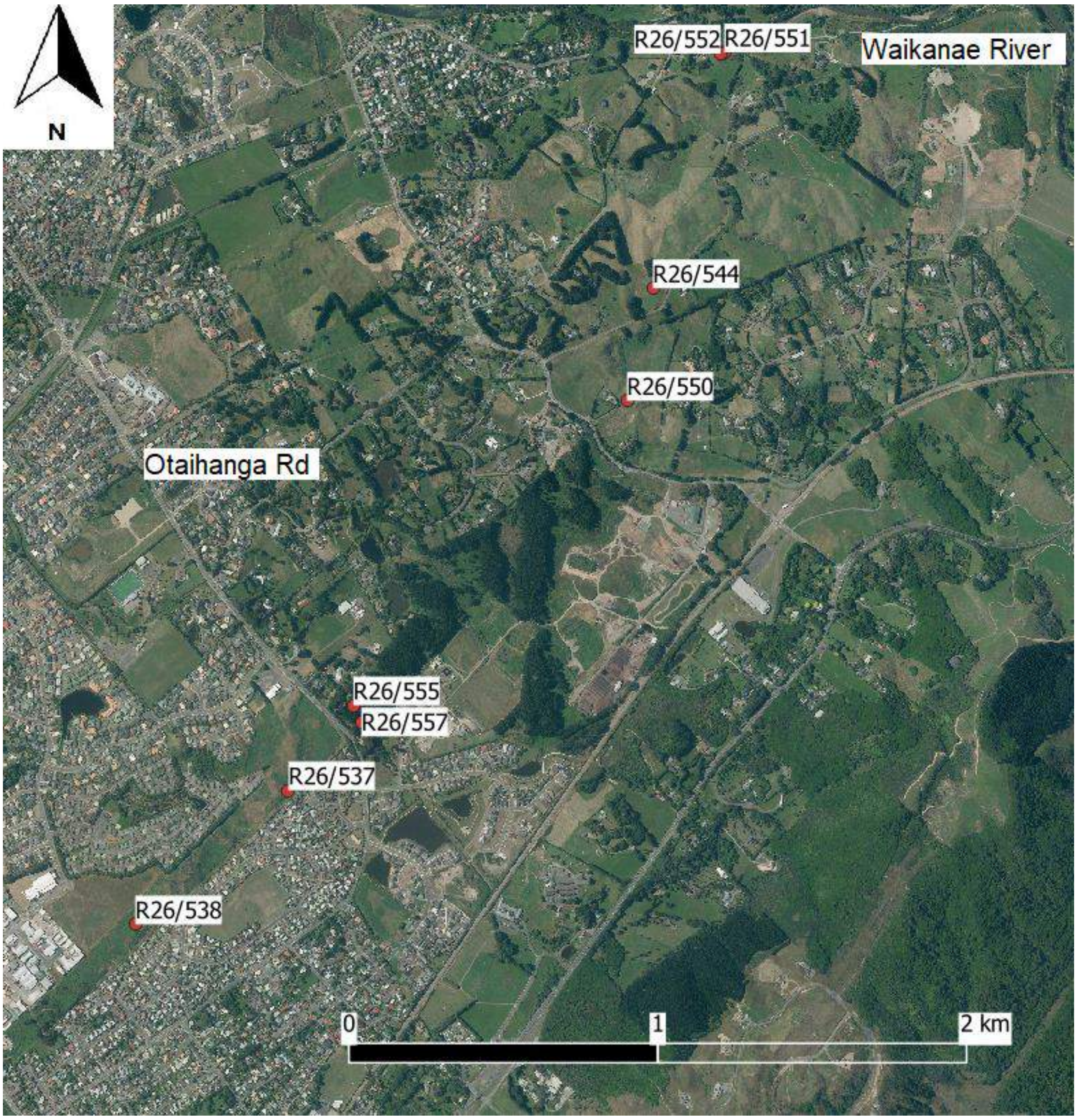
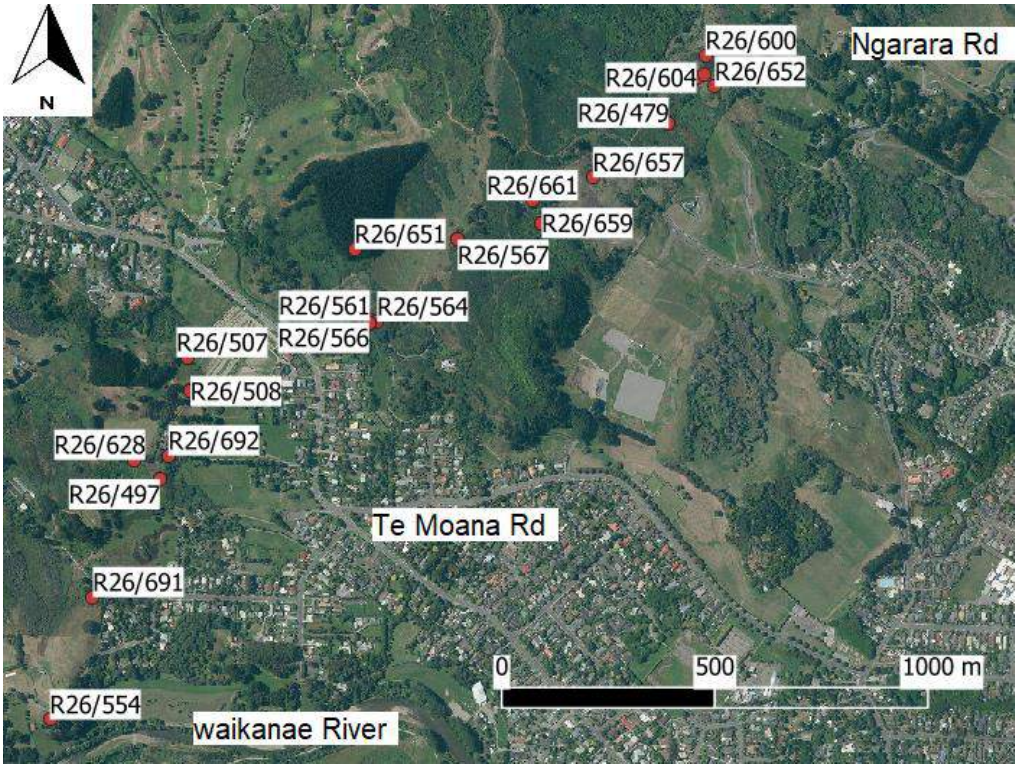


Figure 4: Map showing extent of Central zone and sites included in faunal analysis

Ngarara Rd to Peka Peka Rd



Waikanae River to Ngarara Rd

Figure 5: Map showing extent of Northern zone and sites included in faunal analysis

Southern Zone

R26/528

Sample size: 14 litres[7]

The shell component from this site consisted almost entirely of tuatua (*Paphies sp.)*, forming 99.6% of the sample, with small amounts of freshwater mussel (*Hyridella menziesii*), triangle shell (*Crassula aequilatera*), cake urchin (*Fellaster zelandiae*), and an unidentified gastropod (Table 1, Figure 6). A small amount of unidentified fish bone was also identified in the sample analysed (Table 2). The two fish vertebra in the sample were very large, possibly snapper. Aside from the freshwater mussel, all shellfish species identified are sandy shore inhabitants. The high proportion of tuatua suggests harvesting during a period of calm, stable sea conditions.

Table 1: Results of analysis of invertebrate sample from R26/528

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1894	947	99.58	
Freshwater mussel		1	1	0.11	
Cake urchin			1	0.11	0.84
Gastropod sp.		1	1	0.11	
Triangle shell		1	1	0.11	
Non-diagnostic shell					1943
Total		**1899**	**951**	**100**	

[7] Size of bulk sample prior to sieving

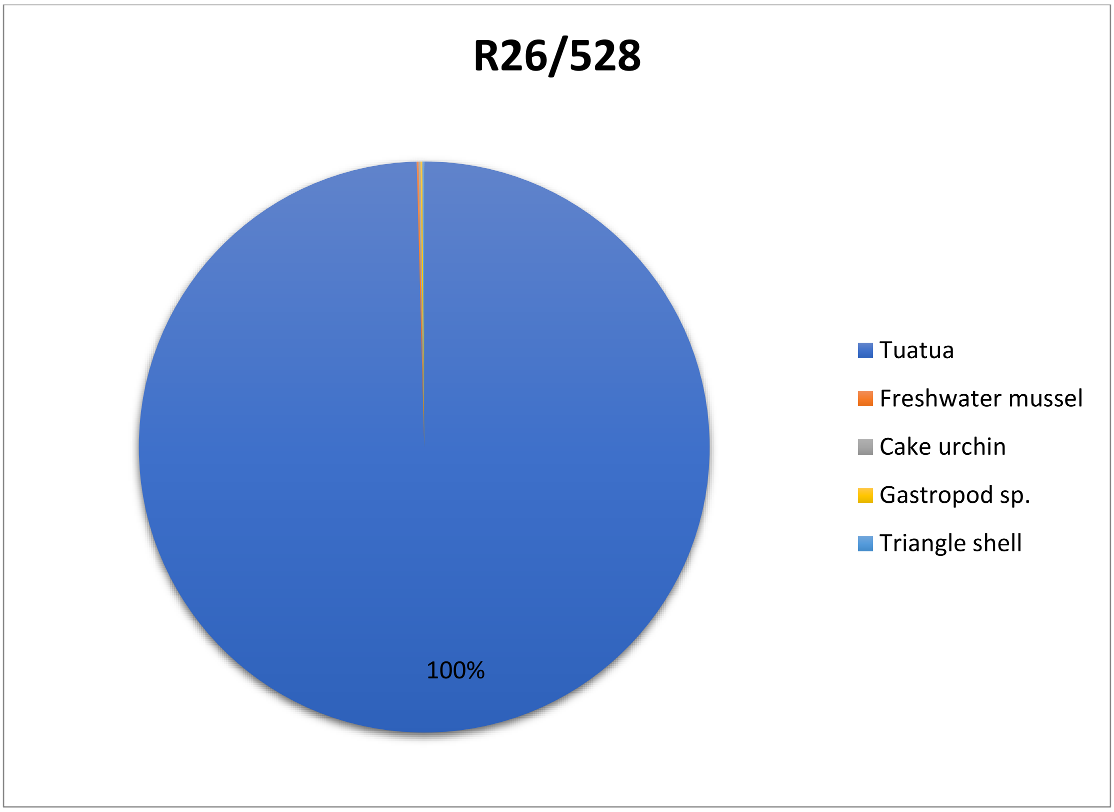


Figure 6: Relative abundance of invertebrate species (MNI) from R26/528

Table 2: Results of analysis of vertebrate sample from R26/528

Class	Species	NISP	MNE	MNI
Fish	Unidentified	18		
	Total	**18**		

R26/527

Sample size: Area A = 9 litres

Area B = 8 litres

Midden samples from two separate areas of this site were analysed. Results are shown in Table 3 and

Table 4, and Figure 7 and Figure 8. The faunal remains from both samples consisted entirely of shellfish. Area A contained remains of four species of shellfish, while Area B contained six species, though the single turret shell (*Maoricocolpus roseus*) in Area B is unlikely to have been food. Of the species present in both samples, only tuatua and triangle shell contributed more than 2% of the total MNI. Tuatua was the dominant species in both areas, though triangle shell forms a larger component of the Area A sample (12%) than that in Area B (6%). Other species present are knobbed whelk (*Austrofusus glans*), ringed dosinia (*Dosinia anus*), and trough shell (*Mactra* sp.). No rocky shore species were identified from either area. Although of similar total volume, the sample from Area B was considerably more fragmented than that from Area A, as reflected in higher weight of the non-diagnostic shell portion.

Table 3: Results of analysis of invertebrate sample from R26/527 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1190	595	86.36	
Triangle shell		162	81	11.76	
Knobbed whelk		10	10	1.45	
Ringed dosinia		6	3	0.44	
Non-diagnostic shell					1599
Total		**1368**	**689**	**100**	

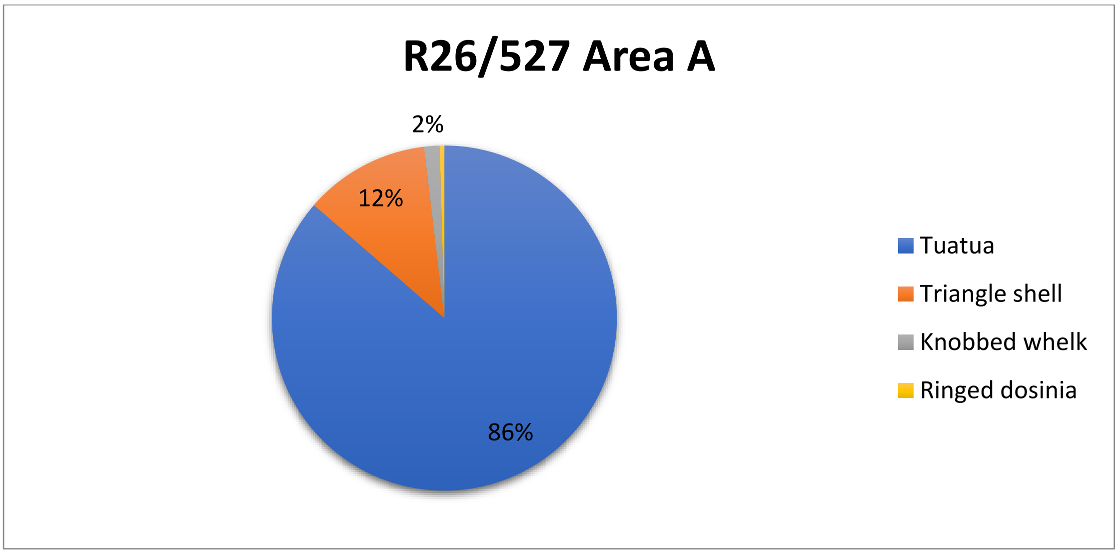


Figure 7: Relative abundance of invertebrate species (MNI) from R26/527 Area A

Table 4: Results of analysis of invertebrate sample from R26/527 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1432	716	93.11	
Triangle shell		92	46	5.98	
Knobbed whelk		3	3	0.39	
Ringed dosinia		3	2	0.26	
Trough Shell		1	1	0.13	
Turret shell		1	1	0.13	
Non-diagnostic shell					2984
Total		**1532**	**769**	**100**	

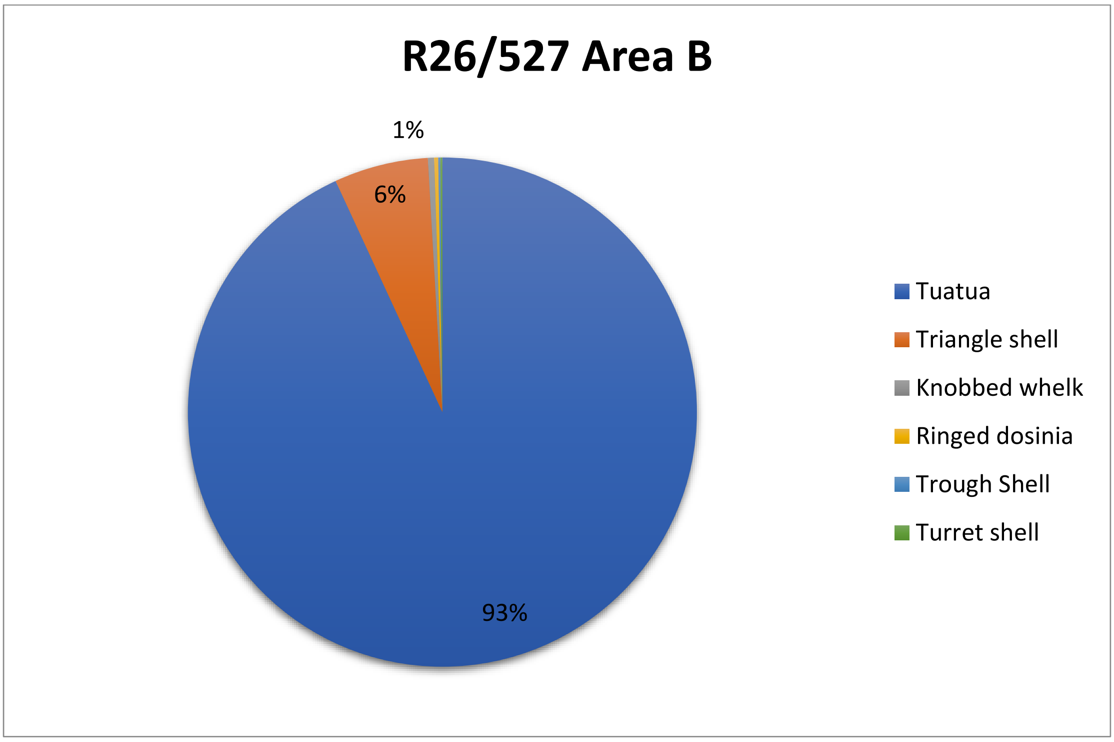


Figure 8: Relative abundance of invertebrate species (MNI) from R26/527 Area B

R26/690

Sample size: 10 litres

The faunal sample from R26/690 was almost entirely shellfish, with tuatua contributing 99% of the MNI. Also present were small amounts of knobbed whelk, triangle shell, pale tiger shell (*Calliostoma selectum*), ringed dosinia, and cake urchin (Table 5, Figure 9). Several rat (*Rattus exulans*) bones, though providing an MNI of only one, were also identified from this site (Table 6). Pale tiger shell differs from other members of the genus *Calliostoma* in that it is found off open sandy beaches, whereas the other species all inhabit rocky shore habitats. Although locally abundant on the Kapiti Coast, it's depth range (20 to several hundred metres) precludes it from being an easily obtained food source, and specimens found in midden sites are likely to represent either empty shells collected during harvesting of other species, or occasional live animals that have washed up, possibly following rough weather or strong currents.

Table 5: Results of analysis of invertebrate sample from R26/690

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1712	856	98.85	
Knobbed whelk		4	4	0.46	
Triangle shell		5	3	0.35	
Pale tiger shell	2		1	0.12	
Ringed dosinia		1	1	0.12	
Cake urchin		1	1	0.12	0.27
Non-diagnostic shell					1587
Total		**1723**	**866**	**100**	

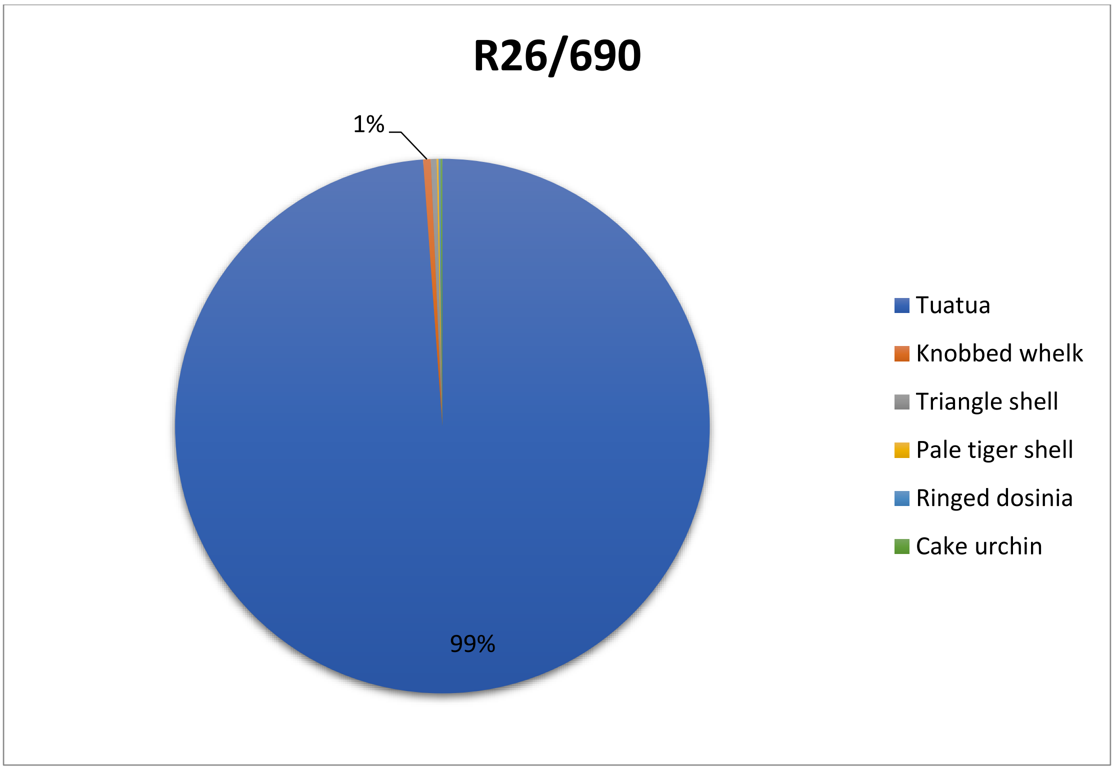


Figure 9: Relative abundance of invertebrate species (MNI) from R26/690

Table 6: Results of analysis of vertebrate sample from R26/690

Class	Species	NISP	MNE	MNI
Mammal	Rat	16	16	1
	Total	**16**	**16**	**1**

R26/697

Sample size: Area A = 22 litres

Area B = 22 litres

Samples were collected from two areas of this site. Both areas were heavily dominated by tuatua, representing 99% of the total shell sample in both areas. Area A had a higher diversity of species represented, with eight species, versus only four species in Area B, though with only one or two examples of each species other than tuatua being present in each area. Results of the shell analysis are shown in Tables 7 and 8 and Figure 10 and Figure 11. The shell material from Area B was considerably more fragmented than that in Area A, and is possibly the result of slope wash, being lower down the dune than Area A.

A small amount of vertebrate bone was also recovered from Area A of R26/697 (Table 9). This included three fish species – kahawai (*Arripis trutta*), snapper (*Pagrus auratus*), and red cod (*Pseudophycus bachus*) – each with an MNI of one, a single rat bone, and a few pieces of unidentified bird.

Table 7: Results of analysis of invertebrate sample from R26/ 697 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1569	785	98.87	
Ringed dosinia		4	2	0.25	
Triangle shell		2	2	0.25	
Crab sp.	1		1	0.13	
Knobbed whelk	14		1	0.13	
Toheroa	1		1	0.13	
Turret shell		1	1	0.13	
Arabic volute	1		1	0.13	
Non-diagnostic shell					1228
Total		**1576**	**794**	**100**	

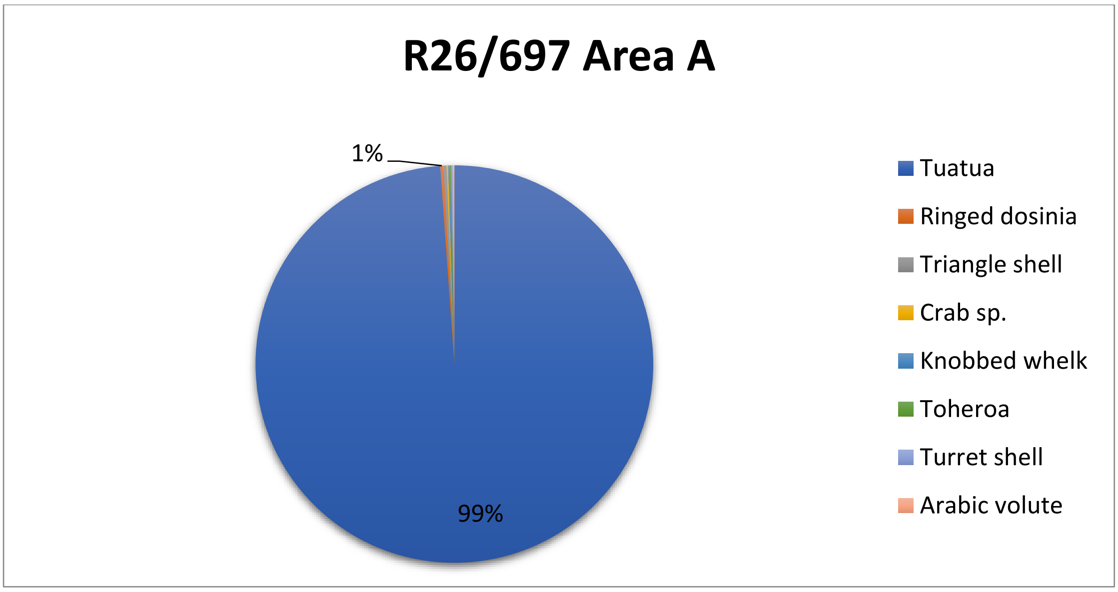


Figure 10: Relative abundance of invertebrate species (MNI) from R26/697 Area A

Table 8: Results of analysis of invertebrate sample from R26/ 697 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		894	497	99.00	
Ringed dosinia		4	2	0.40	
Knobbed whelk		2	2	0.40	
Turret shell		1	1	0.20	
Non-diagnostic shell					2939
Total		**901**	**502**	**100**	

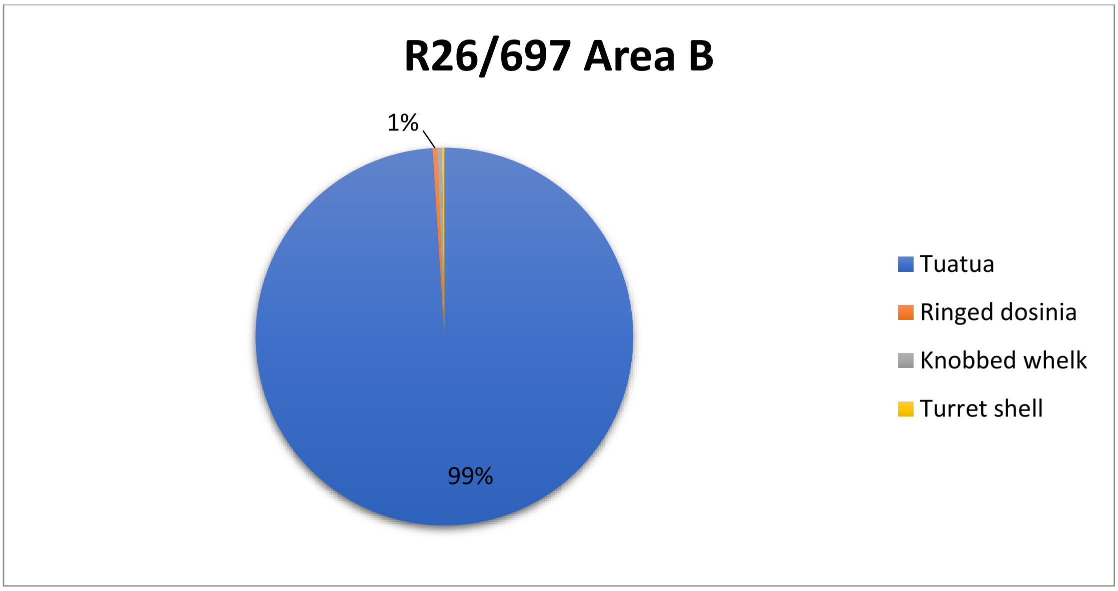


Figure 11: Relative abundance of invertebrate species (MNI) from R26/697 Area B

Table 9: Results of analysis of vertebrate sample from R26/697 Area A

Class	Species	NISP	MNE	MNI
Fish	Kahawai	1	1	1
	Red cod	1	1	1
	Snapper	1	1	1
	Unidentified	93		
	Total	**96**	**3**	**3**
Bird	Unidentified	4		

	Total	**4**		
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

R26/698

Sample size: 22 litres

The results of analysis for R26/698 are markedly different from those in other sites within the southern construction zone, with triangle shell making up 42% of the shellfish component. Also present were ringed dosinia, cake urchin, trough shell, and a possible fragment of marine mussel (Mytilidae) species, though these contribute less than 1% of the total shell sample combined. The results of the shell analysis are shown in Table 10 and Figure 12.

Triangle shell is a sub-tidal species, being most abundant at 3 to 5 metres below mean low tide. Although small numbers may be able to be collected under normal conditions, the numbers represented here suggest harvesting following a period of rough weather or strong currents, during which the animals become weakened and can be washed ashore in high numbers.

R26/698 also contained a small amount of fish bone, but only one bone from a blue cod (*Parapercis colias*) could be identified to species (Table 11).

Table 10: Results of analysis of invertebrate sample from R26/698

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1332	666	58.12	
Triangle shell		948	474	41.36	
Ringed dosinia		5	3	0.26	
Cake urchin			1	0.09	0.5
Mussel?	1		1	0.09	
Trough shell		1	1	0.09	
Non-diagnostic shell					1552
Total		**2286**	**1146**	**100**	

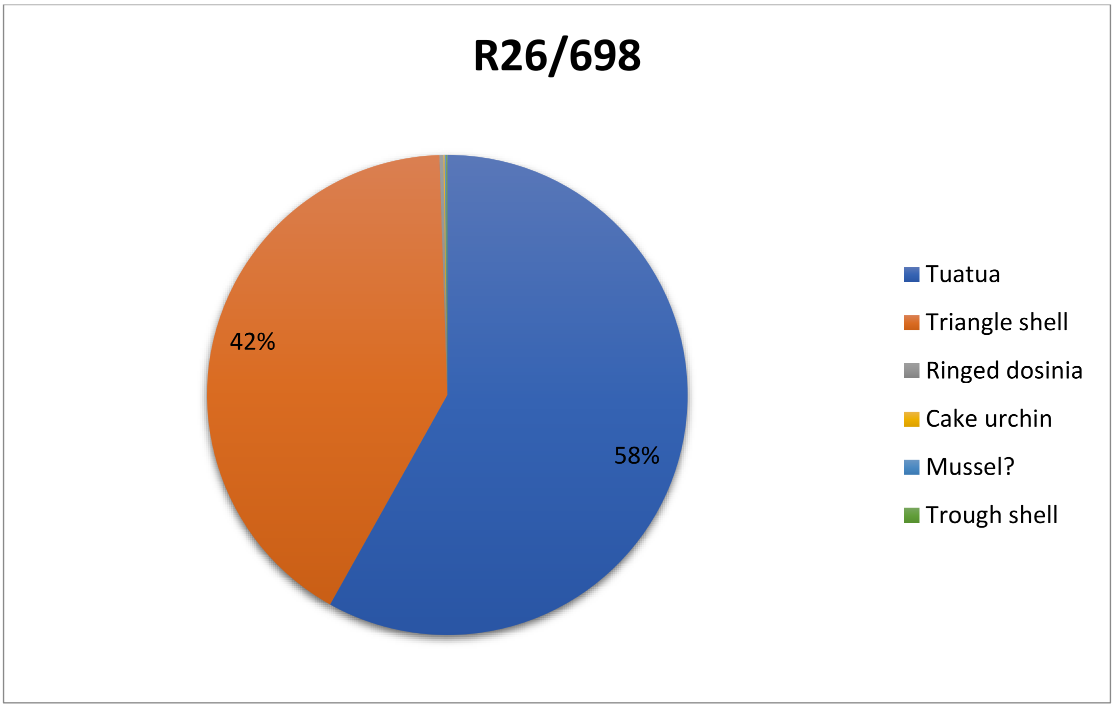


Figure 12: Relative abundance of invertebrate species (MNI) from R26/698

Table 11: Results of analysis of vertebrate sample from R26/ 698

Class	Species	NISP	MNE	MNI
Fish	Blue cod	1	1	1
	Unidentified	30		
	Total	**31**	**1**	**1**

R26/701

Sample size: 22 litres

As with the other middens from the Southern Zone for which sample analysis was undertaken, the species diversity within R26/701 was relatively low, with only five species of shellfish identified (Table 12 and Figure 13). Tuatua dominate the sample, making up 99% of the shell component. Although there was a wide size range in the tuatua (from 1.4 cm to 6.5 cm), most were small to average in size. This site is also notable for the relatively high number of cake urchin fragments, with a total weight of 16.98 g, far more than any of the other sites in this area. R26/701 also yielded a small amount of fish bone, none of which could be identified to taxon (Table 13).

Table 12: Results of analysis of invertebrate sample from R26/701

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		3370	1685	99.23	
Ringed dosinia		11	6	0.35	
Triangle shell		9	5	0.29	
Cake urchin	447		1	0.06	16.98
Knobbed whelk	2		1	0.06	
Non-diagnostic shell					1710
Total		**3390**	**1698**	**100**	

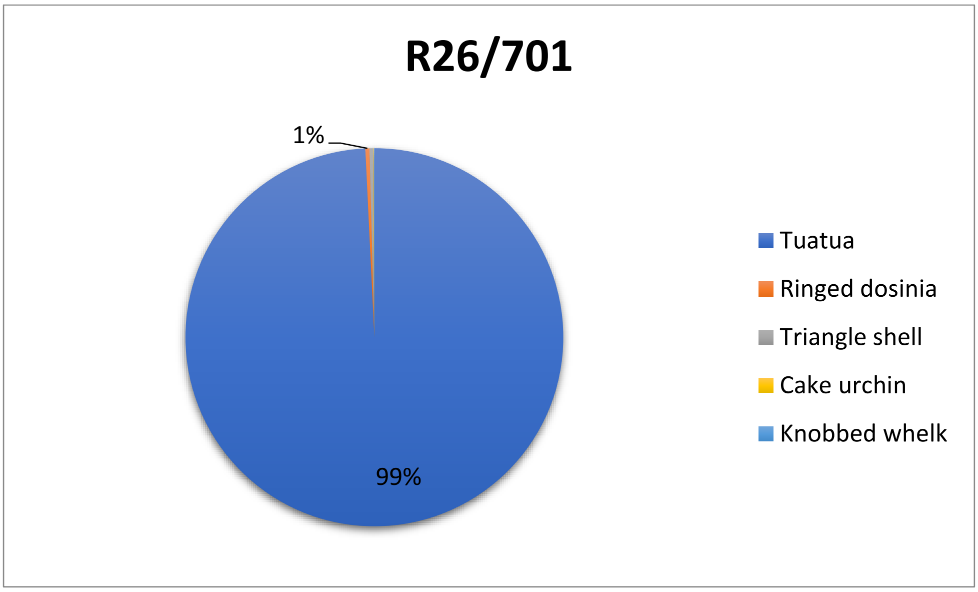


Figure 13: Relative abundance of invertebrate species (MNI) from R26/701

Table 13: Results of analysis of vertebrate sample from R26/701

Class	Species	NISP	MNE	MNI
Fish	Unidentified	8		
	Total	**8**		

R26/695

Sample size: 7 litres

Faunal remains recovered from this site consisted entirely of shellfish, with no vertebrate species identified within the sample. Five species were identified, with tuatua making up 98% of the identified shell. Also present in small amounts were triangle shell, ringed dosinia, and one each of angled wedge shell (Peronaea gaimardi) and an unidentified gastropod. Results of the analysis can be seen in Table 14 and Figure 14. The shell in this sample was highly fragmented, with considerable evidence of burning on the fragmented material.

Table 14: Results of analysis of invertebrate sample from R26/695

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		928	464	98.31	
Triangle shell		7	4	0.85	
Ringed dosinia		3	2	0.42	
Gastropod sp.		1	1	0.21	
Angled wedge shell		1	1	0.21	
Non-diagnostic shell					2752
Total		**940**	**472**		

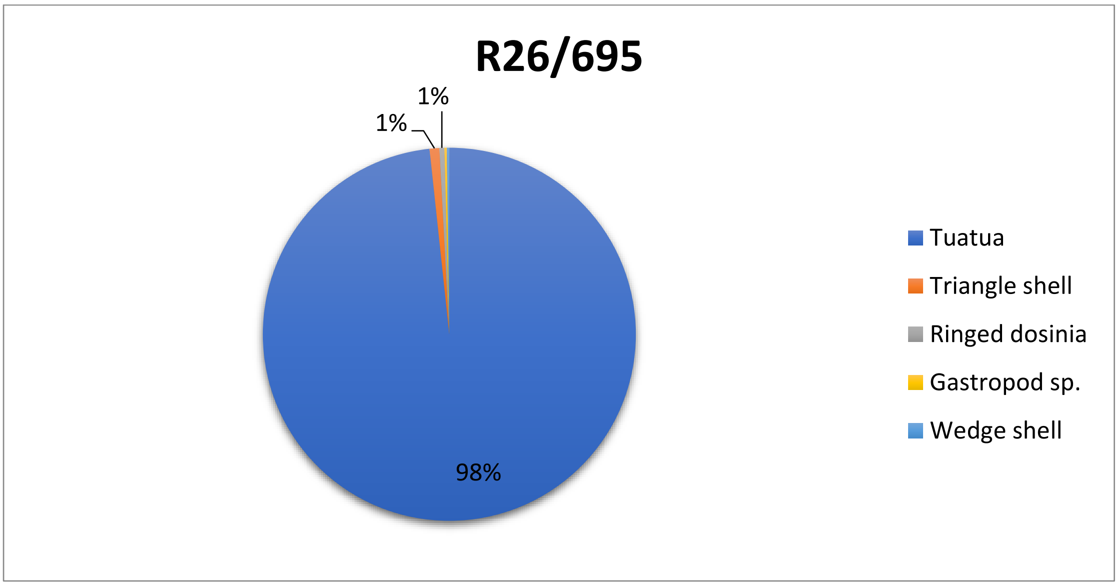


Figure 14: Relative abundance of invertebrate species (MNI) from R26/695

Central Zone

R26/537

Sample size: Area A = 2.3 litres

Area B = 2.8 litres

Samples from two separate deposits of this site were taken for analysis, with only a small amount of faunal material in each. No vertebrate remains were recovered from this site, and only three species of shellfish were identified within the sample, with a combined MNI of 24 for Area A, and 66 for Area B (Tables 15 and 16 and Figure 15 and Figure 16). Tuatua are the dominant species in both areas (71% and 80% of the samples respectively). While the sub-tidal species make up a relatively high percentage of the total MNI, the small sample sizes mean that not too much can be read into this. Both ringed dosinia and triangle shell can usually be collected in small amounts around low tide under normal conditions.

Table 15: Results of analysis of invertebrate sample from R26/537 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		34	17	70.83	
Triangle shell		9	5	20.83	
Ringed dosinia		1	2	8.33	
Non-diagnostic shell					184
Total		**44**	**24**	**100**	

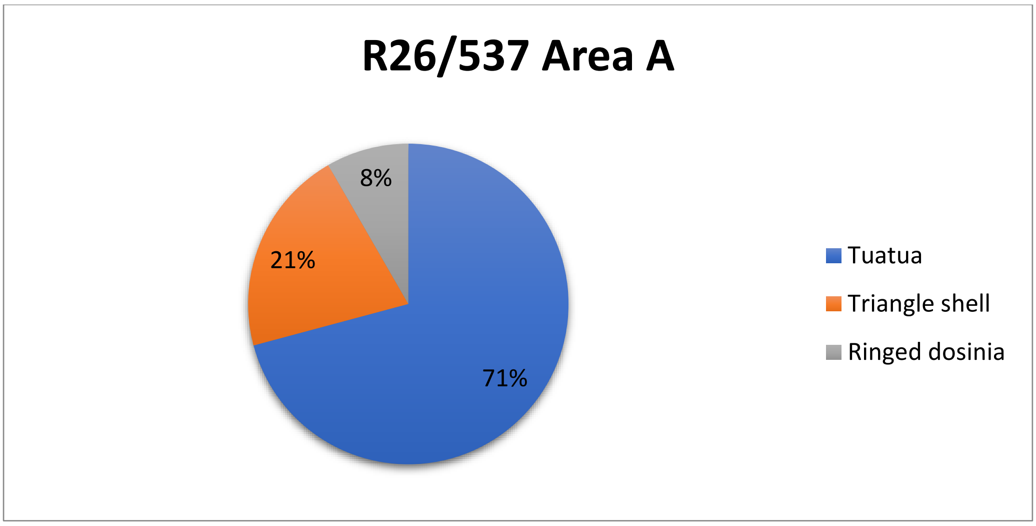


Figure 15: Relative abundance of invertebrate species (MNI) from R26/537 Area A

Table 16: Results of analysis of invertebrate sample from R26/537 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		105	53	80.30	
Triangle shell		16	8	12.12	
Ringed dosinia		9	5	7.58	
Non-diagnostic shell					181
Total		**130**	**66**	**100**	

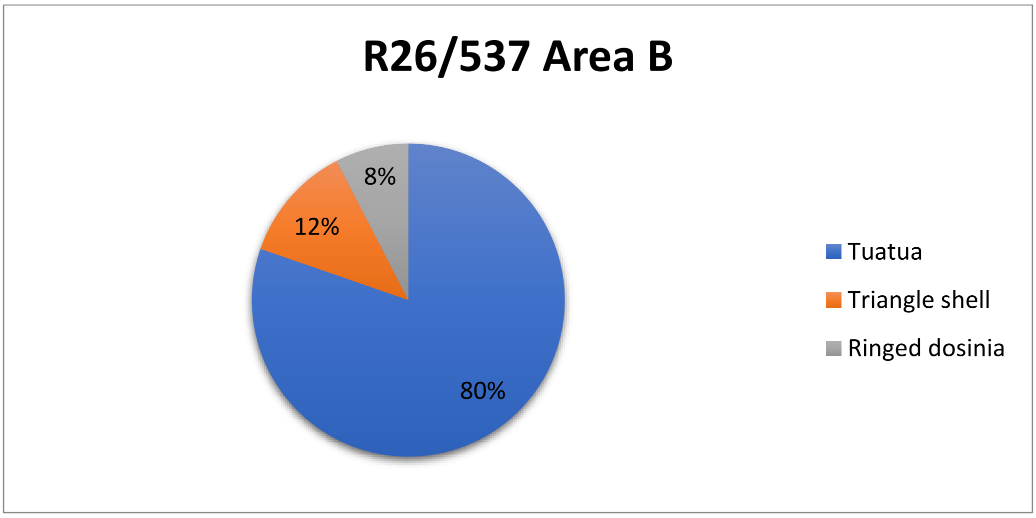


Figure 16: Relative abundance of invertebrate species (MNI) from R26/537 Area B

R26/538

Sample size: 6.5 litres

Only two species of shellfish were identified from this site, tuatua and triangle shell, with tuatua comprising 96% of the identified shell (Table 17, Figure 17). No vertebrate remains were recovered from this site.

Table 17: Results of analysis of invertebrate sample from R26/538

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		656	328	95.63	
Triangle shell		29	15	4.37	
Non-diagnostic shell					1132
Total		**685**	**343**	**100**	

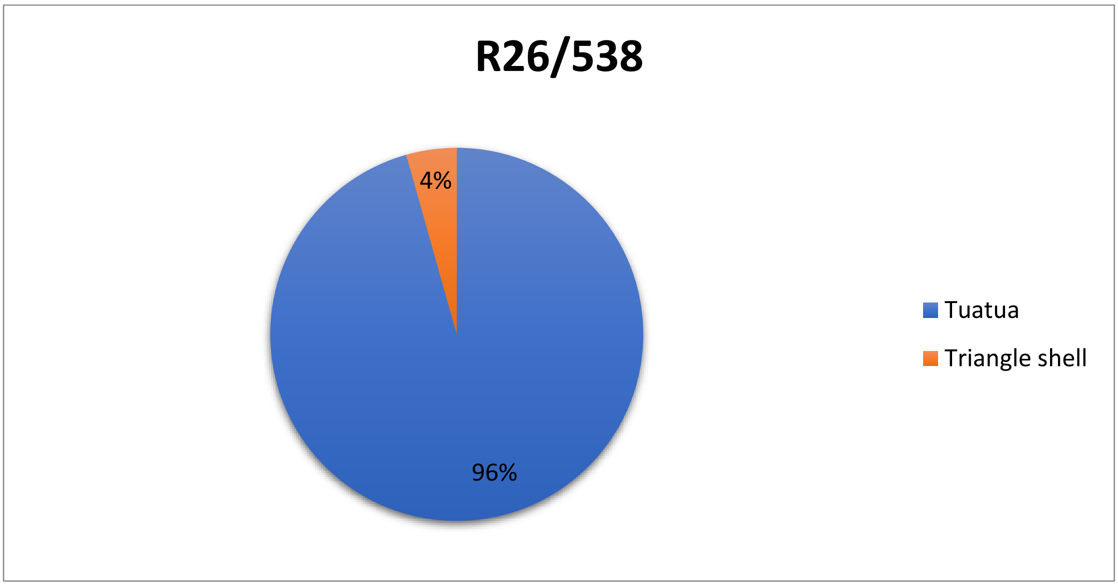


Figure 17: Relative abundance of invertebrate species (MNI) from R26/538

R26/555

Sample size: 6 litres

Analysis of the sample from R26/555 yielded a relatively small amount of faunal material for the sample size, with a total MNI of only 87 for shellfish. A small amount of vertebrate bone was also recovered. Tuatua make up 71% of the identified shell component, with triangle shell contributing 27%. Ringed dosinia and cake urchin were also identified, but with an MNI of only one for each. Results of the shell analysis are shown in Table 18 and Figure 18. Although the results show a relatively high proportion of triangle shell, the small sample size must be taken into account when interpreting these results.

The vertebrate component of the sample consisted of a small amount of fish bone (NISP 33), none of which could be identified to taxon, along with the distal end of a weka (*Gallirallus australis*) tarsometatasus and two unidentified fragments of bird bone (Table 19).

Table 18: Results of analysis of invertebrate sample from R26/555

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		124	62	71.26	
Triangle shell		45	23	26.44	
Cake urchin			1	1.15	0.61
Ringed dosinia		2	1	1.15	
Non-diagnostic shell					211
Total		**171**	**87**	**100**	

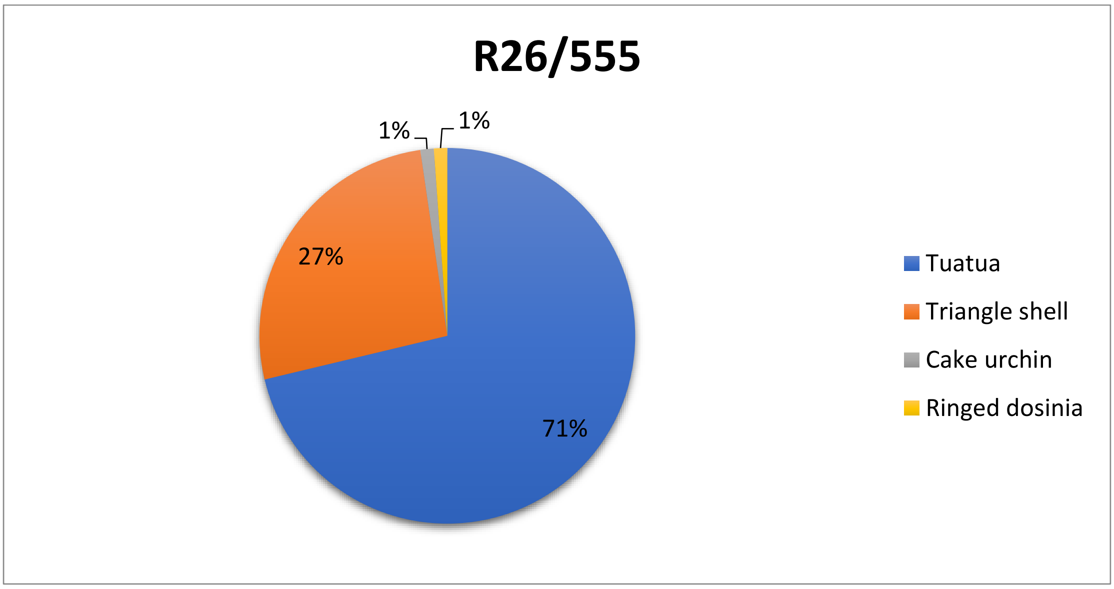


Figure 18: Relative abundance of invertebrate species (MNI) from R26/555

Table 19: Results of analysis of vertebrate sample from R26/555

Class	Species	NISP	MNE	MNI
Fish	Unidentified	33		
	Total	**33**		
Bird	Weka	1	1	1
	Unidentified	2		
	Total	**3**	**1**	**1**

R26/557

Sample size: 10 litres

The faunal sample from R26/557 consisted almost entirely of shellfish, with fish providing a NISP of only two – one scale and one spine. Tuatua account for over 99% of the identified shell, with triangle shell being a very minor component. Results of the analysis are shown in Tables 20 and 21 and Figure 19. The contents of this midden were very well preserved, with the majority of the tuatua being whole. Of interest is the small size of the tuatua, with most being below 5 cm in size.

Table 20: Results of analysis of invertebrate sample from R26/557

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1725	863	99.77	
Triangle shell		3	2	0.23	
Non-diagnostic shell					519
Total		**1728**	**865**	**100**	

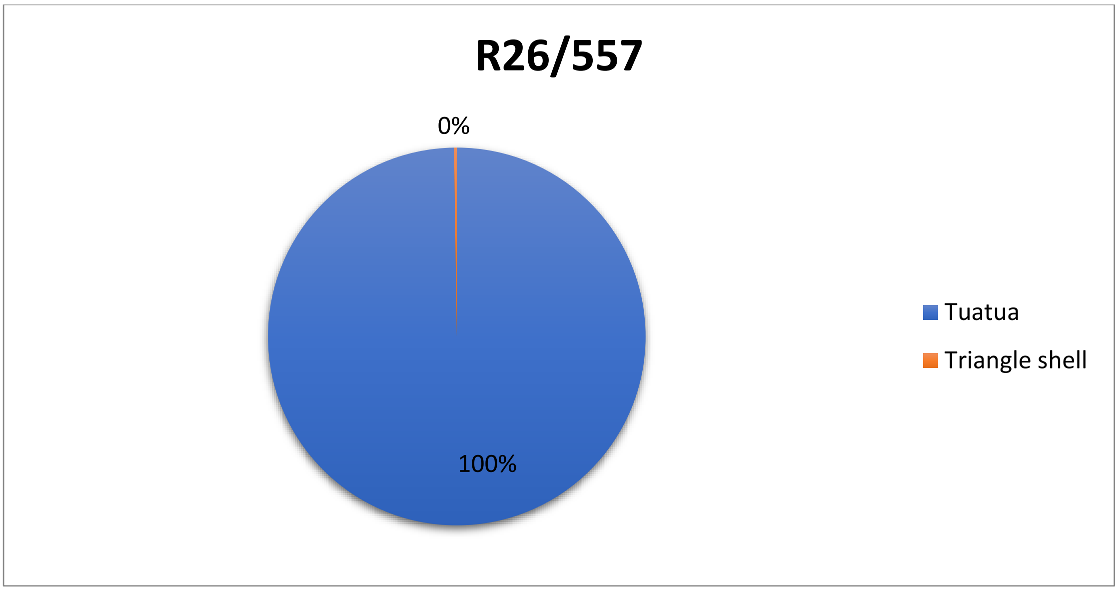


Figure 19: Relative abundance of invertebrate species (MNI) from R26/528

Table 21: Results of analysis of vertebrate sample from R26/557

Class	Species	NISP	MNE	MNI
Fish	Unidentified	2		
	Total	**2**		

R26/559

Sample size: unknown

Four species of shellfish and a small amount of fish bone were identified from the R26/559 sample. The shell component is heavily dominated by tuatua (99%), mostly small in size but with a few larger specimens also present. Other shell species consisted of ringed dosinia, triangle shell and a small amount of cake urchin test. The results are shown in Table 22 and Figure 20. Only one fish bone belonging to a barracouta (*Thyrsites atun*) could be identified to species, with the remaining fish bone consisting of unidentified fragments and a single scale (Table 23).

Table 22: Results of analysis of invertebrate sample from R26/559

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1505	753	98.69	
Ringed dosinia		9	5	0.66	
Triangle shell		7	4	0.52	
Cake urchin			1	0.13	0.53
Non-diagnostic shell					532
Total		**1521**	**763**	**100**	

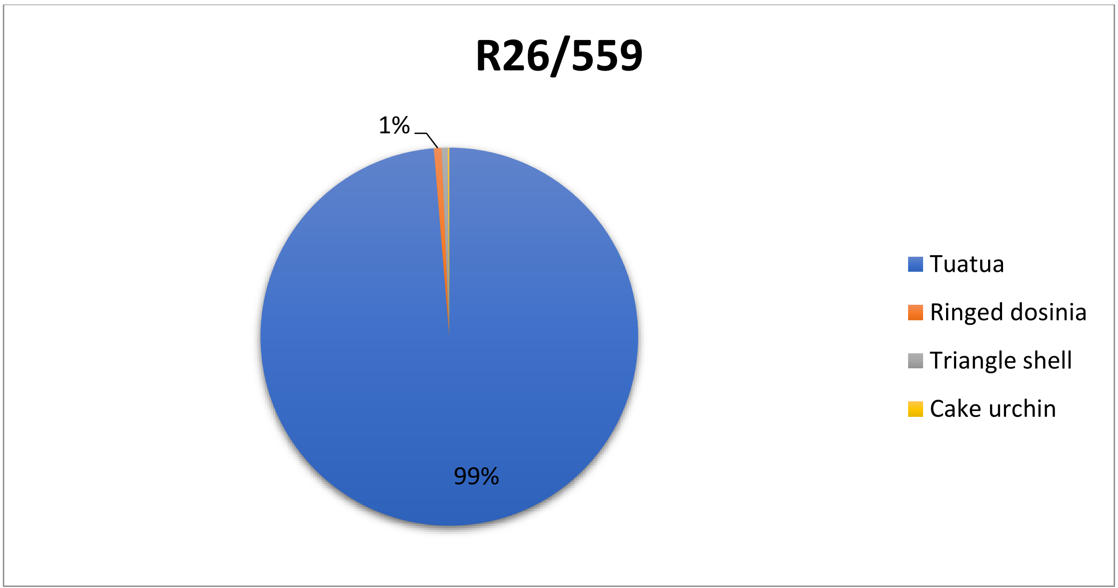


Figure 20: Relative abundance of invertebrate species (MNI) from R26/559

Table 23: Results of analysis of vertebrate sample from R26/559

Class	Species	NISP	MNE	MNI
Fish	Barracouta	1	1	1
	Unidentified	46		
	Total	**47**	**1**	**1**

R26/540

Sample size: 4 litres

The faunal sample from R26/540 was comprised entirely of shellfish, and was surprisingly diverse for such a small sample, with eight species identified, although five of these comprise less than 1% of the total MNI each. Tuatua are the dominant species (83%), with ringed dosinia and triangle shell contributing 8% and 6% respectively. Results are shown in Table 24 and Figure 21.

Table 24: Results of analysis of invertebrate sample from R26/540

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		436	218	83.21	
Triangle shell		41	21	8.02	
Ringed dosinia		25	16	6.11	
Trough shell		4	2	0.76	
Knobbed whelk		2	2	0.76	
Cake urchin			1	0.38	0.02
Olive shell	1		1	0.38	
Angled wedge shell		1	1	0.38	
Non-diagnostic shell					436
Total		**509**	**262**	**100**	

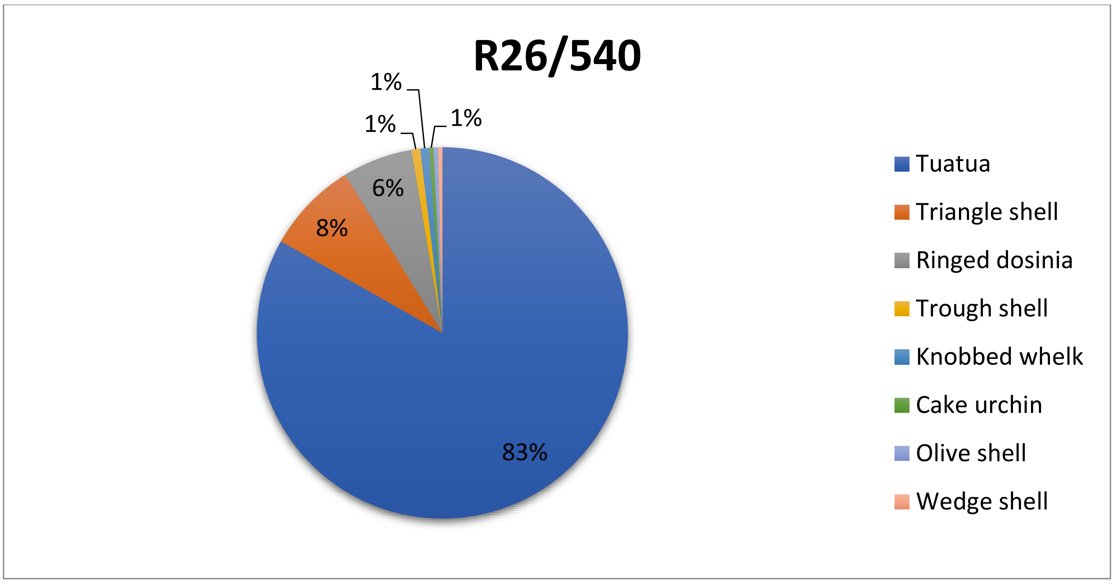


Figure 21: Relative abundance of invertebrate species (MNI) from R26/540

R26/550

Sample size: 5 litres

The shell component of this sample contained six species, including a whole paua (*Haliotis iris*) and a single fragment of freshwater mussel. Tuatua are the dominant species, representing 86% of the identified shell, with 6% ringed dosinia and 5% triangle shell. Results are shown in Table 25 and Figure 22. The presence of paua, a rocky shore species, indicates at least some exploitation of this environment in addition to the sandy shore where the majority of the identified shellfish would have been collected.

Three fish vertebra were also identified in the sample (Table 26). These were not identified to species, but are from a very small fish.

Table 25: Results of analysis of invertebrate sample from R26/550

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		348	174	86.14	
Ringed dosinia		26	13	6.44	
Triangle shell		22	11	5.45	

Trough shell		4	2	0.99	
Paua		1	1	0.50	
Freshwater mussel	1		1	0.50	
Non-diagnostic shell					786
Total		**402**	**202**	**100**	

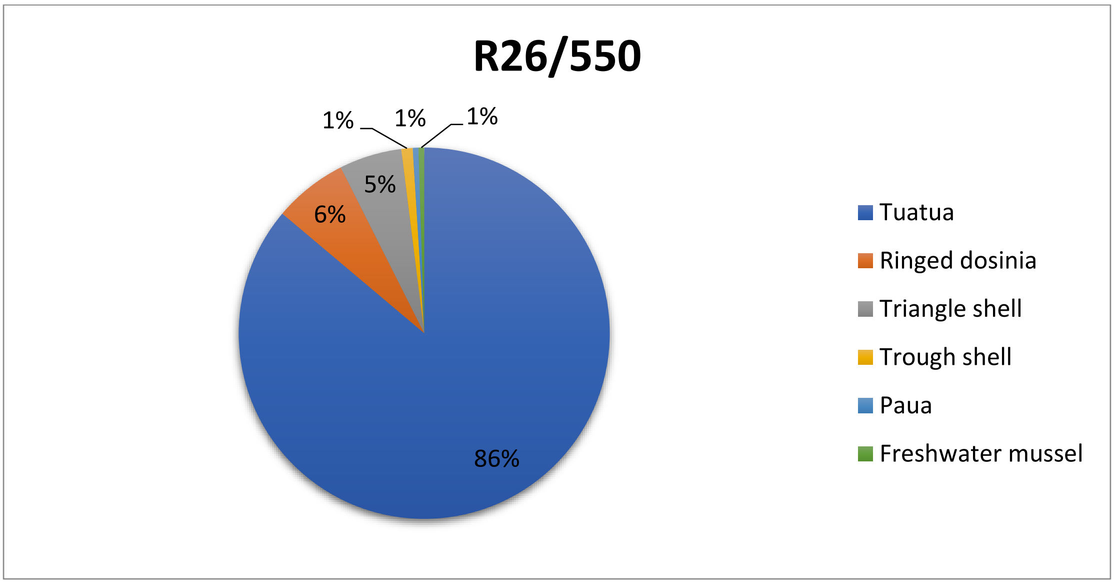


Figure 22: Relative abundance of invertebrate species (MNI) from R26/550

Table 26: Results of analysis of vertebrate sample from R26/550

Class	Species	NISP	MNE	MNI
Fish	Unidentified	3		
	Total	**3**		

R26/544

Sample size: 33 litres

The faunal sample from R26/544 was relatively diverse, with 11 species of shellfish represented, along with small amounts of fish, bird, and rat. Tuatua was the dominant shellfish species at 89%, with 7% ringed dosinia. The other nine species account for the remaining 4% of the total MNI. The presence of paua indicates exploitation of a rocky shore environment, albeit on a small scale. This sample also contained a small number of toheroa, a species not commonly identified in Kapiti Coast middens, and generally only in small numbers. Also present were several crab claws, probably paddle crab (*Ovalipes catharus*). Although crab claws are often seen on the beaches of the Kapiti Coast, and may be inadvertently collected during mass harvesting of shellfish, the number here, accounting for at least six individuals, suggests deliberate collection of whole crabs. This site is also notable for the amount of cake urchin, both in terms of fragments of test (over 200 g), and the number of peristomial teeth. The results for shellfish and other invertebrates are shown in Table 27 and Figure 23.

Two species of fish – red cod and elasmobranchii (cartilaginous sharks and rays) – were identified within the vertebrate component, along with a small amount of unidentified bird bone and a single rat bone (Table 28).

Table 27: Results of analysis of invertebrate sample from R26/544

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		2025	1013	88.78	
Ringed dosinia		153	77	6.75	
Knobbed whelk		18	18	1.58	
Toheroa		15	9	0.79	
Crab sp.	15	12	6	0.53	
Cake urchin		44	5	0.44	204.37
Triangle shell		10	5	0.44	
Trough Shell		5	3	0.26	
Paua		3	3	0.26	
Frilled venus shell		1	1	0.09	
Pale tiger shell		1	1	0.09	
Non-diagnostic shell					3960
Total		**2287**	**1141**	**100**	

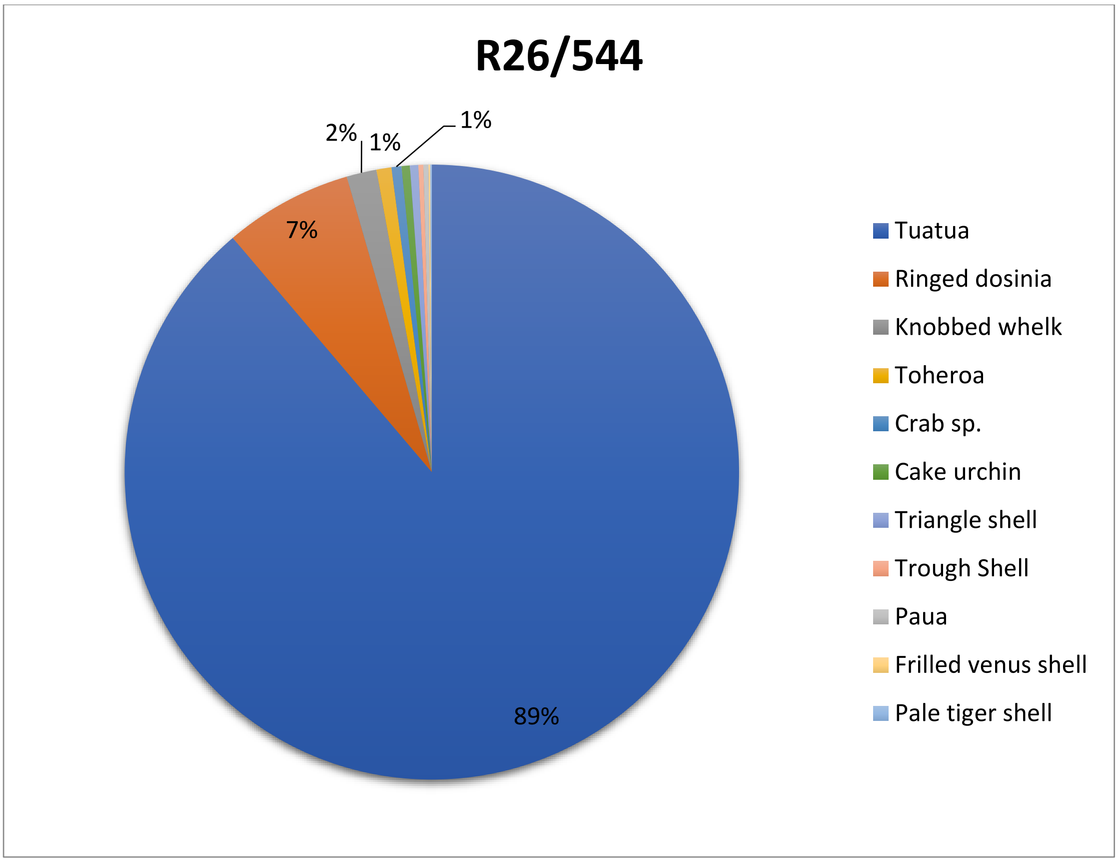


Figure 23: Relative abundance of invertebrate species (MNI) from R26/544

Table 28: Results of analysis of vertebrate sample from R26/544

Class	Species	NISP	MNE	MNI
Fish	Elasmobranchii	1	1	1
	Red cod	1	1	1
	Unidentified	100		
	Total	**102**	**2**	**2**
Bird	Unidentified	13		
	Total	**13**		
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

R26/551

Sample size: 6 litres

The shell component of this midden sample consisted almost entirely of tuatua, with a single Arabic volute (*Alcithoe arabica*) and a small amount of cake urchin test also identified (Table 29, Figure 24). Two species of fish – blue cod and red cod, each with an MNI of one – were also present, along with a small amount of unidentified fragmented mammal bone (Table 30).

Table 29: Results of analysis of invertebrate sample from R26/551

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		597	299	99.34	
Arabic volute		1	1	0.33	
Cake urchin			1	0.33	2.07
Non-diagnostic shell					1266
Total		**598**	**301**	**100**	

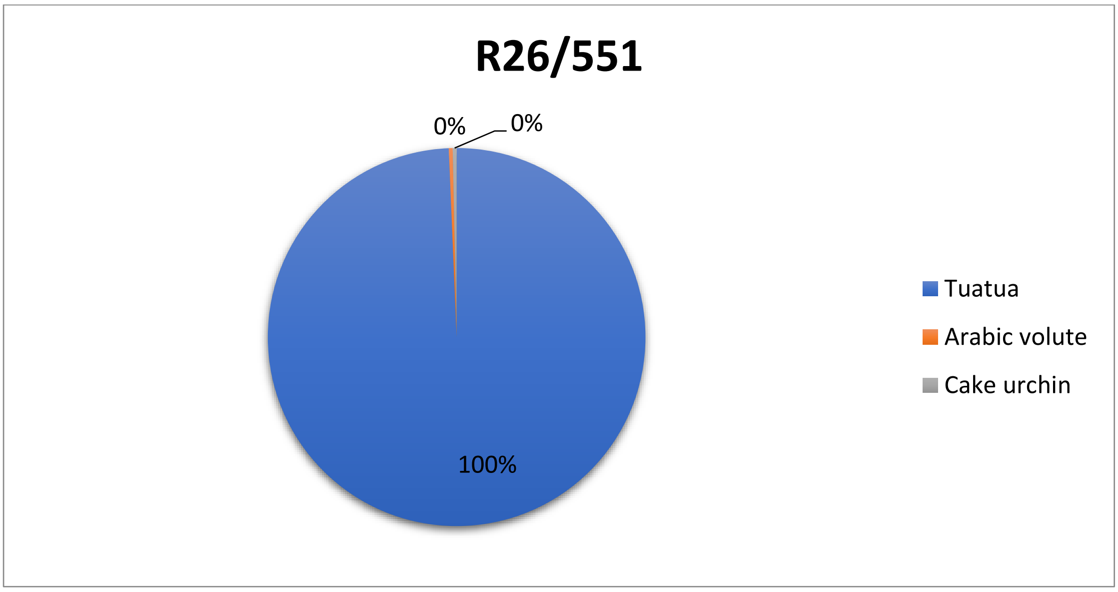


Figure 24: Relative abundance of invertebrate species (MNI) from R26/551

Table 30: Results of analysis of vertebrate sample from R26/551

Class	Species	NISP	MNE	MNI
Fish	Blue cod	1	1	1
	Red cod	1	1	1
	Unidentified	9		
	Total	**11**	**2**	**2**
Mammal	Unidentified	8		
	Total	**8**		

R26/552

Sample size: 8 litres

The faunal sample from R26/552 was again heavily dominated by tuatua, representing 98% of the shell component, with a small amount of triangle shell, cake urchin test, and freshwater mussel. This sample was generally very well preserved, with most of the shell component being whole, although some shells were quite degraded, suggesting the surface of the site may have been exposed to weathering for some time following deposition. The tuatua were notable for their small size, all less than 5 cm in length. The results of analysis are shown in Table 31 and Figure 25.

The vertebrate assemblage included both fish and bird (Table 32). Only one species of fish could be identified, *Galaxias* sp. This is a fresh water species with very fragile bones, not often identified in coastal sites. This may be in part due to the fragility, and therefore low survivability, of the bones of these fish, but may also reflect a reliance on marine fish specimens in reference collections. At least one other species of fish was also present, based on a cleithrum for which a match was not found in the reference collection. Two species of bird were also identified, New Zealand fantail (*Rhipidura fuliginosa*) and North Island saddleback (*Philesturnus rufusater*).

Table 31: Results of analysis of invertebrate sample from R26/552

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1189	595	97.54	
Triangle shell		26	13	2.13	
Cake urchin			1	0.16	0.52

Freshwater mussel	1	1	0.16	
Non-diagnostic shell				104
Total	**1216**	**610**	**100**	

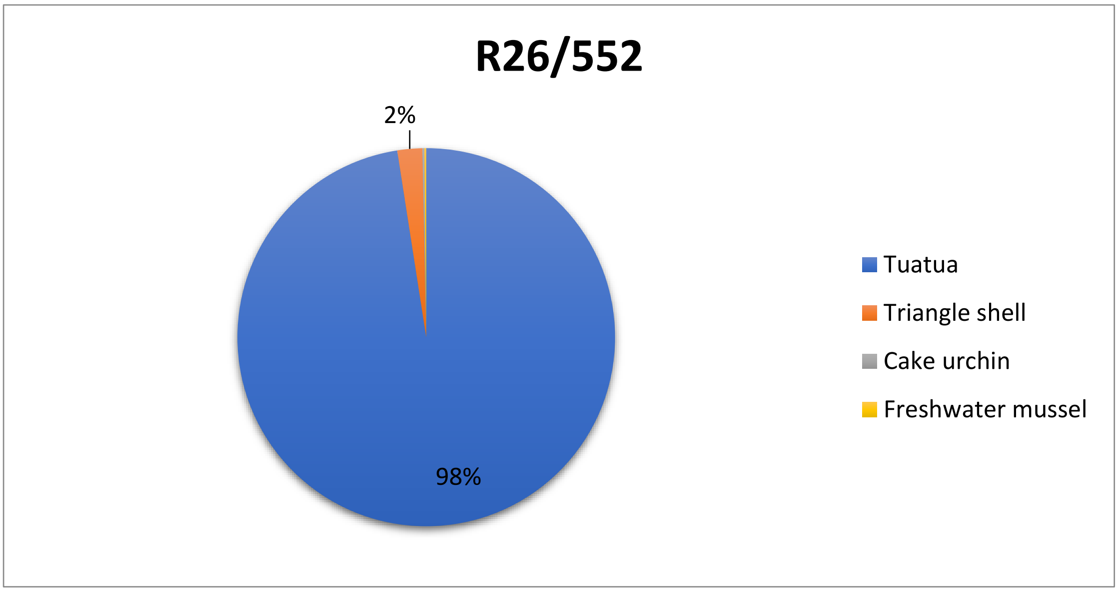


Figure 25: Relative abundance of invertebrate species (MNI) from R26/552

Table 32: Results of analysis of vertebrate sample from R26/552

Class	Species	NISP	MNE	MNI
Fish	*Galaxias* sp.	1	1	1
	Unidentified	20		
	Total	**21**	**1**	**1**
Bird	NZ Fantail	2	2	1
	North Island Saddleback	1	1	1
	Unidentified	2		
	Total	**5**	**3**	**2**

Northern Zone

R26/497

Sample size: Area A = 5 litres

Area B = 11 litres

Area C = 15 litres

Area D = 5 litres

Area E = 16 litres

Area F = 25 litres

Area G = 4.5 litres

Area H = 7 litres

Area I = 19 litres

Area J = 2.5 litres

This site was comprised of a number of discrete midden deposits over a large area. There is considerable variation in terms of the midden components between these deposits, though the small size of some of the samples must be taken into account when interpreting results. Due to the complexity of this site, the results for each area will be discussed separately.

Area A was an oven feature, with the only faunal content being fish bone. This was all identified as red cod, and appears to be the remains of a single fish, although not all bones were present as the feature was only partially sampled. The bone was flaky, but otherwise in good condition with no evidence of burning, and some elements were still in articulation. The unidentified portion reflects fragments of bone that could not be identified to element.

Table 33: Results of analysis of vertebrate sample from R26/497 Area A

Class	Species	NISP	MNE	MNI
Fish	Red cod	59	28	1
	Unidentified	100		
	Total	**159**		

Area B contained an MNI of only 291 shellfish, from six species (Table 34, Figure 26). Tuatua are the most prevalent species (87%), with ringed dosinia contributing 11%. Small amounts of knobbed whelk, trough shell, cake urchin, and pale tiger shell make up the remainder of the shell assemblage. All species are inhabitants of open surf beaches, albeit occupying different zones. A small amount of unidentified fish bone was also contained within the sample (Table 35).

Table 34: Results of analysis of invertebrate sample from R26/497 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		504	252	86.60	
Ringed dosinia		61	31	10.65	
Knobbed whelk		4	4	1.37	
Trough shell		2	2	0.69	
Cake urchin			1	0.34	0.82
Pale tiger shell		1	1	0.34	
Non-diagnostic shell					574
Total		**572**	**291**	**100**	

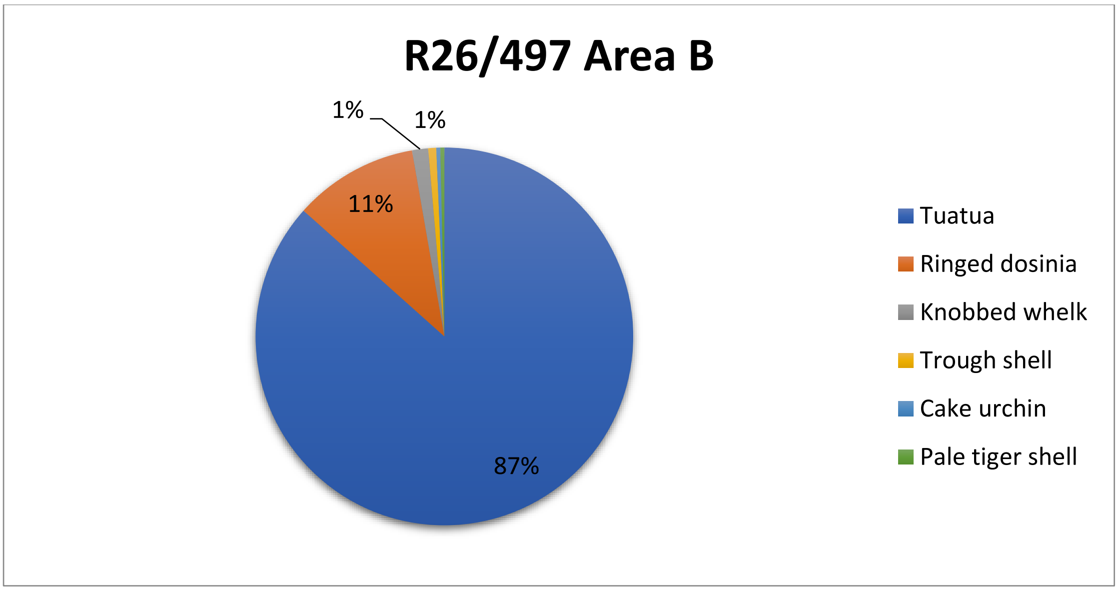


Figure 26: Relative abundance of invertebrate species (MNI) from R26/497 Area B

Table 35: Results of analysis of vertebrate sample from R26/497 Area B

Class	Species	NISP	MNE	MNI
Fish	Unidentified	22		
	Total	**22**		

The Area C sample also yielded only a small amount of shell in comparison to sample size, with total MNI of 321. This was comprised mostly of tuatua (96%), with small amounts of triangle shell, ringed dosinia, cake urchin, and knobbed whelk making up the remainder. Small amounts of unidentified fish and bird bone were also present. Results of the midden analysis are shown in Tables 36 and 37, and Figure 27.

Table 36: Results of analysis of invertebrate sample from R26/497 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		618	309	96.26	
Triangle shell		9	5	1.56	
Ringed dosinia		10	5	1.56	
Cake urchin			1	0.31	0.22
Knobbed whelk		1	1	0.31	
Non-diagnostic shell					1204
Total		**638**	**321**	**100**	

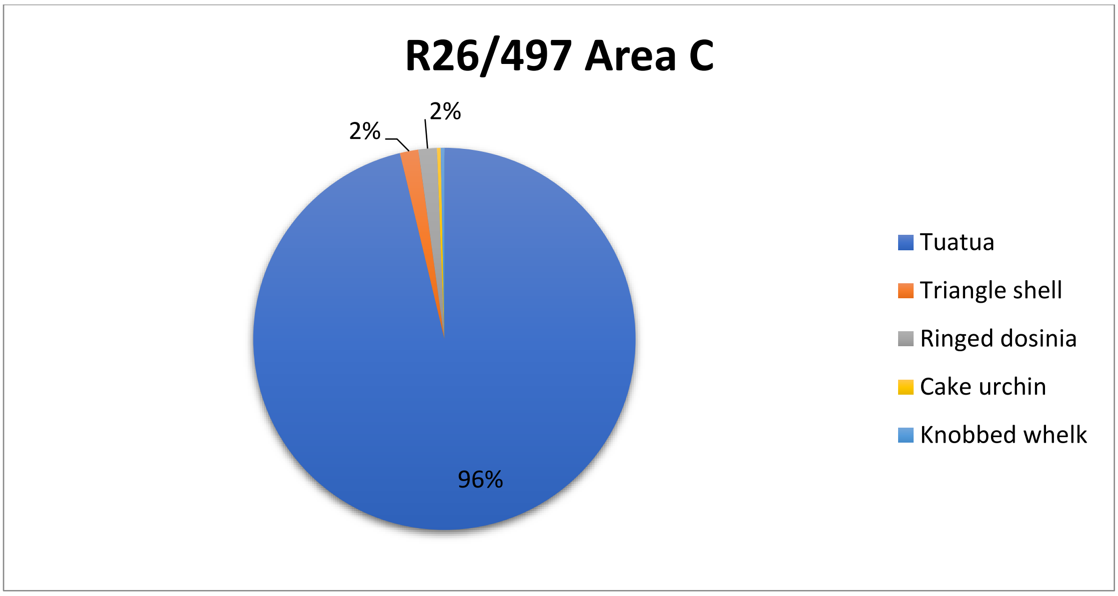


Figure 27: Relative abundance of invertebrate species (MNI) from R26/497 Area C

Table 37: Results of analysis of vertebrate sample from R26/Area C

Class	Species	NISP	MNE	MNI
Fish	Unidentified	14		
	Total	**14**		
Bird	Unidentified	4	1	
	Total	**4**	**1**	

The sample from Area D is a total sample from a small midden deposit, yielding a total MNI for shellfish of 165. As can be seen in Table 38 and Figure 28, the percentages of tuatua and triangle shell in the sample are almost equal, representing 44% and 40% of the total MNI respectively. Ringed dosinia contributes a further 10%. Although the sample size is small, the proportion of sub-tidal surf clams is not reflective of what would be available under normal conditions, and may reflect a harvesting event following rough seas or strong currents. The single specimen of *Potamapyrgus* sp. would not have been a food item, but is an important environmental indicator generally associated with estuarine environments. This may indicate harvesting at or near the Waikanae River mouth.

No vertebrate remains were recovered from this sample.

Table 38: Results of analysis of invertebrate sample from R26/497 Area D

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		145	73	44.24	
Triangle shell		131	66	40.00	
Ringed dosinia		31	16	9.70	
Knobbed whelk		9	9	5.45	
Potamapyrgus sp.		1	1	0.61	
Non-diagnostic shell					434
Total		**317**	**165**	**100**	

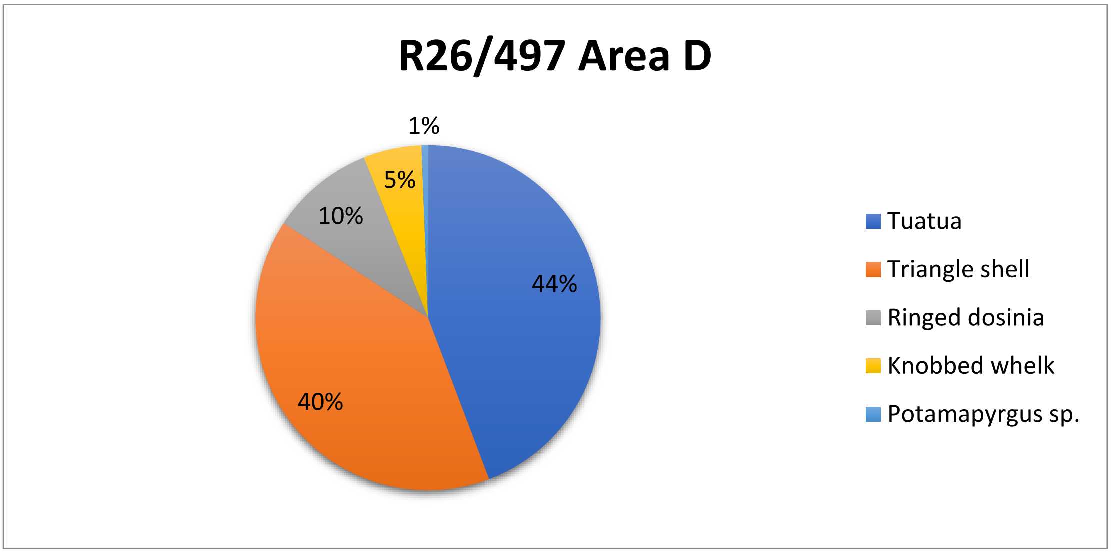


Figure 28: Relative abundance of invertebrate species (MNI) from R26/497 Area D

The faunal remains from Area E consisted entirely of shellfish, with a strong sub-tidal component (Table 39, Figure 29). Triangle shell accounts for 76% of the total MNI, with tuatua contributing only 22%. Nine other species make up the remaining 2% of the sample. The high percentage of triangle shell indicates opportunistic harvesting of this species following a period of rough seas or strong currents, as this would have been the only time when this species could be easily collected in large numbers. A small amount of rocky shore shellfish (cat's eye/*Turbo smaragdus* and Cook's turban/*Cookia sulcata*) was also identified in this sample, suggesting a foraging strategy that was not confined to the sandy beach environment. The presence of pipi (*Paphies australis*) may indicate harvesting at or close to the Waikanae estuary.

Table 39: Results of analysis of invertebrate sample from R26/497 Area E

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		1212	606	75.75	
Tuatua		345	173	21.63	
Ringed dosinia		18	9	1.13	
Cat's eye		4	4	0.50	
Knobbed whelk		3	3	0.38	
Trough shell		1	1	0.13	
Cook's Turban		1	1	0.13	
Arabic volute		1	1	0.13	
Pipi		2	1	0.13	
Angled wedge shell		1	1	0.13	
Non-diagnostic shell					1207
Total		**1588**	**800**	**100**	

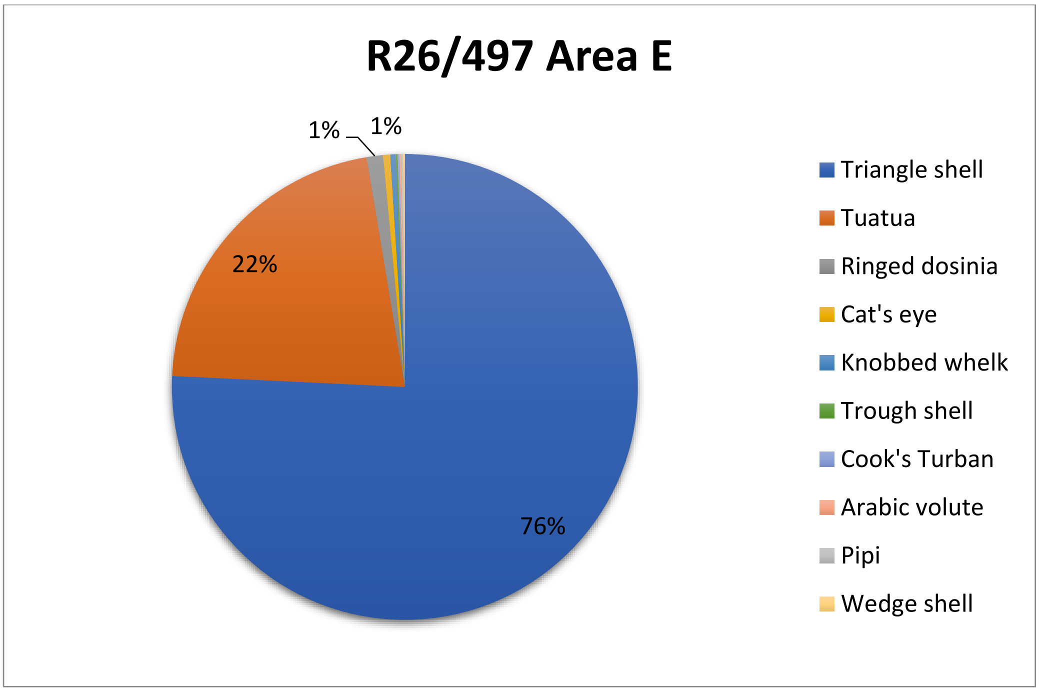


Figure 29: Relative abundance of invertebrate species (MNI) from R26/497 Area E

The Area F sample represents the only assemblage for the project, including the high level investigations, with a significant proportion of estuarine shellfish, with edible estuarine species comprising 25% of the total MNI. Two fragments of paua may indicate some rocky shore harvesting, making this site the most diverse in terms of the range of habitats shellfish were obtained from. Results of the shell analysis are shown in Table 40 and Figure 30. A small amount of both fish and bird bone were also present in the sample, though only one bone, belonging to a snapper, could be identified to species (Table 41).

Table 40: Results of analysis of invertebrate sample from R26/497 Area F

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		932	466	72.02	
Pipi		254	127	19.63	
Mud snail		19	19	2.94	
Tuangi cockle		29	15	2.32	
Potamapyrgus sp.		12	12	1.85	
Triangle shell		9	5	0.77	
Cake urchin			1	0.15	0.33
Ringed dosinia		1	1	0.15	
Paua	2		1	0.15	
Non-diagnostic shell					945
Total		**1256**	**647**	**100**	

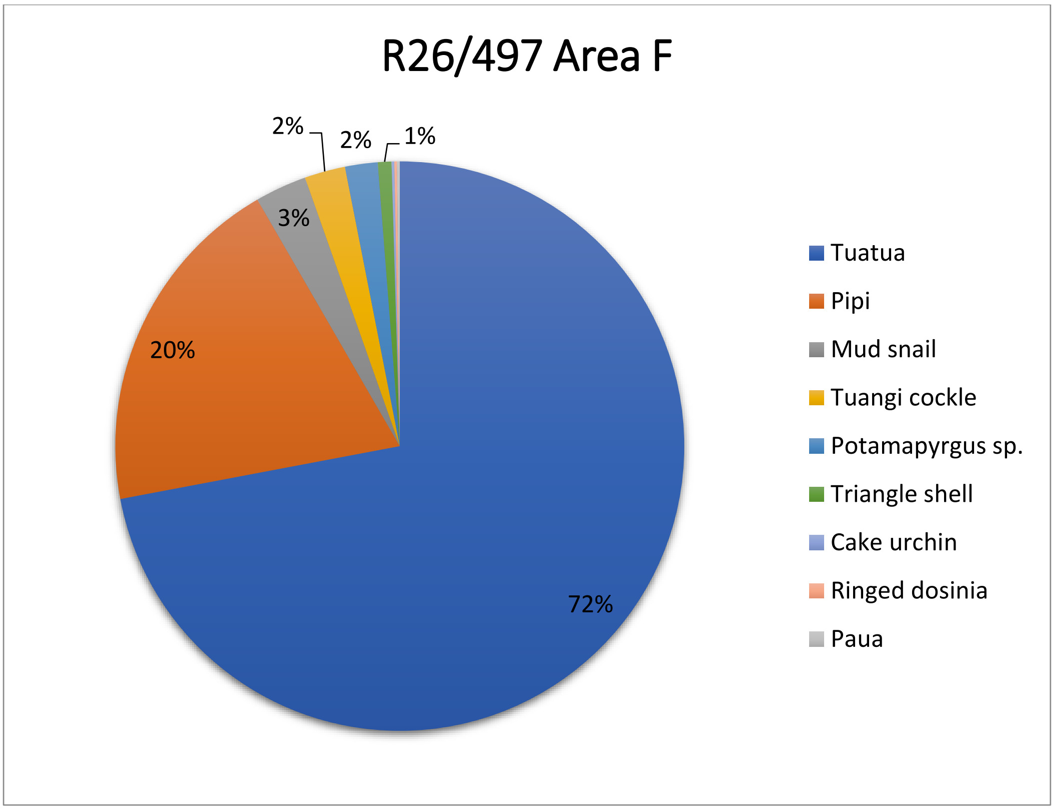


Figure 30: Relative abundance of invertebrate species (MNI) from R26497 Area F

Table 41: Results of analysis of vertebrate sample from R26/497 Area F

Class	Species	NISP	MNE	MNI
Fish	Snapper	1	1	1
	Unidentified	49		
	Total	**50**	**1**	**1**
Bird	Unidentified	3		
	Total	**3**		

The material from Area G is another total sample from a small midden deposit, yielding an MNI of only 102 for shellfish, and a small amount of fish bone (Tables 42 and 43, Figure 31). Four species of shellfish were identified, with triangle shell contributing 78% of the assemblage. Although the sample size is small, this number of triangle shells would not normally be available for easy collection. None of the fish remains could be identified to species.

Table 42: Results of analysis of invertebrate sample from R26/497 Area G

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		160	80	77.67	
Tuatua		39	20	19.42	
Knobbed whelk		2	2	1.94	
Ringed dosinia		1	1	0.97	
Non-diagnostic shell					501
Total		**202**	**103**	**100**	

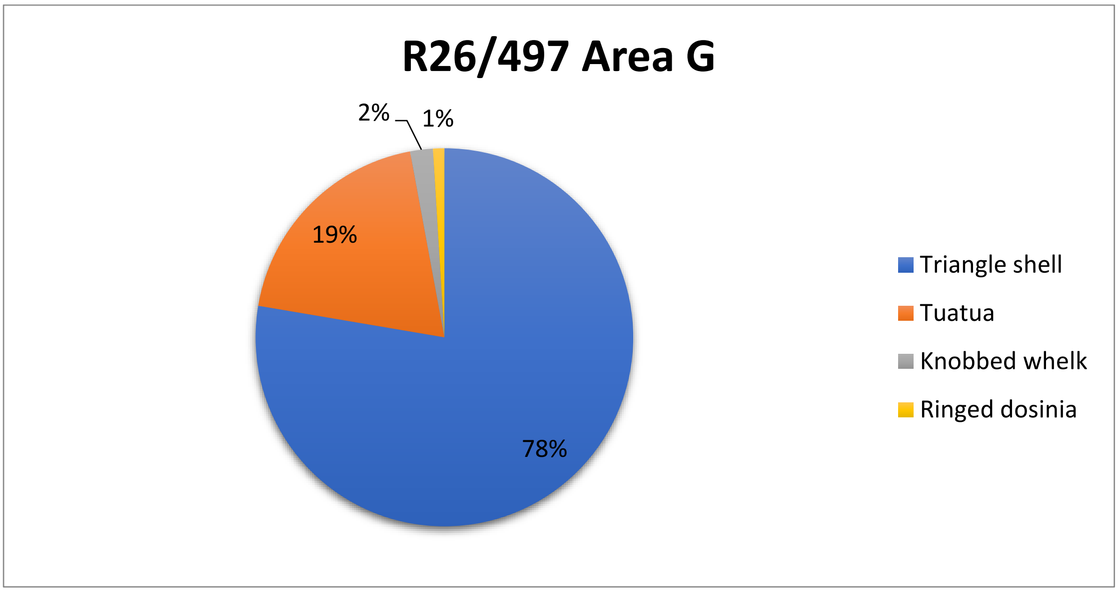


Figure 31: Relative abundance of invertebrate species (MNI) from R26/497 Area G

Table 43: Results of analysis of vertebrate sample from R26/497 Area G

Class	Species	NISP	MNE	MNI
Fish	Unidentified	10		
	Total	**10**		

Tuatua are the dominant species in the sample from Area H, comprising 72% of the total MNI for shellfish, while ringed dosinia make up a further 24%. This deposit also contained a relatively large amount of cake urchin test in comparison to other sites within the project area, particularly in relation to sample size, though an MNI of only two based on peristomial teeth. A small amount of both fish and rat bone was also recovered, though none of the fish could be identified to species. Results of the analysis are shown in Tables 44 and 45, and Figure 32.

Table 44: Results of analysis of invertebrate sample from R26/497 Area H

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		297	149	71.98	
Ringed dosinia		98	49	23.67	
Knobbed whelk		5	5	2.42	
Cake urchin		15	2	0.97	48.08
Gastropod sp.		1	1	0.48	
Triangle shell		2	1	0.48	
Non-diagnostic shell					513
Total		**418**	**207**	**100**	

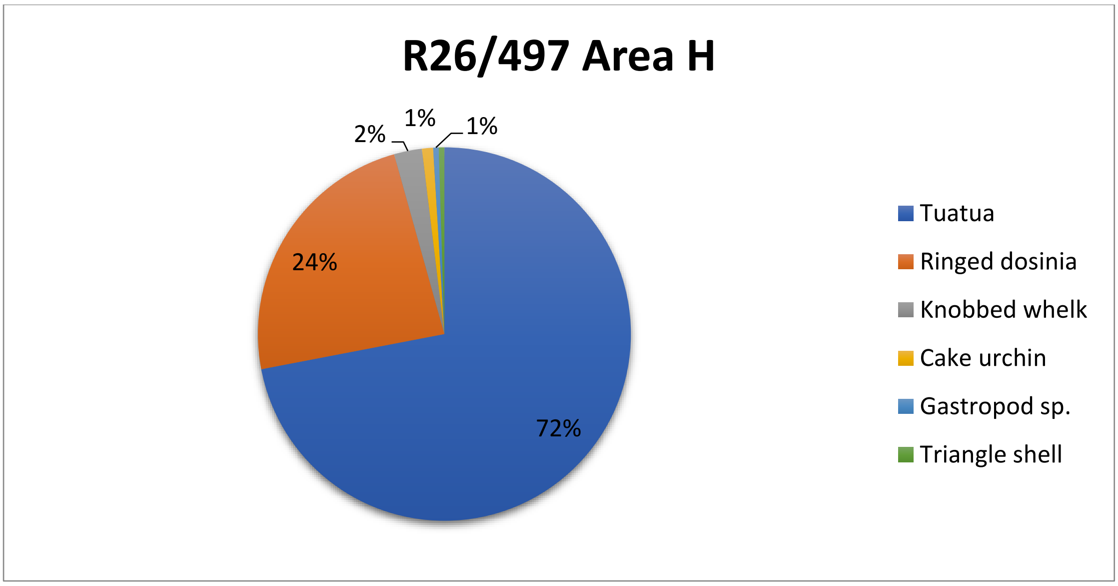


Figure 32: Relative abundance of invertebrate species (MNI) from R26/497 Area H

Table 45: Results of analysis of vertebrate sample from R26/497 Area H

Class	Species	NISP	MNE	MNI
Fish	Unidentified	23		
	Total	**23**		
Mammal	Rat	4	4	1
	Total	**4**	**4**	**1**

The faunal material from Area I of R26/497 was highly fragmented, with considerable evidence of burning. The shellfish assemblage contained eight species, and was heavily dominated by tuatua, which comprised 94% of the total MNI. Knobbed whelk contributed a further 4%, with the other six species making up the remainder. This proportion of knobbed whelk is interesting, given the very small amounts of other sub-tidal species in the assemblage. Results of the shell analysis are shown in Table 46 and Figure 33.

This deposit was notable for its high vertebrate content in comparison to other sites, particularly when sample size is taken into account. Results for the vertebrate analysis are shown in Table 47. The very high NISP count for fish bone is a product of taphonomic processes, with burning likely a significant factor in the high rate of fragmentation.

Three species of fish were identified, representing an MNI of 8. Snapper make up the vast majority of the identifiable bone, with an MNI of 6. Kahawai and wrasse (Labridae) are represented by an MNI of one each. The fish bone assemblage is almost certainly affected by taphonomic bias.

A number of bird bones were also recovered from the sample. As with the fish bone, much of this was fragmented to a degree that it could not be identified to species, however 37 bones could be positively identified, providing an MNI of 11. The majority of these are from parakeets (*Cyanoramphys* sp.), with a total MNI of 8. As previously discussed, there are issues in distinguishing between yellow-crowned and red-crowned parakeets due to an overlap in size between make yellow-crowned parakeets and female red-crowned, however at least three of the eight must be male red-crowned parakeets based on size. Saddleback and tui (*Prosthemadera novaseelandiae*) were also identified. All of the identified bird bone is from forest-dwelling species.

Two rat bones, providing an MNI of one, were also present in the assemblage.

Table 46: Results of analysis of invertebrate sample from R26/497 Area I

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1042	521	94.38	
Knobbed whelk		20	20	3.62	
Arabic volute		3	3	0.54	
Ringed dosinia		5	3	0.54	
Pale tiger shell		2	2	0.36	
Cake urchin		1	1	0.18	0.02
Paua	1		1	0.18	
Triangle shell		1	1	0.18	
Non-diagnostic shell					1357
Total		**1074**	**552**	**100**	

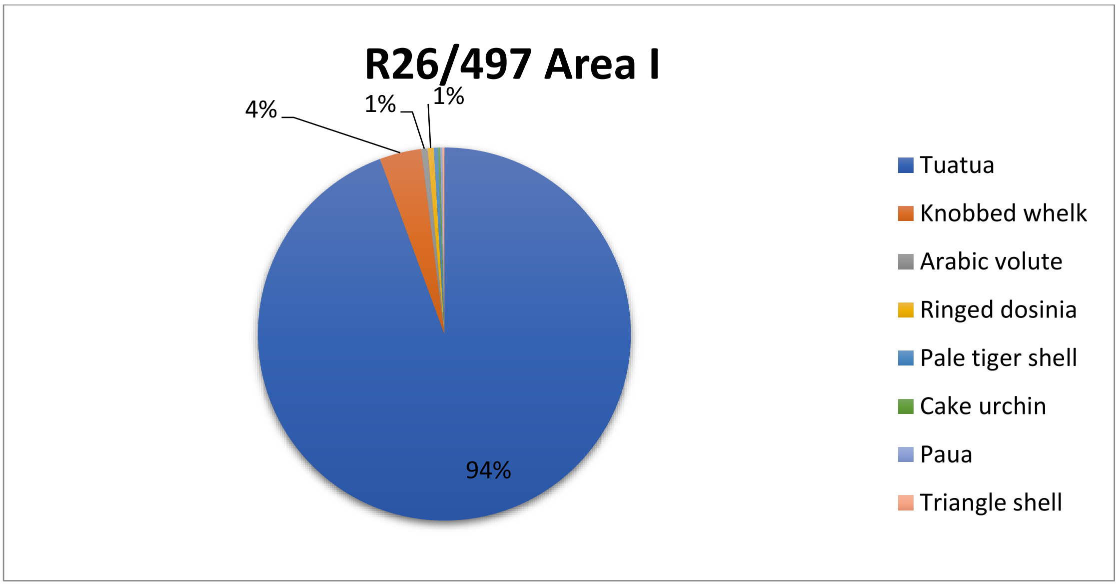


Figure 33: Relative abundance of invertebrate species (MNI) from R26/497 Area I

Table 47: Results of analysis of vertebrate sample from R26/497 Area I

Class	Species	NISP	MNE	MNI
Fish	Kahawai	1	1	1
	Snapper	128	52	6
	Wrasse sp.	5	2	1
	Unidentified	5618		
	Total	**5752**	**57**	**8**
Bird	Parakeet	14	14	5
	Red crowned parakeet	13	12	3
	North Island Saddleback	1	1	1
	Tui	10	10	2
	Unidentified	99	7	
	Total	**137**	**44**	**11**
Mammal	Rat	2	2	1
	Total	**2**	**2**	**1**

The sample from Area J was very small, yielding a total MNI for shellfish of only 57, with three species identified. Two snapper and a tarakihi (*Nemadactylus macropterus*) were also identified within the assemblage. Results of the analysis are shown in Tables 48 and 49, and Figure 34.

Table 48: Results of analysis of invertebrate sample from R26/497 Area J

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		102	51	89.47	
Ringed dosinia		7	4	7.02	
Knobbed whelk		2	2	3.51	
Non-diagnostic shell					72
Total		**111**	**57**	**100**	

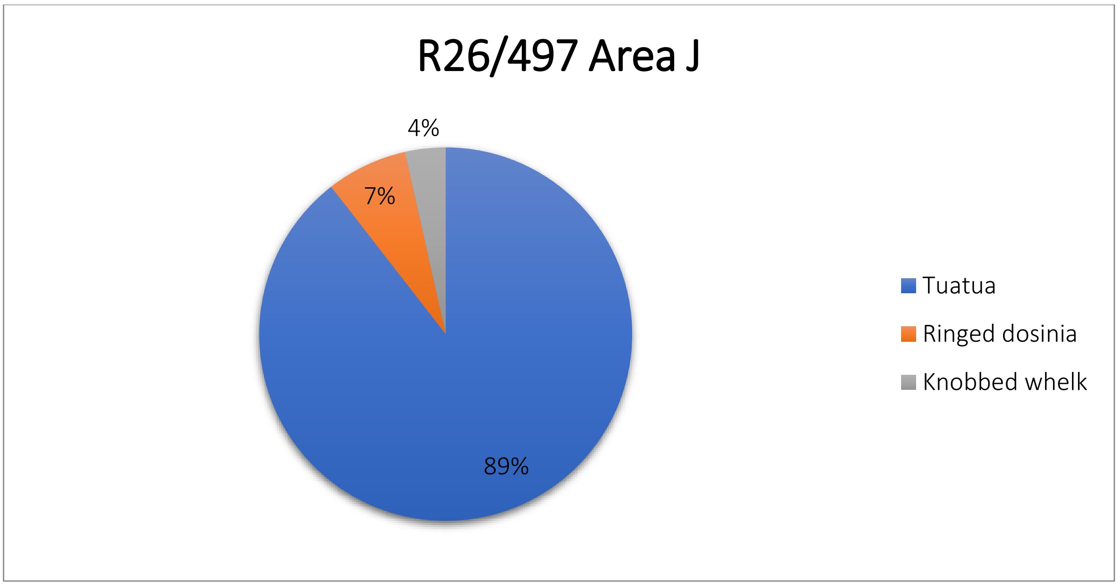


Figure 34: Relative abundance of invertebrate species (MNI) from R26/497 Area J

Table 49: Results of analysis of vertebrate sample from R26/Area J

Class	Species	NISP	MNE	MNI
Fish	Snapper	15	7	2
	Tarakihi	1	1	1
	Unidentified	179		
	Total	**195**	**8**	**3**

R26/507

Sample size: 27.5 litres

The faunal sample from R26/507 showed a high level of diversity, with 16 species of shellfish, four species of fish, rat, and a small amount of unidentified bird bone. Results are shown in Tables 50 and 51, and Figure 35.

The shellfish assemblage is dominated by ringed dosinia, which make up 46% of the total MNI for shellfish. Tuatua contribute a further 29%. This site is notable for the high proportion of knobbed whelk; much higher than in any other site within the project footprint. While empty shells of this species can often be seen washed up on the beach, large numbers of live specimens would likely only have been available for collection following rough seas or strong currents. The presence of a high proportion of ringed dosinia, and a lesser, though still comparatively high, proportion of triangle shell support this. The assemblage also contains five species of rocky shore shellfish (limpet/*Cellana* sp., mussel, paua, Cook's turban, and spotted top shell/*Melagraphia aethiops*), albeit in low numbers, indicating exploitation of this environment in addition to the sandy shore.

Wrasse, leatherjacket (*Parika scaber*), tarakihi, and eel were all identified within the vertebrate assemblage, each with an MNI of one. The eel could unfortunately not be identified below the level of Order (Anguilliformes), due to the similarity of the element upon which identification was based (ceratohyal) across species, so it is not known whether this was a freshwater or marine species. Exploitation of the rocky shore environment, most likely around Kapiti Island, is further supported by the presence of leatherjacket, which prefers rocky or weedy areas near shore.

Table 50: Results of analysis of invertebrate sample from R26/507

Species	NISP	MNE	MNI	% MNI	Weight (g)
Ringed dosinia		594	297	46.26	
Tuatua		371	186	28.97	
Knobbed whelk		90	90	14.02	
Triangle shell		89	45	7.01	
Helmet shell		6	6	0.93	
Pale tiger shell		4	4	0.62	
Trough shell		3	2	0.31	
Olive shell		2	2	0.31	
Limpet sp.		2	2	0.31	
Arabic volute		1	1	0.16	
Angled wedge shell		1	1	0.16	
Mussel sp.		2	1	0.16	
Paua	1		1	0.16	
Pale tiger shell		1	1	0.16	
Cook's turban	1		1	0.16	
Spotted top shell	2		1	0.16	
Cake urchin	1		1	0.16	1.03
Non-diagnostic shell					3139
Total		**1166**	**642**	**100**	

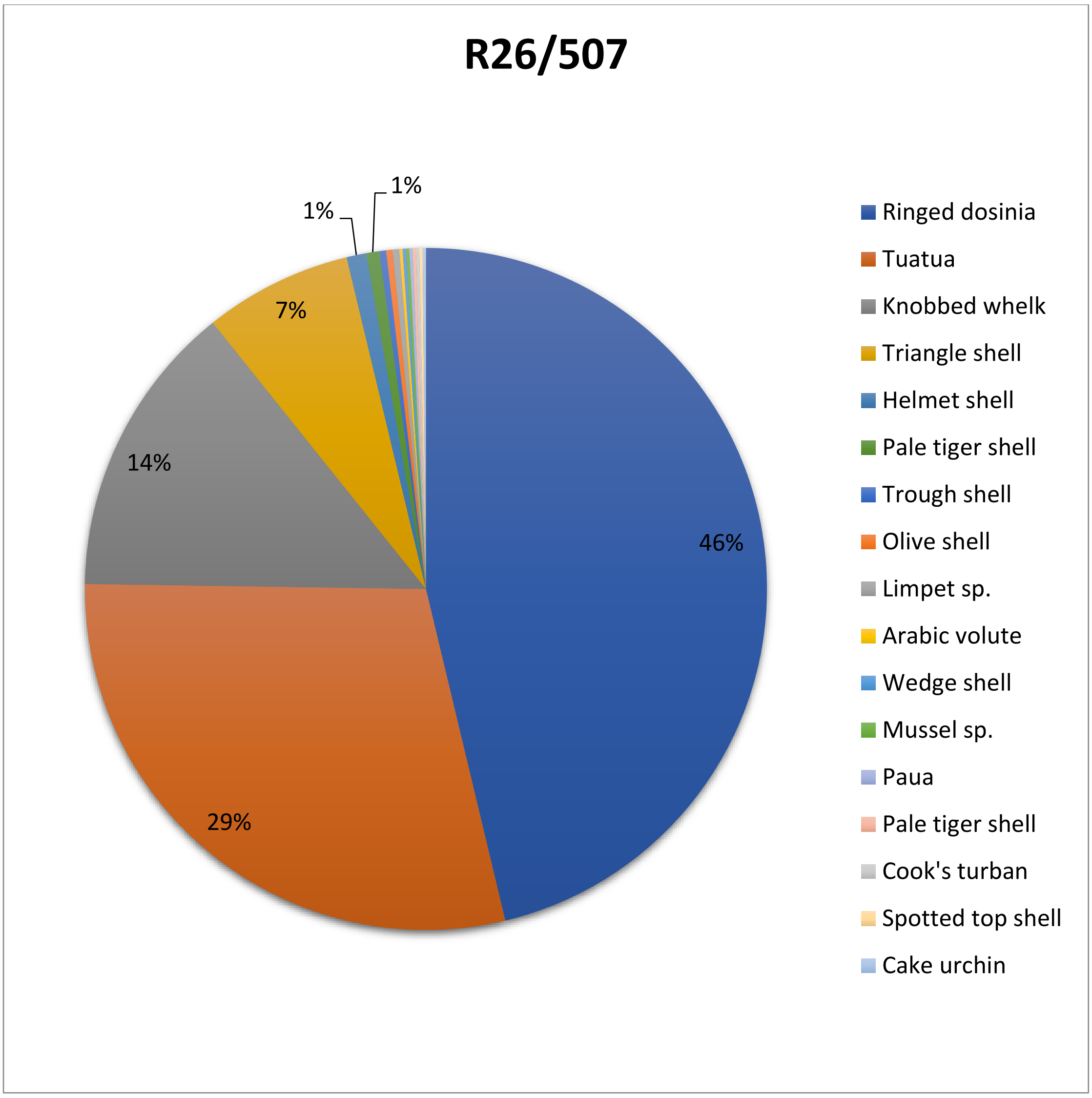


Figure 35: Relative abundance of invertebrate species (MNI) from R26/507

Table 51: Results of analysis of vertebrate sample from R26/507

Class	Species	NISP	MNE	MNI
Fish	Eel sp.	1	1	1
	Leatherjacket	2	1	1
	Tarakihi	1	1	1
	Wrasse sp.	3	3	1
	Unidentified	247		
	Total	**254**	**6**	**4**
Bird	Unidentified	11		

	Total	**11**		
Mammal	Rat	3	3	1
	Total	**3**	**3**	**1**

R26/508

Sample size: Area A = 25 litres

Area B = 12 litres

Area C = 25 litres

Area D = 6 litres

Area E = 4 litres

Area A of R26/508 revealed a relatively diverse assemblage, with 11 species of shellfish, including both soft shore and rocky shore species, as well as two species of fish, 2-3 species of bird, and rat. Tuatua account for 49% of the shellfish assemblage. Most of the remainder consisted of sub-tidal species. Rocky shore species, although present, make up less than 0.5% of the assemblage. Results of the shell analysis are shown in Table 52 and Figure 36. As with several other midden deposits in this vicinity, this assemblage suggests harvesting following an event that resulted in larger than normal amounts of sub-tidal shellfish washing up on the beach.

Analysis of the vertebrate assemblage resulted in the identification of two species of fish, barracouta and wrasse, each with an MNI of one. A small amount of bird bone was also identified, with parakeets and tui both present. The assemblage also contained a surprisingly high number of rats, with five individuals represented. Results are shown in Table 53.

Table 52: Results of analysis of invertebrate sample from R26/508 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		811	406	48.86	
Ringed dosinia		661	331	39.83	
Knobbed whelk		45	45	5.42	
Triangle shell		54	27	3.25	

Helmet shell	8	8	0.96	
Arabic volute	5	5	0.60	
Ostrich foot	3	3	0.36	
Paua	2	2	0.24	
Pale tiger shell	2	2	0.24	
Cake urchin	9	1	0.12	48.77
Cat's eye	1	1	0.12	
Non-diagnostic shell				1267
Total	**1601**	**831**		

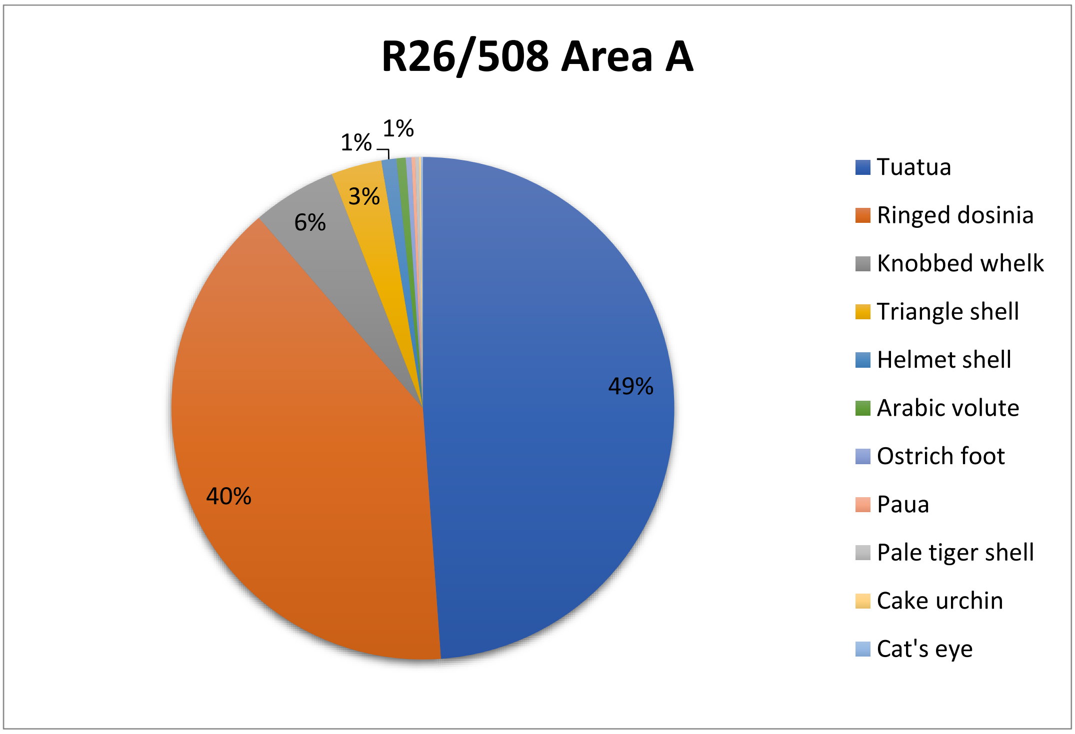


Figure 36: Relative abundance of invertebrate species (MNI) from R26/508 Area A

Table 53: Results of analysis of vertebrate sample from R26/508 Area A

Class	Species	NISP	MNE	MNI
Fish	Barracouta	1		1
	Wrasse sp.	1	1	1
	Unidentified	309		

	Total	**311**	**1**	**2**
Bird	Parakeet	2	2	1
	Red crowned parakeet	2	2	1
	Tui	2	2	1
	Unidentified	15		
	Total	**21**	**6**	**3**
Mammal	Rat	14	14	5
	Total	**14**	**14**	**5**

The Area B sample for this site is dominated by ringed dosinia, representing almost 68% of the total MNI for shellfish. Tuatua contribute a further 27% of the assemblage, with seven other sandy shore species making up the remainder. A small amount of fish bone was also recovered in the sample, with barracouta and snapper identified to species. Results of the analyses are shown in Tables 54 and 55, and Figure 37.

Table 54: Results of analysis of invertebrate sample from R26/508 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Ringed dosinia		615	308	67.84	
Tuatua		241	121	26.65	
Knobbed whelk		10	10	2.20	
Triangle shell		18	9	1.98	
Helmet shell		2	2	0.44	
Pale tiger shell		1	1	0.22	
Arabic volute		1	1	0.22	
Angled wedge shell		1	1	0.22	
Cake urchin			1	0.22	2.12
Non-diagnostic shell					2689
Total		**889**	**454**	**100**	

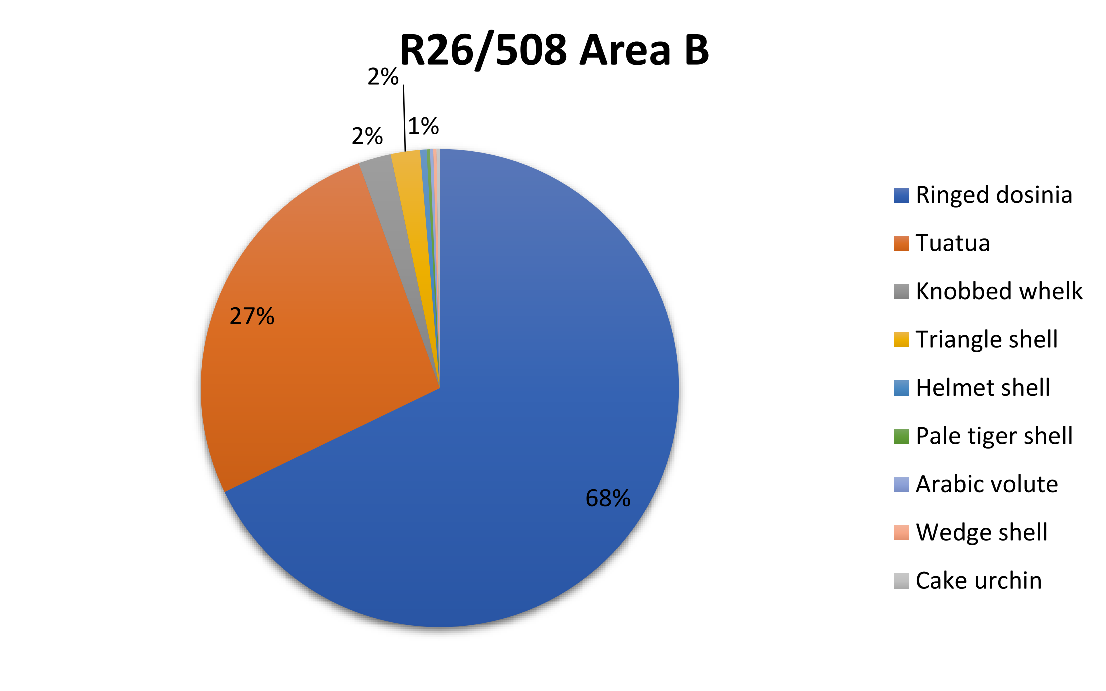


Figure 37: Relative abundance of invertebrate species (MNI) from R26/508 Area B

Table 55: Results of analysis of vertebrate sample from R26/508 Area B

Class	Species	NISP	MNE	MNI
Fish	Barracouta	1	1	1
	Snapper	2	1	1
	Unidentified	26		
	Total	**29**	**2**	**2**

Area C again shows a very strong sub-tidal influence in the shellfish assemblage. Ten species are represented, with ringed dosinia dominating (Table 56, Figure 38). Eight of the 10 species come from the open surf beach. A small amount of rocky shore shell was also present, with two species, paua and spotted top shell identified.

Four fish were identified to taxon, each with an MNI of one (Table 57). The elasmobranchii and eel remains could not be identified to species level. The bird bone assemblage yielded positive identifications for grey duck (*Anas gibberifrons*) and weka, and a small, unidentified phalange suggests the presence of forest bird. A small number of rats were also present.

Table 56: Results of analysis of invertebrate sample from R26/508 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Ringed dosinia		780	390	48.93	
Tuatua		560	280	35.13	
Triangle shell		165	83	10.41	
Knobbed whelk		35	35	4.39	
Paua		3	3	0.38	
Helmet shell		2	2	0.25	
Arabic volute		1	1	0.13	
Pale tiger shell	2		1	0.13	
Spotted top shell	2		1	0.13	
Cake urchin			1	0.13	5.74
Non-diagnostic shell					1718
Total		**1546**	**797**	**100**	

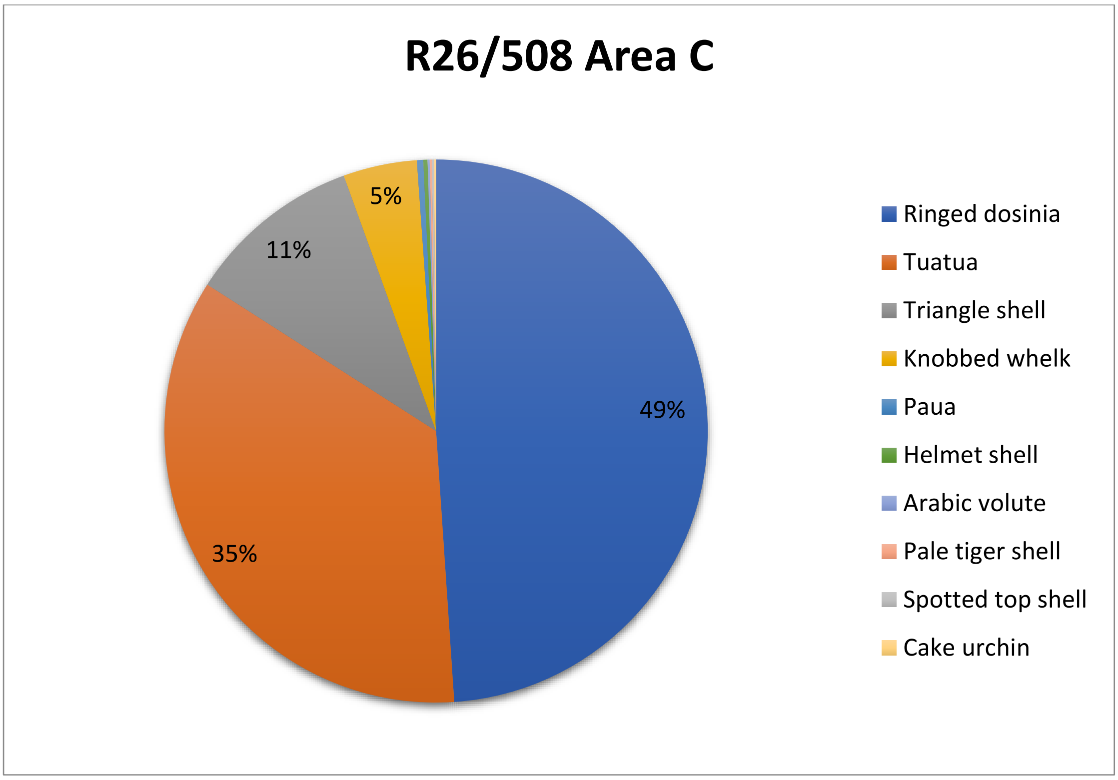


Figure 38: Relative abundance of invertebrate species (MNI) from R26/508 Area C

Table 57: Results of analysis of vertebrate sample from R26/508 Area C

Class	Species	NISP	MNE	MNI
Fish	Barracouta	2	2	1
	Eel	1	1	1
	Elasmobranchii	7	5	1
	Kahawai	2	2	1
	Unidentified	371		
	Total	**383**	**10**	**4**
Bird	cf Grey Duck	1	1	1
	cf Weka	1	1	1
	Unidentified	14	3	
	Total	**16**	**5**	**2**
Mammal	Rat	24	23	3
	Total	**24**	**23**	**3**

In contrast to the other areas of the site, the sample from Area D is dominated by tuatua, though sub-tidal species still make up a significant proportion of the shellfish assemblage (Table 58, Figure 39). The species diversity within the shellfish assemblage is also lower than in other areas of the site. This may be a product of the much smaller sample size, but may also represent harvesting following a minor event causing sub-tidal shellfish to wash up.

The vertebrate component of the sample contained a relatively high number of fish in comparison to sample size, with five species represented, each with an MNI of one (Table 59). Both open water and rocky shore species are present, suggesting a varied fishing strategy.

Table 58: Results of analysis of invertebrate sample from R26/508 Area D

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		237	114	82.01	
Ringed dosinia		37	14	10.07	
Knobbed whelk		7	7	5.04	
Helmet shell		2	2	1.44	

Triangle shell	2	1	0.72	
Cake urchin		1	0.72	0.04
Non-diagnostic shell				492
Total	**285**	**139**		

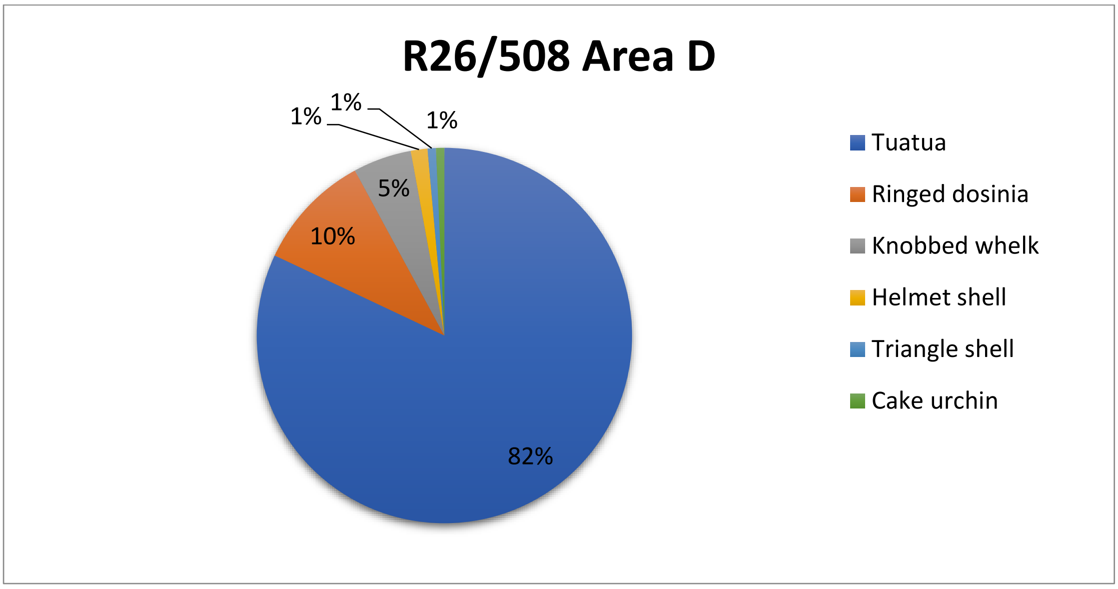


Figure 39: Relative abundance of invertebrate species (MNI) from R26/508 Area D

Table 59: Results of analysis of vertebrate sample from R26/508 Area D

Class	Species	NISP	MNE	MNI
Fish	Barracouta	1	1	1
	Blue cod	2	2	1
	Greenbone	1	1	1
	Mackerel sp.	1	1	1
	Wrasse sp.	2	2	1
	Unidentified	285		
	Total	**292**	**7**	**5**

The shellfish assemblage from Area E is broadly similar to that of Area D in composition (Table 60, Figure 40), with tuatua being the dominant shellfish but an almost 20% contribution from sub-tidal species. One species of fish, one of bird, and a rat bone were identified from the vertebrate assemblage (Table 61).

Table 60: Results of analysis of invertebrate sample from R26/508 Area E

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		385	193	80.75	
Ringed dosinia		42	21	8.79	
Knobbed whelk		12	12	5.02	
Trough shell		16	8	3.35	
Triangle shell		7	4	1.67	
Cake urchin			1	0.42	0.33
Non-diagnostic shell					402
Total		**462**	**239**		

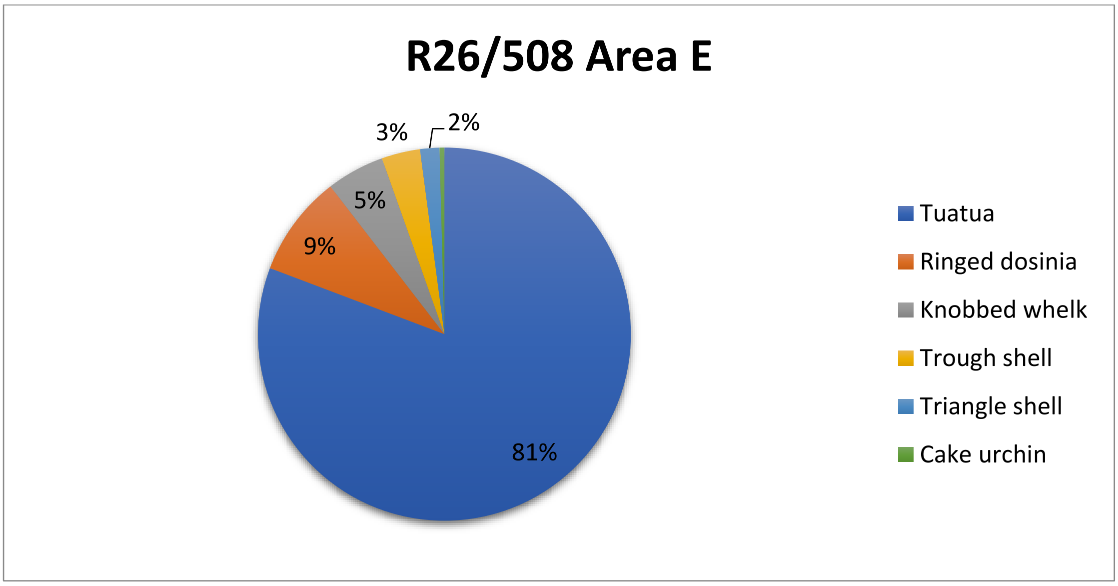


Figure 40: Relative abundance of invertebrate species (MNI) from R26/508 Area E

Table 61: Results of analysis of vertebrate sample from R26/508 Area E

Class	Species	NISP	MNE	MNI
Fish	Tarakihi	1	1	1
	Unidentified	74		
	Total	**75**	**1**	**1**
Bird	Red crowned parakeet	2	1	1
	Unidentified	3		
	Total	**5**	**1**	**1**
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

R26/628

Sample size: Unknown

Tuatua dominate the shellfish assemblage from R26/628 at 82.5%, with lesser amounts of ringed dosinia, knobbed whelk and triangle shell. The remaining six species contribute only 1% of the total MNI combined. The sample contained a columella from a Cook's turban, as well as very small flakes of shiny shell material that may have come from this species, suggesting some exploitation of a rocky shore environment. A small amount of fish bone and fragmented mammal bone was also present. Most of this could not be identified to taxon, however one vertebra was assigned to the class elasmobranchii. Results are shown in Tables 62 and 63, and Figure 41.

Table 62: Results of analysis of invertebrate sample from R26/628

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1236	618	82.51	
Ringed dosinia		181	91	12.15	
Knobbed whelk		20	20	2.67	
Triangle shell		24	12	1.60	
Arabic volute		3	3	0.40	
Cake urchin			1	0.13	9

Trough shell		2	1	0.13	
Pale tiger shell		1	1	0.13	
Cook's Turban		1	1	0.13	
Pale tiger shell	1		1	0.13	
Non-diagnostic shell					2285
Total		**1468**	**749**	**100**	

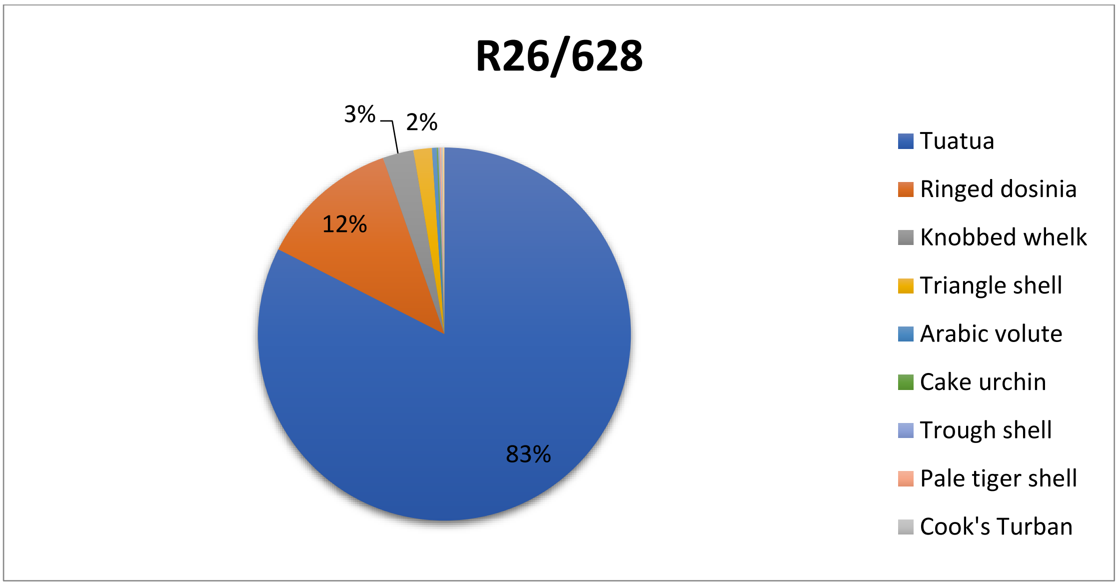


Figure 41: Relative abundance of invertebrate species (MNI) from R26/628

Table 63: Results of analysis of vertebrate sample from R26/628

Class	Species	NISP	MNE	MNI
Fish	Elasmobranchii	1	1	1
	Unidentified	54		
	Total	**55**	**1**	**1**
Mammal	Unidentified	6		
	Total	**6**		

R26/691

Sample size: 2.5 litres

Only three species of shellfish were present in this sample, with nearly equal amounts of triangle shell and tuatua, and a single ringed dosinia. The tuatua in this sample were very large, with most being in the range of 7-8 cm in size. Although not formally identified to species, these are likely southern tuatua (*Paphies donacina*), which grows to a larger size than northern tuatua. Although both species of tuatua can be found in the same bed, and are both able to be harvested at low tide, larger specimens of southern tuatua may be more abundant at greater depths. The combination of this along with the high percentage of triangle shell may indicate harvesting following an event that resulted in more sub-tidal shellfish washing ashore, however the small sample size must be taken into account. Results are shown in Table 64 and Figure 42.

Table 64: Results of analysis of invertebrate sample from R26/691

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		75	38	51.35	
Tuatua		70	35	47.30	
Ringed dosinia		2	1	1.35	
Non-diagnostic shell					180
Total		**147**	**74**	**100**	

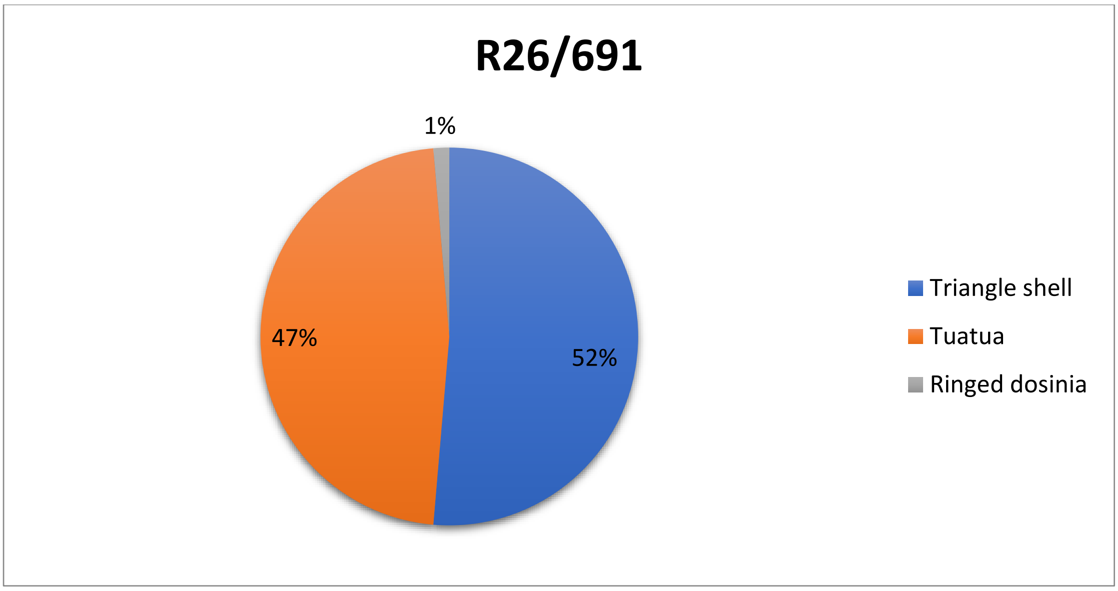


Figure 42: Relative abundance of invertebrate species (MNI) from R26/691

R26/554

Sample size: 3.2 litres

The shellfish assemblage from R26/554 was heavily dominated by tuatua, accounting for over 98% of the total shell by MNI. The remaining five species occur only in small numbers. Most of these are surf clams, though three fragments of paua shell and an unidentified gastropod were also present (Table 65, Figure 43). The sample also contained a small amount of fish bone, none of which could be identified to species, and a single rat bone (Table 66).

Table 65: Results of analysis of invertebrate sample from R26/554

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1112	556	98.41	
Ringed dosinia		7	4	0.71	
Triangle shell		4	2	0.35	
Trough shell		1	1	0.18	
Paua	3		1	0.18	
Gastropod sp.		1	1	0.18	
Non-diagnostic shell					344

Total	**1125**	**565**	**100**

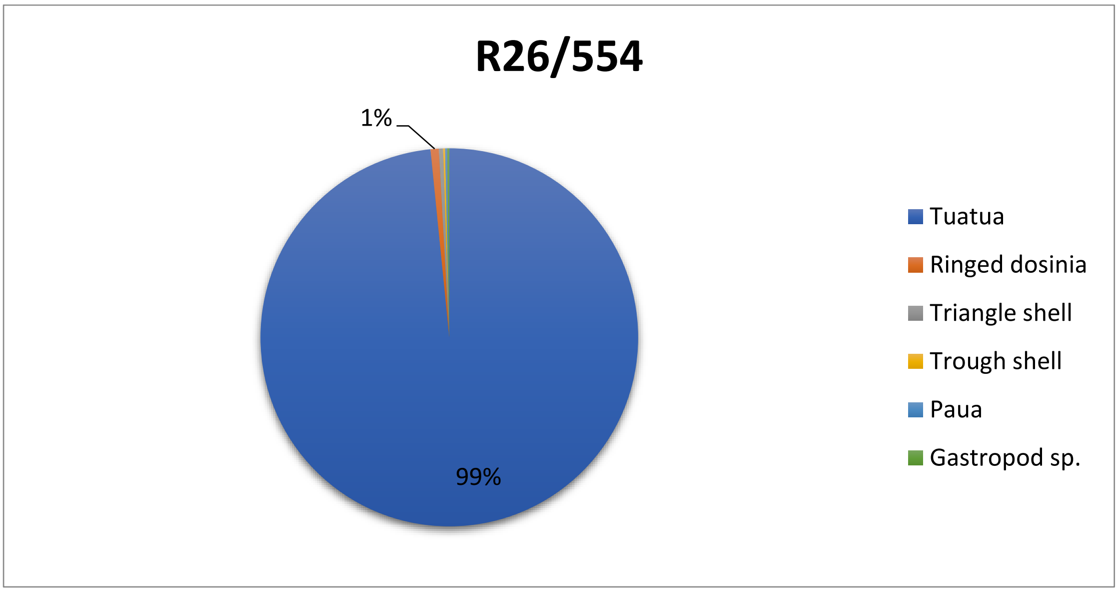


Figure 43: Relative abundance of invertebrate species (MNI) from R26/554

Table 66: Results of analysis of vertebrate sample from R26/554

Class	Species	NISP	MNE	MNI
Fish	Unidentified	47		
	Total	**47**		
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

R26/692

Sample size: 8.5 litres

Four species of shellfish were identified from the sample for R26/692. Tuatua dominate (91%), with pipi contributing just over 8%. A fragment of tuangi cockle (*Austrovenus stuchburyi*) was also identified, which in conjunction with the pipi indicates some exploitation of an estuarine environment, most likely the nearby Waikanae Estuary. Both the tuatua and the pipi in this sample were small in size.

Results of the shell analysis are shown in Table 67 and Figure 44. A small amount of fish bone (NISP 5) was also recovered (Table 68). Only a tail spine from a snapper could be identified to species, however the presence of another species is indicated by an unidentified premaxilla. Also present was the tibia of a sheep (*Ovis aries*). A clay pipe stem was also recovered from this site, suggesting a post-European occupation.

Table 67: Results of analysis of invertebrate sample from R26/692

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		674	337	91.08	
Pipi		61	31	8.38	
Triangle shell		2	1	0.27	
Tuangi cockle	1		1	0.27	
Non-diagnostic shell					308
Total		**737**	**370**	**100**	

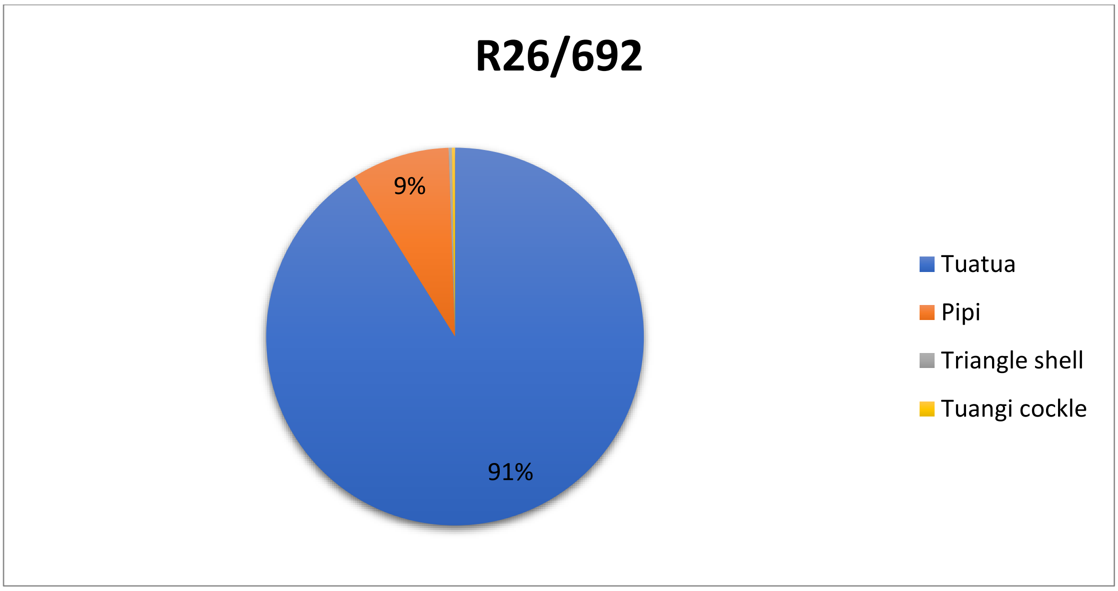


Figure 44: Relative abundance of invertebrate species (MNI) from R26/692

Table 68: Results of analysis of vertebrate sample from R26/692

Class	Species	NISP	MNE	MNI
Fish	Snapper	1	1	1
	Unidentified	4		
	Total	**5**	**1**	**1**
Mammal	Sheep	1	1	1
Total		**1**	**1**	**1**

R26/561

Sample size: 4 litres

The faunal sample from R26/561 contained seven species of shellfish. The majority of the assemblage is comprised of Tuatua (93%), with only a few individuals of the other species being present (Table 69, Figure 45). A small amount of mud snail and a fragment of Cook's turban may indicate some small-scale exploitation of estuarine and rocky shore environments, however the vast majority of the identified shellfish indicate primary exploitation of the open surf beach.

Small amounts of both fish and bird bone were also present in the sample. Three fish species – snapper, tarakihi and wrasse - each with an MNI of one, were identified. The bird bone assemblage consisted entirely of unidentified fragments. Results of the vertebrate analysis are shown in Table 70.

Table 69: Results of analysis of invertebrate sample from R26/561

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		316	158	92.94	
Ringed dosinia		11	6	3.53	
Mud snail		2	2	1.18	
Cook's Turban	1		1	0.59	
Gastropod sp.		1	1	0.59	
Helmet shell		1	1	0.59	
Cake urchin			1	0.59	0.05

Non-diagnostic shell				525
Total	**331**	**170**	**100**	

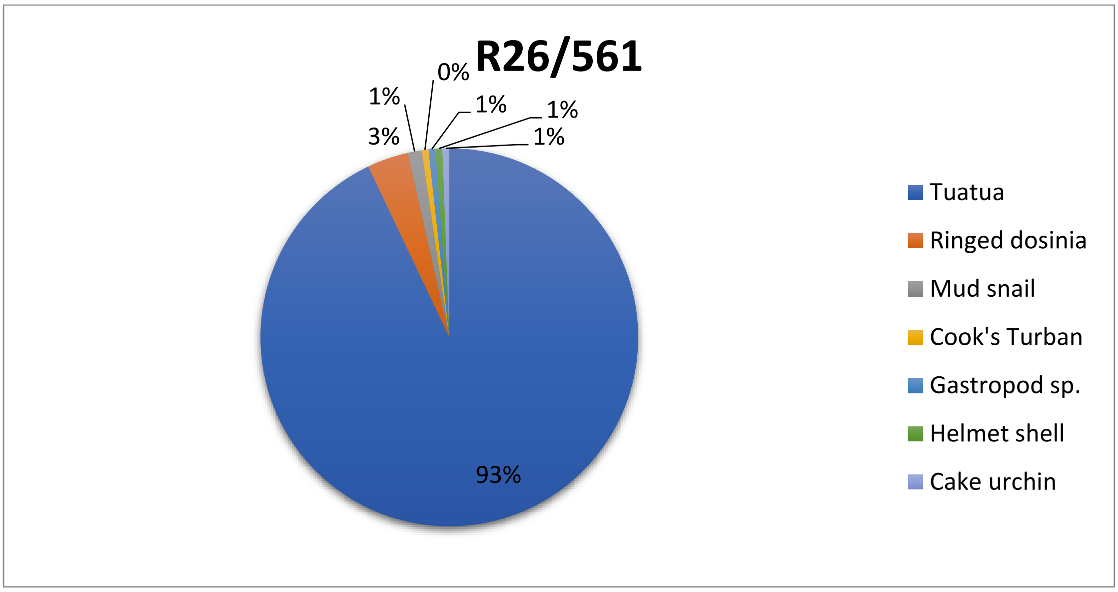


Figure 45: Relative abundance of invertebrate species (MNI) from R26/561

Table 70: Results of analysis of vertebrate sample from R26/561

Class	Species	NISP	MNE	MNI
Fish	Snapper	2	2	1
	Tarakihi	1	1	1
	Wrasse	1	1	1
	Unidentified	73		
	Total	**77**	**4**	**3**
Bird	Unidentified	19		
	Total	**19**		

R26/564

Sample size: 3 litres

The sample from this site consisted almost entirely of tuatua (over 99%), with a small amount of cake urchin test and a single marine mussel valve fragment being the only other invertebrates present. Although generally associated with rocky shore environments, marine mussel shells are occasionally seen washed up on the sandy beaches of the Kapiti Coast, so its presence in the assemblage is not necessarily indicative of rocky shore exploitation. The tuatua shell was in very good condition, with the majority of the assemblage consisting of whole or mostly whole shells. Also notable was the small size of the tuatua, with most falling into the 3-5 cm range. It is possible that the small size of the tuatua reflects harvesting on a neap tide, though further research is required to substantiate this. A small amount of fish bone was also recovered, with snapper the only identified species. Results are shown in Tables 71 and 72, and Figure 46.

Table 71: Results of analysis of invertebrate sample from R26/564

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1015	508	99.61	
Cake urchin			1	0.20	0.05
Mussel sp.		1	1	0.20	
Non-diagnostic shell					295
Total		**1014**	**510**	**100**	

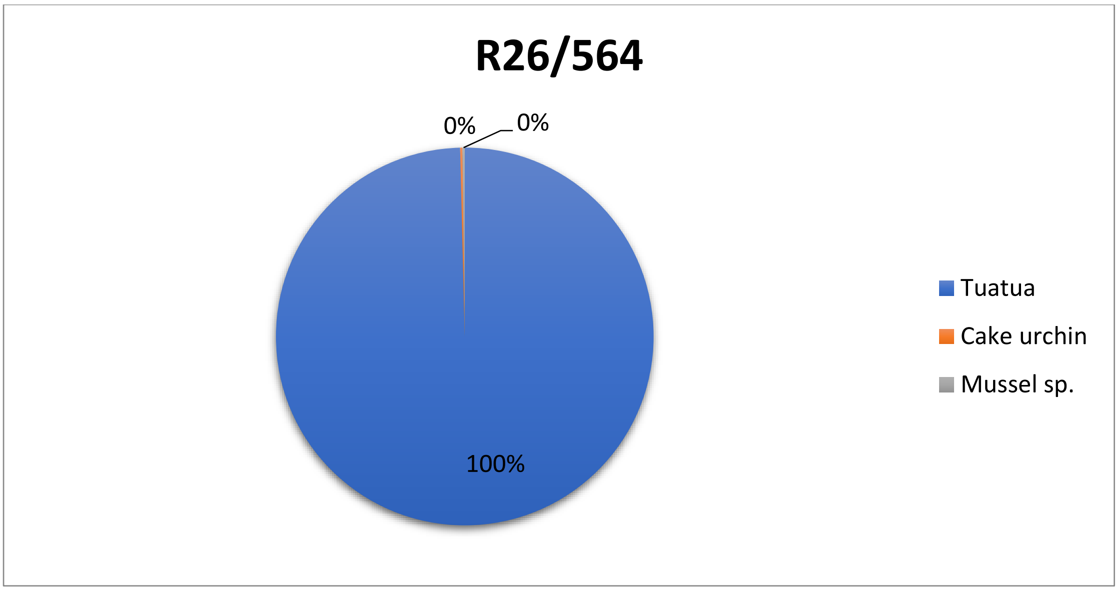


Figure 46: Relative abundance of invertebrate species (MNI) from R26/564

Table 72: Results of analysis of vertebrate sample from R26/564

Class	Species	NISP	MNE	MNI
Fish	Snapper	1	1	1
	Unidentified	25		
	Total	**26**	**1**	**1**

R26/566

Sample size: 7.3 litres

The faunal sample from R26/566 showed considerable diversity in both the invertebrate and vertebrate assemblages. Nine species of invertebrates, including cake urchin and crab, were identified. Of particular note are the relatively higher proportions of some of these in comparison to other sites within the project footprint. Tuatua comprised just under 62% of the assemblage, with the remainder made up of sub-tidal species. A large number of cake urchin peristomial teeth were recovered from the sample, providing an MNI for this species of 17. Results are shown in Table 73 and Figure 47.

Analysis of the vertebrate assemblage identified eight species of fish, with a total MNI of 11, two species of bird, and a rat (Table 74). The range of fish species suggests a strategy that encompassed both rocky shore and open sea environments, and it is likely a range of techniques were employed. The bird bone assemblage included identifiable elements from a fluttering shearwater (*Puffinus gavia*) and a saddleback, along with a small amount of unidentified bone. The shearwater may reflect the opportunistic collection of an injured or weakened seabird, with the shellfish assemblage supporting a hypothesis of harvesting following a storm event.

Table 73: Results of analysis of invertebrate sample from R26/566

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		515	258	61.87	
Ringed dosinia		215	108	25.90	
Cake urchin		164	17	4.08	209.42
Helmet shell		13	13	3.12	
Triangle shell		25	13	3.12	
Knobbed whelk		5	5	1.20	
Crab sp.		1	1	0.24	
Pale tiger shell	1	1	1	0.24	
Trough shell		2	1	0.24	
Non-diagnostic shell					406
Total		**941**	**417**	**100**	

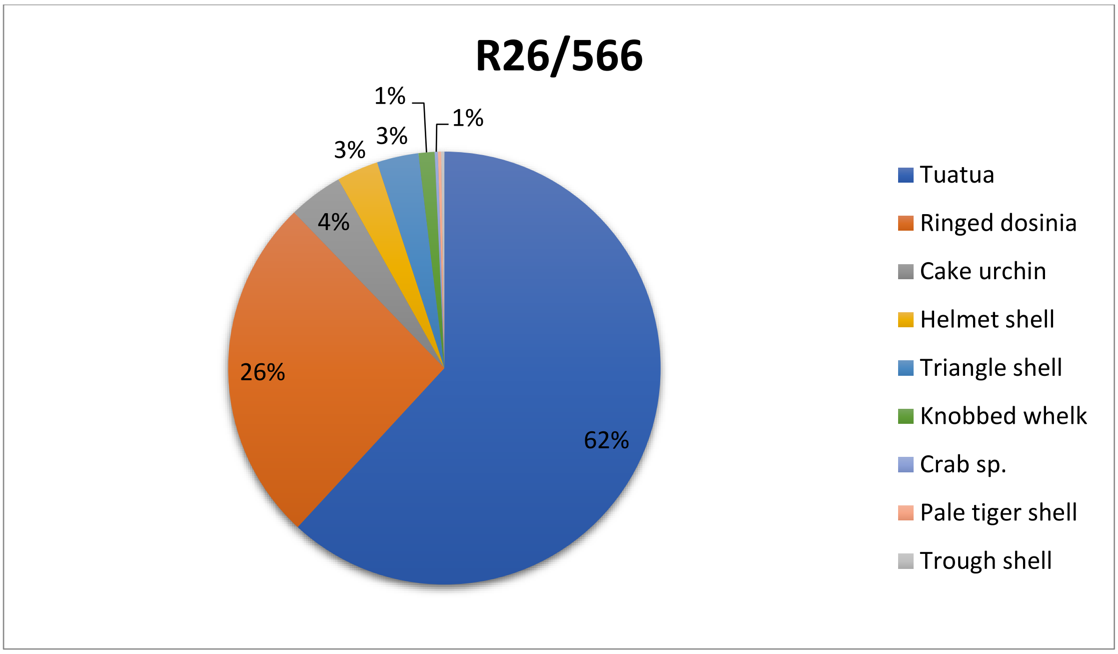


Figure 47: Relative abundance of invertebrate species (MNI) from R26/566

Table 74: Results of analysis of vertebrate sample from R26/566

Class	Species	NISP	MNE	MNI
Fish	Barracouta	1	1	1
	Blue cod	12	12	2
	Elasmobranchii	2	2	1
	Greenbone	1	1	1
	Kahawai	3	3	1
	Leatherjacket	9	7	3
	Marblefish	1	1	1
	Wrasse	4	4	1
	Unidentified	1096		
	Total	**1129**	**31**	**11**
Bird	Fluttering shearwater	1	1	1
	North Island Saddleback	1	1	1
	Unidentified	6		
	Total	**8**	**2**	**2**
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

R26/572

Sample size: 9 litres

Tuatua dominate the invertebrate assemblage for R26/572, making up 92% of the total MNI (Table 75, Figure 48). Ringed dosinia contribute a further 6.5%. The low diversity within the assemblage, and the relative abundance of tuatua, likely reflects harvesting in relatively stable sea conditions. A small amount of fish bone was also recovered. Species present were barracouta, blue cod, and wrasse, each with an MNI of one (Table 76).

Table 75: Results of analysis of invertebrate sample from R26/572

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1037	519	92.02	
Ringed dosinia		74	37	6.56	
Triangle shell		7	4	0.71	
Knobbed whelk		4	3	0.53	
Cake urchin			1	0.18	0.38
Non-diagnostic shell					1948
Total		**1122**	**564**	**100**	

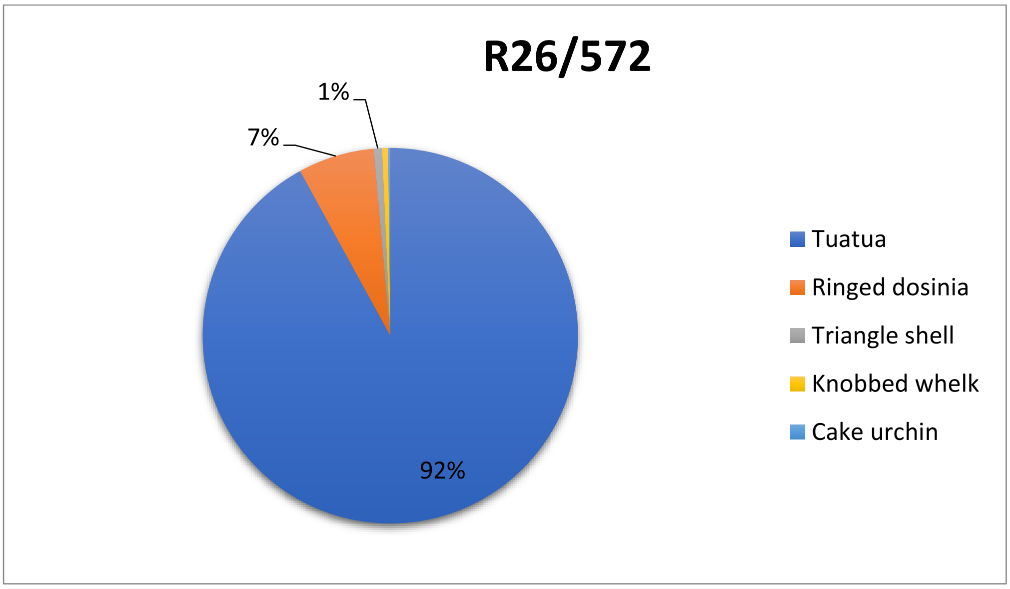


Figure 48: Relative abundance of invertebrate species (MNI) from R26/572

Table 76: Results of analysis of vertebrate sample from R26/572

Class	Species	NISP	MNE	MNI
Fish	Barracouta	3	3	1
	Blue cod	1	1	1
	Wrasse sp.	1	1	1
	Unidentified	157		
	Total	**162**	**5**	**3**

R26/651

Sample size: 11 litres

The faunal sample for R26/651 contained eight species of invertebrates, three species of fish, and a small amount (NISP 2) of unidentified bird bone, likely from forest species based on size. Triangle shell comprised 52% of the assemblage, with tuatua making up just over 37%, ringed dosinia 6%, and knobbed whelk 3.5%. Two fragments of paua shell were also recovered from this sample. The relative abundances of the species identified indicates a harvesting strategy concentrated on the open surf beach following a period of rough seas or strong currents, resulting in the availability of sub-tidal species. The presence of paua shell may indicate some small-scale exploitation of a rocky shore environment in addition to this. Results are shown in Table 77 and Figure 49. Identifiable fish included freshwater eel (*Anguilla sp.*), barracouta, and blue cod (Table 78), indicating both marine and freshwater fishing.

Table 77: Results of analysis of invertebrate sample from R26/651

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		644	322	52.27	
Tuatua		460	230	37.34	
Ringed dosinia		73	37	6.01	
Knobbed whelk		22	22	3.57	
Pale tiger shell		2	2	0.32	
Cake urchin		2	1	0.16	22.04

Paua	2		1	0.16	
Angled wedge shell		1	1	0.16	
Non-diagnostic shell					2116
Total		**1204**	**616**	**100**	

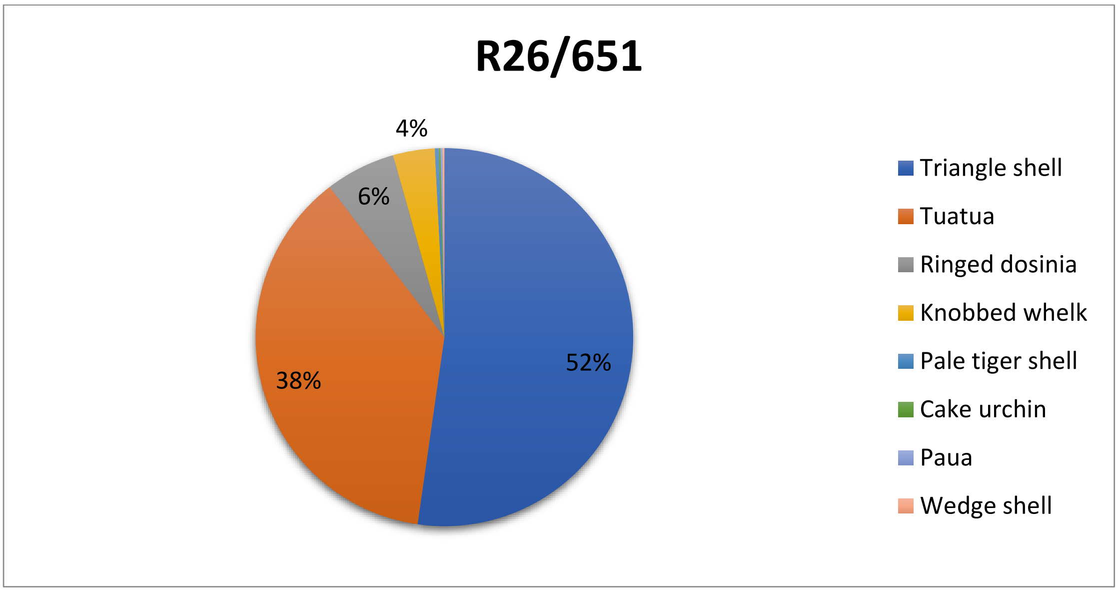


Figure 49: Relative abundance of invertebrate species (MNI) from R26/651

Table 78: Results of analysis of vertebrate sample from R26/651

Class	Species	NISP	MNE	MNI
Fish	Anguilla sp.	2	2	1
	Barracouta	1	1	1
	Blue cod	1	1	1
	Unidentified	418		
	Total	**422**	**4**	**3**
Bird	Unidentified	2	2	1
	Total	**2**	**2**	**1**

R26/567

Sample size: Area A = 9 litres

Area B = 13 litres

Samples were taken from two discrete midden deposits within this site. Although broadly similar in species composition, the rank order abundance and difference in some minor species suggests two separate harvesting events.

Tuatua dominate the invertebrate sample from Area A, comprising nearly 89% of the sample, with 5.6% ringed dosinia and nearly 3% knobbed whelk. A small number of pipi and tuangi cockle were also recovered. This suggests harvesting of shellfish from both an estuarine environment and the open beach, and at a time when slightly higher than normal amounts of sub-tidal species were available for collection. This does not necessarily reflect different harvesting times, as both estuarine and sandy shore species could have been collected in relatively close proximity to each other at the Waikanae river mouth. A small amount of fish bone, none of which could be identified to species, was also recovered from the Area A sample. Results of the analyses are shown in Tables 79 and 80, and Figure 50.

Table 79: Results of analysis of invertebrate sample from R26/567 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1491	746	88.92	
Ringed dosinia		93	47	5.60	
Knobbed whelk		23	23	2.74	
Pipi		18	9	1.07	
Triangle shell		14	7	0.83	
Tuangi cockle		7	4	0.48	
Cake urchin			1	0.12	0.4
Pale tiger shell		1	1	0.12	
Trough shell		1	1	0.12	
Non-diagnostic shell					1532
Total		**1648**	**839**	**100**	

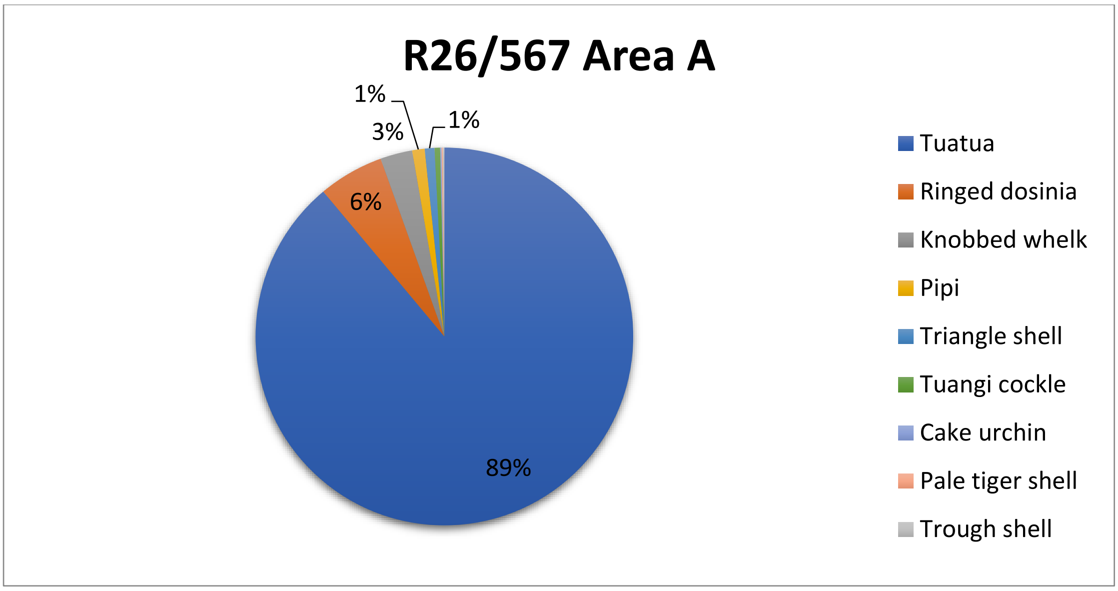


Figure 50: Relative abundance of invertebrate species (MNI) from R26/567 Area A

Table 80: Results of analysis of vertebrate sample from R26/567 Area A

Class	Species	NISP	MNE	MNI
Fish	Unidentified	8		
	Total	**8**		

In contrast to Area A, nearly 30% of the invertebrate assemblage is comprised of sub-tidal species, with nearly 26% of these being ringed dosinia (Table 81, Figure 51). The presence of paua, albeit a single specimen, may indicate some exploitation of a rocky shore environment. No estuarine species were recovered from this sample, however this may merely be a product of sampling bias. A small amount of fish bone was also present, with conger eel (*Conger* sp.), eagle ray (*Myliobtus tenuicaudatus*), and red cod identified to species, each with an MNI of one (Table 82). The presence of conger eel supports the hypothesis of some rocky shore exploitation by the occupants of this site.

Table 81: Results of analysis of invertebrate sample from R26/567 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1152	576	70.59	
Ringed dosinia		421	211	25.86	
Triangle shell		26	13	1.59	
Knobbed whelk		8	8	0.98	
Pale tiger shell		4	4	0.49	
Paua		1	1	0.12	
Arabic volute		1	1	0.12	
Trough shell		2	1	0.12	
Cake urchin			1	0.12	1.79
Non-diagnostic shell					3664
Total		**1615**	**816**	**100**	

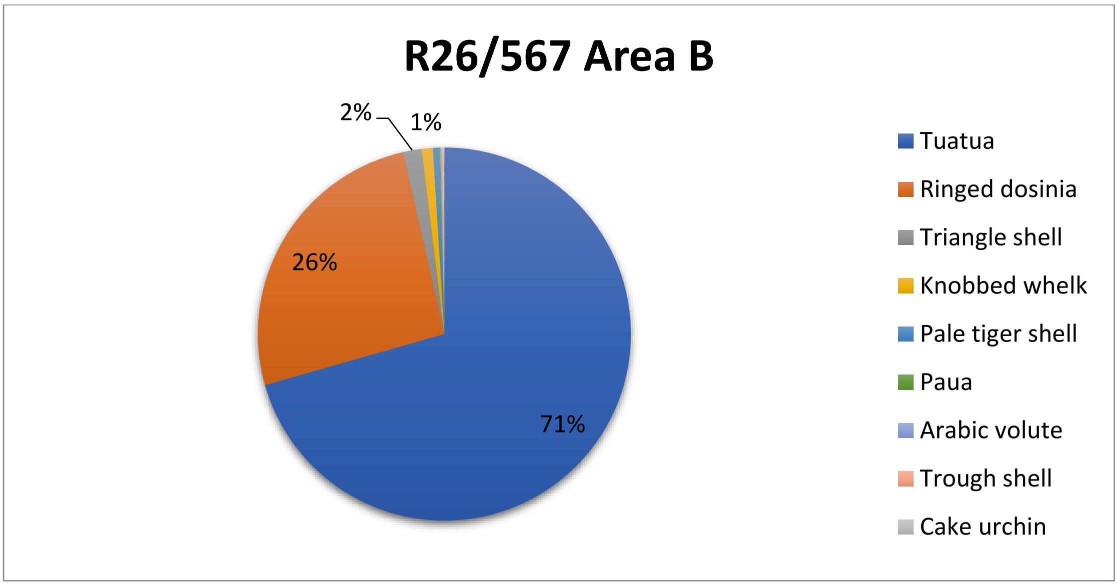


Figure 51: Relative abundance of invertebrate species (MNI) from R26/567 Area B

Table 82: Results of analysis of vertebrate sample from R26/567 Area B

Class	Species	NISP	MNE	MNI
Fish	*Conger* sp.	1	1	1

Eagle ray	1	1	1
Red cod	1	1	1
Unidentified	39		
Total	**42**	**3**	**3**

R26/659

Sample size: 9 litres

This site was uncovered during tree stump removal and exhibited a high degree of fragmentation, possibly owing to damage during stumping and/or its location within an area of former forestry. Eight species of shellfish and a small amount of cake urchin were identified, along with a small amount of unidentified fish bone (Tables 83 and 84, Figure 52). Tuatua make up 81% of the invertebrate assemblage, ringed dosinia nearly 8%, tuangi cockle 5.5%, and knobbed whelk 4.5%. The remaining five species combined contribute only just over 1% of the assemblage. Aside from the tuangi cockle (an estuarine species), all of these come from the open surf beach environment.

Table 83: Results of analysis of invertebrate sample from R26/659

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		939	470	81.03	
Ringed dosinia		90	45	7.76	
Tuangi cockle		64	32	5.52	
Knobbed whelk		26	26	4.48	
Triangle shell		3	2	0.34	
Arabic volute		2	2	0.34	
Toheroa		2	1	0.17	
Pale tiger shell	2		1	0.17	
Cake urchin			1	0.17	0.21
Non-diagnostic shell					4161
Total		**1126**	**580**	**100**	

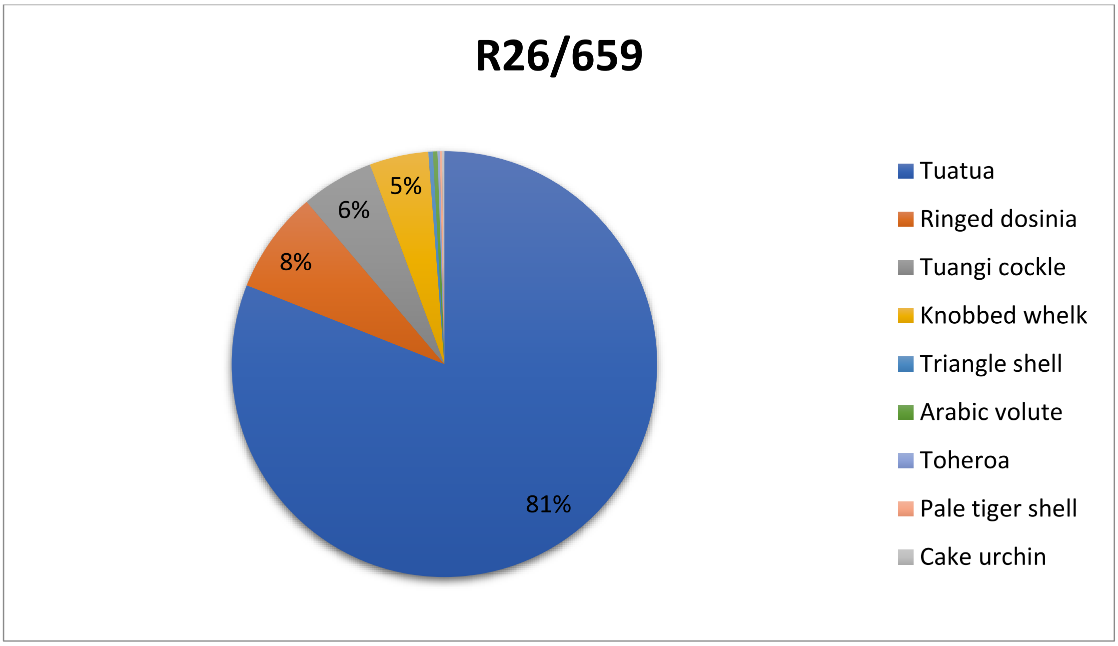


Figure 52: Relative abundance of invertebrate species (MNI) from R26/659

Table 84: Results of analysis of vertebrate sample from R26/659

Class	Species	NISP	MNE	MNI
Fish	Unidentified	18		
	Total	**18**		

R26/661

Sample size: Area A = 11 litres

Area A lower = 11 litres

Area B = 70 litres

Area C = 11 litres

R26/661 was a very large site, with considerable variation in species abundance between deposits. Samples were taken from four areas to reflect this variation.

Area A contained five species of shellfish, a small amount of cake urchin test, and a small amount of unidentified fish bone. Ringed dosinia dominate this assemblage, comprising 79% of the identified shellfish, while tuatua account for less than 17%. Results are shown in Tables 85 and 86, and Figure 53.

Table 85: Results of analysis of invertebrate sample from R26/661 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Ringed dosinia		705	353	79.15	
Tuatua		147	74	16.59	
Triangle shell		29	15	3.36	
Knobbed whelk		2	2	0.45	
Cake urchin			1	0.22	0.03
Trough shell		1	1	0.22	
Non-diagnostic shell					1993
Total		**884**	**446**	**100.00**	

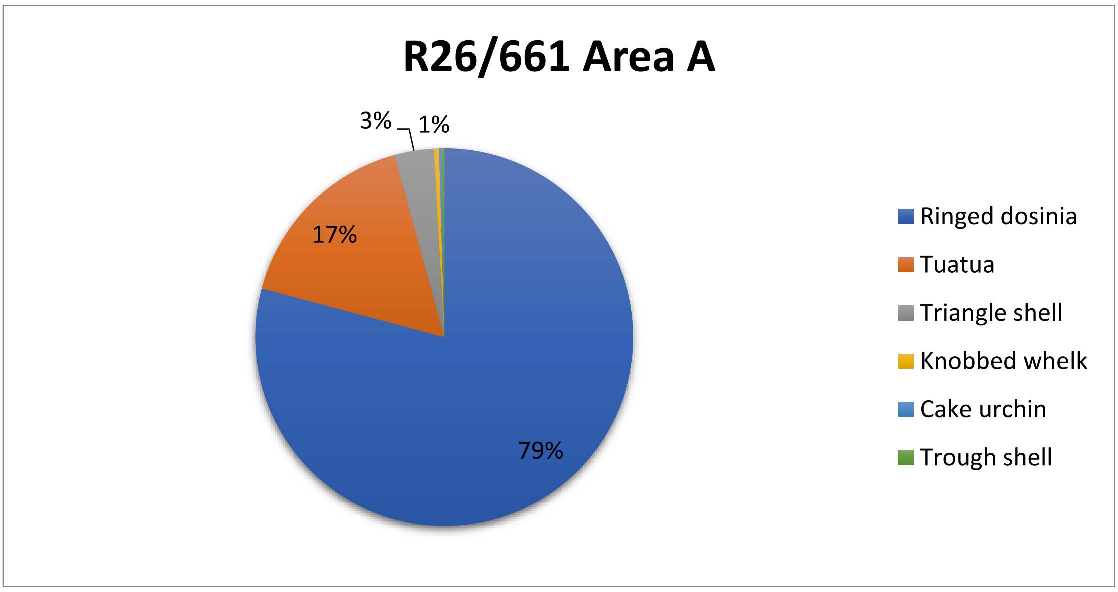


Figure 53: Relative abundance of invertebrate species (MNI) from R26/661 Area A

Table 86: Results of analysis of vertebrate sample from R26/661 Area A

Class	Species	NISP	MNE	MNI
Fish	Unidentified	12		

Total	**12**

A second sample from the Area A deposit was taken further downslope. Although broadly similar to the previous sample in terms of invertebrate species identified, there is a considerable difference in the rank order abundance, with triangle shell comprising nearly 59% of the identified shell, versus less than 4% in the upslope sample (Table 87, Figure 54). This may reflect harvesting of a different area along the beach, where triangle shells were more numerous than ringed dosinia due to the locations of different shell beds, or sea conditions affecting the two species at different times. This sample also contained considerably more vertebrate bone. Five species of fish were identified, each with an MNI of one. Two parakeets, at least one of which was a red-crowned parakeet, were also present (Table 88).

Table 87: Results of analysis of invertebrate sample from R26/661 Area A lower

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		768	384	58.72	
Tuatua		252	176	26.91	
Ringed dosinia		166	83	12.69	
Knobbed whelk		7	7	1.07	
Trough shell		2	2	0.31	
Cake urchin			1	0.15	4.28
Helmet shell		1	1	0.15	
Non-diagnostic shell					862
Total		**1196**	**654**	**100**	

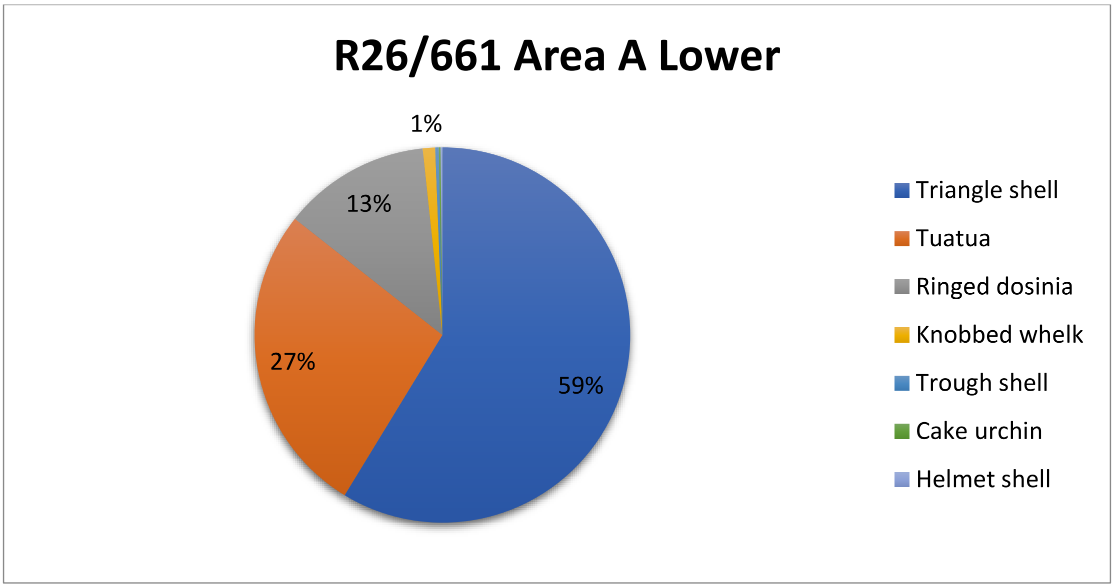


Figure 54: Relative abundance of invertebrate species (MNI) from R26/661 Area A lower

Table 88: Results of analysis of vertebrate sample from R26/661 Area A lower

Class	Species	NISP	MNE	MNI
Fish	Blue cod	1	1	1
	Kahawai	1	1	1
	NZ sole	1	1	1
	Red cod	3	3	1
	Snapper	1	1	1
	Unidentified	215		
	Total	**222**	**7**	**5**
Bird	Parakeet	1	1	1
	Red crowned parakeet	1	1	1
	Unidentified	6		
	Total	**8**	**2**	**2**

Area B of R26/661 has the greatest diversity of shellfish species of any site within the project, with 20 species represented, along with a small amount of cake urchin (Table 89, Figure 55). This is in part due to the large sample size. Nearly 96% of the assemblage is comprised of three surf clam species. The majority of these are ringed dosinia (52%), followed by tuatua (33%), and triangle shell (10%). Most of the remaining open beach species, although comprising a small percentage of the assemblage, would only have been available for collection in the numbers represented following a period of very rough seas and/or strong currents. This sample also yielded the greatest diversity of rocky shore shellfish, with seven species identified, though they account for less than 1.5% of the total assemblage combined. The majority of these have an MNI of only one, however a total of 32 limpets were recovered.

The vertebrate assemblage from this midden also shows considerable diversity, with 14 species of fish, 7-8 species of bird, rat, and dog (*Canis familiaris*) all represented (Table 90).

The fish bone assemblage was highly fragmented, with a total NISP of 3418. Of this, nearly half (NISP 1683) was unidentified fragments. Unidentified spines and rays, scales, and vertebra account for 44% of the assemblage combined. A further 79 bones could be identified to element, but not to species. This is a very high rate of unidentified material, with only 4.6% of the assemblage able to be identified to species. This high rate of fragmentation is fairly typical of Kapiti Coast small bone (fish and bird) assemblages, and suggests taphonomic processes are affecting these.

Fish species from open water, rocky shore, and freshwater habitats were all identified within the Area B assemblage, suggesting a varied fishing strategy, and a range of techniques. Fourteen species of fish were identified, with a total MNI of 22. Barracouta and red cod are the most common species, each with an MNI of 3, while kahawai, mackerel (*Trachurus* sp. - jack or horse mackerels), snapper, and wrasse each have an MNI of two. The remaining eight species each have an MNI of one. The presence of hoki (*Macuronus novaezelandiae*) is interesting. This is a deep-water species, and is rarely found in New Zealand archaeological sites.

Parakeets make up the majority of the identified birds in the assemblage, with a combined MNI of 7. Tui have an MNI of two, while the remaining six species each have an MNI of one. Most of the birds are forest species, with one seabird (sooty shearwater – *Ardenna grisea*) and one waterfowl (duck) also represented. Of note is the presence of stitchbird (hihi - *Notiomystis cincta*), which has been identified in only a few archaeological sites in New Zealand. This is also the only assemblage from the monitoring phase of the project in which dog was identified.

Table 89: Results of analysis of invertebrate sample from R26/661 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)

Ringed dosinia	3241	1621	52.04	
Tuatua	2079	1040	33.39	
Triangle shell	649	325	10.43	
Knobbed whelk	50	50	1.61	
Limpet sp.	32	32	1.03	
Arabic volute	10	10	0.32	
Helmet shell	7	7	0.22	
Trough shell	14	7	0.22	
Pale tiger shell	6	6	0.19	
Angled wedge shell	6	3	0.10	
Cake urchin	20	2	0.06	41.31
Toheroa	2	2	0.06	
Spotted top shell	2	2	0.06	
Brown olive shell	1	1	0.03	
Cook's turban	1	1	0.03	
Dark rock shell	1	1	0.03	
Fan shell	1	1	0.03	
Paua	1	1	0.03	
Silver paua	1	1	0.03	
Sunset shell	2	1	0.03	
Turret shell	1	1	0.03	
Non-diagnostic shell				5531
Total	**6127**	**3115**	**100**	

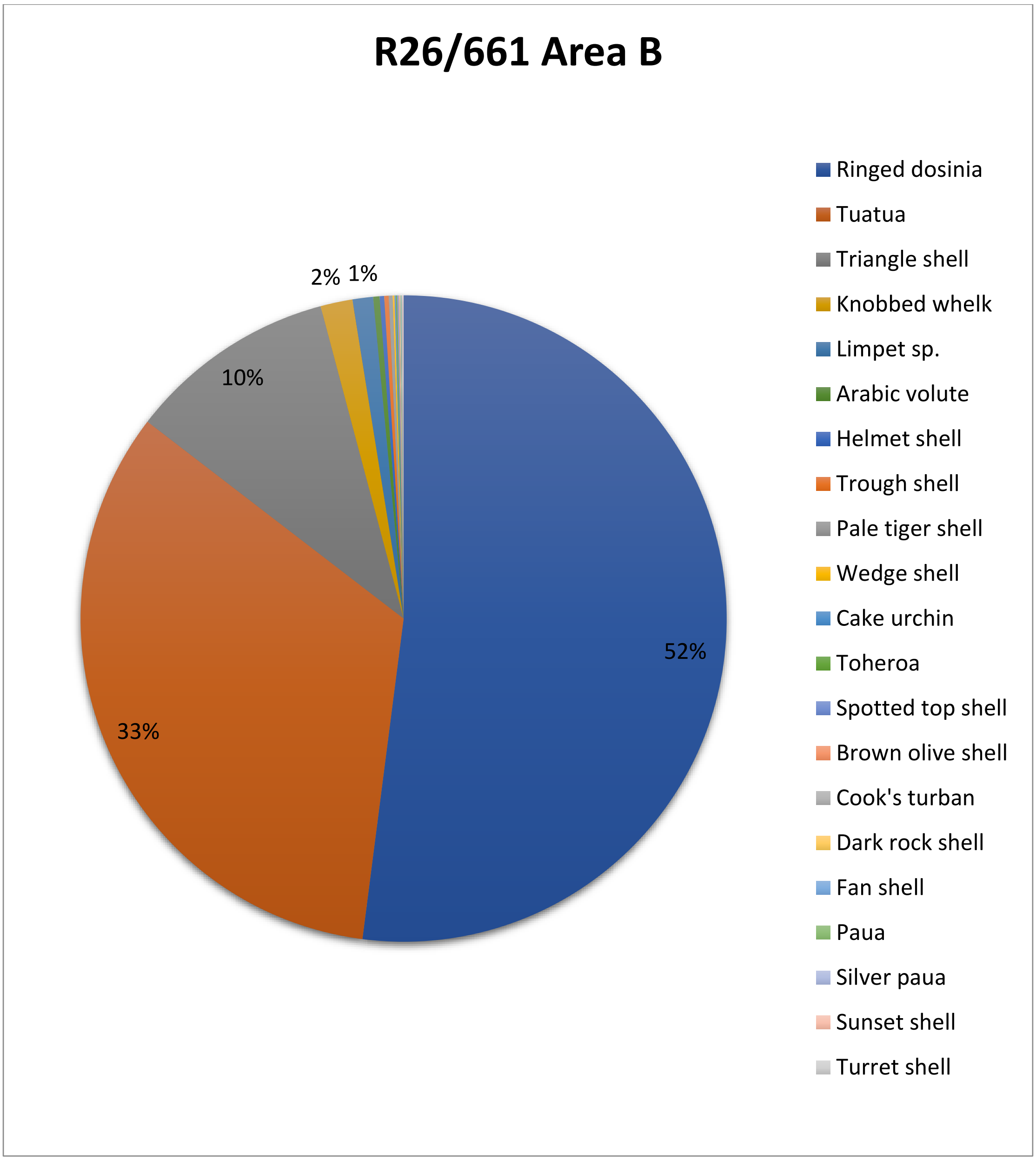


Figure 55: Relative abundance of invertebrate species (MNI) from R26/661 Area B

Table 90: Results of analysis of vertebrate sample from R26/661 Area B

Class	Species	NISP	MNE	MNI
Fish	Anguilla sp.	2	2	1
	Barracouta	19	12	3
	Blue cod	1	1	1
	Elasmobranchii	12	12	1
	Greenback flounder	1	1	1

	Hapuku	1	1	1
	Hoki	2	2	1
	Kahawai	4	4	2
	Mackerel sp.	25	13	2
	Red cod	34	34	3
	Snapper	39	10	2
	Tarakihi	1	1	1
	Trumpeter	1	1	1
	Wrasse sp.	15	15	2
	Unidentified	3261		
	Total	**3418**	**109**	**22**
Bird	Anatidae	1	1	1
	Parakeet	5	5	4
	Kaka	3	3	1
	Red crowned parakeet	20	20	3
	North Island Saddleback	3	3	1
	Sooty shearwater	3	3	1
	Stitchbird	4	3	1
	Tui	6	6	2
	Unidentified	40		
	Total	**85**	**44**	**14**
Mammal	Rat	28	27	6
	Dog	1	1	1
	Unidentified	25		
	Total	**54**	**28**	**7**

The sample from Area C contained only six species of shellfish, with 98% of the total MNI from just two of these. Ringed dosinia again dominate, comprising just under 65% of the assemblage. Five species of fish, each with an MNI of one, were also identified, along with small amounts of unidentified bird and mammal bone. Results are shown in Tables 91 and 92, and Figure 56.

Table 91: Results of analysis of invertebrate sample from R26/661 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Ringed dosinia		642	321	64.59	
Tuatua		331	166	33.40	
Triangle shell		12	6	1.21	
Arabic volute		2	2	0.40	
Knobbed whelk		1	1	0.20	
Paua	14		1	0.20	
Non-diagnostic shell					4218
Total		**988**	**497**	**100**	

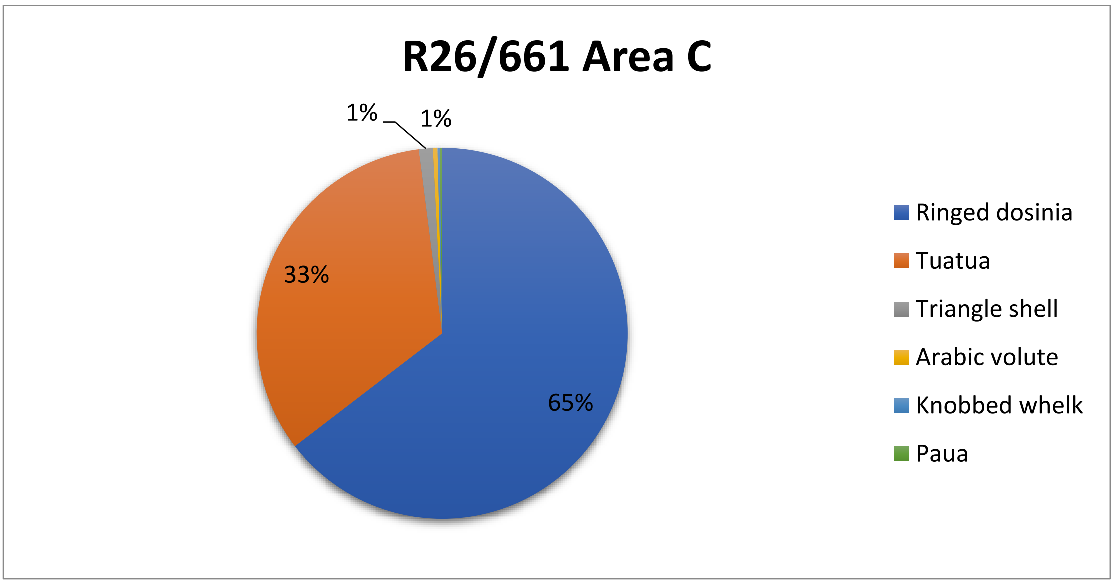


Figure 56: Relative abundance of invertebrate species (MNI) from R26/661 Area C

Table 92: Results of analysis of vertebrate sample from R26/661 Area C

Class	Species	NISP	MNE	MNI
Fish	Barracouta	2	2	1
	Mackerel sp.	2	2	1
	Red cod	1	1	1
	Snapper	132	2	1

	Tarakihi	2	2	1
	Unidentified	1392		
	Total	**1531**	**9**	**5**
Bird	Unidentified	14		
	Total	**14**		
Mammal	Unidentified	1		
	Total	**1**		

Machine trenching through each of the midden areas showed the high sub-tidal component in the shell assemblages to be consistent across the site. The total size of R26/661, and the high proportion of sub-tidal shellfish species in all areas, is highly indicative of occupation during a period of extremely unsettled sea conditions, though presumably interspersed with days calm enough to allow for fishing expeditions.

R26/657

Sample size: 20.6 litres

The faunal assemblage from R26/657 is made up of a number of samples from generally small midden deposits and a fire feature spread over an area of approximately 5m by 3m that did not seem to fit the usual pattern of a processing site. Several small pockets of midden, not analysed, were only a few centimetres each in diameter. Although initially analysed separately, the results for the individual deposits have been grouped together here to provide a more robust sample size and remove the skewing often inherent in very small samples. Much of the material was highly fragmented, as can be seen from the high weight of the non-diagnostic shell portion. This is likely the result of the shell having been subjected to high heat.

Six species of shellfish, along with one of echinoderm, and a small amount of unidentified fish bone was recovered from the site. Tuatua are the dominant shellfish, representing 67% of the total MNI. The remaining shell species are all from the sub-tidal surf beach habitat, indicating that they were likely harvested following an event causing rough seas or strong currents. Results are shown in Tables 93 and 94, and Figure 57.

Table 93: Results of analysis of invertebrate sample from R26/657

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		646	323	67.29	
Triangle shell		247	124	25.83	
Ringed dosinia		44	22	4.58	
Knobbed whelk		6	6	1.25	
Pale tiger shell		3	3	0.63	
Arabic volute		1	1	0.21	
Cake urchin			1	0.21	17.58
Non-diagnostic shell					6738
Total		**952**	**480**	**100**	

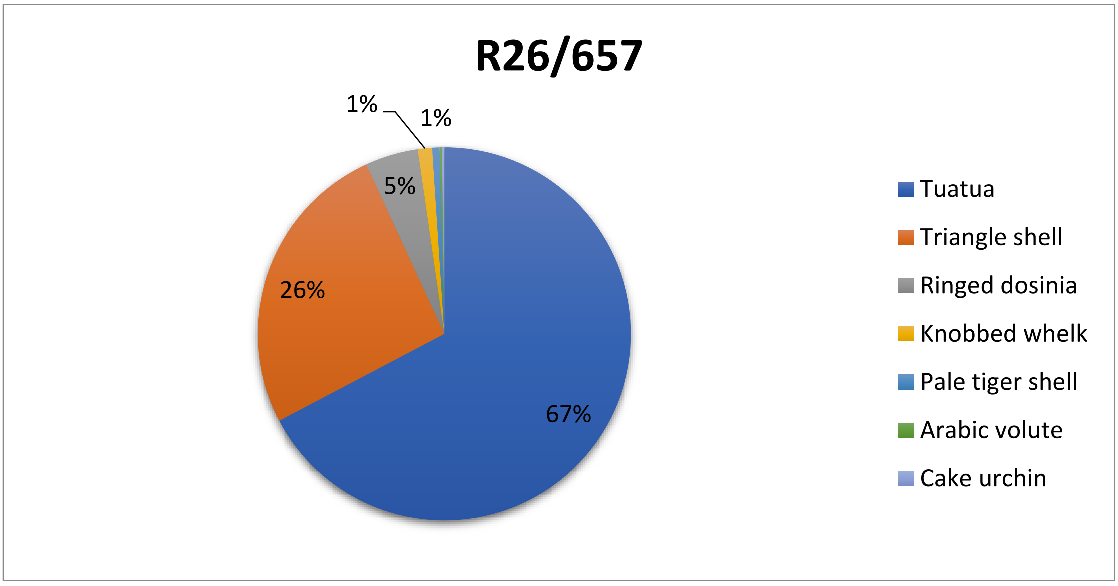


Figure 57: Relative abundance of invertebrate species (MNI) from R26/657

Table 94: Results of analysis of vertebrate sample from R26/657

Class	Species	NISP	MNE	MNI
Fish	Unidentified	100		
	Total	**100**		

R26/604

Sample size: Area A-1 = 9 litres

Area A-2 = 14 litres

Area A-3 = 10 litres

Area B = 11 litres

Samples were taken from three places along a 12 metre profile trench through Area A of this site. Although there was sparse shell and evidence of burning between the denser deposits of midden, the contents of each of these deposits was considered suitably different, possibly reflecting different harvesting events, to analyse each one separately for shellfish, though the vertebrate bone from all three deposits has been combined to ensure minimum numbers of individuals for these are not artificially inflated.

Tuatua were the dominant shell species in each of the samples from Area A, though to varying amounts, as can be seen in Tables 95-97 and Figure 58 to Figure 60. A total of 20 invertebrate species, 19 shellfish and one echinoderm, were identified from Area A. There is variability in the species present, and in relative abundance within each of the Area A deposits, with the A2 deposit (Table 96) showing the greatest diversity (16 species) and also the highest sub-tidal component (66% of the assemblage). This is also the only sample from the project from which a significant amount of trough shell was recovered. The samples are highly indicative of harvesting following unstable sea conditions. Although the same harvesting techniques were likely used in the collection of the soft shore shellfish, that is hand collection of washed up sub-tidal shellfish and digging for tuatua, the percentages of each species within each deposit illustrates the variability, either day to day or along the beach in relation to bed locations, of what was available for collection. The use of advanced techniques such as sclerochronology would be required to determine if the shellfish from each sample were collected in a single day or represent separate harvesting expeditions.

Six species of rocky shore shellfish were also identified within the Area A samples, including a number of whole silver paua (*Haliotis australis*). The majority of the rocky shore specimens were recovered from the A2 sample, with some fragmented Cook's turban also present in the A3 sample. In addition to this, a small amount of freshwater mussel was present in each sample, and a tuangi cockle was identified in the A1 sample, indicating the occupants of this site were exploiting a number of environments, albeit with an emphasis on collecting from the open surf beach.

Vertebrate remains from Area A also showed a relatively high diversity, with 10 species of fish, one of bird, rat, and a reptile (tuatara) represented (Table 98).

As with most of the other assemblages from the project, the fish bone was highly fragmented, and represents an MNI of only 12. Barracouta and red cod each have an MNI of two, while the remaining eight species each have an MNI of one. Like the assemblage from R26/661 B, the species present come from open sea, rocky shore and freshwater habitats, and would likely have been caught via a number of techniques including hook and line, trolling, and spearing or netting.

Table 95: Results of analysis of invertebrate sample from R26/604 Area A1

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		154	77	63.64	
Ringed dosinia		51	21	17.36	
Knobbed whelk		7	7	5.79	
Trough shell		11	6	4.96	
Triangle shell		7	4	3.31	
Arabic volute		2	2	1.65	
Freshwater mussel	3	1	1	0.83	
Helmet shell		1	1	0.83	
Tuangi cockle		1	1	0.83	
Cake urchin			1	0.83	0.2
Non-diagnostic shell					500
Total		**235**	**121**	**100**	

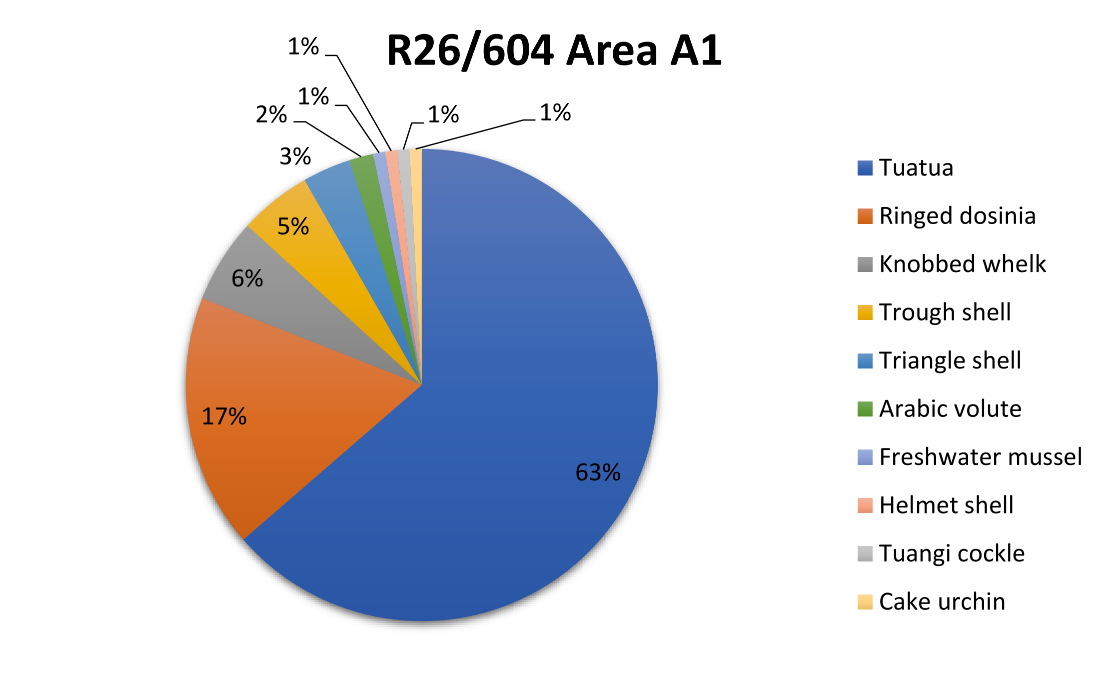


Figure 58: Relative abundance of invertebrate species (MNI) from R26/604 Area A1

Table 96: Results of analysis of invertebrate sample from R26/604 Area A2

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		347	174	32.77	
Trough shell		247	124	23.35	
Ringed dosinia		224	112	21.09	
Triangle shell		141	71	13.37	
Knobbed whelk		30	31	5.84	
Silver Paua		5	5	0.94	
Helmet shell	4	4	4	0.75	
Pale tiger shell	3	2	2	0.38	
Arabic volute		1	1	0.19	
Freshwater mussel	1	1	1	0.19	
Limpet sp.	1	1	1	0.19	
Ostrich foot		1	1	0.19	
Paua		1	1	0.19	
Spotted top shell		1	1	0.19	
Cat's eye		1	1	0.19	

Cake urchin			1	0.19	4.29
Non-diagnostic shell					2189
Total		**1007**	**531**	**100**	

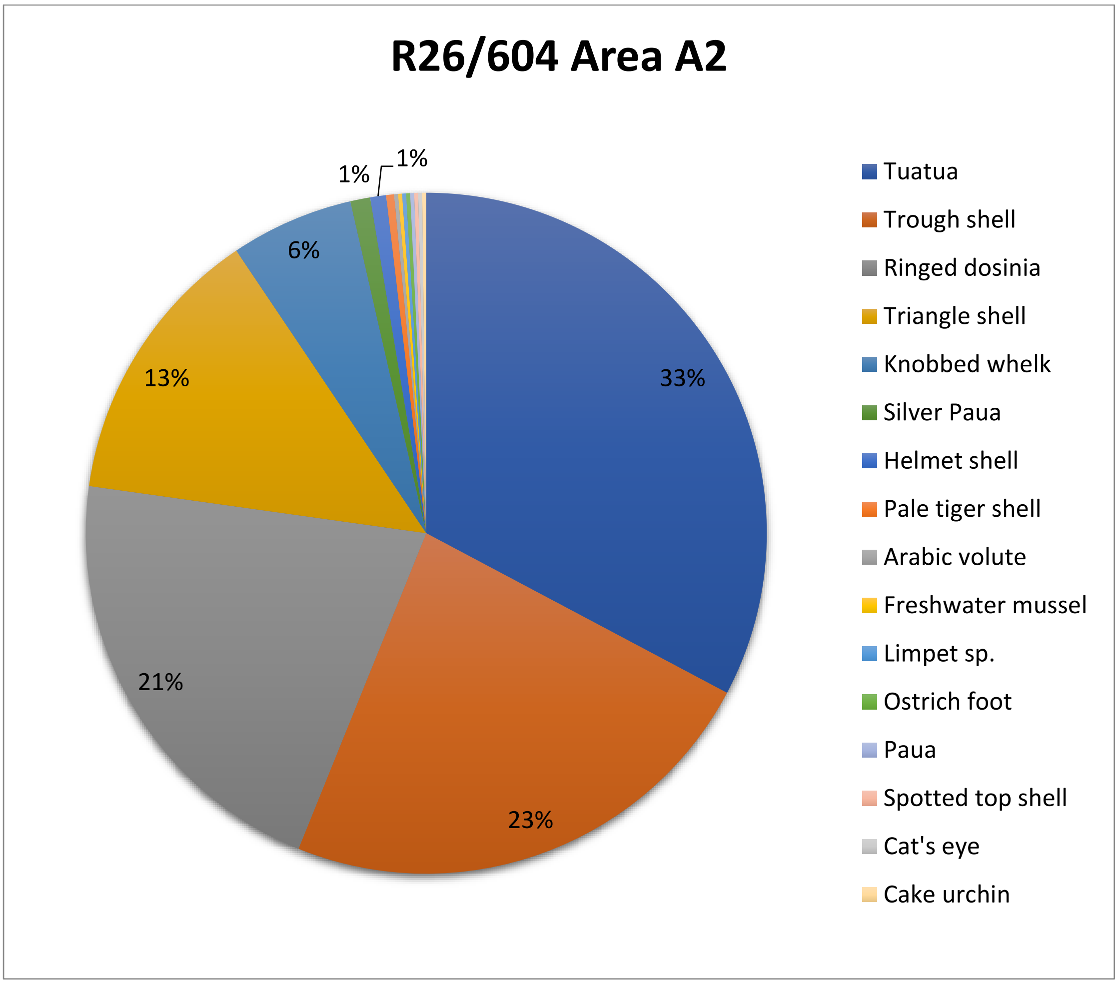


Figure 59: Relative abundance of invertebrate species (MNI) from R26/604 Area A2

Table 97: Results of analysis of invertebrate sample from R26/604 Area A3

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		716	358	78.17	
Ringed dosinia		165	83	18.12	
Triangle shell		10	5	1.09	
Knobbed whelk		3	3	0.66	

Arabic volute		1	1	0.22	
Angled wedge shell		1	1	0.22	
Cook's turban	8		1	0.22	
Freshwater mussel	2	1	1	0.22	
Pale tiger shell	3	1	1	0.22	
Spotted top shell	1	1	1	0.22	
Toheroa		1	1	0.22	
Tuangi cockle		1	1	0.22	
Cake urchin			1	0.22	4.91
Non-diagnostic shell					512
Total		**901**	**458**	**100**	

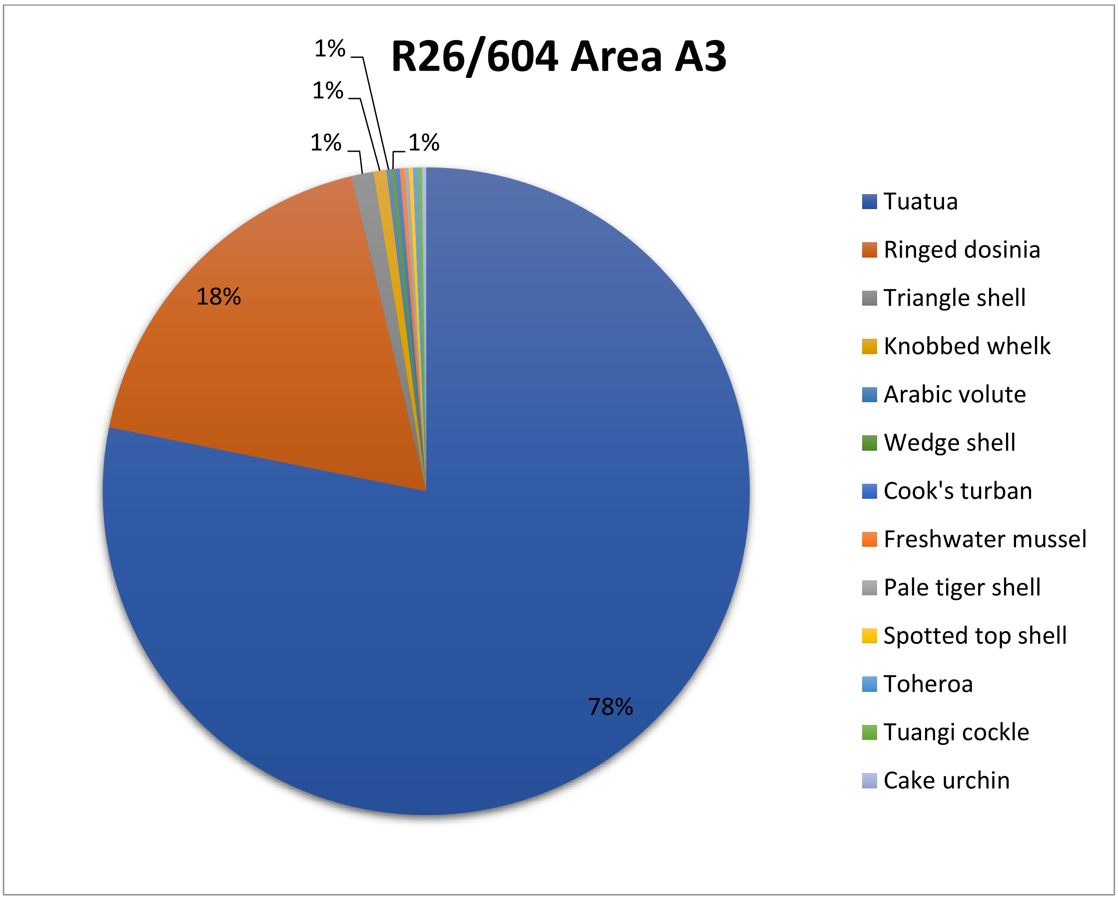


Figure 60: Relative abundance of invertebrate species (MNI) from R26/604 Area A3

Table 98: Results of analysis of vertebrate sample from R26/604 Area A

Class	Species	NISP	MNE	MNI
Fish	Anguilla sp.	1	1	1
	Barracouta	11	8	2
	Blue cod	3	3	1
	Blue moki	1	1	1
	Elasmobranchii	1	1	1
	Greenbone	1	1	1
	Mackerel sp.	2	2	1
	Red cod	3	3	2
	Snapper	1	1	1
	Wrasse sp.	5	4	1
	Unidentified	1707		
	Total	**1736**	**25**	**12**
Bird	Parakeet	1	1	1
	Unidentified	2		
	Total	**3**	**1**	**1**
Mammal	Rat	8	8	1
	Total	**8**	**8**	**8**
Reptile	Tuatara	2	2	1
	Total	**2**	**2**	**1**

The sample from the Area B deposit of R26/604 again shows a strong sub-tidal component, although in this case most of the shell species contribute less than 1% each of the total MNI, with ringed dosinia and tuatua making nearly 96% of the assemblage combined (Table 99 and Figure 61).

Analysis of the vertebrate assemblage from Area B identified four species of fish – three barracouta, and one each of blue cod, jack or horse mackerel, and wrasse – and a small number of rat bones (MNI 1). Results are shown in Table 100.

Table 99: Results of analysis of invertebrate sample from R26/604 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Ringed dosinia		336	168	52.17	
Tuatua		280	140	43.48	
Knobbed whelk		4	4	1.24	
Triangle shell		3	2	0.62	
Pale tiger shell		2	2	0.62	
Cake urchin		16	2	0.62	
Ostrich foot		1	1	0.31	
Oyster		2	1	0.31	
Spotted top shell	1		1	0.31	
Tuangi cockle	1		1	0.31	32.78
Non-diagnostic shell					1751
Total		**644**	**322**	**100**	

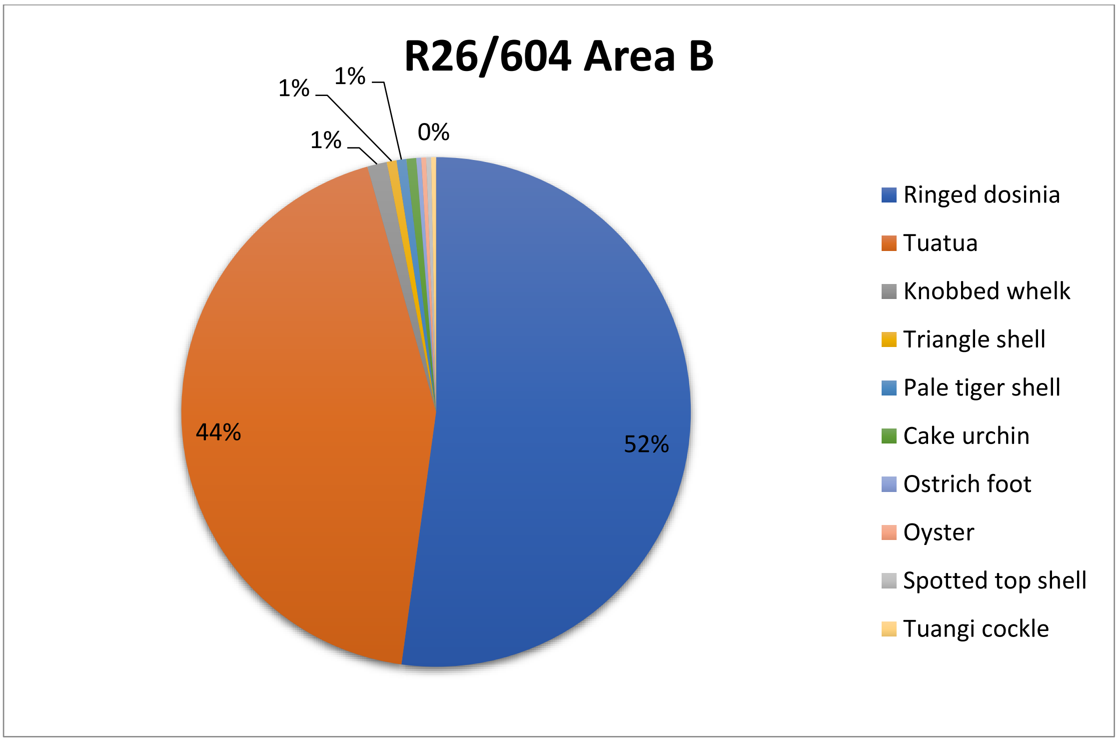


Figure 61: Relative abundance of invertebrate species (MNI) from R26/604 Area B

Table 100: Results of analysis of vertebrate sample from R26/604 Area B

Class	Species	NISP	MNE	MNI
Fish	Barracouta	7	7	3
	Blue cod	3	3	1
	Mackerel sp.	1	1	1
	Wrasse sp.	2	2	1
	Unidentified	600		
	Total	**613**	**13**	**6**
Mammal	Rat	11	11	1
	Total	**11**	**11**	**1**

R26/652

Sample size: Area A = 10 litres

Area B = 22 litres

Midden samples were taken from two areas within R26/651. Tuatua were the dominant species in both areas, representing 91% of the Area A invertebrate assemblage, and just over 97% of that from Area B. Most of the remaining invertebrates come from the sandy shore environment, though both assemblages contained a small amount of freshwater mussel, suggesting some small-scale exploitation of this habitat also. The results, shown in Tables 101 and 102, and Figure 62 and Figure 63, are indicative of shellfish harvesting mainly on the sandy shore during a period of calm sea conditions, when relatively few sub-tidal shellfish would have been available for collection.

Small amounts of fish and bird bone were also recovered from each area (Tables 103 and 104). The fish species represent both open water and rocky shore species, suggesting a generalised fishing strategy. None of the bird bone could be identified to species.

Table 101: Results of analysis of invertebrate sample from R26/652 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)

Tuatua		704	352	90.96	
Ringed dosinia		45	23	5.94	
Triangle shell		11	6	1.55	
Knobbed whelk		4	4	1.03	
Freshwater mussel	19	2	1	0.26	
Cake urchin		2	1	0.26	18.36
Non-diagnostic shell					1719
Total		**768**	**387**		

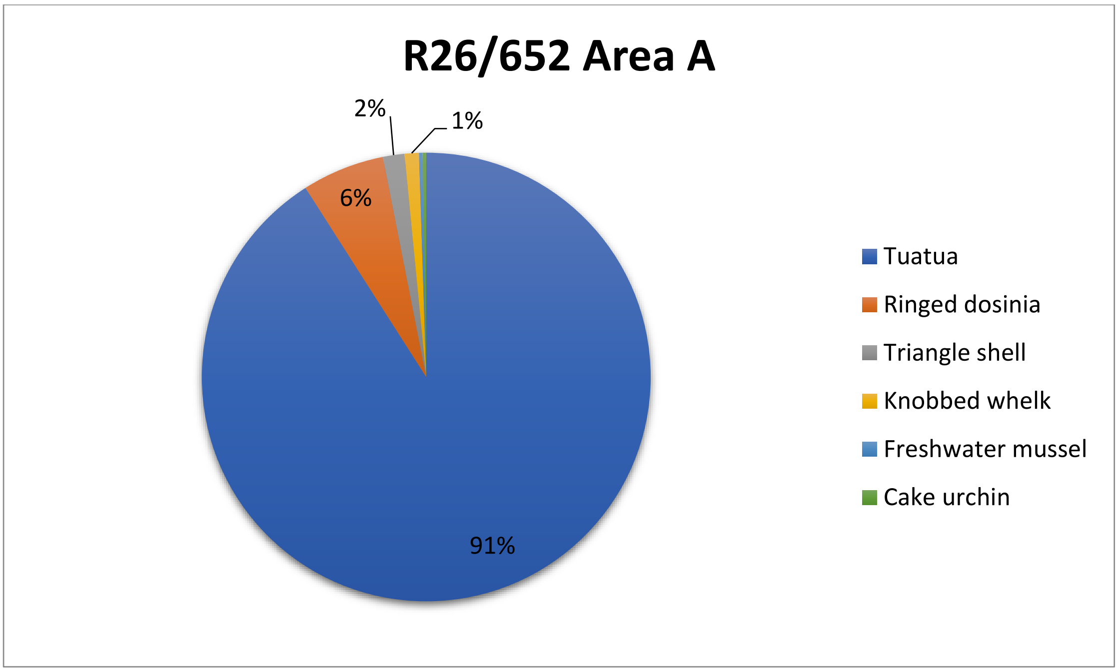


Figure 62: Relative abundance of invertebrate species (MNI) from R26/652 Area A

Table 102: Results of analysis of invertebrate sample from R26/652 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		4943	2472	97.28	
Triangle shell		63	32	1.26	
Ringed dosinia		53	27	1.06	
Freshwater mussel	18	5	4	0.16	
Arabic volute		1	1	0.04	

Gastropod sp.	1	1	0.04	
Helmet shell	1	1	0.04	
Knobbed whelk	1	1	0.04	
Crab sp.	2	1	0.04	
Cake urchin	1	1	0.04	16.77
Non-diagnostic shell				6330
Total	**5071**	**2541**		

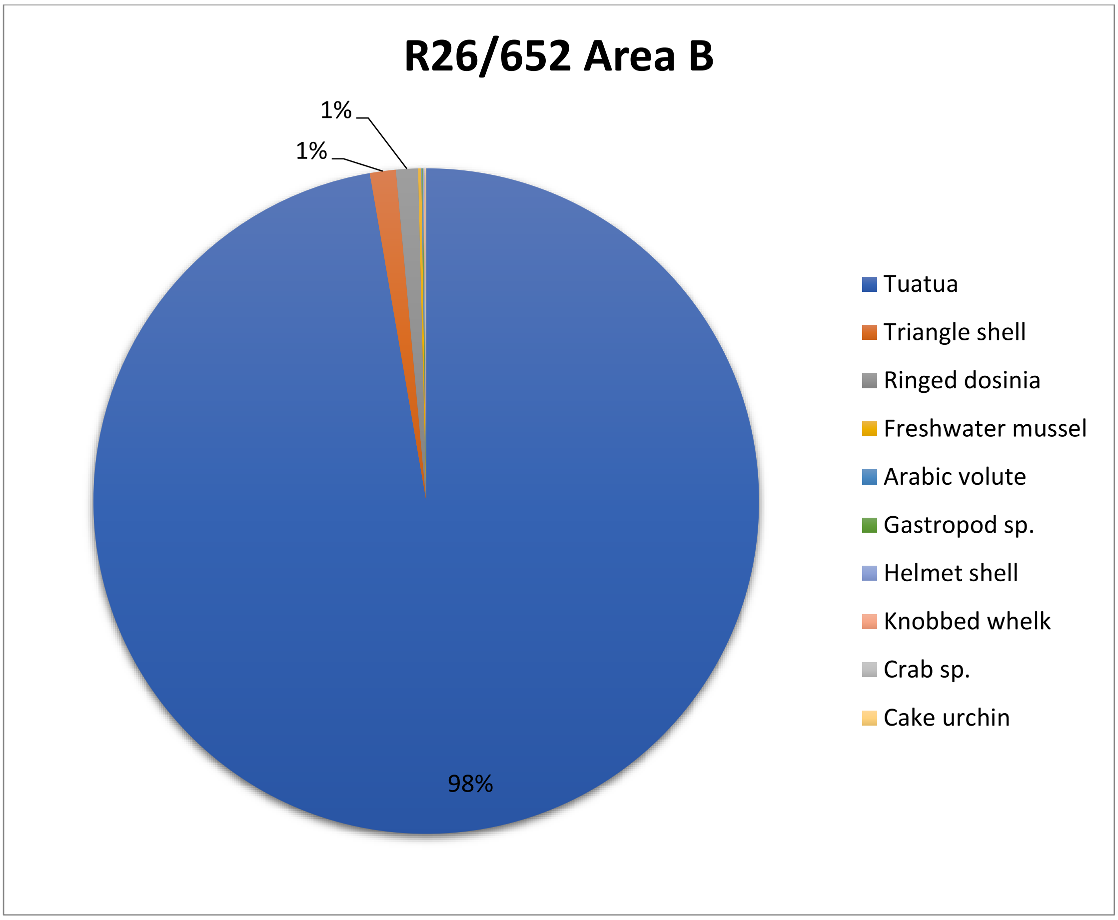


Figure 63: Relative abundance of invertebrate species (MNI) from R26/652 Area B

Table 103: Results of analysis of vertebrate sample from R26/652 Area A

Class	Species	NISP	MNE	MNI
Fish	Blue moki	1	1	1
	Mackerel sp.	1	1	1
	Wrasse sp.	1	1	1

	Unidentified	104		
	Total	**107**	**3**	**3**
Bird	Unidentified	7		
	Total	**7**		

Table 104: Results of analysis of vertebrate sample from R26/652 Area B

Class	Species	NISP	MNE	MNI
Fish	Kahawai	1	1	1
	Leatherjacket	1	2	1
	Wrasse sp.	1	2	1
	Unidentified	269		
	Total	**272**	**5**	**3**
Bird	Unidentified	2		
	Total	**2**		

R26/606

Sample size: Area A = 40 litres

Area B = 44 litres

The samples from the two dense midden areas forming R26/606 revealed broadly similar results for invertebrates. Although 10 species of shellfish, along with small amounts of cake urchin and crab, were identified, most form only a very small component of each deposit, with tuatua by far the dominant species in both areas (Tables 105 and 106, Figure 64 and Figure 65). Freshwater mussel was identified in small amounts in both assemblages, indicating some exploitation of this habitat, while a small amount of fragmented paua shell was present in the Area B sample. A small number of toheroa were also identified from both areas. As with the previous site, the high abundance of tuatua in these samples is indicative of harvesting during stable sea conditions, when other sandy shore species would not have been readily available in any quantity.

The vertebrate assemblages from R26/606 yielded some of the largest amounts of fish bone for any sites within the project. Ten species of fish were identified within the

Area A sample, with a total MNI of 22. Blue cod were the most common (MNI = 4), with barracouta, greenbone (*Odax pullus*) and wrasses each having an MNI of three, and eagle ray, red cod and tarakihi having an MNI of two. This assemblage is also one of only two from the project to contain the freshwater fish kokopu (*Galaxias* sp.). Area B, contained considerably less fish bone than Area A (NISP = 1446 vs. NISP = 6537), although this is still high compared to most other sites analysed. Nine species were identified, with blue moki and wrasses each having an MNI of two, while the remaining species each had an MNI of one. As with other sites with sufficient fish bone on which to draw conclusions, the species present indicate a generalised fishing strategy encompassing more than one habitat, and utilising a range of techniques.

Both areas contained a small amount of bird bone, though only one species, tui, could be identified. Results of the vertebrate analysis are shown in Tables 107 and 108.

Table 105: Results of analysis of invertebrate sample from R26/606 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		5097	2549	96.81	
Ringed dosinia		94	47	1.79	
Triangle shell		38	19	0.72	
Toheroa		17	9	0.34	
Freshwater mussel	13	5	2	0.08	
Cake urchin		14	2	0.08	32.25
Arabic volute		1	1	0.04	
Gastropod sp.		1	1	0.04	
Knobbed whelk	1		1	0.04	
Trough shell		1	1	0.04	
Crab sp.	2	1	1	0.04	
Non-diagnostic shell					7578
Total		**5269**	**2633**	**100**	

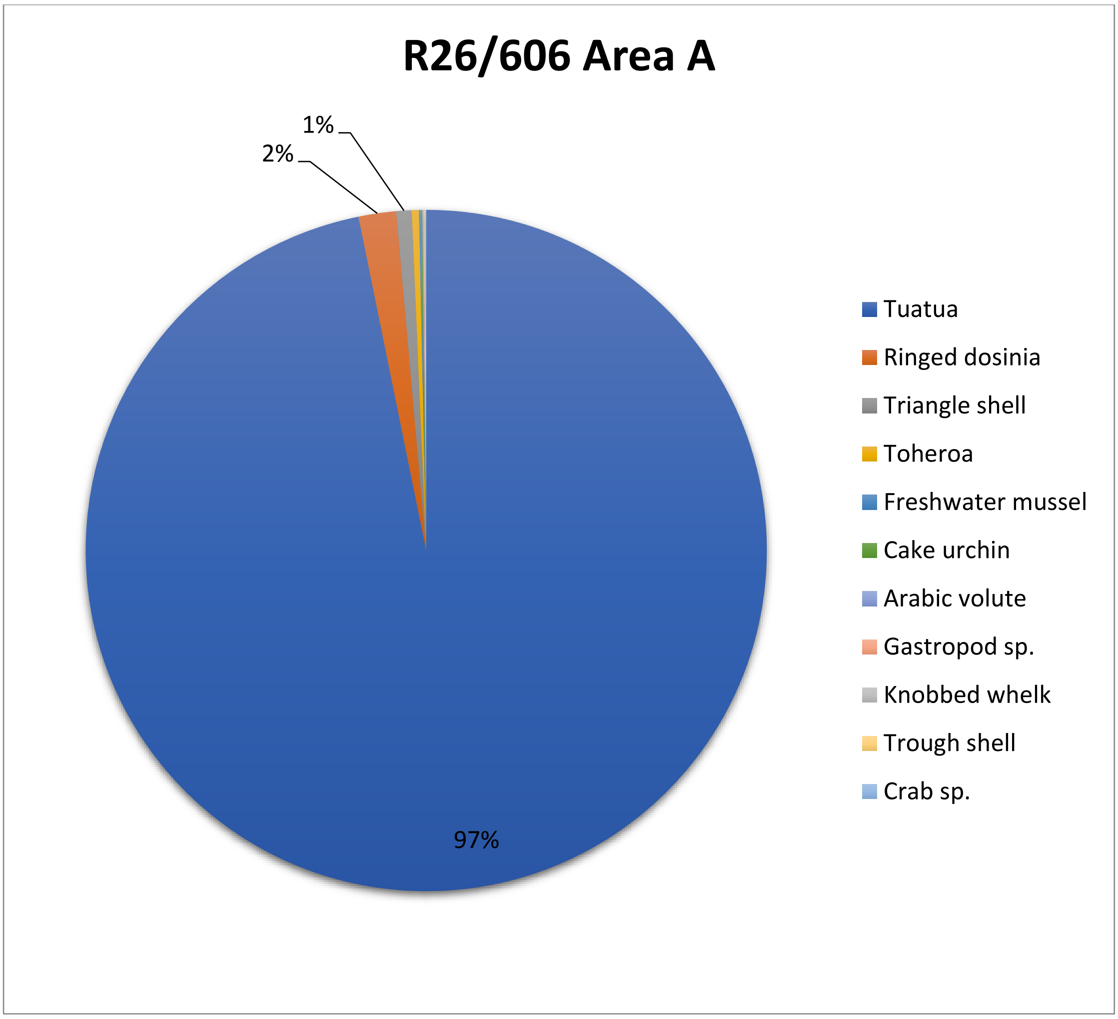


Figure 64: Relative abundance of invertebrate species (MNI) from R26/606 Area A

Table 106: Results of analysis of invertebrate sample from R26/606 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		6607	3304	97.64	
Ringed dosinia		85	43	1.27	
Triangle shell		56	28	0.83	
Toheroa		5	3	0.09	
Paua sp.	7		1	0.03	
Freshwater mussel	10	1	1	0.03	
Paua	6		1	0.03	
Knobbed whelk		1	1	0.03	
Cake urchin		2	1	0.03	10.61

Crab sp.	1	1	0.03	
Non-diagnostic shell				4442
Total	**6758**	**3384**	**100**	

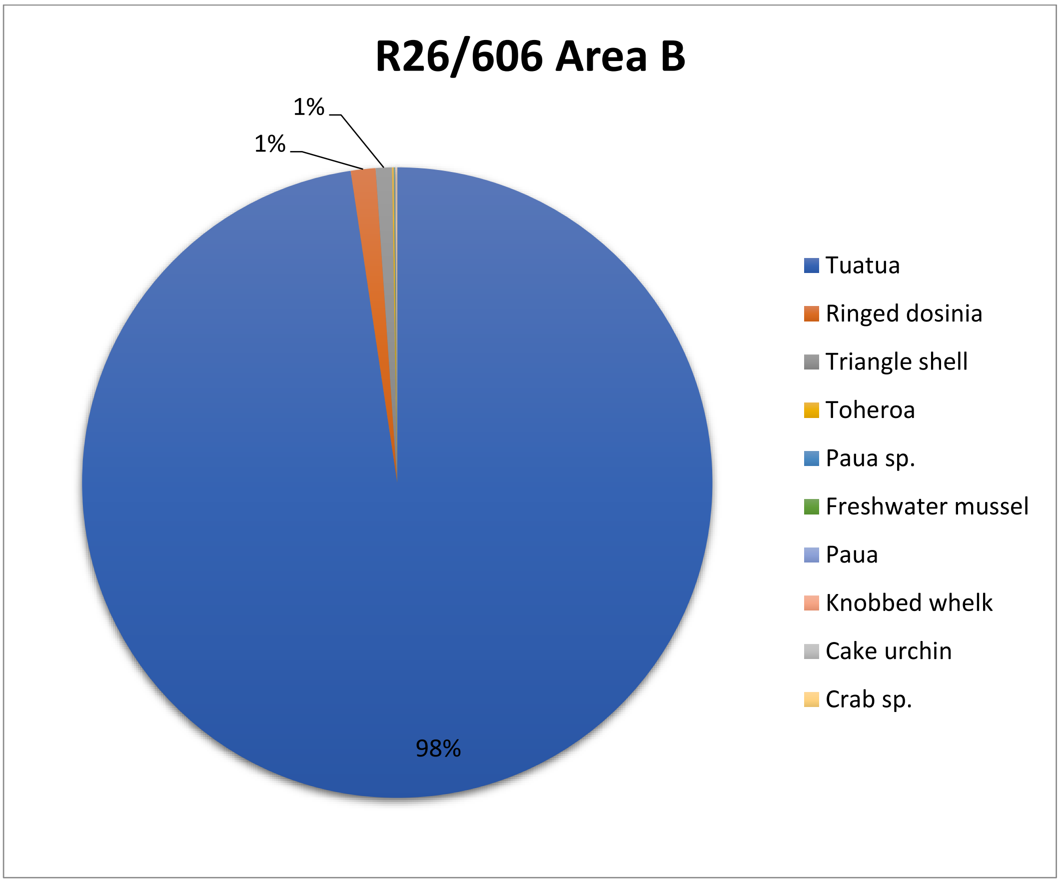


Figure 65: Relative abundance of invertebrate species (MNI) from R26/606 Area B

Table 107: Results of analysis of vertebrate sample from R26/606 Area A

Class	Species	NISP	MNE	MNI
Fish	Barracouta	44	21	3
	Blue cod	24	23	4
	Eagle ray	2	2	2
	Galaxias sp.	1	1	1
	Greenbone	12	12	3
	Red cod	16	16	2

	Tarakihi	9	9	2
	Mackerel sp.	2	2	1
	Trumpeter	2	2	1
	Wrasse sp.	28	28	3
	Unidentified	6397		
	Total	**6537**	**116**	**22**
Bird	Unidentified	7	1	1
	Total	**7**	**1**	**1**

Table 108: Results of analysis of vertebrate sample from R26/606 Area B

Class	Species	NISP	MNE	MNI
Fish	Barracouta	9	8	1
	Blue cod	7	7	1
	Blue moki	3	3	2
	Greenbone	1	1	1
	Red cod	2	2	1
	Snapper	1	1	1
	Tarakihi	6	6	1
	Trumpeter	2	2	1
	Wrasse sp.	6	5	2
	Unidentified	1409		
	Total	**1446**	**35**	**11**
Bird	Tui	1	1	1
	Total	**1**	**1**	**1**

R26/578

Sample size: 8 litres

The faunal assemblage from R26/578 contained nine species of shellfish, small amounts of crab and cake urchin, and a small amount of fish bone. Tuatua make up nearly 71% of the invertebrate assemblage, with ringed dosinia contributing a further 25%. The remaining species contribute less than 1% of the total MNI each

(Table 109, Figure 66). This is more ringed dosinia than would be available for hand collection under stable sea conditions, indicating harvesting following an event causing some disturbance of the sea bed. The assemblage includes small amounts of estuarine and freshwater shellfish, suggesting some exploitation of these habitats in addition to the sandy shore. One blue cod bone was identified from the fish bone assemblage (Table 110).

Table 109: Results of analysis of invertebrate sample from R26/578

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		584	292	70.87	
Ringed dosinia		205	103	25.00	
Triangle shell		6	3	0.73	
Knobbed whelk		3	3	0.73	
Pipi		2	2	0.49	
Tuangi cockle		4	2	0.49	
Freshwater mussel		2	2	0.49	
Arabic volute		2	2	0.49	
Helmet shell		1	1	0.24	
Crab sp.		1	1	0.24	
Cake urchin			1	0.24	0.86
Non-diagnostic shell					776
Total		**810**	**412**	**100**	

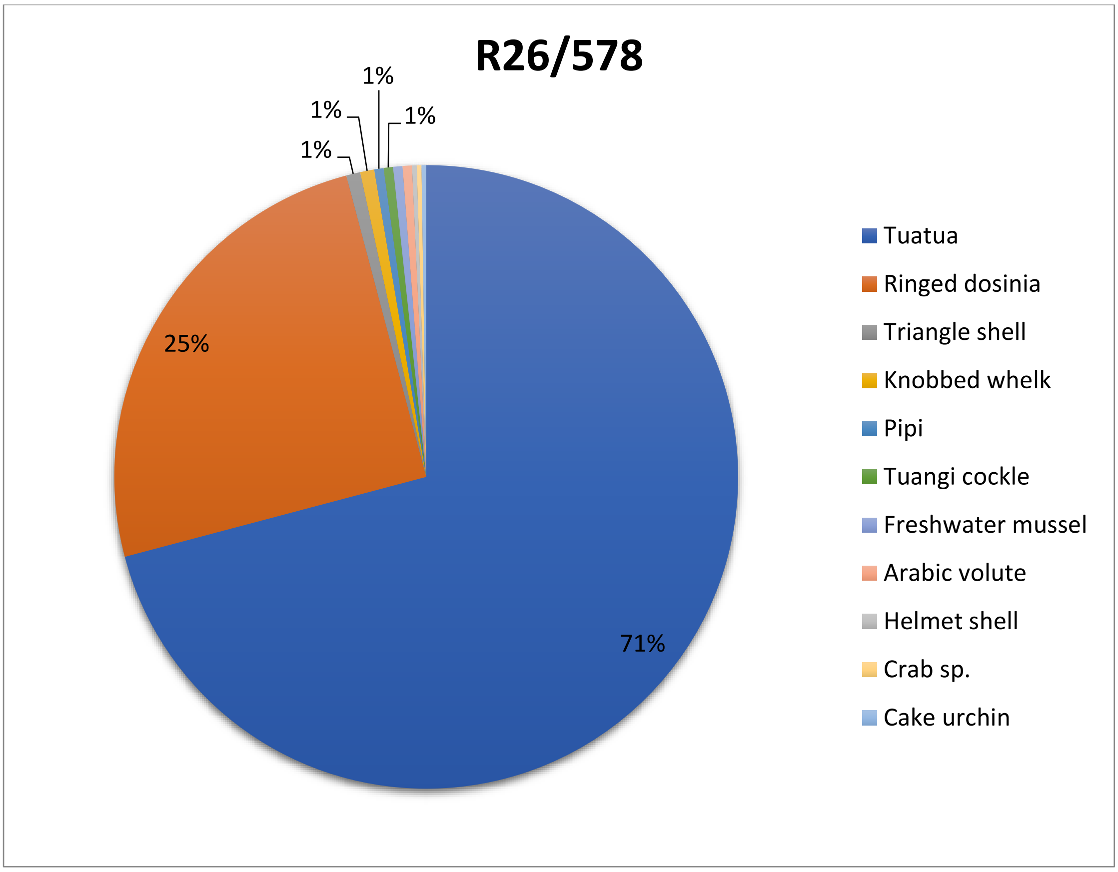


Figure 66: Relative abundance of invertebrate species (MNI) from R26/578

Table 110: Results of analysis of vertebrate sample from R26/578

Class	Species	NISP	MNE	MNI
Fish	Blue cod	1	1	1
	Unidentified	30		
	Total	**31**	**1**	**1**

R26/479

Sample size: Area A = 17 litres

Area C = 35 litres

Samples from two midden deposits within R26/497 were analysed (Tables 111 and 112, Figure 67 and Figure 68). Tuatua were the dominant shellfish in both deposits, though to a lesser extent in Area A (90%) than in Area C (98%). Most of the remaining invertebrates in each assemblage are from the open sandy beach environment, though two fragments of paua shell in Area C may indicate some small-scale exploitation of the rocky shore.

Area A contained only a very small amount of fish bone (NISP = 7), none of which could be identified to species. More fish bone was present in the sample from Area C, with elasmobranchii and red cod identified, each with an MNI of one. This sample also contained a small amount of rat bone. Results of the vertebrate analyses are shown in Tables 113 and 114.

Table 111: Results of analysis of invertebrate sample from R26/497 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1355	678	89.68	
Triangle shell		76	38	5.03	
Ringed dosinia		61	31	4.10	
Knobbed whelk		6	6	0.79	
Arabic volute		1	1	0.13	
Pale tiger shell		1	1	0.13	
Cake urchin			1	0.13	0.3
Non-diagnostic shell					959
Total		**1500**	**756**	**100**	

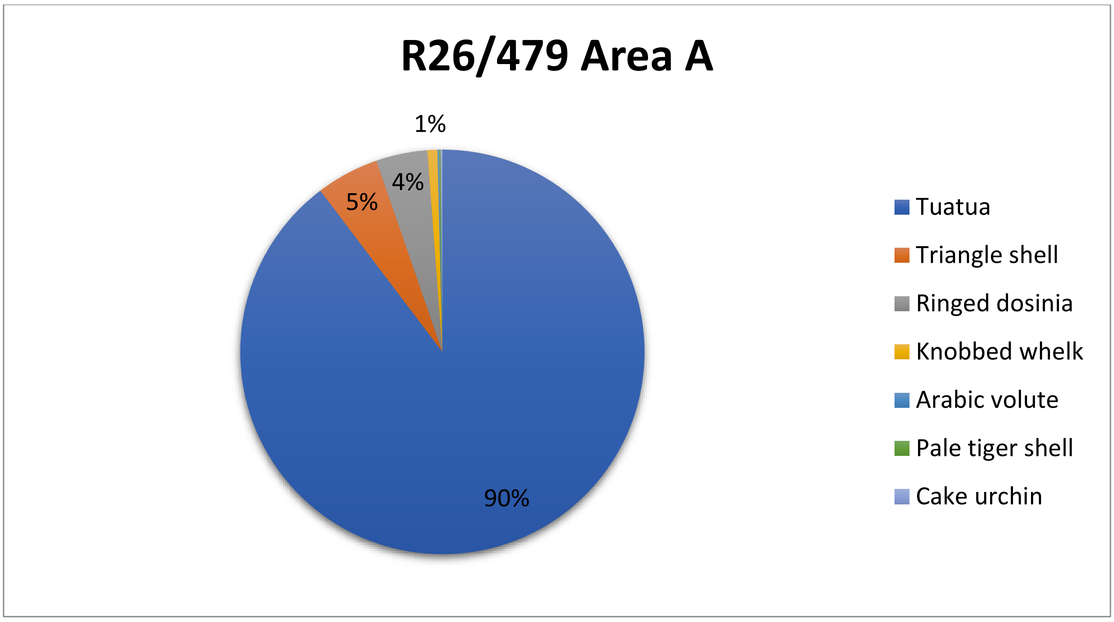


Figure 67: Relative abundance of invertebrate species (MNI) from R26/479 Area A

Table 112: Results of analysis of invertebrate sample from R26/497 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		2439	1220	98.47	
Ringed dosinia		19	10	0.81	
Triangle shell		12	6	0.48	
Angled wedge shell		1	1	0.08	
Paua sp.	2		1	0.08	
Cake urchin			1	0.08	0.4
Non-diagnostic shell					6664
Total		**2471**	**1239**	**100**	

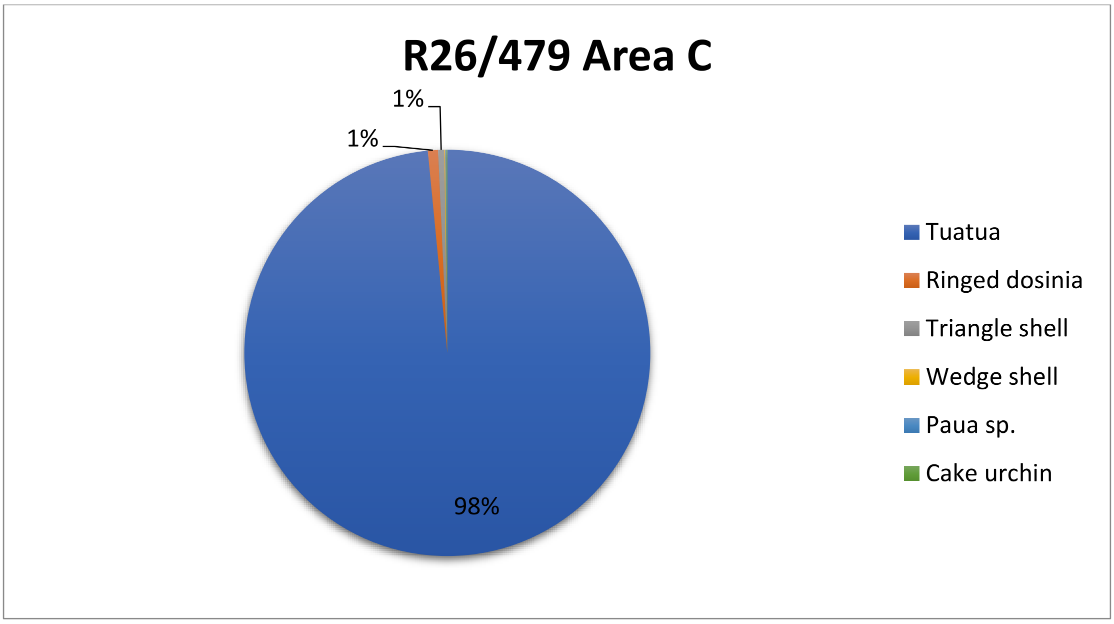


Figure 68: Relative abundance of invertebrate species (MNI) from R26/479 Area C

Table 113: Results of analysis of vertebrate sample from R26/497 Area A

Class	Species	NISP	MNE	MNI
Fish	Unidentified	7		
	Total	**7**		

Table 114: Results of analysis of vertebrate sample from R26/497 Area C

Class	Species	NISP	MNE	MNI
Fish	Elasmobranchii	1	1	1
	Red cod	1	1	1
	Unidentified	237		
	Total	**239**	**2**	**2**
Mammal	Rat	13	13	1
	Total	**13**	**13**	**1**

R26/581

Sample size: 19 litres

Eight species of shellfish and one of echinoderm were identified in the invertebrate assemblage from R26/581. The majority of these are found on the open surf beach, although a small amount of rocky shore shellfish (paua and dark rock shell) was also present. Tuatua comprised just over 78% of the assemblage, with just under 18% of the assemblage being ringed dosinia. The amount of sub-tidal shellfish represented would not be available for hand collecting during a period of prolonged settled sea conditions, suggesting harvesting following an event causing these species to wash up on the beach. Results are shown in Table 115 and Figure 69.

Much of the fish bone from the site was highly fragmented, however five species were identified, with a total MNI of six. Both open water and rocky shore species are represented in the assemblage. Blue cod had an MNI of two, while the other species – barracouta, blue moki (*Latridopsis cilaris*), red cod, and wrasse – each had an MNI of one. The vertebrate assemblage also contained bird bone, most of which was highly fragmented and not able to be identified to species. The only identifiable elements were an albatross (*Diomedea* sp.) vertebra, and a phalange most likely from a forest bird. Results of the vertebrate analysis are shown in Table 116.

Table 115: Results of analysis of invertebrate sample from R26/581

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1822	911	78.33	
Ringed dosinia		416	208	17.88	
Triangle shell		39	20	1.72	
Trough shell		32	16	1.38	
Knobbed whelk		2	2	0.17	
Arabic volute		1	1	0.09	
Paua sp.		3	3	0.26	
Dark rock shell		1	1	0.09	
Cake urchin		2	1	0.09	21.5
Non-diagnostic shell					3920
Total		**2316**	**1163**	**100**	

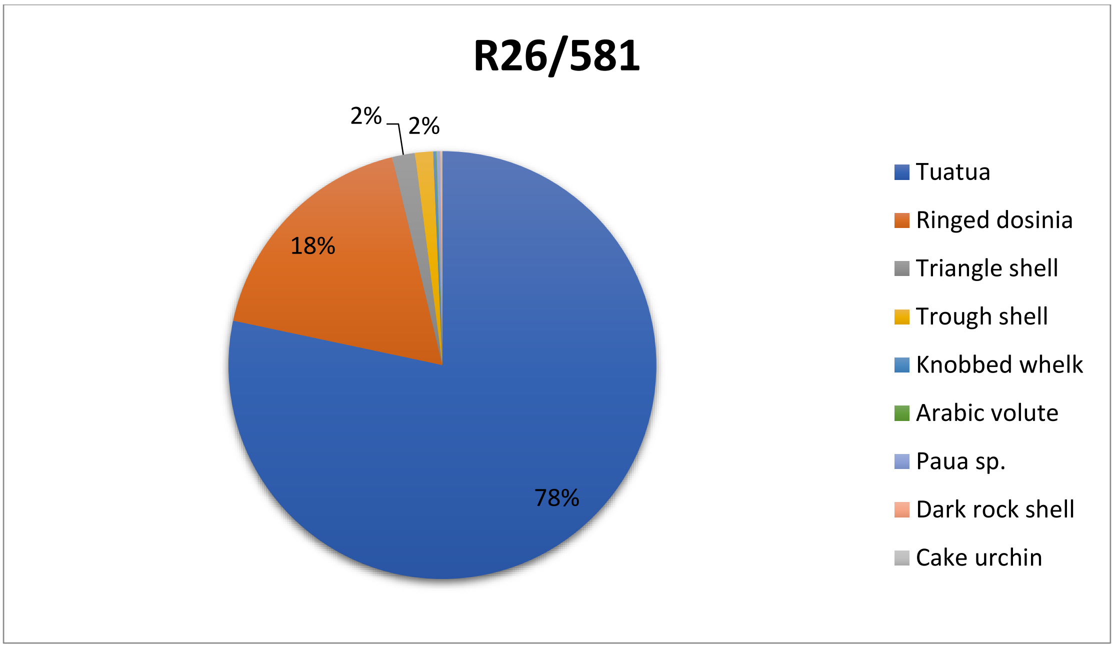


Figure 69: Relative abundance of invertebrate species (MNI) from R26/581

Table 116: Results of analysis of vertebrate sample from R26/581

Class	Species	NISP	MNE	MNI
Fish	Barracouta	5	5	1
	Blue cod	4	4	2
	Blue moki	1	1	1
	Red cod	1	1	1
	Wrasse sp.	3	3	1
	Unidentified	518		
	Total	**532**	**14**	**6**
Bird	*Diomedea* sp.	1	1	1
	Unidentified	144	1	1
	Total	**145**	**1**	**2**

R26/586

Sample size: 10 litres

Tuatua dominate the invertebrate assemblage from R26/586, contributing nearly 92% of the total MNI. Seven species of shellfish and one of echinoderm were identified from the sample, with most of these belonging to the sandy shore habitat. A small amount of freshwater mussel was also present, indicating some exploitation of this environment in addition to harvesting along the open surf beach. A small amount of fish bone was also recovered. The vast majority of the unidentified fish remains are scales (NISP = 112 out of total NISP of 127). The only species identified was kahawai. Results of the analyses are shown in Tables 117 and 118, and Figure 70.

Table 117: Results of analysis of invertebrate sample from R26/586

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1336	668	91.63	
Ringed dosinia		84	42	5.76	
Freshwater mussel	13	12	8	1.10	
Triangle shell		9	5	0.69	
Knobbed whelk		3	3	0.41	
Helmet shell		1	1	0.14	
Toheroa		1	1	0.14	
Cake urchin			1	0.14	1.51
Non-diagnostic shell					3465
Total		**1446**	**729**	**100**	

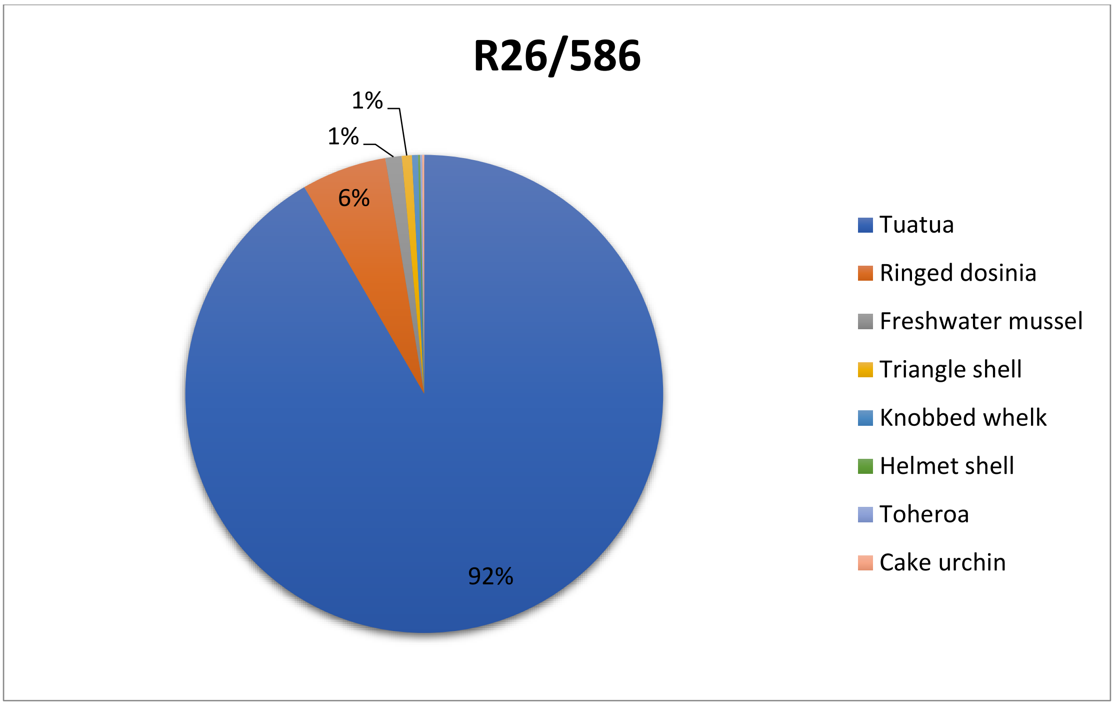


Figure 70: Relative abundance of invertebrate species (MNI) from R26/586

Table 118: Results of analysis of vertebrate sample from R26/586

Class	Species	NISP	MNE	MNI
Fish	Kahawai	1	1	1
	Unidentified	126		
	Total	**127**	**1**	**1**

R26/653

Sample size: 22 litres

Seven species of shellfish and one of echinoderm were identified from the invertebrate assemblage for this site (Table 119, Figure 71). All of these come from the open beach environment, though most inhabit the sub-tidal zone. Tuatua dominate the assemblage, representing 96% of the total MNI, indicating harvesting during relatively stable sea conditions, though still with some sub-tidal shellfish able to be collected. Analysis of the vertebrate assemblage identified three species of fish, along with small amounts of unidentified bird bone and rat (Table 120).

Table 119: Results of analysis of invertebrate sample from R26/653

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		4859	2430	96.03	
Ringed dosinia		136	68	2.69	
Triangle shell		19	10	0.40	
Knobbed whelk		8	8	0.32	
Trough shell		9	7	0.28	
Pale tiger shell		5	5	0.20	
Arabic volute		1	1	0.04	
Cake urchin		2	1	0.04	7.32
Non-diagnostic shell					814
Total		**5039**	**2530**	**100**	

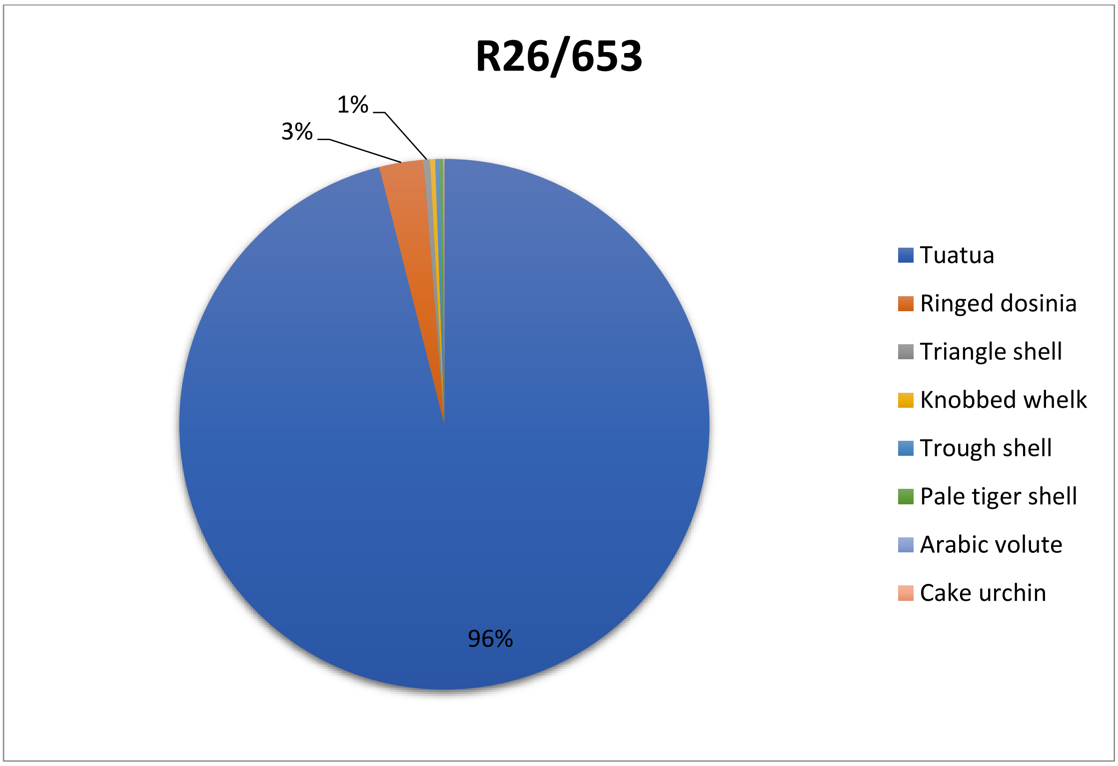


Figure 71: Relative abundance of invertebrate species (MNI) from R26/653

Table 120: Results of analysis of vertebrate sample from R26/653

Class	Species	NISP	MNE	MNI
Fish	Eel sp.	1	1	1
	Hapuku	1	1	1
	Kahawai	4	4	2
	Unidentified	227		
	Total	**233**	**6**	**4**
Bird	Unidentified	6		
	Total	**6**		
Mammal	Rat	6	6	2
	Total	**6**	**6**	**2**

R26/600

Sample size: 2.2 litres

The faunal assemblage from R26/600 consisted almost entirely of tuatua, with a small amount of cake urchin also present. Results are shown in Table 121.

Table 121: Results of analysis of invertebrate sample from R26/600

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		296	198	99.50	
Cake urchin			1	0.50	0.1
Non-diagnostic shell					216
Total		**296**	**199**	**100**	

R26/683

Sample size: Area B = 77 litres

Area C = 39 litres

Samples were taken from two discrete midden deposits within R26/683. The whole of one of the Area B midden deposits was taken as a sample due to the large amount of fish bone noted during recording of the site, although only half of this was analysed.

The invertebrate assemble from Area B was relatively diverse, with 10 species of shellfish identified, along with small amounts of cake urchin and crab (Table 122, Figure 72). This diversity is at least in part a product of the large sample size. The assemblage is heavily dominated by tuatua (98%), and aside from a single fragment of freshwater mussel, all species identified are from the open surf beach habitat. Given the large size of the sample, this assemblage is likely a good proxy for the percentages of sub-tidal species able to be collected during a period of stable sea conditions, though the percentage of knobbed whelks is somewhat higher than expected.

The vertebrate assemblage from Area B was comprised of a large amount of fish bone in comparison to most other sites within the project area, with 14 species identified and a total MNI of 19. Kahawai and snapper were the most common, each with an MNI of three, wrasse have an MNI of two, with the remaining species each having an MNI of one. This is a very diverse range of fish species, representing the exploitation of both open water and rocky shore habitats, and a range of capture techniques. A small amount of rat bone was also identified within the vertebrate assemblage. Results of the analysis are shown in Table 123.

Table 122: Results of analysis of invertebrate sample from R26/683 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		19629	9815	97.73	
Knobbed whelk		152	152	1.51	
Triangle shell		51	26	0.26	
Ringed dosinia		47	24	0.24	
Pale tiger shell		9	9	0.09	
Trough shell		17	9	0.09	
Arabic volute		2	2	0.02	
Helmet shell		2	2	0.02	
Cake urchin		1	1	0.01	14.63

Crab sp.		3	1	0.01	
Freshwater mussel	1		1	0.01	
Turret shell		1	1	0.01	
Non-diagnostic shell					12048
Total		**19914**	**10043**	**100**	

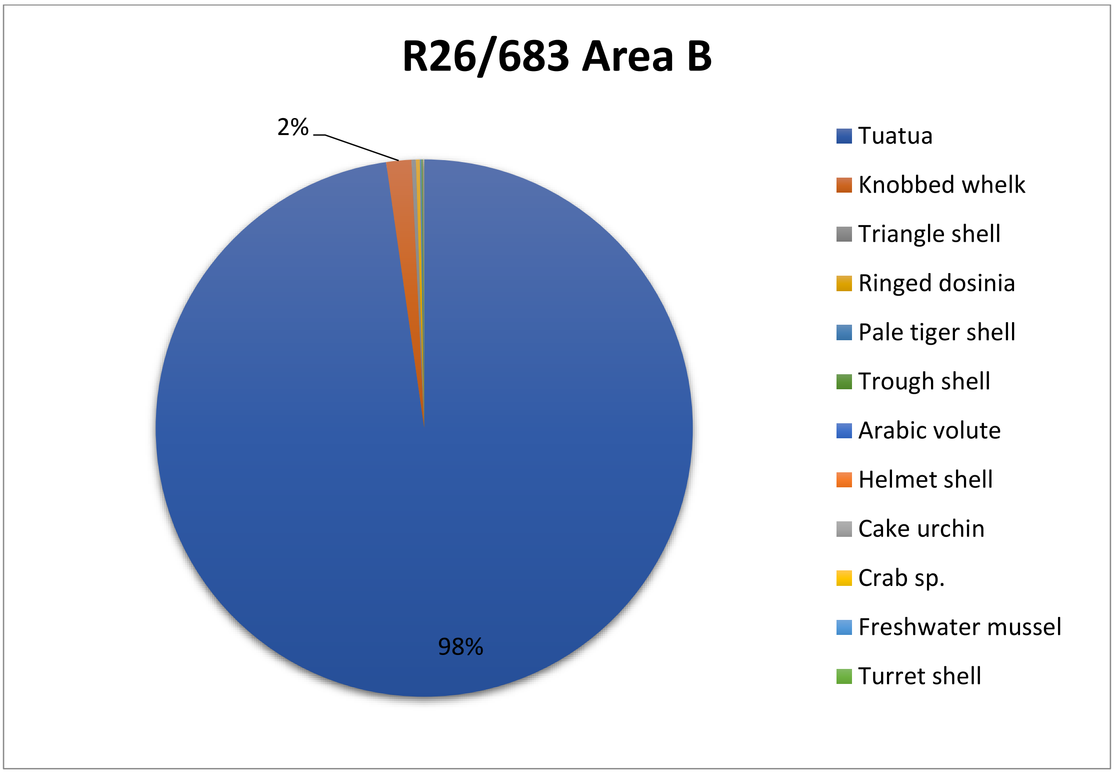


Figure 72: Relative abundance of invertebrate species (MNI) from R26/683 Area B

Table 123: Results of analysis of vertebrate sample from R26/683 Area B

Class	Species	NISP	MNE	MNI
Fish	Barracouta	16	7	1
	Blue cod	1	1	1
	Blue moki	4	4	1
	Eagle ray	1	1	1
	Greenbone	4	4	1
	Hapuku	1	1	1

	Kahawai	19	19	3
	Mackerel sp.	1	1	1
	Marblefish	2	2	1
	Red cod	2	2	1
	Scarpee	6	6	1
	Snapper	90	20	3
	Tarakihi	1	1	1
	Wrasse sp.	2	2	2
	Unidentified	4186		
	Total	**4336**	**118**	**19**
Mammal	Rat	9	9	1
	Total	**9**	**9**	**1**

Nine species of shellfish, one of echinoderm, and one crustacean (pink barnacle/*Balanus decorus*) were identified from the invertebrate assemble for Area C of R26/683 (Table 124, Figure 73). The assemblage is dominated by tuatua (75%), but with ringed dosinia also contributing a significant proportion of the total MNI (23%). The remaining species each contribute no more than 1% of the total assemblage. The majority of the species are from the sandy shore environment, however freshwater mussel and some rocky shore species (cat's eye, limpet and pink barnacle) were also present, indicating small-scale exploitation of these habitats in addition to the surf beach. The proportion of ringed dosinia in this assemblage is considerably higher than what would be accessible under stable conditions, and is indicative of harvesting following rough seas or strong currents, or possibly some other factor that would have weakened these animals, allowing them to be washed up onto the beach.

The vertebrate assemblage for Area C consisted entirely of fish bone. Seven species were identified, two each of barracouta and wrasse, with the remaining five species each having an MNI of one. Both open water and rocky shore species are represented, again indicating a generalised fishing strategy. Results are shown in Table 125.

Table 124: Results of analysis of invertebrate sample from R26/683 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		3284	1642	74.87	
Ringed dosinia		989	495	22.57	
Triangle shell		44	22	1.00	
Freshwater mussel		28	18	0.82	
Limpet sp.		8	8	0.36	
Cat's eye		2	2	0.09	
Trough shell		3	2	0.09	
Cake urchin			1	0.05	4.25
Pink barnacle		1	1	0.05	
Southern olive shell		1	1	0.05	
Toheroa		1	1	0.05	
Non-diagnostic shell					7799
Total		**4361**	**2193**	**100**	

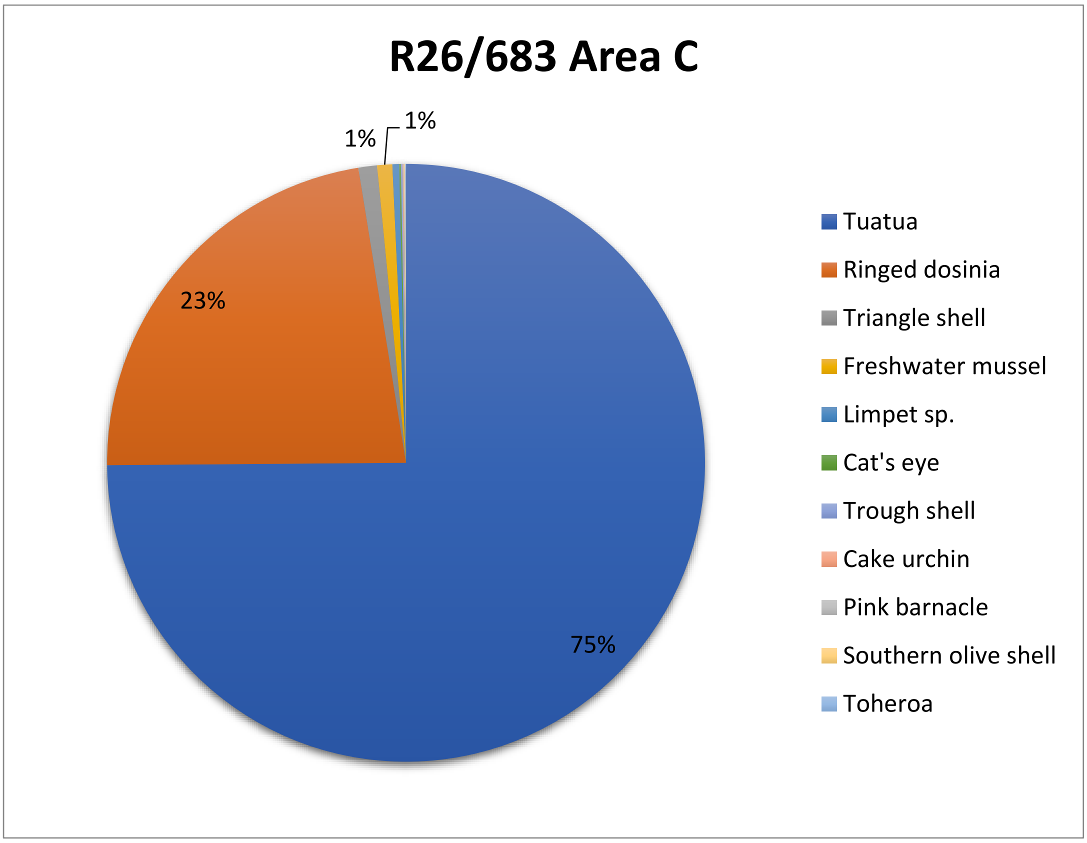


Figure 73: Relative abundance of invertebrate species (MNI) from R26/683 Area C

Table 125: Results of analysis of vertebrate sample from R26/683 Area C

Class	Species	NISP	MNE	MNI
Fish	Barracouta	25	14	2
	Blue cod	4	4	1
	Blue moki	2	2	1
	Eagle ray	1	1	1
	Red cod	6	6	1
	Tarakihi	6	6	1
	Wrasse sp.	15	13	2
	Unidentified	1583		
	Total	**1642**	**46**	**9**

R26/677

Sample size: Area H = 12 litres

Area K = 45 litres

Samples were taken from two midden deposits within R26/677.

The sample from Area H contained only five species of shellfish, along with a small amount of cake urchin and a small amount of fish bone. The invertebrate assemblage is heavily dominated by tuatua, comprising nearly 98% of the total MNI. Only one species of fish – wrasse – was identified from the fishbone assemblage. Results are shown in Tables 126 and 127, and Figure 74.

Table 126: Results of analysis of invertebrate sample from R26/677 Area H

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1653	827	97.64	
Triangle shell		27	14	1.65	
Ringed dosinia		3	2	0.24	
Toheroa		4	2	0.24	
Cake urchin			1	0.12	0.28
Gastropod sp.		1	1	0.12	

Non-diagnostic shell				1570
Total	**1688**	**847**	**100**	

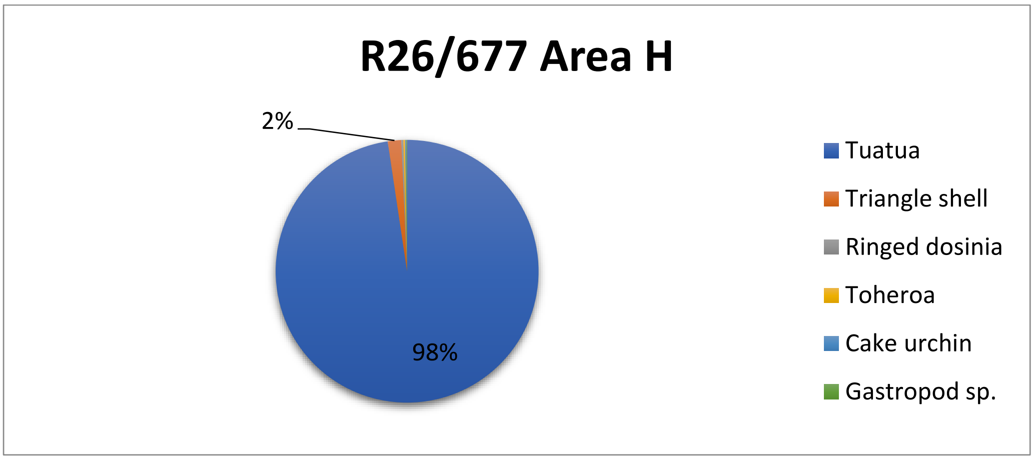


Figure 74: Relative abundance of invertebrate species (MNI) from R26/677 Area H

Table 127: Results of analysis of vertebrate sample from R26/677 Area H

Class	Species	NISP	MNE	MNI
Fish	Wrasse	1	1	1
	Unidentified	49		
	Total	**50**	**1**	**1**

The assemblage from Area K was more diverse than that from Area H, with nine species of shellfish from three different habitats, cake urchin, three species of fish, rat, and small amounts of unidentified bird and mammal bone (Tables 128 and 129, Figure 75). Tuatua comprised just over 91% of the invertebrate assemblage, with triangle shell contributing just over 7%, and ringed dosinia just over 1%. The remaining species account for less than 1% of the assemblage combined. This is one of the few assemblages from the project to contain freshwater eel, though this apparent paucity may be a product of the ways in which eels were prepared and consumed (Marshall 1987).

Table 128: Results of analysis of invertebrate sample from R26/677 Area K

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		4825	2413	91.19	
Triangle shell		376	188	7.11	
Ringed dosinia		61	31	1.17	
Knobbed whelk		5	5	0.19	
Arabic volute		2	2	0.08	
Freshwater mussel	8	3	2	0.08	
Gastropod sp.		2	2	0.08	
Cat's eye		1	1	0.04	
Trough shell		1	1	0.04	
Cake urchin			1	0.04	36.7
Non-diagnostic shell					11601
Total		**5276**	**2646**	**100**	

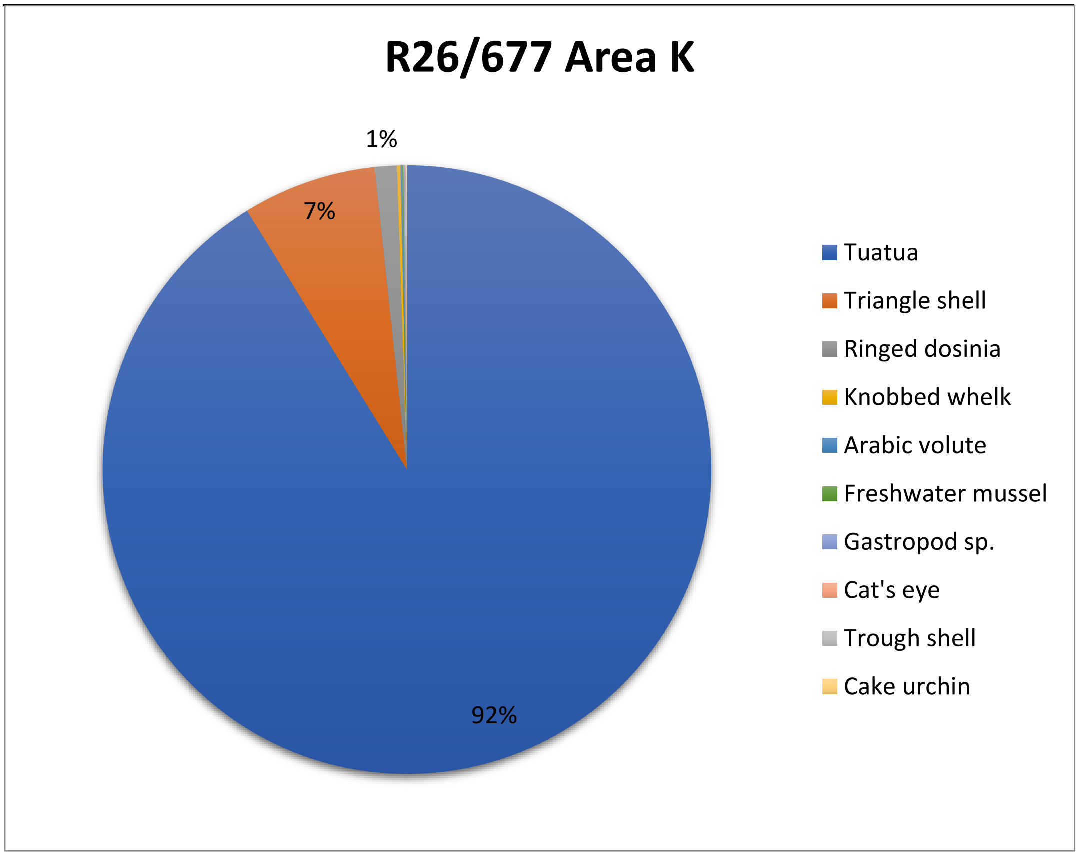


Figure 75: Relative abundance of invertebrate species (MNI) from R26/677 Area K

Table 129: Results of analysis of vertebrate sample from R26/677 Area K

Class	Species	NISP	MNE	MNI
Fish	Anguilla sp.	1	1	1
	Snapper	10	3	1
	Wrasse	1	1	1
	Unidentified	174		
	Total	**187**	**5**	**3**
Bird	Unidentified	1		
	Total	**1**		
Mammal	Rat	23	23	1
	Unidentified	2	1	1
	Total	**25**	**24**	**2**

R26/524

Sample size: 6 litres

The faunal assemble from R26/524 consisted almost entirely of tuatua, with a few fragments of fish bone being the only other component (Tables 130 and 131). The majority of the tuatua were below average size, which may reflect harvesting higher up the beach, either deliberately or in response to tidal conditions.

Table 130: Results of analysis of invertebrate sample from R26/524

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1213	607	100	
Non-diagnostic shell					267
Total		**1213**	**607**	**100**	

Table 131: Results of analysis of vertebrate sample from R26/524

Class	Species	NISP	MNE	MNI
Fish	Unidentified	7		

Total	**7**

R26/514

Sample size: 3 litres

Tuatua were the dominant species identified from this site, comprising 78.5% of the sample, with ringed dosinia comprising a further 12%. All of the invertebrate species are from the open surf beach habitat, though most are sub-tidal and not generally able to be harvested in significant numbers. The relative abundances seen here may indicate harvesting following rough seas or strong currents, however the small sample size makes this difficult to substantiate. A single rat bone was also present in the faunal assemblage. Results are shown in Tables 132 and 133, and Figure 76.

Table 132: Results of analysis of invertebrate sample from R26/514

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		292	146	78.49	
Ringed dosinia		44	22	11.83	
Knobbed whelk		8	8	4.30	
Triangle shell		14	7	3.76	
Helmet shell		1	1	0.54	
Pale tiger shell		1	1	0.54	
Cake urchin			1	0.54	0.03
Non-diagnostic shell					267
Total		**360**	**186**	**100**	

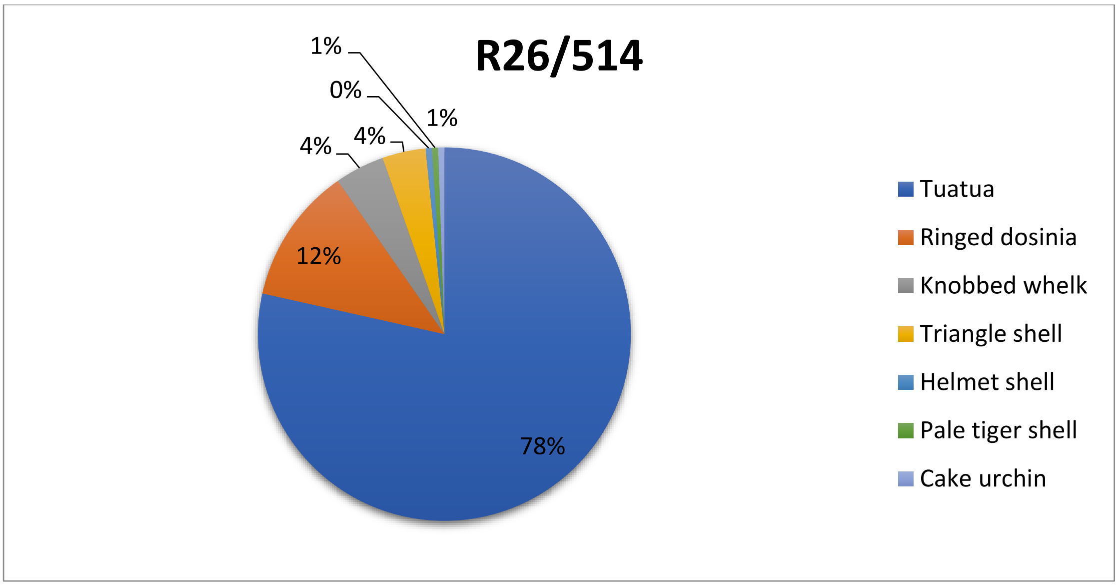


Figure 76: Relative abundance of invertebrate species (MNI) from R26/514

Table 133: Results of analysis of vertebrate sample from R26/514

Class	Species	NISP	MNE	MNI
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

R26/522

Sample size: 3 litres

The faunal assemblage from R26/522 contained only four species of shellfish and a small amount of cake urchin. Tuatua make up just over 94% of the assemblage (Table 134, Figure 77).

Table 134: Results of analysis of invertebrate sample from R26/522

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		325	163	93.14	
Ringed dosinia		16	8	4.57	
Knobbed whelk		2	2	1.14	
Cake urchin			1	0.57	1.99

Trough shell	2	1	0.57	
Non-diagnostic shell				261
Total	**345**	**175**	**100**	

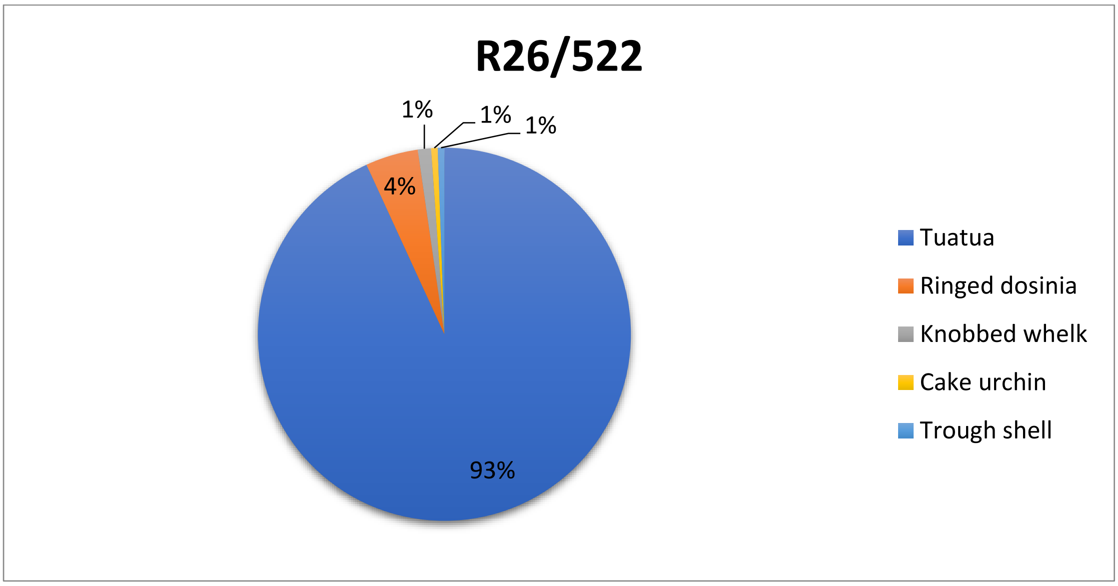


Figure 77: Relative abundance of invertebrate species (MNI) from R26/522

R26/610

Sample size: Area A = 8 litres

Area C = 2.5 litres

Samples from two midden deposits within this site were analysed, with very similar results (Tables 135 and 136, and Figure 78 and Figure 79). In both areas, tuatua comprised 75% of the assemblage, with ringed dosinia contributing another 15-16%. All species come from the sandy shore environment, though most would not have been available for collection in significant quantities under stable sea conditions. The percentages represented here suggest harvesting following an event that caused larger than normal amounts of sub-tidal shellfish to be washed up. A small amount of rat bone was also identified from the Area A sample (Table 137).

Table 135: Results of analysis of invertebrate sample from R26/610 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		393	197	75.19	
Ringed dosinia		85	43	16.41	
Trough shell		13	7	2.67	
Triangle shell		9	5	1.91	
Toheroa		6	4	1.53	
Necklace shell		3	3	1.15	
Knobbed whelk		2	2	0.76	
Helmet shell		1	1	0.38	
Non-diagnostic shell					706
Total		**512**	**262**	**100**	

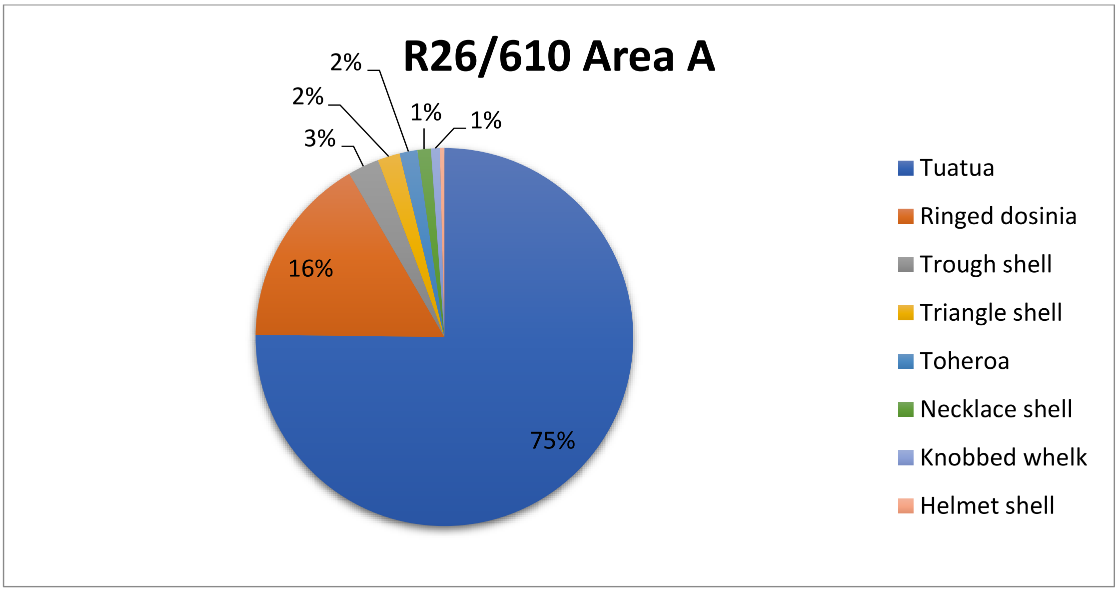


Figure 78: Relative abundance of invertebrate species (MNI) from R26/610 Area A

Table 136: Results of analysis of invertebrate sample from R26/610 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		146	73	74.49	
Ringed dosinia		30	15	15.31	

Knobbed whelk	3	3	3.06	
Toheroa	4	3	3.06	
Trough shell	6	3	3.06	
Helmet shell	1	1	1.02	
Non-diagnostic shell				189
	190	**98**	**100**	

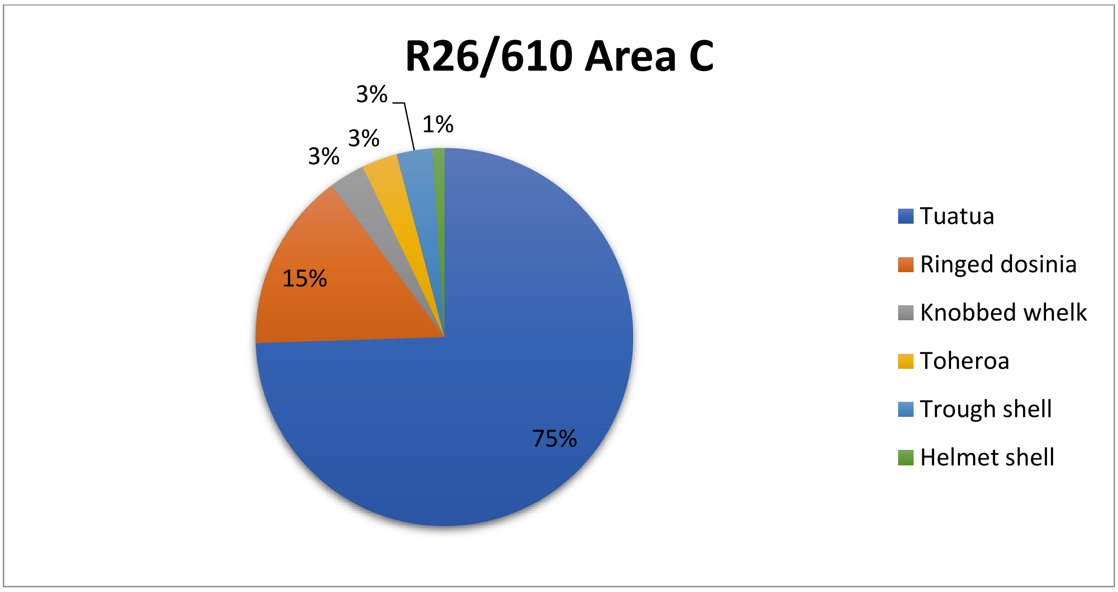


Figure 79: Relative abundance of invertebrate species (MNI) from R26/610 Area C

Table 137: Results of analysis of vertebrate sample from R26/610 Area A

Class	Species	NISP	MNE	MNI
Mammal	Rat	8	8	2
	Total	**8**	**8**	**2**

R26/639

Sample size: Area A = 10 litres

Area B = 10 litres

The invertebrate assemblages from R26/639 are highly unusual in comparison to all other assemblages from the project area. Both midden deposits were dominated by triangle shell, with tuatua forming only a minor component of each (2.7% in Area A, and just over 4% in Area B). Also unusual is the relative abundance of freshwater mussel, which ranks second in both assemblages. The assemblages are also interesting in terms of their low species diversity given the very high sub-tidal component. This may indicate that whatever caused the triangle shells to wash up on the beach did not affect the other sub-tidal species to the same extent. While it might be feasible to collect juvenile triangle shells in shallow water on a very low tide, the size range – from very small to large – suggest this was likely not the case. Results are shown in Tables 138 and 139, and Figure 80 and Figure 81.

Area A contained a small amount of fish bone, none of which could be identified to species, while Area B contained one each of snapper, kahawai and New Zealand sole (*Peltorhamphus novazeelandiae*), and a small amount of unidentified bird bone (Tables 140 and 141).

Table 138: Results of analysis of invertebrate sample from R26/639 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		950	475	91.70	
Freshwater mussel		37	24	4.63	
Tuatua		27	14	2.70	
Ringed dosinia		8	4	0.77	
Cake urchin			1	0.19	2.31
Non-diagnostic shell					1586
Total		**1022**	**518**	**100**	

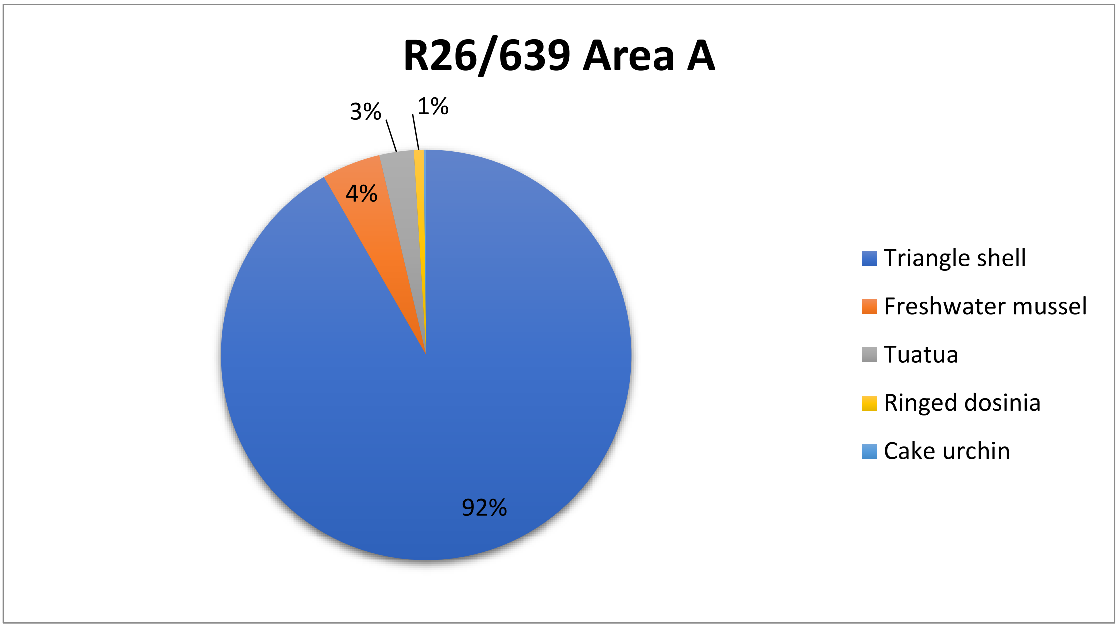


Figure 80: Relative abundance of invertebrate species (MNI) from R26/639 Area A

Table 139: Results of analysis of invertebrate sample from R26/639 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Triangle shell		931	466	84.27	
Freshwater mussel		71	43	7.78	
Tuatua		46	23	4.16	
Ringed dosinia		35	18	3.25	
Toheroa		2	1	0.18	
Arabic volute		1	1	0.18	
Cake urchin			1	0.18	0.27
Non-diagnostic shell					1595
Total		**1086**	**553**	**100**	

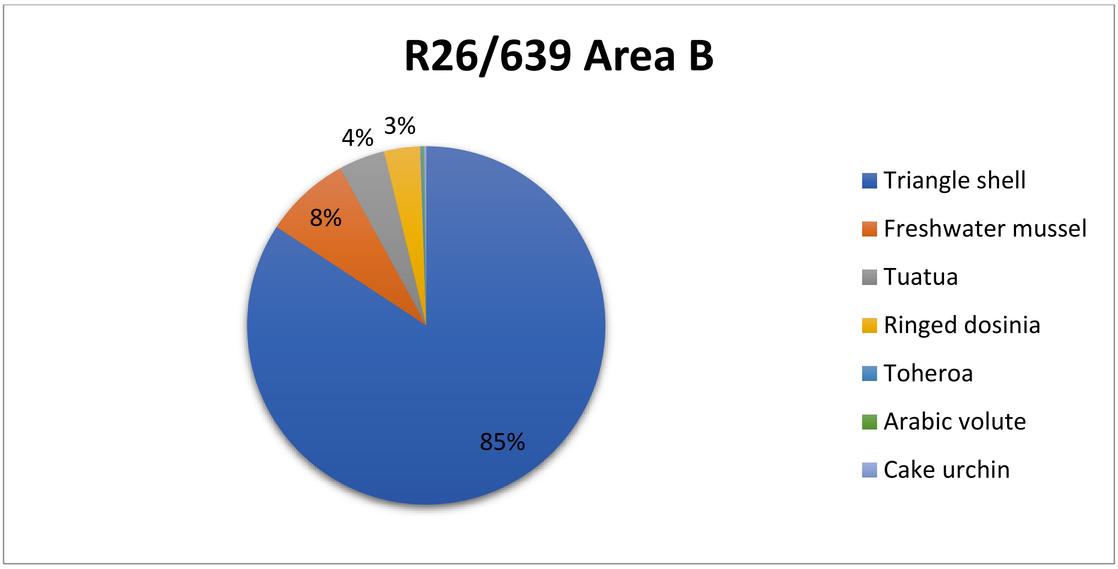


Figure 81: Relative abundance of invertebrate species (MNI) from R26/639 Area B

Table 140: Results of analysis of vertebrate sample from R26/639 Area A

Class	Species	NISP	MNE	MNI
Fish	Unidentified	64		
	Total	**64**		

Table 141: Results of analysis of vertebrate sample from R26/639 Area B

Class	Species	NISP	MNE	MNI
Fish	Kahawai	1	1	1
	NZ Sole	3	3	1
	Snapper	1	1	1
	Unidentified	43		
	Total	**48**	**5**	**3**
Bird	Unidentified	5		
	Total	**5**		

R26/641

Sample size: Area A = 14 litres

Area B = 12 litres

Samples were taken from two midden deposits within R26/641, with analysis of the invertebrate assemblages yielding similar results (Tables 142 and 143, Figure 82 and Figure 83). Tuatua are heavily dominant in both areas, indicating harvesting during a period of stable sea conditions. Both assemblages also contain a small amount of freshwater mussel. No rocky shore species were identified in either assemblage.

The vertebrate assemblage for Area A contained small amounts of fish, bird, and rat. Only one species of fish, a jack/horse mackerel, was identified. The vertebrate assemblage from Area B contained only fish bone, with red cod and snapper each having an MNI of one. Results are shown in Tables 144 and 145.

Table 142: Results of analysis of invertebrate sample from R26/641 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		2336	1168	98.82	
Ringed dosinia		13	7	0.59	
Triangle shell		5	3	0.25	
Cake urchin			1	0.08	0.12
Freshwater mussel	21	1	1	0.08	
Knobbed whelk		2	2	0.17	
Non-diagnostic shell					4857
Total		**2358**	**1182**	**100**	

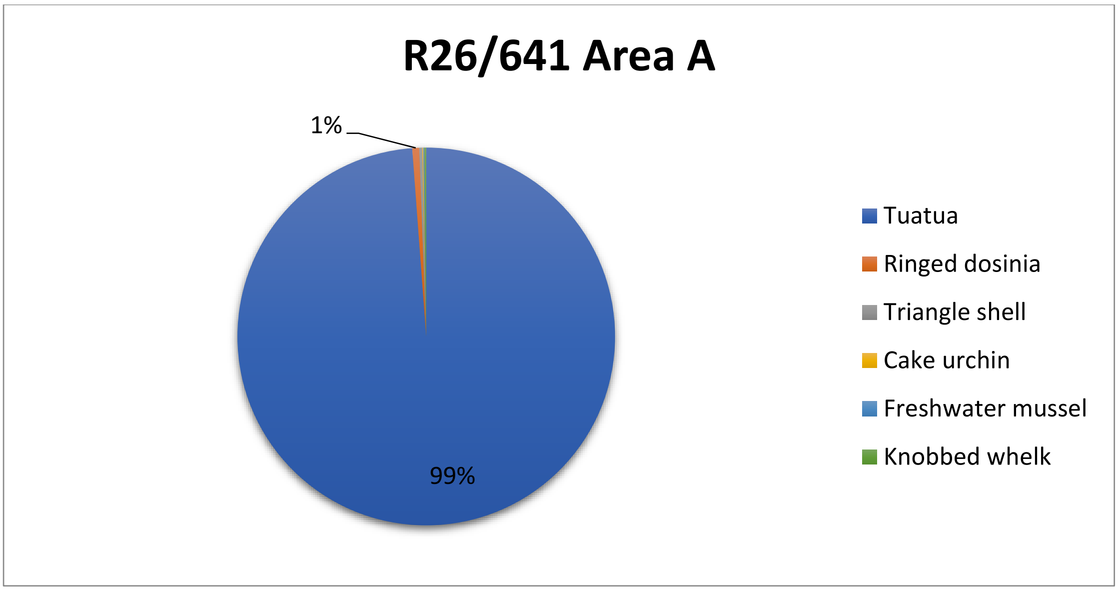


Figure 82: Relative abundance of invertebrate species (MNI) from R26/641 Area A

Table 143: Results of analysis of invertebrate sample from R26/641 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		2359	1180	97.20	
Ringed dosinia		48	24	1.98	
Freshwater mussel		12	6	0.49	
Cake urchin			1	0.08	0.56
Knobbed whelk	5	1	1	0.08	
Toheroa		1	1	0.08	
Triangle shell		1	1	0.08	
Non-diagnostic shell					4856
Total		**2422**	**1214**	**100**	

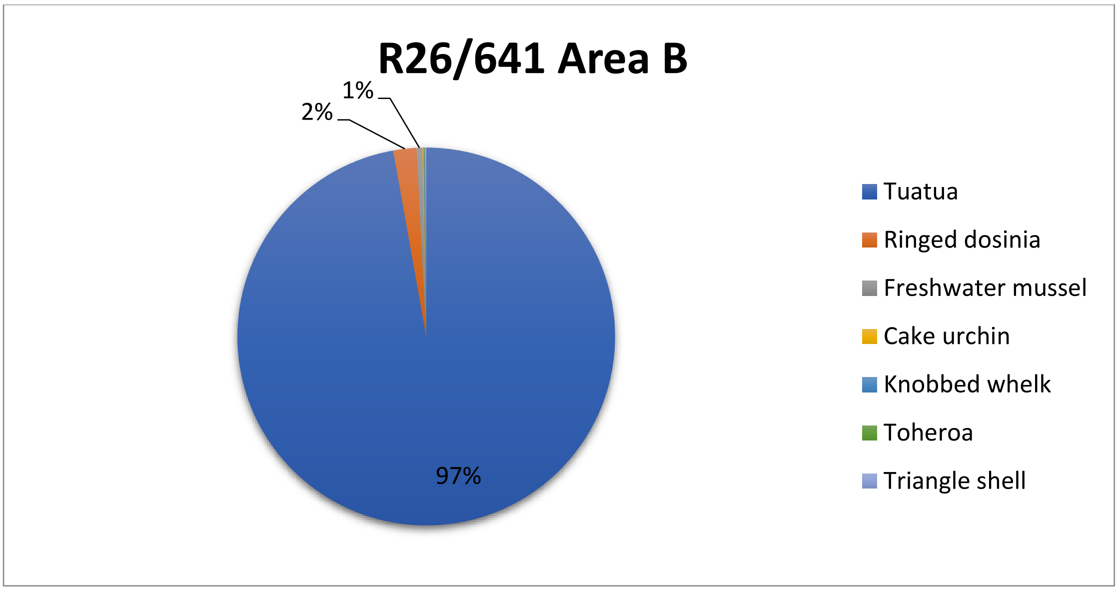


Figure 83: Relative abundance of invertebrate species (MNI) from R26/641 Area B

Table 144: Results of analysis of vertebrate sample from R26/641 Area A

Class	Species	NISP	MNE	MNI
Fish	Mackerel sp.	1	1	1
	Unidentified	65		
	Total	**66**	**1**	**1**
Bird	Unidentified	2		
	Total	**2**		
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

Table 145: Results of analysis of vertebrate sample from R26/641 Area B

Class	Species	NISP	MNE	MNI
Fish	Red cod	1	1	1
	Snapper	2	2	1
	Unidentified	19		
	Total	**22**	**3**	**2**

R26/618

Sample size: Area C = 11.5 litres

Area D = 8 litres

Samples were analysed from two midden deposits within R26/618. Five species of shellfish and one of echinoderm were identified within each sample, all from the sandy beach habitat (Tables 146 and 147, Figure 84 and Figure 85). The Area C assemblage was heavily dominated by tuatua, with the remaining species accounting for less than 1% of the total MNI combined. Tuatua also dominate the Area D assemblage, though to a lesser extent, making up just over 83% of the total MNI. Small amounts of fish, bird, and rat bone were also identified from each sample (Tables 148 and 149). Identified fish species were barracouta, red cod, and elsamobranchii, each with an MNI of one. Identified birds were parakeet, weka, and grey duck. Weka was identified in both areas, but it is possible these elements represent only one bird given the close proximity of the deposits to each other.

Table 146: Results of analysis of invertebrate sample from R26/618 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1073	537	99.08	
Cake urchin			1	0.18	0.26
Knobbed whelk		1	1	0.18	
Olive shell		1	1	0.18	
Toheroa		2	1	0.18	
Triangle shell		1	1	0.18	
Non-diagnostic shell					2297
Total		**1078**	**542**	**100**	

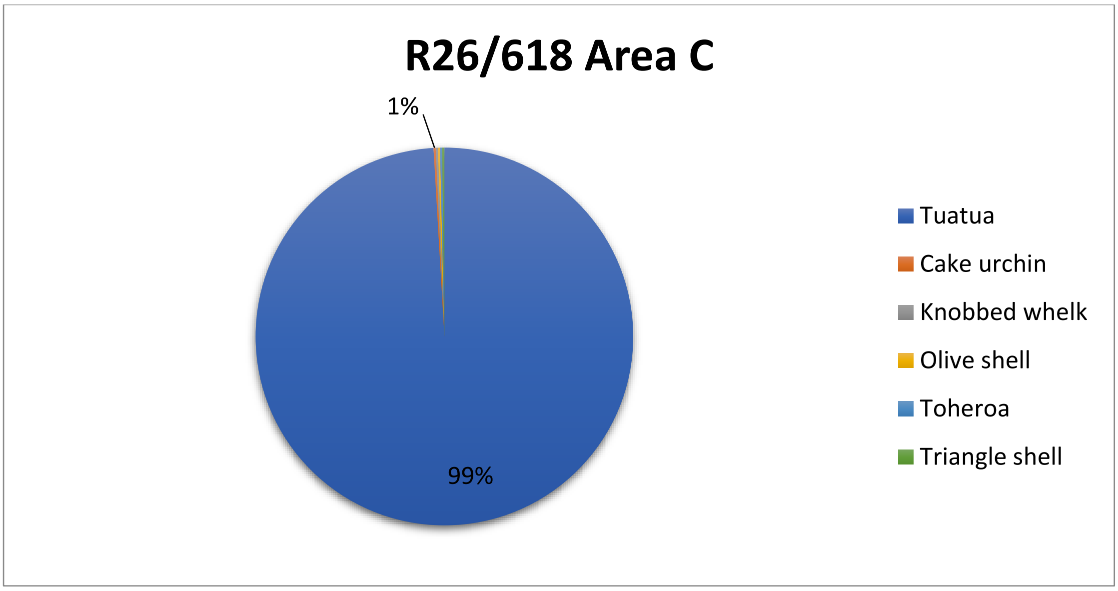


Figure 84: Relative abundance of invertebrate species (MNI) from R26/618 Area C

Table 147: Results of analysis of invertebrate sample from R26/618 Area D

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		139	70	83.33	
Triangle shell		3	4	4.76	
Knobbed whelk		3	3	3.57	
Toheroa		5	3	3.57	
Ringed dosinia		6	3	3.57	
Cake urchin			1	1.19	0.64
Non-diagnostic shell					1154
Total		**156**	**84**	**100**	

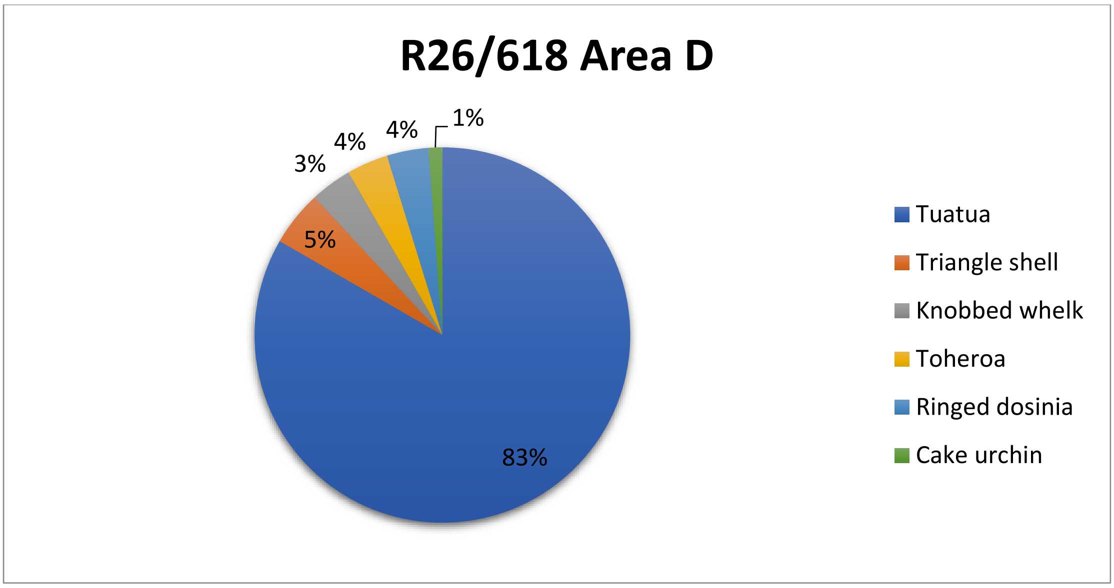


Figure 85: Relative abundance of invertebrate species (MNI) from R26/618 Area D

Table 148: Results of analysis of vertebrate sample from R26/618 Area C

Class	Species	NISP	MNE	MNI
Fish	Barracouta	1	1	1
	Red cod	6	6	1
	Unidentified	221		
	Total	**228**	**7**	**2**
Bird	Parakeet	1	1	1
	cf Weka	8	2	1
	Unidentified	2		
	Total	**11**	**3**	**2**
Mammal	Rat	1	1	1
	Total	**1**	**1**	**1**

Table 149: Results of analysis of vertebrate sample from R26/618 Area D

Class	Species	NISP	MNE	MNI
Fish	Eslasmobranchii	1	1	1
	Unidentified	56		
	Total	**57**	**1**	**1**

Bird	cf Grey Duck	1	1	1
	cf Weka	1	1	1
	Unidentified	2		
	Total	**4**	**2**	**2**
Mammal	Rat	5	5	1
	Total	**5**	**5**	**1**

R26/646

Sample size: Area A = 25 litres

Area B = 13 litres

Area C = 39 litres

Samples from three areas within this large, dense midden deposit were taken for analysis due to variations seen within the site during fieldwork. Interestingly, the samples from Areas A and C showed less species diversity for shellfish than the much smaller Area B sample (Tables 150-152, Figure 86 to Figure 88). Due to the contiguous nature of the deposit, the vertebrate bone from all three sample areas have been combined to ensure minimum numbers of individuals for these are not artificially inflated.

The invertebrate assemblages from Areas A and C are both heavily dominated by tuatua, with all species present coming from the sandy shore environment. The Area B assemblage is also dominated by tuatua, though to a lesser extent than in the other areas, with tuatua comprising just over 91% and ringed dosinia just over 7% of the total MNI. As above, this area had a greater diversity of species, mostly comprised of single individuals of sub-tidal species, but also including a small amount of freshwater mussel. The difference in species composition and abundance between the areas is likely reflective of variable sea conditions during occupation of the site. This site also has the highest amount of toheroa (*Paphies ventricosa*) of any site in the project, albeit still less than 1% of the total MNI, with just 22 individuals from the three assemblages combined.

Analysis of the vertebrate assemblage identified two species of fish, two of bird, and a comparatively large number of rats (Table 153). The total MNI for fish was six, with five of these being red cod. This is one of only two instances in the project area where one species of fish has a clear dominance, though given the nature of sampling in a monitoring context, not too much can be read into this. Identified birds were tui (MNI = 3) and red-crowned parakeet (MNI = 1). Although rats can get into middens via natural processes, the large number here (MNI = 9) suggests these were almost certainly deliberately caught as food.

Table 150: Results of analysis of invertebrate sample from R26/646 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		5308	2654	97.79	
Ringed dosinia		66	33	1.22	0
Toheroa		18	11	0.41	
Triangle shell		14	7	0.26	
Knobbed whelk		5	5	0.18	0
Cake urchin			1	0.04	2.51
Olive shell		1	1	0.04	
Angled wedge shell		1	1	0.04	
Trough shell		1	1	0.04	
Non-diagnostic shell					1854
Total		**5415**	**2714**	**100**	

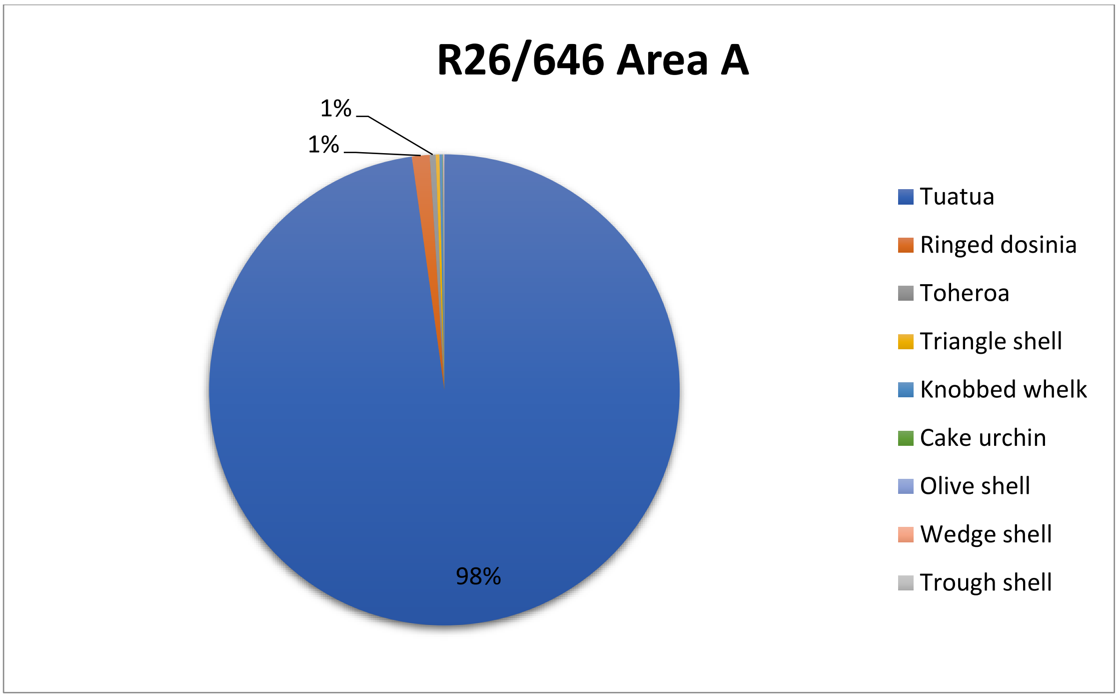


Figure 86: Relative abundance of invertebrate species (MNI) from R26/646 Area A

Table 151: Results of analysis of invertebrate sample from R26/646 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		2498	1249	91.17	
Ringed dosinia		200	100	7.30	
Triangle shell		16	8	0.58	
Toheroa		4	3	0.22	
Knobbed whelk		2	2	0.15	
Cake urchin			1	0.07	0.36
Trough shell		1	1	0.07	
Fine dosinia		1	1	0.07	
Frilled dosinia	5	1	1	0.07	
Ostrich foot		1	1	0.07	
Angled wedge shell		1	1	0.07	
Freshwater mussel		2	1	0.07	
Pale tiger shell		1	1	0.07	
Non-diagnostic shell					3708
Total		**2728**	**1370**	**100**	

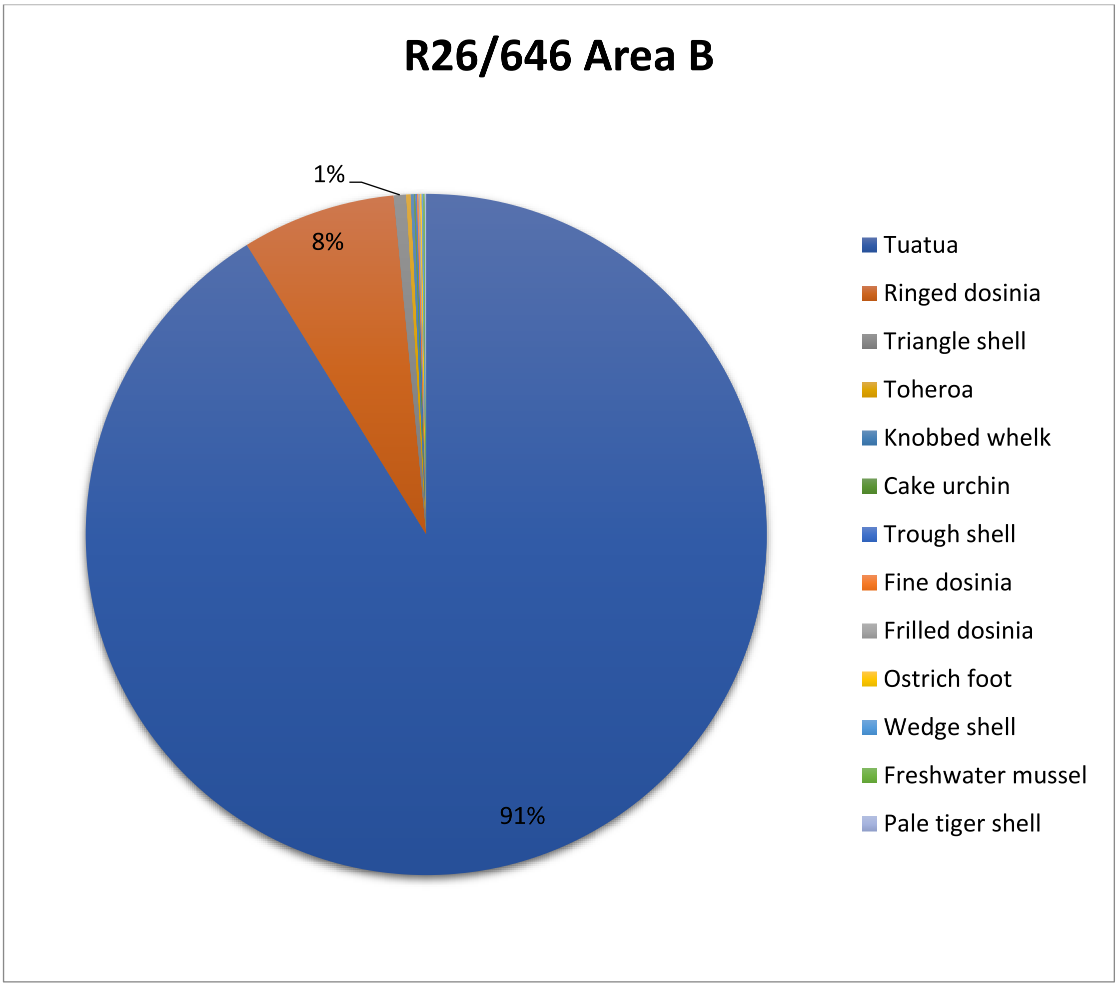


Figure 87: Relative abundance of invertebrate species (MNI) from R26/646 Area B

Table 152: Results of analysis of invertebrate sample from R26/646 Area C

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		9554	4777	98.68	
Ringed dosinia		86	43	0.89	
Toheroa		13	8	0.17	
Triangle shell		12	6	0.12	
Knobbed whelk		5	5	0.10	
Cake urchin			1	0.02	0.92
Pale tiger shell	2	1	1	0.02	
Non-diagnostic shell					7655
Total		**9671**	**4841**	**100**	

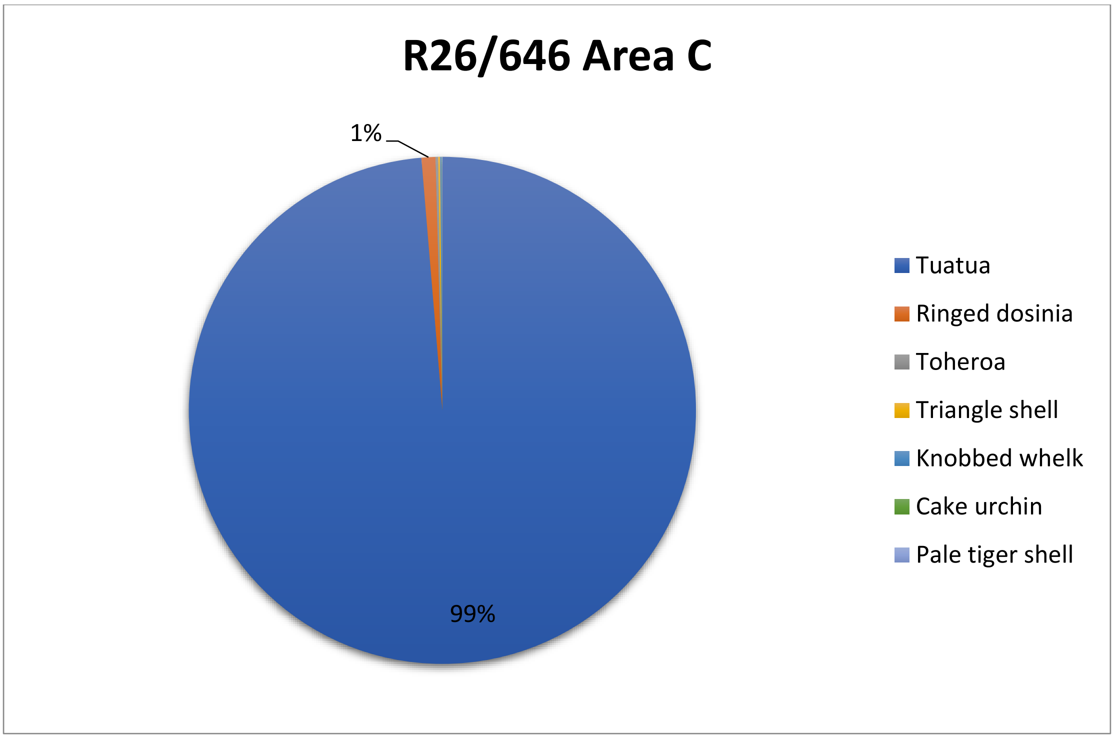


Figure 88: Relative abundance of invertebrate species (MNI) from R26/646 Area C

Table 153: Results of analysis of vertebrate sample from R26/646

Class	Species	NISP	MNE	MNI
Fish	Barracouta	5	2	1
	Red cod	29	28	5
	Unidentified	1349		
	Total	**1383**	**30**	**6**
Bird	Red crowned Parakeet	3	2	1
	Tui	9	8	3
	Unidentified	21	2	
	Total	**33**	**12**	**4**
Mammal	Rat	48	46	9
	Total	**48**	**46**	**9**

R26/615

Sample size: Area A = 8.5 litres

Area B = 10 litres

Analysis was undertaken on samples from two midden deposits within R26/615. There were relatively minor differences between the invertebrate assemblages from the two areas. Both are dominated by tuatua, though Area B had a slightly higher sub-tidal component and higher species diversity than Area A (Tables 154 and 156, Figure 89 and Figure 90). Both assemblages contain a small amount of freshwater mussel, indicating small-scale exploitation of this habitat, with the remaining species all being from the sandy shore habitat.

Both areas also contained small amounts of vertebrate bone (Tables 157 and 158). The only identified fish from Area A was wrasse, while the Area B assemblage contained one each of kahawai and snapper, and a small amount of rat bone.

Table 154: Results of analysis of invertebrate sample from R26/615 Area A

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		908	454	97.22	
Ringed dosinia		13	7	1.50	
Triangle shell		3	2	0.43	
Crab sp.		1	1	0.21	
Cake urchin			1	0.21	0.64
Toheroa		1	1	0.21	
Freshwater mussel	3	1	1	0.21	
Non-diagnostic shell					636
Total		**927**	**467**	**100**	

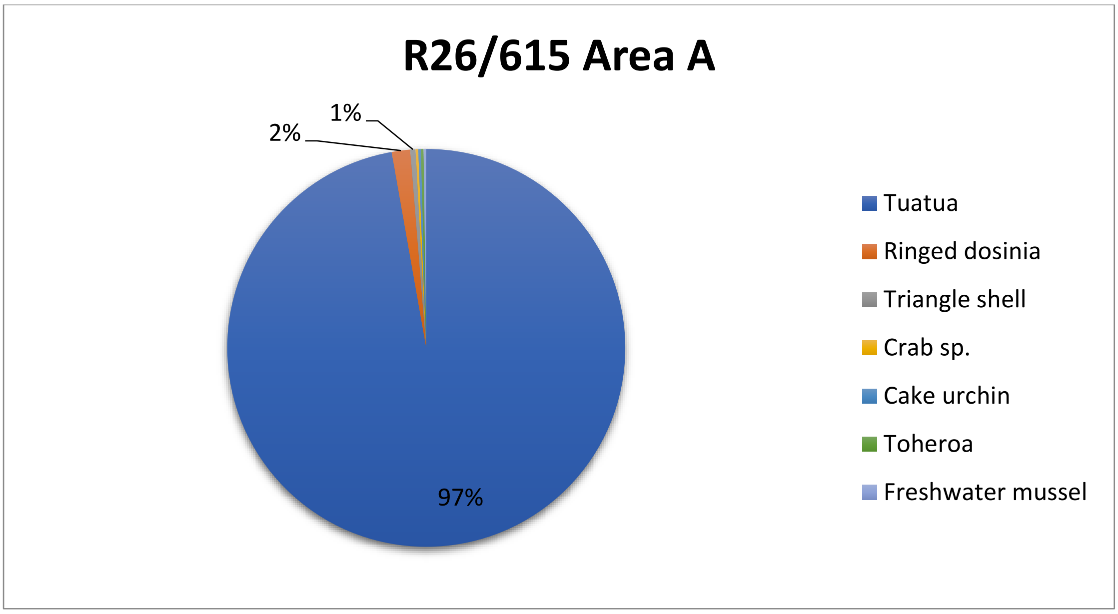


Figure 89: Relative abundance of invertebrate species (MNI) from R26/615 Area A

Table 155: Results of analysis of invertebrate sample from R26/615 Area B

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1131	566	93.40	
Ringed dosinia		53	27	4.46	
Toheroa		5	3	0.50	
Trough shell		4	2	0.33	
Knobbed whelk		2	2	0.33	
Cake urchin			2	0.33	2.1
Triangle shell		1	1	0.17	
Arabic volute		1	1	0.17	
Crab sp.		1	1	0.17	
Freshwater mussel	8	2	1	0.17	
Non-diagnostic shell					1245
Total		**1199**	**606**	**100**	

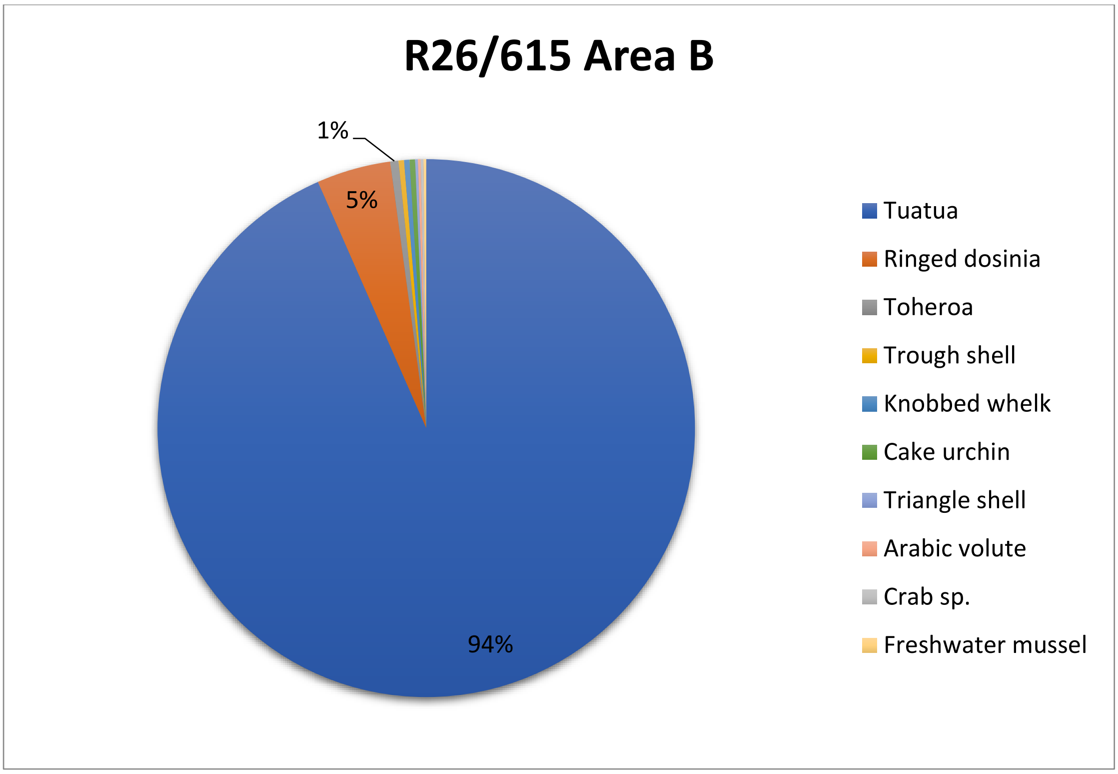


Figure 90: Relative abundance of invertebrate species (MNI) from R26/615 Area B

Table 156: Results of analysis of vertebrate sample from R26/615 Area A

Class	Species	NISP	MNE	MNI
Fish	Wrasse sp.	2	2	1
	Unidentified	33		
	Total	**35**	**2**	**1**

Table 157: Results of analysis of vertebrate sample from R26/615 Area B

Class	Species	NISP	MNE	MNI
Fish	Kahawai	1	1	1
	Snapper	2	2	1
	Unidentified	87		
	Total	**90**	**3**	**2**
Mammal	Rat	3	3	1
	Total	**3**	**3**	**1**

R26/612

Samples size: Upper lens = 6.5 litres

Lower lens = 1.4 litres

The R26/612 samples come from two discrete lens of midden exposed in section, with the lower lens approximately one metre below the upper. Tuatua comprise almost 100% of the assemblage from the upper layer, with a small amount of cake urchin being the only other species present, while the lower layer was comprised entirely of tuatua (Tables 158 and 159). Both layers also contained small amounts of vertebrate material. The upper layer contained a bone identified to red cod, as well as a small amount of unidentified fish bone, and at least three species of forest bird – two parakeets, of which one was definitely a red-crowned parakeet, and one each of tui and wood pigeon (*Hemiphaga novaseelandiae*). The lower layer contained a few fragments of unidentified fish bone only (Tables 160 and 161).

Table 158: Results of analysis of invertebrate sample from R26/612 Upper

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		1218	609	99.84	
Cake urchin			1	0.16	0.26
Non-diagnostic shell					587
Total		**1218**	**610**	**100**	

Table 159: Results of analysis of invertebrate sample from R26/612 Lower

Species	NISP	MNE	MNI	% MNI	Weight (g)
Tuatua		111	56	100	
Non-diagnostic shell					123
Total		**111**	**56**	**100**	

Table 160: Results of analysis of vertebrate sample from R26/612 Upper

Class	Species	NISP	MNE	MNI
Fish	Red cod	1	1	1
	Unidentified	18		
	Total	**19**	**1**	**1**
Bird	Parakeet	1	1	1
	Red crowned parakeet	3	3	1
	Tui	1	1	1
	Wood pigeon	1	1	1
	Unidentified	16		
	Total	**22**	**6**	**4**

Table 161: Results of analysis of vertebrate sample from R26/612 Lower

Class	Species	NISP	MNE	MNI
Fish	Unidentified	6		
	Total	**6**		

Discussion

A total of 91 faunal samples from 54 sites were analysed in order to gain an understanding of the range and diversity of subsistence practices within the project area. Much of the previous archaeological work on the Kapiti Coast has been undertaken within the context of residential development, with the results of faunal analyses generally showing a low diversity of species, particularly in the case of vertebrates. The large scale of the MacKays to Peka Peka Expressway project provided an opportunity to examine a much larger dataset of faunal remains from a number of sites over a wide geographic area, allowing for more robust interpretation and a fuller understanding of the factors affecting food procurement and environmental exploitation.

Invertebrates

Shellfish make up the vast majority of the faunal material analysed. This is a pattern seen commonly in archaeological sites along the Kapiti Coast. A total of 37 invertebrate species were identified during analysis, with sandy shore, estuarine, rocky shore and freshwater habitats all represented, although species from the latter three are present in only small numbers (Table 162, Figure 91). The results from all midden deposits show a clear emphasis on sandy shore species. Tuatua make up 84% of the total invertebrate MNI, followed by the sub-tidal species ringed dosinia (8%) and triangle shell (5.5%). Combined, these three surf clams represent nearly 98% of the identified invertebrates. As can be seen from the previous section, despite the clear dominance of tuatua overall, there is considerable variation amongst individual midden deposits in terms of both species richness and abundance of the various taxa, particularly the three main surf clams. In fact, only 55.5% of the deposits analysed have 84% or more tuatua, while in 20% of the deposits tuatua comprise less than 50% of the total shellfish assemblage. This calls into question the usual characterisation of Kapiti Coast middens as mono-species, although for all intents and purposes some most certainly are. These differences will be further discussed below.

Table 162: Aggregated MNI and % MNI for invertebrates across all sites

Species	MNI	% MNI
Tuatua	66753	83.981
Ringed dosinia	6505	8.184
Triangle shell	4410	5.548
Knobbed whelk	726	0.913
Trough Shell	218	0.274
Pipi	170	0.214
Freshwater mussel	123	0.155
Cake urchin	93	0.117
Toheroa	69	0.087
Pale tiger shell	57	0.072
Tuangi cockle	57	0.072
Helmet shell	55	0.069
Arabic volute	50	0.063
Limpet sp.	43	0.054
Mud snail	21	0.026
Paua	19	0.024
Crab sp.	15	0.019
Potamapyrgus sp.	13	0.016
Angled wedge shell	13	0.016
Gastropod sp.	10	0.013
Cat's eye	9	0.011
Spotted top shell	7	0.009
Cook's Turban	6	0.008
Ostrich foot	6	0.008
Silver paua	6	0.008
Olive shell	5	0.006
Paua sp.	5	0.006
Turret shell	5	0.006
Mussel Sp.	3	0.004
Necklace shell	3	0.004
Dark rock shell	2	0.003

Frilled venus shell	2	0.003
Brown olive shell	1	0.001
Fan shell	1	0.001
Fine dosinia	1	0.001
Oyster	1	0.001
Pink barnacle	1	0.001
Southern olive shell	1	0.001
Sunset shell	1	0.001
Total	**79486**	**100**

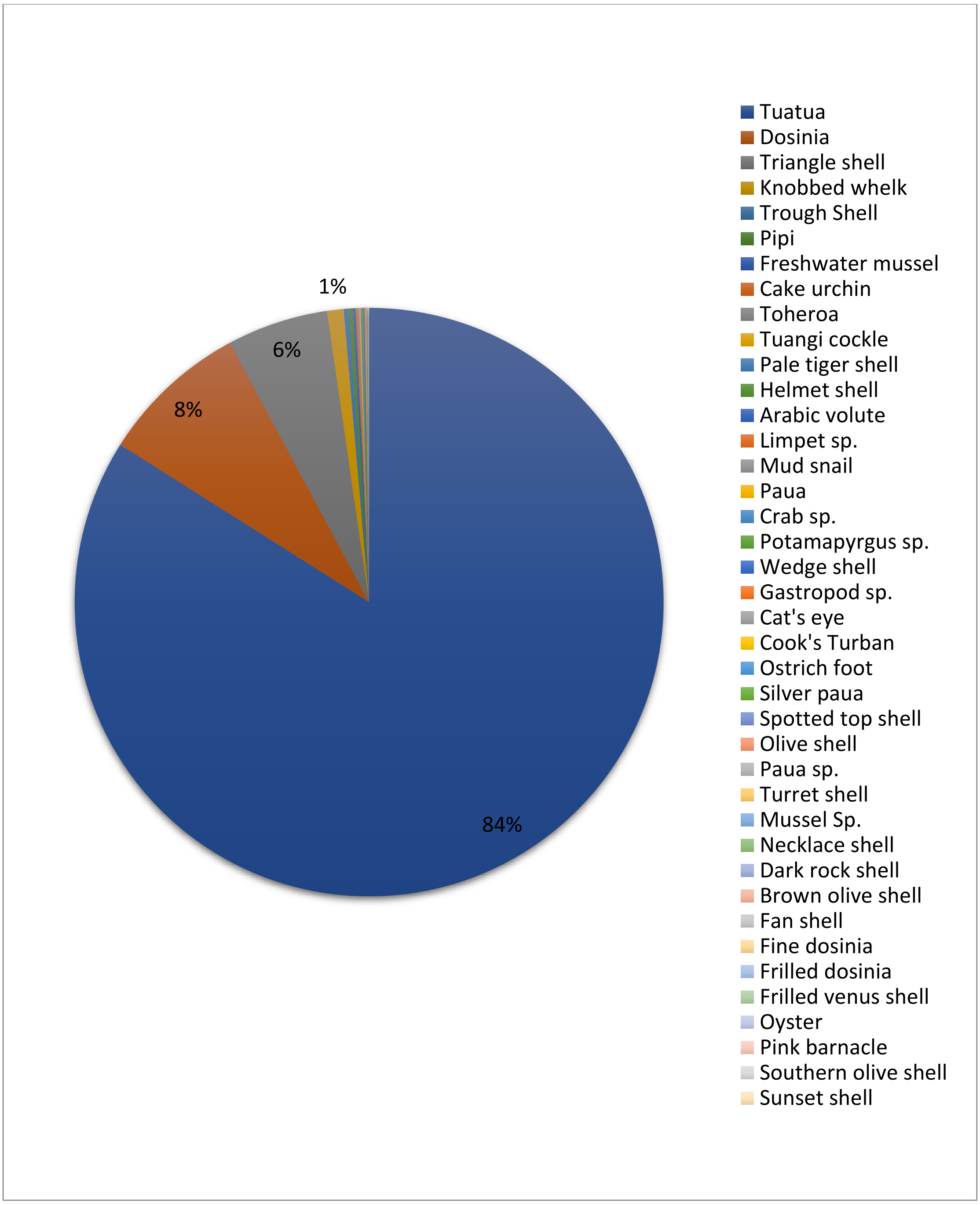


Figure 91: Aggregated MNI % for invertebrates across all sites

The Kapiti Coast is home to two species of tuatua – *Paphies subtriangulata* (northern tuatua) and *Paphies donacina* (southern tuatua). Southern tuatua is generally referred to as sub-tidal, however this is somewhat misleading. While the depth range of *P. donacina* extends further into the sub-tidal than that of *P. subtriangulata*, and the biomass is higher below the low tide mark, both species can be collected at low tide on Kapiti beaches, and co-mingle within beds (Richardson *et al.* 1982: 231). The two species are very similar, but can be distinguished via a number of attributes, though some of these are not always observable on archaeological specimens (Leach *et al.* 2000). Given the time consuming nature of distinguishing between the two species, and the fact that both can be harvested in the same manner from the same location on the beach, species differentiation was not undertaken as part of the analysis for this project. Differentiating between the species may, however, provide other useful information beyond method of collection. For example, adult southern tuatua are more abundant below the low tide mark, and may only be accessible for harvesting in significant numbers at spring tides during stable sea conditions (Ministry for Primary Industries 2017: 1445). Large specimens are likely to be inaccessible even at spring tides, as they live at greater depths than younger, smaller animals (Cranfield and Michael 2001: 12), and their presence in archaeological sites may indicate harvesting of stranded individuals following rough seas. Southern tuatua are also more cold tolerant than northern tuatua, therefore higher percentages of the former in archaeological sites when not in association with significant numbers of other sub-tidal species may be an important palaeo-environmental indicator.

Although no formal study of shell size was undertaken, the size variation observed for tuatua generally suggests non-selective harvesting as opposed to selecting only larger individuals. For most sites, the tuatua are of a size comparable to what is able to be collected at low tide currently. A few sites contain only or mostly very small tuatua. This may indicate harvesting further up the beach profile where juvenile tuatua are more common, though there may be other explanations for high instances of small tuatua.

The other two main surf clams identified are entirely sub-tidal. Ringed dosinia are most abundant at a depth of 5-8 metres, though are common across the whole sub-tidal range from 2 metres, while triangle shells have a peak density at 2-4 metres (Ministry for Primary Industries 2017). The remaining sandy beach species also all live in the shallow sub-tidal or below. This would have made these species largely inaccessible to pre-European Maori under stable sea conditions. Thus, the two species of tuatua would have been the only sandy shore shellfish available for harvesting during prolonged calm periods.

Surf clams are subject to high mortality as a result of erosion during storm events, and this is particularly the case on the Kapiti Coast due to the exposed nature of the beaches. Other causes of natural mortality resulting in strandings include strong currents, freshwater influx, toxic algal blooms, low oxygen levels during summer calm periods, and sudden drops in water temperature (Eggleston and Hickman 1972: 382; Ministry for Primary Industries 2017: 1440). When shellfish are dislodged from the substrate and are unable to rebury they will wash up on the beach a day or two after, once the sea settles, and be available for collection. Carkeek (1966: 104) states:

> “An explanation of this predominance of tipatipa in some places is, as an old Ngati Huia informant pointed out, that this species was usually to be found in great quantities after a storm and high tide. Following such conditions a food gathering party might return with a catch consisting entirely of Dosinia.”

The quantities of sub-tidal surf clams available after a stranding event will vary depending on the cause and severity of the event, and this is reflected in the archaeological record. Live individuals may only be available for a day, or may continue to wash up for several days. Although mass strandings that would allow scooping up of large numbers of animals very quickly are occasionally reported (eg. Eggleston and Hickman 1972), the smaller, more frequent strandings require hand picking of individuals. Following ex-tropical cyclone Gita in February of 2018, the author was able to collect 500 live ringed dosinia within 20 minutes along a relatively short stretch of beach. Tuatua, other than large sub-tidal individuals, appear to be less prone to strandings following storms, possibly due to greater burrowing ability (McLachlan *et al.* 1995). It would seem that even when sub-tidal species were available for collection from the beach following strandings, harvesting of tuatua would still have required digging in the normal manner, suggesting a two-pronged approach to shellfish harvesting. Collection of stranded animals was also likely more time-consuming than harvesting tuatua, where several animals can be scooped out at once by hand or larger numbers collected by dredging with a kete.

The proportions of sub-tidal species within sites are likely a reflection of both the biomass of individual species, and the locations of beds containing these. Modern biomass studies for the Kapiti-Horowhenua coast show that ringed dosinia have a far greater biomass than triangle shell (Cranfield *et al.* 1994, Table 6), and based on the archaeological record this is likely to have been the case in the past also.

Toheroa were present in 16 of the 54 sites analysed, though only in small amounts. Most of these sites were north of the Waikanae River. Though generally thought of as living higher on the beach than tuatua, they do extend to the low intertidal, and possibly even shallow sub-tidal zones. Although deliberate harvesting cannot be ruled out, given the very low numbers of toheroa seen in the M2PP middens it seems likely that these were individuals living at or near the low water mark, harvested as part of the tuatua catch.

The differing amount of cake urchin within sites presents an interesting issue. Broken pieces of cake urchin are often seen along the beaches of the Kapiti Coast, and small amounts could be easily dismissed as dead exoskeleton (test) inadvertently collected during harvesting of shellfish. However these dead and broken exoskeletons no longer contain the peristomial teeth that form the Aristotle's lantern (mouth apparatus), suggesting that the presence of this element in sites indicates whole animals having been collected. Although generally considered inedible, and bearing little flesh, at least two sites have a number of individuals represented within the midden assemblages, and this has also been observed at other sites on the Kapiti Coast. Carkeek (1966: 104) suggests that cake urchin may have been used as a flavouring or relish.

Rocky shore shellfish are represented in less than half of the sites analysed, and only ever in small amounts, comprising just 0.12% of total shellfish MNI for the project. Given the effort required to obtain rocky shore shellfish, with the closest available sources being south of Paekakariki or Kapiti Island, the low abundance of these species in the middens where they are present is somewhat perplexing. This suggests that shellfish gathering was not the primary reason for visits to places where rocky shore species could be obtained, or that rocky shore species are under-represented. This could result from either (or both) 'in field' processing of shellfish, with only the meat being returned to site, or removal of shells from sites for later use in tool manufacture or ornamentation. Estuarine and freshwater shellfish are also represented in only very small numbers overall.

Analysis of the shell material suggests industrial level harvesting of shellfish, primarily focused on the sandy shore habitat, which were then transported to sites for processing and preservation by drying for later consumption. Best (1929: 70, 77) details several ways in which bivalves were heated or cooked to allow extraction of the meat, which would then be threaded on strings of fibre for drying. Shellfish meat could then be stored and kept for some time, before being steamed again prior to eating. Small sites likely represent very short-term occupation of perhaps only one or two days, with medium to large sites indicating longer periods of occupation, most likely on a seasonal basis. Although the results of individual harvest events could sometimes be discerned within sites during recording, the lack of windblown sand within midden deposits suggests continual occupation over a probably short period of time (days to weeks), as opposed to sporadic visits and reuse of sites.

There is an interesting dichotomy between sites south of the Waikanae River and those to the north both in terms of site size (O'Keeffe, in press) and the diversity of shellfish within sites (Table 163). There are also considerably fewer sites south of the river. Lower species diversity is likely a product of shorter periods of occupation: shorter periods of occupation would allow fewer opportunities for occupation to coincide with stranding events. There is little evidence for exploitation of the rocky shore environment in the sites south of the river. Although there may be other cultural factors at play, the smaller size of sites and lower site density south of the river may be reflective of variability in the populations of surf clams along the coast. A recent study of tuatua populations along the Horowhenua coastline between Hokio and Otaki showed considerable variation in population densities (Newcombe *et al* 2014), and Carkeek (1966: 104) discusses being directed by elders to the best places to harvest tuatua as a child. Thus, while tuatua populations south of the river were clearly sufficient to support small-scale exploitation, they may not have been suitable for the large-scale exploitation indicated by sites north of the river.

Table 163: Aggregated MNI and %MNI for invertebrates south (left) and north (right) of Waikanae River

Species	MNI	%MNI
Tuatua	11586	92.27
Triangle shell	723	5.76
Ringed dosinia	146	1.16
Knobbed whelk	41	0.33
Cake urchin	14	0.11
Toheroa	10	0.08
Trough Shell	9	0.07
Crab sp.	7	0.06
Paua	4	0.03
Freshwater mussel	3	0.02
Turret shell	3	0.02
Arabic volute	2	0.02
Gastropod sp.	2	0.02
Pale tiger shell	2	0.02
Angled wedge shell	2	0.02
Frilled venus shell	1	0.01
Mussel Sp.	1	0.01
Olive shell	1	0.01
Grand Total	**12557**	**100**

Species	MNI	%MNI
Tuatua	55167	82.426
Ringed dosinia	6359	9.501
Triangle shell	3687	5.509
Knobbed whelk	685	1.023
Trough shell	209	0.312
Pipi	170	0.254
Freshwater mussel	120	0.179
Cake urchin	79	0.118
Toheroa	59	0.088
Tuangi cockle	57	0.085
Helmet shell	55	0.082
Pale tiger shell	55	0.082
Arabic volute	48	0.072
Limpet sp.	43	0.064
Mud snail	21	0.031
Paua	15	0.022
Potamapyrgus sp.	13	0.019
Angled wedge shell	11	0.016
Cat's eye	9	0.013
Crab sp.	8	0.012
Gastropod sp.	8	0.012
Spotted top shell	7	0.010
Cook's Turban	6	0.009
Ostrich foot	6	0.009
Silver paua	6	0.009
Paua sp.	5	0.007
Olive shell	4	0.006
Necklace shell	3	0.004
Dark rock shell	2	0.003

Mussel sp.	2	0.003
Turret shell	2	0.003
Brown olive shell	1	0.001
Fan shell	1	0.001
Fine dosinia	1	0.001
Frilled venus shell	1	0.001
Oyster	1	0.001
Pink barnacle	1	0.001
Southern olive shell	1	0.001
Sunset shell	1	0.001
Grand Total	**66929**	**100**

The relative proportions of different sandy shore species and species diversity within individual sites is a product of accessibility, as opposed to deliberate choice of one species over others – tuatua are plentiful and easily collected at low tide at any time, whereas ringed dosinia and triangle shell, along with other sub-tidal species, would only have been available under certain conditions. When available, these species were collected, despite potentially requiring greater time expenditure for return compared to harvesting tuatua. Although it cannot be proven it is possible that, on some occasions, storm events were deliberately exploited in order to collect species of shellfish not normally available, though this would require people to be living close enough to the coast to take advantage of these events.

Vertebrates

Vertebrates make up only a very small proportion of the analysed midden assemblages. Taphonomic factors may play a role in this, and it was noted during fieldwork that fish bone often had very poor structural integrity, particularly when in dense shell deposits, essentially having the consistency of wet weetbix. This may explain the disparity in the amount of bone, both overall and in terms of what could be identified to species, between the investigation and monitoring phases of the project, with post-collection treatment of midden samples (wet sieving on-site versus bulk sampling, drying, then dry sieving) having a considerable effect on retention.

The poor preservation of bone material means that the results of analysis are likely skewed by taphonomic bias.

Although the inter-site variability in vertebrate species and amounts of bone is interesting, it is important to note that the nature of sampling in a monitoring context, where often only a very small percentage of the midden is collected, can create a significant bias, particularly if bone is distributed unevenly throughout the site. This may be particularly evident when fishing and fowling form a relatively minor component of the subsistence strategy, as appears to be the case with the M2PP sites. Thus, it is more useful to look at the data from all sites collectively in order to provide a more accurate interpretation.

Fish

Fish remains were present in 43 of the 54 sites analysed, although ten of these did not contain any material identifiable to species. As previously stated, the fish bone was generally poorly preserved and had a very high fragmentation rate, with 63% of the total NISP unable to be identified to element and only 3% of the total NISP identified to taxon. Total MNIs for most sites amount to only a few fish, though as can be seen from the individual site descriptions a small number of sites contained significantly higher amounts of fish bone. There is a clear difference between sites south of the Waikanae River and those to the north, both in terms of amount of fish bone present and species diversity. This is likely a reflection of the generally larger size of sites north of the river, which presumably reflects longer periods of occupation and a more diverse range of subsistence activities being undertaken.

A total of 24 taxa, including cartilaginous sharks and rays, were identified, yielding a total MNI for all sites of 221 (Table 164, Figure 92). Red cod, barracouta, snapper, and wrasses each comprised 12% of the total identifiable species, and blue cod and kahawai contributed 9.5% and 7% respectively. The top five species correlate with those listed by Leach (2006: 61) as being most abundant in New Zealand archaeological sites. Kahawai generally rank quite low in New Zealand sites in terms of relative abundance, though are noticeably more prevalent in sites from the lower North Island bordering Cook Straight (Leach *et al.* 2000: 23). The rank order abundance and species diversity for the M2PP sites collectively indicates a very generalised fishing strategy, as opposed to one focusing on only one or two species and with a low overall diversity. This higher species diversity appears to be a distinctive feature of sites along the south and west coasts of the lower North Island (Leach 2006: 155).

Table 164: Aggregated NISP, MNE and MNI values for fish across all sites

Species	NISP	MNE	MNI	%MNI
Red cod	169	137	27	12.22
Barracouta	155	97	27	12.22
Snapper	430	156	26	11.76
Wrasse sp.	99	92	26	11.76
Blue cod	67	66	21	9.50
Kahawai	39	39	16	7.24
Tarakihi	29	29	11	4.98
Mackerel sp.	36	24	10	4.52
Elasmobranchii	26	24	8	3.62
Greenbone	20	20	8	3.62
Blue moki	12	12	7	3.17
Leatherjacket	13	10	6	2.71
Eagle ray	5	5	5	2.26
Anguilla sp.	6	6	4	1.81
Hapuku	3	3	3	1.36
Trumpeter	5	5	3	1.36
Conger sp.	2	2	2	0.90
Eel sp.	2	2	2	0.90
Galaxias sp.	2	2	2	0.90
Marblefish	3	3	2	0.90
NZ sole	4	4	2	0.90
Greenback flounder	1	1	1	0.45
Hoki	2	2	1	0.45
Scarpee	6	6	1	0.45
Unidentified	34198			
Total	**35334**	**747**	**221**	**100**

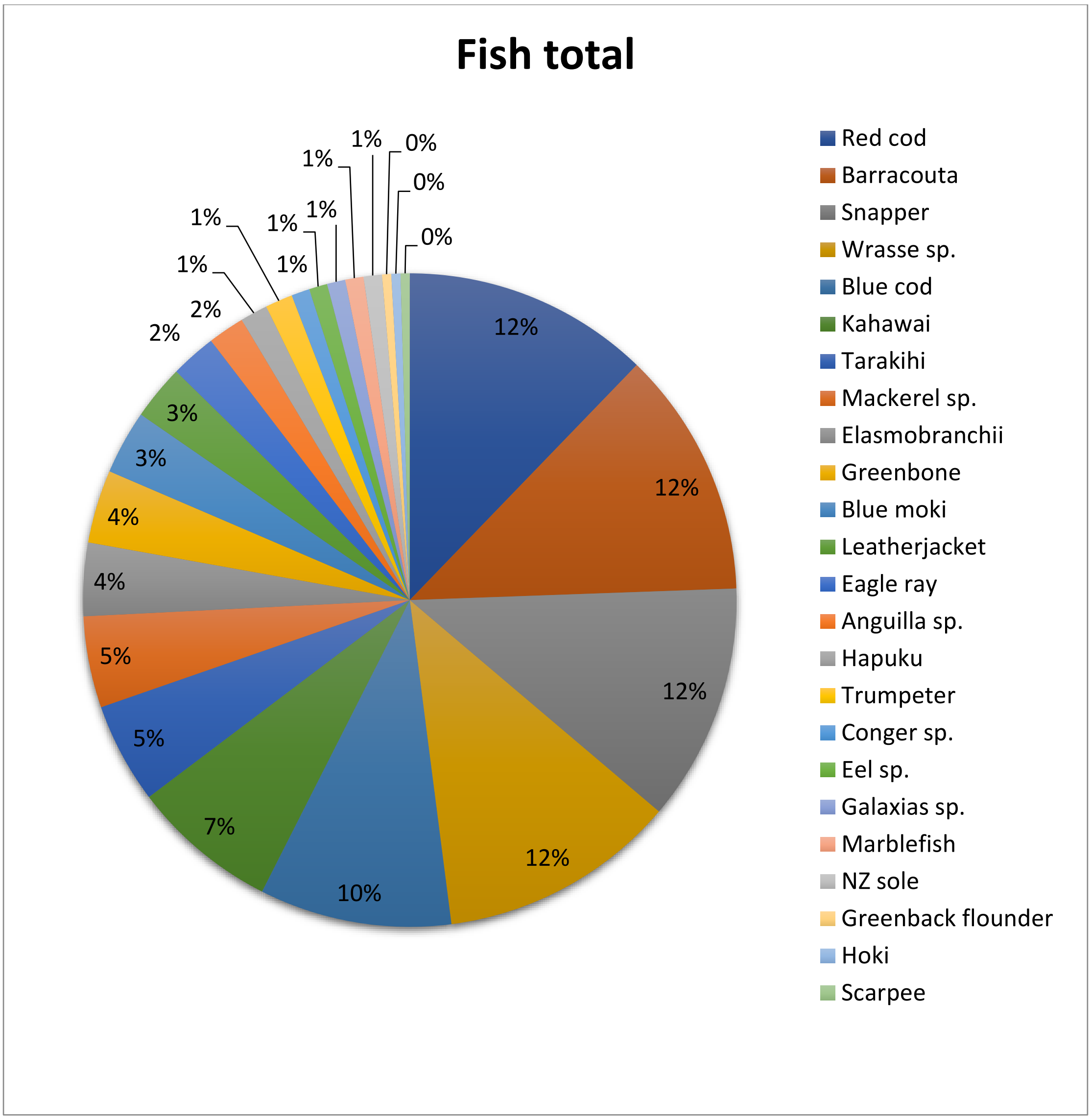


Figure 92: Aggregated MNI % for fish across all sites

The species identified come from a range of habitats, including open water, rocky shore and freshwater, and would have required a range of fishing techniques to capture. Interpreting zone of capture and fishing technique is not always straightforward, as some fish will range over a number of habitats, and most can be caught via more than one technique. For example, snapper may be caught by hook and line from canoes in open water, or near shore while fishing from the rocky or sandy shore (Paul 2000: 97), and may also be taken in nets (Leach 2006: 76). Kahawai are caught by trolling or hook and line fishing from canoes (Anderson 1997), but can also be caught by line from the beach, and are often caught in set nets on the Kapiti Coast (Paul 2000: 93). Wrasses may also be taken by hook or net. Greenbone, a rocky shore species, are most commonly caught by spearing or netting, though are possible to take with a hook occasionally (Leach 2006: 96).

Small-scale freshwater fishing is indicated by the presence of freshwater eels and kokopu. It is possible that eels are under represented in the archaeological record (*cf* Marshall 1987). If eels were preserved whole and removed from the sites for later consumption, this would have left no trace within the archaeological sites. The few eel bones identified may be from individuals consumed during occupation. As far as the author is aware, this is the first instance of kokopu being identified in Kapiti Coast middens, and Leach (2006) does not mention their presence in any of the sites included in his book *Pre-European Fishing in New Zealand*. This may be due to a number of reasons: they were not commonly exploited; they are under-represented due to the fragility of their bones; or their bones may go unrecognised in coastal sites due to a concentration on marine reference specimens.

Recent work in New Zealand looking at body part representation in order to examine patterns of butchery and processing has yielded interesting results suggestive of preservation of some fish for later consumption (Campbell 2016; Harris *et al.* 2017). This type of analysis was not undertaken for this project, but it is possible that a portion of the fish catch was being preserved and removed from site, resulting in evidence for fishing being under-represented.

Birds

Just over 600 bird bones were recovered, with birds represented in 21 of the 54 sites included in the analysis, the majority being north of the Waikanae River. As with the fish remains, most of the bird bone was too fragmented to identify. Analysis resulted in the identification of at least 12 species, with a combined MNI for all sites of 53. The assemblage is dominated by forest birds (parakeets, tui, North Island saddleback, kaka, wood pigeon, stitchbird, and fantail), but also contained weka, grey duck, fluttering shearwater, sooty shearwater, and mollymawk (Table 165, Figure 93). Parakeets were by far the most commonly identified bird, representing nearly half of the total MNI, followed by tui.

Table 165: Aggregated NISP, MNE, and MNI for birds across all sites

Species	NISP	MNE	MNI	% MNI
Anatidae	1	1	1	1.89

cf Grey Duck	2	2	2	3.77
cf Weka	11	4	4	7.55
Diomedea sp.	1	1	1	1.89
Fluttering shearwater	1	1	1	1.89
Kaka	3	3	1	1.89
NZ Fantail	2	2	1	1.89
Parakeet	69	66	25	47.17
North Island Saddleback	6	6	4	7.55
Sooty shearwater	3	3	1	1.89
Stitchbird	4	3	1	1.89
Tui	29	28	10	18.87
Wood pigeon	1	1	1	1.89
Unidentified	474	13		
Total	**607**	**134**	**53**	**100**

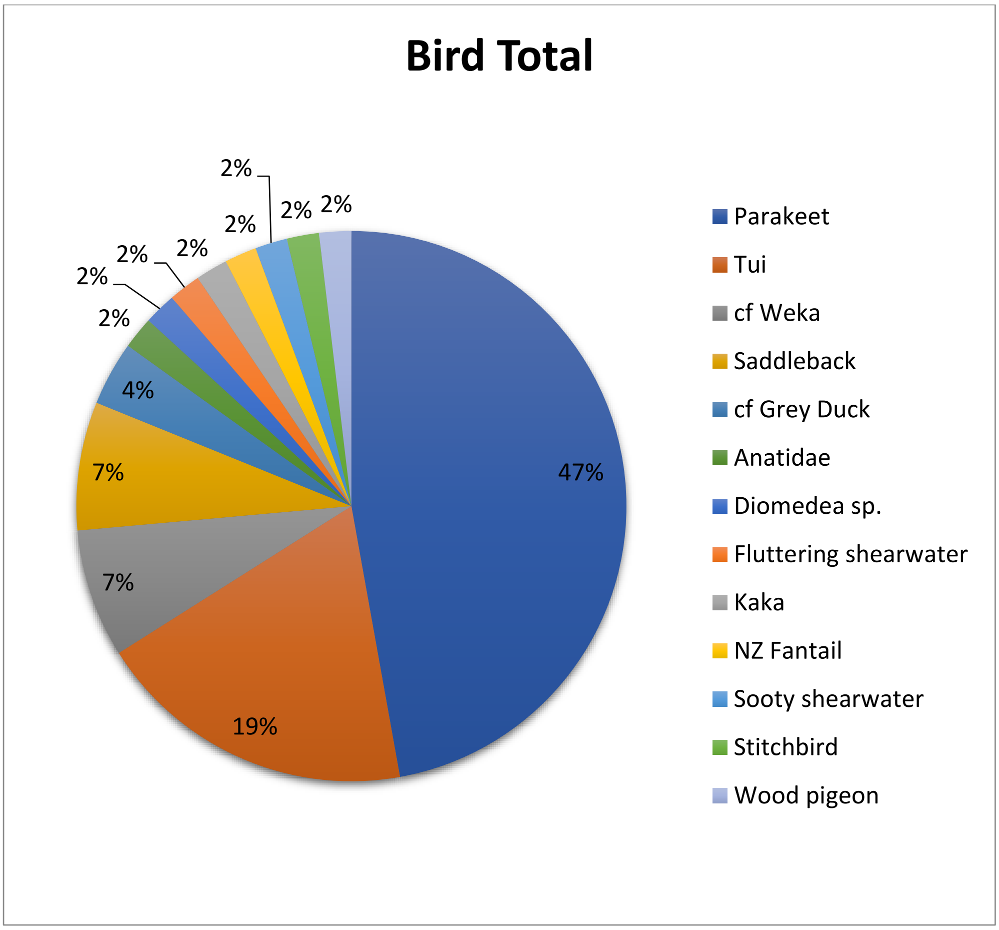


Figure 93: Aggregated MNI % for birds across all sites

The majority of the identified birds are commonly found in New Zealand archaeological sites (Worthy 1997: 147-150). The exception to this is the stitchbird. Worthy lists only one stitchbird from an archaeological context in his review of avian exploitation. Petersen (2007a) also recovered stitchbird from a midden at Peka Peka.

Parakeets are likely represented by both the red crowned and yellow crowned species, though there is overlap in the size range of male yellow crowned parakeets and female red crowned parakeets making positive species identification difficult. Twelve the 25 parakeets of are too large to be yellow crowned and therefore must be red crowned.

Based on the number of lower leg bones present, forest birds appear to have been brought to the site whole. There is some unevenness in element representation that could be indicative of preservation and removal of birds, however this anomaly may also be explained by sampling error. Carkeek (1966: 107) notes that Maori often carried supplies of preserved birds, and it cannot be assumed that birds represented by bone in a site were caught nearby, however Best (1942) gives detailed descriptions of the capture and preservation of forest birds, noting that the extremities were removed prior to potting. It can therefore be concluded that the forest birds were likely caught in relatively close proximity to the sites that they are found in. The bird spear recovered during the investigation phase of the project (Brooks *et al.* 2016) supports this hypothesis.

The dominance of forest birds fits well with the palaeoenvironmental reconstruction based on land snails (O'Keeffe, in press), and with the charcoal analysis presented in the investigation phase report (Brooks *et al.,* 2016), which both indicate that the surrounding landscape at the time of occupation was largely covered in Matai-dominant broadleaf forest with sites located in clearings. Forest birds would have been easily obtained within close proximity to the sites. The lack of forest birds in the more southern sites may indicate a difference in the environment north and south of Waikanae River in terms of forest cover.

The small number of seabirds (MNI = 3) suggests opportunistic collection rather than deliberate hunting. These birds were possibly found injured on the beach during shellfish harvesting expeditions. The three sites containing seabirds all have higher proportions of sub-tidal shellfish (at least 20% of MNI), which lends weight to the hypothesis that these were weakened or injured birds resulting from stormy weather.

There are surprisingly few wetland birds represented, given the environment. It is possible they were caught in greater numbers and preserved for later consumption at a different location, however a greater presence of extremities bearing little meat within the sites would be expected if this was the case.

Mammals

Three species of mammal were identified from the samples analysed: Polynesian rat (kiore), dog, and sheep, along with some mammal bone that was too fragmented to identify to species (Table 166). Over half of the unidentified fragments came from the same site the dog tooth was found in, and is likely dog also. Rat and dog were both introduced to New Zealand by Polynesian colonists, while sheep is a European-era introduction. The sheep bone came from a site that also contained a clay pipe stem, indicating early historic period occupation.

Table 166: Aggregated NISP, MNE, and MNI of mammals across all sites

Species	NISP	MNE	MNI
Rat	233	229	46
Dog	1	1	1
Sheep	1	1	1
Unidentified	43		
Total	**278**	**231**	**48**

Rats were present in 20 of the 54 sites analysed. As with other vertebrate species, most of these sites were north of the Waikanae River. Rats in midden sites can be problematic, as they can enter the site through natural means; however the numbers represented here suggest they were a food source in at least some of the sites. Best (1942: 365-384) provides detailed descriptions of rat trapping, and they were commonly preserved for later consumption. No details are provided on the treatment of rats for potting in terms of whether they were preserved whole, or if some butchery such as removal of extremities was undertaken, so it is not possible to speculate as to whether rats were being caught for preservation purposes or as a supplement to the diet during occupation of the sites.

Reptile

Two tuatara jaw bones were found in one of the sites. So far as the author is aware, this is the first time tuatara has been identified from an archaeological context on the Kapiti Coast. Although tuatara are known from other midden sites around New Zealand, and were presumably eaten (Davidson 1984: 131), there are other potential explanations for its presence.

Length of Occupation and Change Through Time

O'Keeffe (in press) notes that no postholes or evidence of structures were uncovered during either the high level investigations or the construction phase of the project. Likewise, no evidence of gardening was found. Although a number of artefacts were recovered during the project, the total number in relation to the number of sites was relatively low. The lack of structural and artefactual evidence at the sites suggests that the sites were probably occupied on a temporary basis, possibly seasonally.

The radiocarbon dates obtained for sites encountered during the construction phase generally cluster within the 16th century (O'Keeffe, in press: 144). It therefore does not appear that date of occupation played a role in the level of diversity in midden contents of sites within the expressway footprint.

Comparison with other Kapiti Coast Middens

Although a large number of midden sites have been recorded on the Kapiti Coast, the majority of previous archaeological work undertaken has resulted from small-scale development driven projects where only a small number of sites have been uncovered. These have often been considered in isolation, with little consideration of the wider landscape. This piecemeal approach has resulted in the characterisation of the subsistence economy as having little diversity, essentially a mono-species economy focused on tuatua harvesting. Reports are often lacking information on sample sizes, methods of analysis, and in some cases quantification, making comparison between sites more difficult. Work undertaken by Dodd (2013, 2015, 2016), Leach *et al.* (2000), and Petersen (2007a, 2007b, 2008a, 2008b, 2009), in conjunction with the pre-construction investigations for the M2PP Expressway project (Brooks *et al.* 2016), has utilised more robust sampling, methods of analysis, and reporting of midden contents. When considered as a whole, the archaeological record for the Kapiti Coast shows a far more diverse subsistence economy than when individual sites are considered in isolation, albeit one still focused on the collection of sandy shore shellfish.

Adkin divided middens on the Horowhenua Coast into an older group and a younger group based partly on the shell species contained within them (1948: 39-40). He categorised the younger middens as loose scatters containing tuatua and tohemanga (*Oxyperas elongata*) with few or no artefacts, while the older group consisted of dense concentrations containing tuatua, triangle shell, and ringed dosinia, with often numerous artefacts, and a conspicuous absence of tohemanga. Without the benefit of radiocarbon dates it is difficult to say how accurate these age divisions are, however both triangle shell and ringed dosinia occur fairly frequently in Kapiti coast middens dated to the 16th century, with few or no artefacts (Dodd 2015, 2016; Brooks *et al.* 2016, this report), suggesting that Adkin's use of shell species as a relative dating method does not hold weight. Tohemanga has not been found in any Kapiti Coast middens, and dredging surveys on the Kapiti-Horowhenua coast have not recovered this species (Cranfield and Michael 2001: 9), though Best (1929: 71) notes that it was present at Otaki in 1919. Its absence from sites within the M2PP project area and surrounds is likely a product of it not being locally available, rather than it not being exploited.

The vast majority of analysed middens from the Kapiti Coast yield broadly similar results to those obtained from the monitoring phase of the M2PP project. These show a subsistence economy focused on exploitation of the sandy shore environment, with variations in species diversity and proportions of shellfish largely a product of whether harvesting took place during a prolonged calm period or following rough seas. When viewed collectively, it can be seen that collection of at least small numbers of sub-tidal species was a fairly common occurrence, with larger amounts not uncommon. Rocky shore species, when present, only occur in small numbers, generally contributing less than 1% of total MNI. Estuarine species occur in only a few sites, these appear to all be north of the Waikanae River. The estuarine component is generally small, though with three notable exceptions. At the Ngarara subdivision on the north side of Te Moana Road, Waikanae, one midden deposit was almost entirely composed of tuangi cockle (94%), with lesser amounts of pipi and mud snail, and only a single tuatua (Jones, in prep). At Fairway Oaks, also on Te Moana Road, one midden contained 17% estuarine species (Petersen 2007b). One midden from the M2PP project, Area F of R26/497, contained 25% estuarine species. Interestingly, no estuarine shellfish were reported from middens at the Kotuku subdivision, despite being located directly adjacent to the Waikanae Estuary. The commonly eaten estuarine species are present within the estuary currently, though the biomass of these appears to be very low. Based on the archaeological record, this was likely also the case in the past. Toheroa have likewise been recorded in only a few sites previously, and generally occur only in small numbers (Dodd 2015, 2016; Greig 2003; Jones in prep; Petersen 2008b). Greig (2003) reported 12% toheroa by volume at the Fairway Oaks subdivision, which appears to be the largest amount of toheroa found in any site on the Kapiti Coast thus far. The majority of the toheroa identified from the M2PP monitoring phase samples were within the upper size limit of southern tuatua, and it is possible that toheroa has been misidentified as tuatua in some previously analysed assemblages. Regardless, it does not appear that toheroa was ever a targeted species on the Kapiti Coast. Carkeek (1966: 104) notes the rarity of toheroa in midden sites in comparison to its former availability. This species can still be found at Waikanae and Peka Peka, but the populations are very small (Les Mullen, pers comm., and author observation).

Vertebrates have generally formed a very minor component of the midden assemblages in which they have been found. Fish bone, when present, is usually highly fragmented and both species diversity and total MNIs in individual sites are low. An exception to this is R26/291 at Raumati Beach (Leach *et al.* 2000). At this site 14 families of fish were identified, with a total MNI of 86, making this by far the largest fish bone assemblage reported from the Kapiti Coast thus far. Bird remains are present less frequently than fish, and are often not able to be identified to species. Taphonomic factors affecting the preservation of bone have undoubtedly played a role in the apparent paucity of vertebrate remains, though to what extent is not clear.

At only one location on the Kapiti Coast does the archaeological evidence suggest a divergence from the usual pattern of temporary shellfish processing sites. This site, referred to as Pukenamu, is located at Te Horo, to the north of the M2PP project area. Investigations following discovery of the site revealed large areas of midden, along with structural evidence in the form of postholes, hearths, and possible house and working floors, and a comparatively large number of artefacts (Sharpe 2014). Although the final report for this project is still pending, preliminary analysis of the midden material has identified large amounts of bone material from fish, birds and mammals. The evidence suggests that this site was occupied on a more permanent basis.

Conclusion

Analysis of the midden assemblages from the monitoring phase of the M2PP earthworks programme indicates a subsistence economy largely focused on the collection of sandy shore shellfish, with minor contributions from other habitats. Taken in conjunction with other evidence from the sites, it is likely that shellfish harvesting was undertaken for the express purpose of processing and preserving shellfish meat for later consumption off-site. Based on the archaeological evidence, fishing and fowling appear to have formed only a minor component of the subsistence economy, as a supplement to the diet during occupation of the sites. Taphonomic processes affecting preservation of bone have undoubtedly created a bias in the vertebrate assemblages, and some of the fish and bird catches may also have been preserved for later consumption. It is therefore possible that fishing and fowling formed a larger component of the subsistence economy that that suggested by the archaeological record.

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Appendix One – Scientific and Common Names of Identified Species

Class	Scientific name	Common name
Shellfish	*Alcithoe arabica*	Arabic volute
	Amalda australis	Southern olive shell
	Amalda mucronata	Brown olive shell
	Amalda sp.	Olive shell
	Amphibola crenata	Mud snail
	Austrofusus glans	Knobbed whelk
	Austrovenus stutchburyi	Tuangi cockle
	Bassina yatei	Frilled venus shell
	Calliostoma selectum	Pale tiger shell
	Cellana sp.	Limpet
	Cookia sulcata	Cook's turban
	Crassula aequilatera	Triangle shell
	Dosinia anus	Ringed dosinia
	Dosinia subrosa	Fine dosinia
	Gari sp.	Sunset shell
	Haliotidae	Paua
	Haliotis australis	Silver paua
	Haliotis iris	Paua
	Haustrum haustorium	Dark rock shell
	Hyridella menziesii	Freshwater mussel
	Mactra sp.	Trough shell
	Melagraphia aethiops	Spotted top shell
	Maoricolpus roseus	Turret shell
	Mytilidae	Mussel
	Ostreidae	Oyster

	Paphies australis	Pipi
	Paphies subtriangulata/Paphies donacina	Tuatua
	Paphies ventricosa	Toheroa
	Peronaea gaimardi	Angled wedge shell
	Potamapyrgus sp.	
	Semicassis pyrum	Helmet shell
	Struthiolariidae	Ostrich foot
	Talochlamys zelaniae	Fan shell
	Tanea zelandica	Necklace shell
	Turbo smaragdus	Cat's eye
Echinoderm	*Fellaster zelandiae*	Cake urchin
Crustacea	*Balanus decorus*	Pink barnacle
	Cantharides ovalipes	Paddle crab

Class	**Scientific name**	**Common name**
Fish	*Anguilliformes*	Eel
	Anguilla sp.	Freshwater eel
	Aplodactylus arctidens	Marblefish
	Arripis trutta	Kahawai
	Conger sp.	Conger eel
	Elasmobranchii	Sharks and rays
	Galaxias sp.	Kokopu
	Helicolenus percoides	Scarpee
	Labridae	Wrasse
	Latridopsis ciliaris	Blue moki
	Latris lineata	Trumpeter
	Macuronus novaezelandiae	Hoki
	Myliobtus tenuicaudatus	Eagle ray

	Nemadactylus macropterus	Tarakihi
	Odax pullus	Greenbone
	Pagrus auratus	Snapper
	Parika scaber	Leatherjacket
	Parapercis colias	Blue cod
	Peltorhamphus novazeelandiae	NZ sole
	Polyprion oxygeneios	Hapuku
	Pseudophycis bachus	Red cod
	Rhomosolea tapirina	Greenback flounder
	Thyrsites atun	Barracouta
	Trachurus sp.	Mackerel (Jack/horse)
Bird	*Anas gibberifrons*	Grey duck
	Anatidae	Duck
	Ardenna grisea	Sooty shearwater
	Cyanoramphys sp.	Parakeet
	Diomedea sp.	Mollymawk
	Gallirallus australis	Weka
	Hemiphaga novaeseelandiae	Kereru
	Nestor meridionalis	Kaka
	Notiomystis cincta	Stitchbird
	Philesturnus rufusater	North Island saddleback
	Prosthemadera novaeseelandiae	Tui
	Puffinus gavia	Fluttering shearwater
	Rhipidura fuliginosa	NZ fantail

Class	Scientific name	Common name
Mammal	*Canis familiaris*	Kuri
	Ovis aries	Sheep
	Rattus exulans	Polynesian rat
Reptile	*Sphenodon punctalus*	Tuatara

Otaihanga Roundabout: archaeological monitoring of construction earthworks

Authority 2013/374

Report to NZ Historic Places Trust Pouhere Taonga

Mary O'Keeffe
Heritage Solutions
Wellington

August 2013

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Figures

Introduction

1.1 Background

New Zealand Transport Agency (NZTA) is addressing safety issues at the intersection of Otaihanga Rd and State Highway 1, north of Paraparaumu on the

Kapiti Coast. This is an area of high traffic crashes. The proposal is to construct a roundabout at the intersection. The location can be seen in Figure 94.

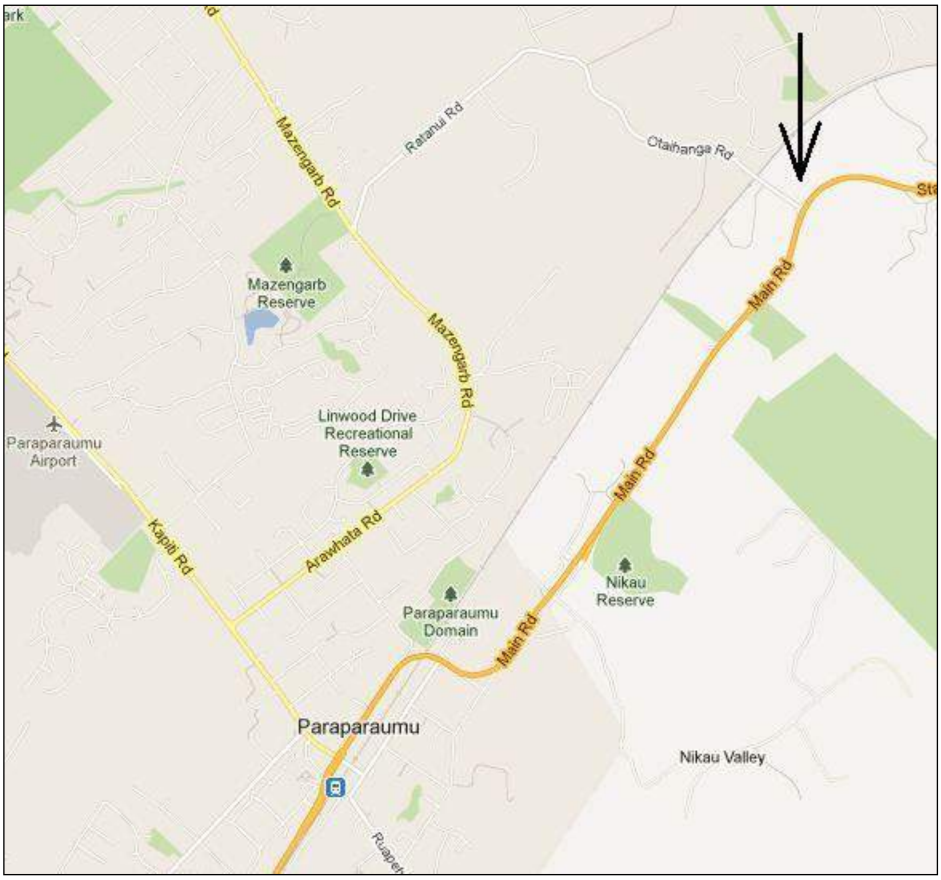

Figure 94: Location of proposed work

It is noted that, at the time of writing this report, planning work is also being undertaken on the proposed MacKays to Peka Peka Expressway (M2PP), which will be located less than 1km west of the intersection. While the roading network is all related, the work at the intersection is unrelated to the M2PP proposal.

Mary O'Keeffe, of Heritage Solutions ("the archaeologist") was engaged by Beca on behalf of NZTA in May 2012 to provide advice and report on the effects of the proposed roundabout in relation to archaeology. NZTA applied for, and was granted, an authority under Part 1 of the Historic Places Act 1993 to modify, damage or destroy archaeological sites that may be located within the footprint of the construction earthworks (authority 2013/374.

Condition 13 of the authority required a report on the archaeological monitoring. This report is presented in fulfillment of that condition.

1.2 Site visit

A site visit was made on 23 May 2012, as part of the assessment process. The consultant met with the property owner, then walked the high dunes adjacent to SH1. One site was recorded (see section 4 of this report).

Existing environment

The physical environment is an important factor in understanding and interpreting the archaeological record. As McFadgen states

> "People in pursuit of their everyday lives exploited and changed their environment to meet their needs for food, clothing and shelter and their culture was, in turn, conditioned by it. The flow of information in this approach is two way: archaeological remains provide an historical perspective for the landscape as it appears today; and understanding the natural and cultural processes which have shaped the landscape is important for the interpretation of human and natural history"[8].

The physical environment of the Kapiti Coast is a major influence on archaeology, both in terms of the types of sites present, and where they are found.

The nature of the environment is discussed in detail in the archaeological assessment prepared by the archaeologist for this work[9], and for the MacKays to Peka Peka Expressway[10]

A summary of the key environmental factors is presented here:

- the majority of the coastal environment is compromised of dunes
- the inland edge is a steep wave cut cliff
- A major influence on the landscape is the Waikanae River, which both separates different topographic areas to its north and south, and is also a major contributor to the nature of the coastline through water borne material.

[8] McFadgen, 1997:6
[9] O'Keeffe, 2012b
[10] O'Keeffe, 2012a

- the dunes south of the river are parallel to the coast, are generally steep sided, and are relatively unstable, with weather and stock induced erosion
- in contrast the dues north of the river are gentler sided than those south of the river, and meander in a more abstract pattern, without reference to the alignment of the coast
- there are areas of former wetland interspersed between the dunes.
- The wetland areas are significant in terms of human occupation as they would have been rich sources of food and raw materials, including birds, eels and plant species.

Archaeological resource

Detail of the history of occupation on the Kapiti Coast, and on the archaeological sites and recording can be found in the assessment prepared by the archaeologist for this work[11].

There is a strong functional relationship between the environment and the archaeological resource. Along the Kapiti-Horowhenua Coast the predominant site type on the coastal dunes is midden. These are deposits of shell, occasionally with oven evidence or some bone, marking either a temporary resting place of groups of people, or occasionally locations of more permanent settlements. The shell content of the midden varies. Some are almost entirely made up of tuatua, a coastal species. Other middens have a variety of species, including both coastal and estuarine species, indicating exploitation of the resource from both locations. Most middens contain either shell only, or shell with some fishbone. Relatively few artefacts have been found in the Kapiti middens; however this statement should be qualified by the fact that very little strategic analysis of middens has taken place.

The other type of site found relatively frequently within the sand dunes is burials. Placement of a body in sand was a common burial technique of the pre-European Maori, along with secondary burial.

Archaeological work along the coast shows that due to the dynamic nature of the unstable dunes sites can be found several metres below the ground surface. Middens especially can be inundated by windblown sand.

[11] O'Keeffe, 2012b

Figure 95: Example of midden buried by windblown sand

(Petersen, 2007: 4)

In marked contrast to the dunes are the sites found in the foothills behind the coastal dunes. The types of sites recorded here include pa, pits and terraces, as a result of the more stable soils and geology.

The sites on the coastal dunes may represent more transient settlement, either small groups of people collecting resources from the coast, river, forest or swamp, or groups of people passing through the region. More permanent settlement would have occurred in the hills above the coastal flat where more stable soils and geology would have permitted the construction of more permanent shelters, and would have provided better gardening soils, along with the strategic advantage of height. Other resources were not far away, such as the food and plant resources available from Kapiti Island, and the important lithic (stone) resources available from D'Urville Island at the top of the South Island[12].

A predictive model was developed for the MacKays to Peka Peka expressway archaeological project. Although relatively little strategic or primarily research-based archaeology has been undertaken on the coast, enough data has been gathered through investigations, surveying and opportunistic sighting to create a predictive model, which can predict likely site type and occurrence along the coast.

[12] D'Urville Island argillite is an important source of stone for adzes and other tools, and artefacts made from this material were being traded throughout New Zealand at least by the 12th Century AD (Davidson, 1984:195)

As noted above, sites can occasionally be on buried topsoils some metres below the ground surface, and thus there may be no surface evidence of sites. In this way, a predictive model can assist in determining where previously unknown or buried sites may be present.

The model comprises the following elements:

- There are over 280 recorded archaeological sites on the Kāpiti Coast
- They are of both pre European Maori and European origin
- The most common site type is shell midden
- Middens are occasionally, but not always, found in association with ovens
- Another common site type is individual or small group burials within the dunes
- The vast majority of sites are found on the sand dune ridges
- The dunes themselves have been identified and dated; relative ages of sites can be extrapolated from the original dune surface on which they are found
- The oldest and most stable dunes are found inland
- The younger coastal dunes are geologically dynamic
- Due to the dynamic nature of the unstable dunes sites can be found several metres below the ground surface, and thus there may be no surface evidence of them
- The dunes closer to the coast tend to be lower than the older dunes further inland
- The dunes south of the river are more linear, tend to run parallel with the coast and can be steep sided and quite high
- The dunes north of the river are more meandering, do not run parallel to the coast, and tend to be lower with less steep slopes than those south of the river
- At the time of human settlement the dunes would have been largely forested, inferred through analysis of landsnails found in archaeological deposits taken from the dunes
- The dunes are interspersed with peat swamps; these were rich sources of food and raw materials, including birds, eels and plant species.

- Earthwork sites – pits, terraces, pa – are also found on the coast, but are less likely to be visible on the surface found because their more fragile nature is prone to wind and stock erosion

- More earthworks sites have been recorded north of the Waikanae River than south. The reasons for this are not clear and require further analysis. This may be a reflection of human activity and resource utilisation, but is more likely to be a result of more stable sand and dunes in the area north of the river

- Little evidence of gardening has been recovered on the Kāpiti Coast; the archaeological evidence of gardening is thus not clear

- Very little cultural material has been recovered from swamps or wetlands by archaeologists on the Kāpiti Coast; this is in marked contrast to the material recovered from the edges of Lake Horowhenua. Adkin, and Barrow and Keyes record canoe finds from swamps in Te Horo[13], and Carkeek records a canoe and wooden maul recovered from the swamp at the foot of Mataihuka Pa[14]. A fragment of trim from a waka was recovered in 2007 from a low-lying wetland area during earthworks for a subdivision at Paetawa Rd, Peka Peka[15].

Archaeological monitoring

4.1 Proposed work

As noted the proposal is to construct a roundabout at the current intersection, to better manage and regulate traffic flow, as seen in Figure 96.

The location is the corner of Otaihanga Rd and State Highway 1.

[13] Cited in McFadgen, 1997: 15
[14] Carkeek: 1966:123
[15] Petersen, 2007

Figure 96: Proposed work

Beca

Prior to construction earthworks the environment was dominated by a large dune north of the intersection of SH1 and Otaihanga Rd.

Figure 97: Environment prior to earthworks

This dune was the highest dune in the vicinity; it had a strategic view in all directions and from its top the beach would have been visible prior to European introduced trees. Its west side sloped gently in the direction of the coast (this side had been modified in the 1960s for sand mining). Its east side had also been modified, by construction of SH1; the dune has been truncated and would have continued to the east.

Figure 98: Dune as seen from SH1, looking north, prior to earthworks

This dune was completely removed by earthworks for the roundabout.

4.2 Archaeological monitoring

Archaeological testing and monitoring took place between 17 July 2013 and 22 July 2013.

One probable site was recorded prior to construction earthworks, during the site visit undertaken by the archaeologist for the assessment. This site has been entered into ArchSite as R26/461. It is a possible terrace site, located on the north facing side of the crest of the highest dune beside SH1. It is not completely clear whether this is an archaeological feature: it is assumed it is an occupation platform of Maori origin. Several factors suggest this is a man-made feature: firstly the base of the platform is reasonably flat, whereas a windblown feature would have a more scooped base, and secondly, it is considered significant that this feature is located on the sunny side of the highest strategic dune in the vicinity, to take advantage of the height and views afforded.

Figure 99: Possible trench feature

O'Keeffe

4.2.1 Test trenching

The archaeologist was accompanied by Danny Mullen from Te Ati Awa ki Whakarongotai. Test trenching was undertaken on 17 July 2013. Trenches were machine dug using a 13 tonne digger with a 1m wide clean up bucket.

Five trenches were dug: two in the possible terrace feature recorded as R26/461, one on the highest point of that dune, one on the south-western side of that dune ridge (which would have been slightly sheltered from the prevailing wind), and highest point of the dune ridge immediately adjacent.

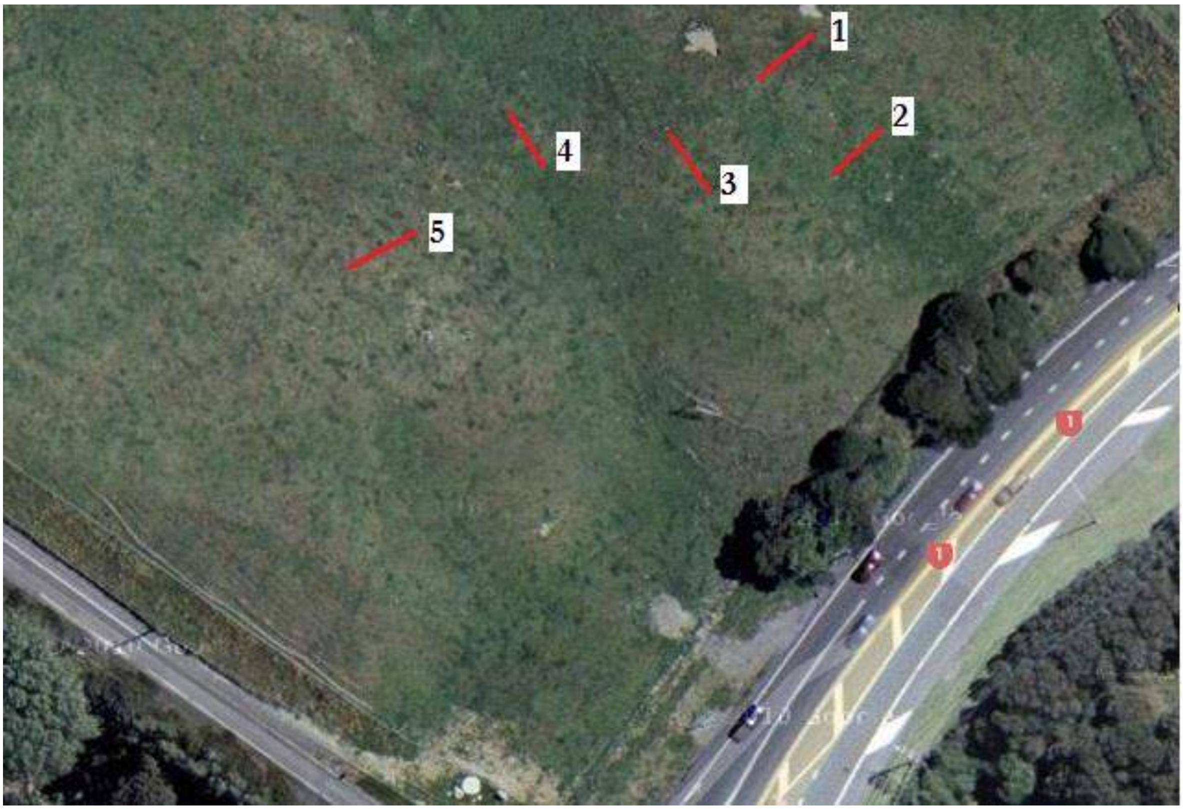

Figure 100: Test trench locations

Trench 1

This 3m long trench was located at the western end of the possible terrace feature recorded as R26/461. It ran from the back to the front of the terrace platform. It was intended to determine whether the terrace feature was of natural or cultural origin.

The trench was 3m long x 1m wide, and was dug to a depth of about 0.8m. 30cm of topsoil overlaid uniform yellow brown sand. The topsoil was deeper towards the rear of the platform beside the riser, where presumably topsoil material had washed down the terrace riser. The horizon was mottled.

The base of a late 19th century black beer bottle was found at the base of the topsoil layer. It is inferred that this bottle was dropped on the dune in decades past, and soil creep and bioturbation has moved it down within the topsoil horizon.

Apart from the bottle, no cultural material was observed.

Figure 101: Trench 1

O'Keeffe

Trench 2

This trench was also on the possible terrace platform, at its eastern end near the fenceline beside the cut dune above SH1. This trench also ran from the back to the front of the platform. Like trench 1, it was intended to determine whether the terrace feature was of natural or cultural origin.

The trench was similar to trench 1: it was 3m long x 1m wide, and was dug to a depth of about 0.8m. 40cm of topsoil overlaid uniform yellow brown sand. The topsoil was deeper towards the rear of the platform beside the riser, where presumably topsoil material had washed down the terrace riser. The horizon was mottled.

No cultural material was observed.

Figure 102: Trench 2

O'Keeffe

Trench 3

This trench was located on the crest of the highest point of the dune, immediately beside and south of the possible terrace feature. It was intended to test whether the highest and most strategic part of the dune had been occupied.

The trench was 3m long x 1m wide, and dug to a depth of about 0.3m. 12cm of topsoil overlaid uniform yellow brown sand. It is notable that the topsoil layer on the dune crest was much thinner than the topsoil on the platform, due to slopewash deposition on the platform.

No cultural material was observed.

Figure 103: Trench 3

O'Keeffe

Trench 4

Trench 4 was located in a swale or low point running east to west between the highest crest of the dune and an adjacent slightly lower high crest. It was intended to test for possible occupation in the side of the dune that would have been sheltered from the prevailing wind.

The trench was 2m long x 1m wide, and was dug to a depth of 1m. 60cm of topsoil overlaid uniform yellow brown sand.

No cultural material was observed.

Figure 104: Trench 4

O'Keeffe

Trench 5

This trench was on the top of the adjacent dune crest, located beside and south of the high crest. Whilst a high dune, it was not as high as the dune containing trenches 1-3. The trench was intended to test for possible occupation on the dune.

The trench was 2m long x 1m wide, and was dug to a depth of 0.5m. 10cm of topsoil overlaid uniform yellow brown sand.

No cultural material was observed.

Figure 105: Trench 5

O'Keeffe

4.2.2 Monitoring earthworks

The archaeologist monitored stripping of the crest of the high dune and slightly lower adjacent dune. No cultural material was observed.

Figure 106: Dune stripping

O'Keeffe

Discussion

Test trenching established that the terrace feature was not cultural in origin, and was formed by wind blow-out. This is inferred from two pieces of evidence:

- there was no sign of human occupation on the terrace platform, such as shell, ovenstones or artefacts.
- there was an undisturbed thick well-established topsoil layer on the terrace platform, suggesting that the blowout occurred long enough ago to allow formation of a deep topsoil. The topsoil became deeper towards the rear of the platform, consistent with topsoil material washing down the terrace riser.

The bases of two 19th century black beer bottles were found within the topsoil layer on the dune. It is assumed they were deposited during the late 19th century or early 20th century, with sufficient time passing from deposition to allow incorporation into the topsoil layer. These bottles may have been dropped by construction workers during the construction of the road, or by subsequent travellers resting on the high dune.

No other archaeological features were observed, and the undisturbed topsoil and lower horizon suggests there was no occupation of the dune ridge. This was a surprising result, given the strategic potential of the dune - the top of the highest point afforded a good view in all directions (Mt Ruapehu was observed on one clear morning).

Land use in pre European times may be somewhat different to that suggested by the predictive model. The model suggests that most high dune ridges were occupied and utilised. The Otaihanga dune is one of the highest in the immediate vicinity, yet it was not occupied.

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M2PP EXPRESSWAY: WAIKANAE RIVER TO WAIMEHA STREAM

REPORT ON ARCHAEOLOGICAL MONITORING OF EARTHWORKS (2013-639

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Archaeological Services
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M2PP EXPRESSWAY: WAIKANAE RIVER TO WAIMEHA STREAM

REPORT ON ARCHAEOLOGICAL MONITORING OF EARTHWORKS

Prepared by: Andy Dodd

For: Heritage Solutions & MacKays to Peka Peka Alliance

Date submitted: 28 November 2017

INTRODUCTION

On 10 April 2013, the New Zealand Historic Places Trust (now Heritage New Zealand) issued an archaeological authority under section 14 of the *Historic Places Act* 1993 to the New Zealand Transport Agency (NZTA) to allow for earthworks for the construction of a section of the Mackays to Peka Peka Expressway (M2PP) between the Waikanae River and the Waimeha Stream on the Kā piti Coast. This authority (2013/639) was granted alongside a suite of other archaeological authorities intended to cover earthworks along the length of the M2PP Expressway which were to be exercised concurrently during construction. The locations of these authorities are shown in Figures 1 and 2.

Condition 9 of the archaeological authority required that any archaeological evidence encountered during construction was to be investigated, recorded and analysed in accordance with the approved Archaeological Management Plan (O'Keeffe 2013b) and Archaeological Research Strategy (Jacomb and O'Keeffe 2012).

This report has been prepared by Andy Dodd to assist the designated M2PP project archaeologist, Mary O'Keeffe (Heritage Solutions Ltd) with meeting the requirements of condition 14 of the authority (2013-639). Section headings follow those recommended by Heritage New Zealand for preliminary reporting (Heritage New Zealand 2013). A sector report (required by condition 15 of the authority has been submitted for this sector (O'Keeffe 2016).

Subsurface Ltd was contracted to undertake the field work component for on-site monitoring and recording during the construction of the M2PP expressway between the Waikanae River and the Waimeha Stream (Sector 4). Analysis of samples has been contracted independently and is not included in this report.

LOCATION

This report covers the area between Te Moana Road and the Waikanae River. The alignment passes between the townships of Waikanae and Waikanae Beach, approximately 1.2 kilometers from the coast. It traverses an area of Aeolian (Taupō /Foxton) dunes through the Takamore wā hi tapu precinct (Figure 3).

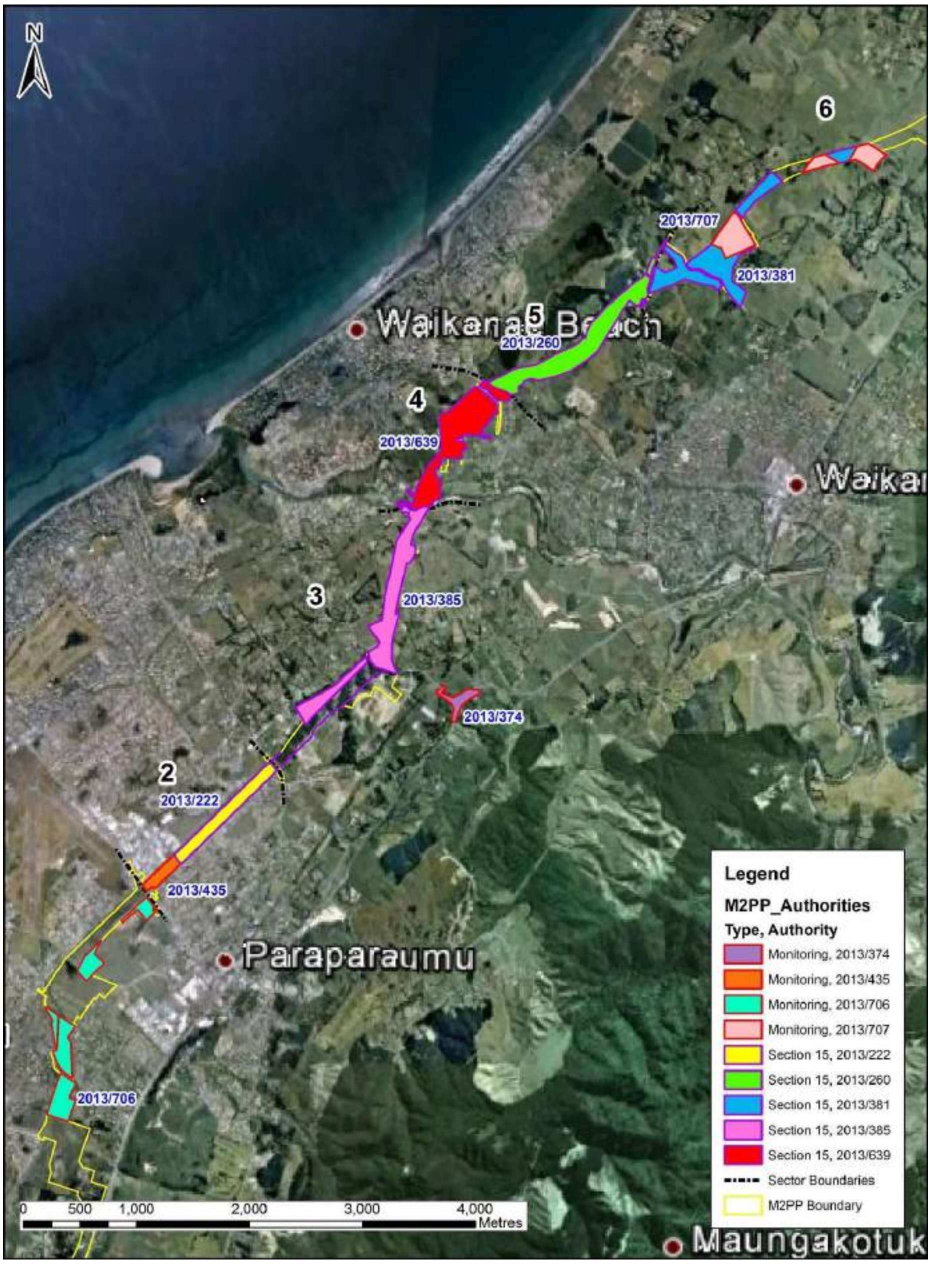

Figure 1: Route of M2PP Expressway through Paraparaumu and Waikanae (supplied by Heritage New Zealand)

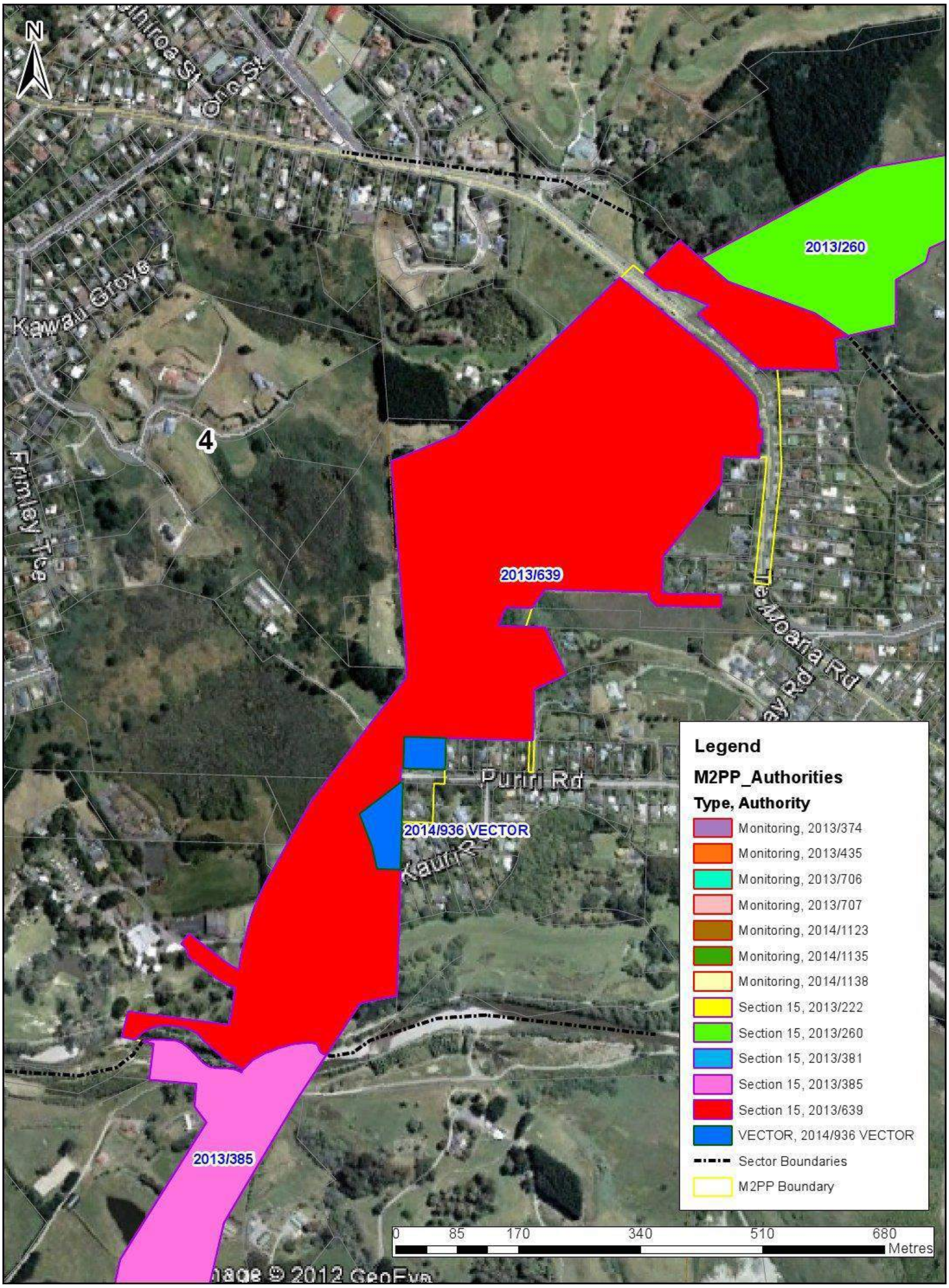

Figure 2: Area covered by authority 2013/639 between the Waikanae River and Waimeha Stream (supplied by Heritage New Zealand)

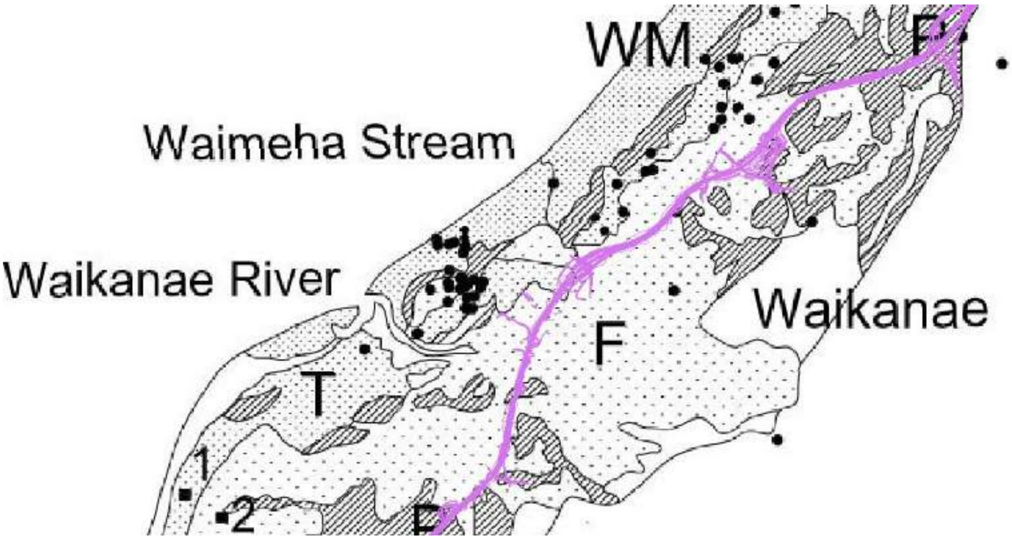

Figure 3: Dune phases in the Waikanae area with M2PP route in purple (after McFadgen 1997:10).

SUMMARY OF AUTHORITY ASSESSMENT AND EXPECTED FINDINGS

The archaeological assessment (O'Keeffe 2011) described the project area in the context of the archaeology of human occupation and settlement of the Kā piti Coast, and summarised previous archaeological work in the immediate vicinity. Sector 4, between the Waikanae River and the Waimeha Stream, was noted as comprising an area of moderate to high rolling dunes (O'Keeffe 2011:92-96). The alignment in Sector 4 was described as passing through the Takamore cultural precinct which incorporates several places of high cultural significance to Te Ā ti Awa. These included the Takamore urupā , Maketu tree and dune, Tuku Rakau village, and the Takamore wā hi tapu area (O'Keeffe 2011:58). The area for greatest archaeological potential in Section 4 was the Takamore ridge, and in particular, the areas of previously unmodified dune. The potential for unrecorded archaeological sites had also been assessed by South Pacific Archaeological Research (SPAR) as part of their preliminary investigations for the Western Link Road alignment, and was determined to have medium to high likelihood of sites being present (Jacomb and Walter 2009:35).

DESCRIPTION OF ARCHAEOLOGICAL WORK UNDERTAKEN

Archaeological monitoring work in Section 4 was largely carried out between December 2013 and October 2016. Works were subject to an archaeological management plan (O'Keeffe 2013) and research strategy (Jacomb and O'Keeffe 2012). When archaeological features were encountered by earthworks operators the archaeologist was notified if not already on site. Archaeological features were typically stripped back with the mechanical excavator, and cleaned down with hand tools for photography and recording. Depending on the size of the feature, either a profile was cut with a mechanical digger, or the feature was half-sectioned. Samples were collected in the field and deposited for processing at the M2PP Otaihanga yard with an assistant to the project archaeologist. Excavation and vegetation removal was carried out by Goodmans Contractors Ltd. and archaeological monitoring work described in this report was undertaken by Andy Dodd of Subsurface Ltd.

Initial processing was undertaken by the author on samples collected early on in the construction timetable to reduce bulk. This involved wet-sieving to float charcoal and landsnails. When facilities were made available at Otaihanga, subsequent bulk samples were delivered unprocessed. The size of the samples varied depending on the size of the feature and the amount of material available. Preference was for 20-litre bulk samples to provide a minimum 10-litre processed sample, but this was not always possible.

CONSTRAINTS AND LIMITATIONS OF ARCHAEOLOGICAL WORK

Archaeological investigation was constrained by the limited nature of the earthworks required for establishing the expressway and access roads. This effectively resulted in the excavation being limited to a corridor through the dune 1-2 kilometres from the coast rather than truly representative sample of archaeological sites in the Waikanae area.

The information in this report is intended as an aid to the preparation of the final report for Heritage New Zealand authority 2013/639 and does not duplicate seek to duplicate M2PP reporting carried out under other authorities (Dodd 2013, 2014, 2017), or work carried out under this authority by other researchers (Jones 2014).

No quantification, dating or analysis of samples was undertaken by the author, as this work has been commissioned separately by the M2PP Alliance.

PRELIMINARY SITE PLAN

The marked aerial below (Figure 4) shows the locations of recorded archaeological sites in Sector 4. The earthworks for the alignment are shown in purples and archaeological sites in yellow (sites recorded outside the project area are not shown).

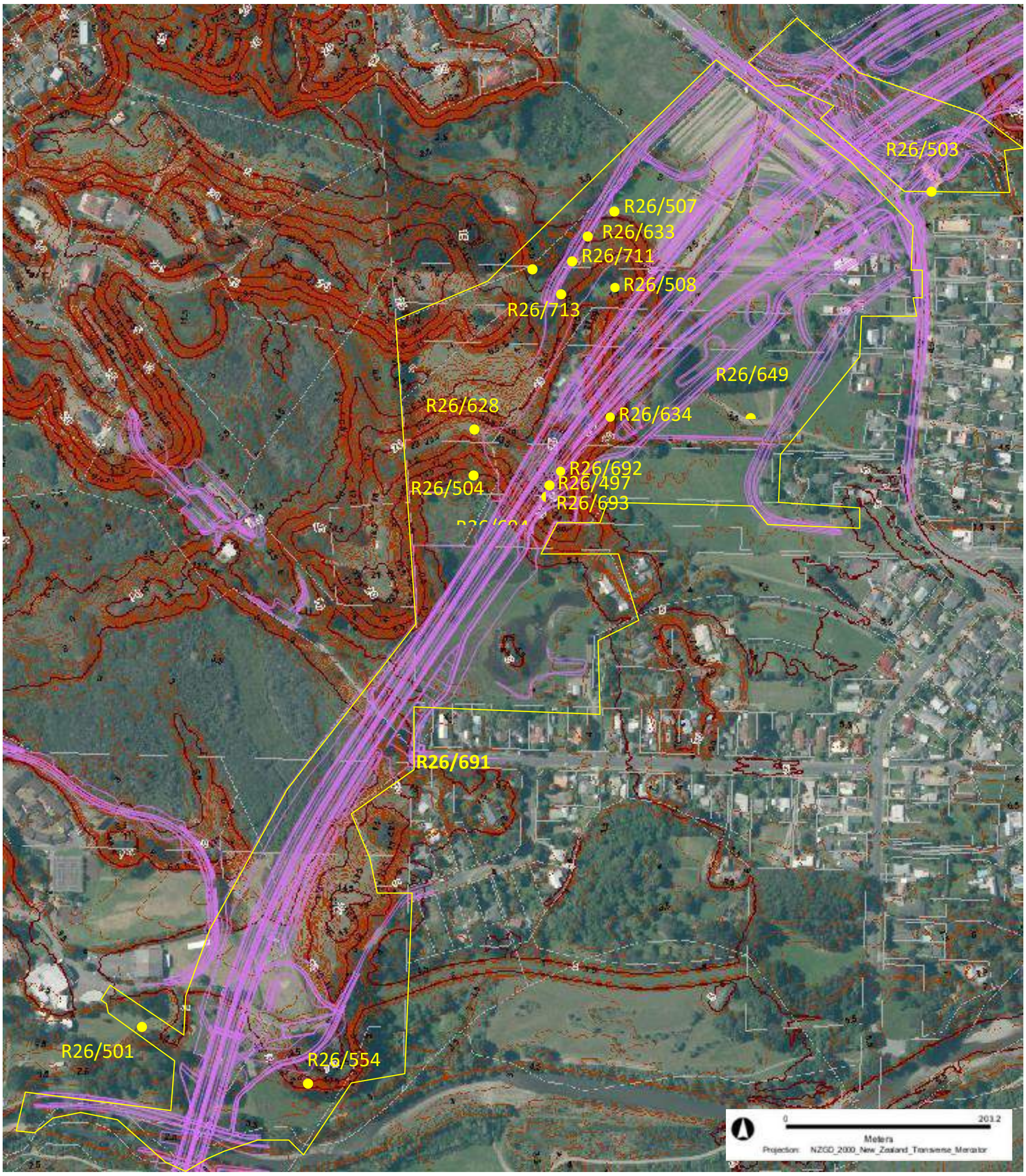

Figure 4: Indicative locations of recorded sites

PRELIMINARY RESULTS

Eleven new site records have been submitted into the New Zealand Archaeological Association Archsite, and two previously recorded sites (R26/368, R26/497) have been updated with additional information. The majority of these sites were midden or oven sites, and many of them comprised a number of features. An additional five sites within the area covered by the authority were not investigated by the author (R26/554, R26/691-694), so have not been further described in this report. Recorded sites are as follows:

Site No.	Easting	Northing	Description	Recorded by	Date recorded	Last updated
R26/368	1771167	5473738	Midden	Jacomb	07.11.2006	07.11.2006
R26/497	1771184	5473514	Midden/Ovens	Forbes	12.02.2014	12.11.2015
R26/501	1770776	5472985	Midden	Dodd	08.04.2014	
R26/503	1771570	5473830	Findspot	Dodd	09.12.2013	
R26/504	1771100	5473535	Track	Dodd	13.06.2014	13.11.2015
R26/507	1771250	5473799	Midden/Ovens	Dodd	28.08.2014	
R26/508	1771256	5473720	Midden/Ovens	Dodd	29.08.2014	
R26/554	1770926	5472950	Midden	O'Keeffe	26.02.2015	
R26/628	1771115	5473565	Midden	Dodd	25.08.2015	
R26/633	1771236	5473774	Midden/Ovens	Dodd	12.11.2015	
R26/634	1771252	5473597	Midden	Dodd	12.11.2015	
R26/649	1771385	5473600	Ovens	Dodd	20.05.2016	
R26/691	1771027	5473237	Midden	O'Keeffe	16.07.2016	
R26/692	1771204	5473569	Midden	O'Keeffe	16.07.2016	
R26/693	1771193	5473550	Midden	O'Keeffe	16.07.2016	
R26/694	1771186	5473511	Midden	O'Keeffe	16.07.2016	
R26/711	1771212	5473754	Oven	Dodd	11.10.2016	
R26/713	1771198	5473720	Midden	Dodd	08.03.2017	

Figure 5: Recorded archaeological sites along the M2PP route between the Waikanae River and Waimeha Stream.

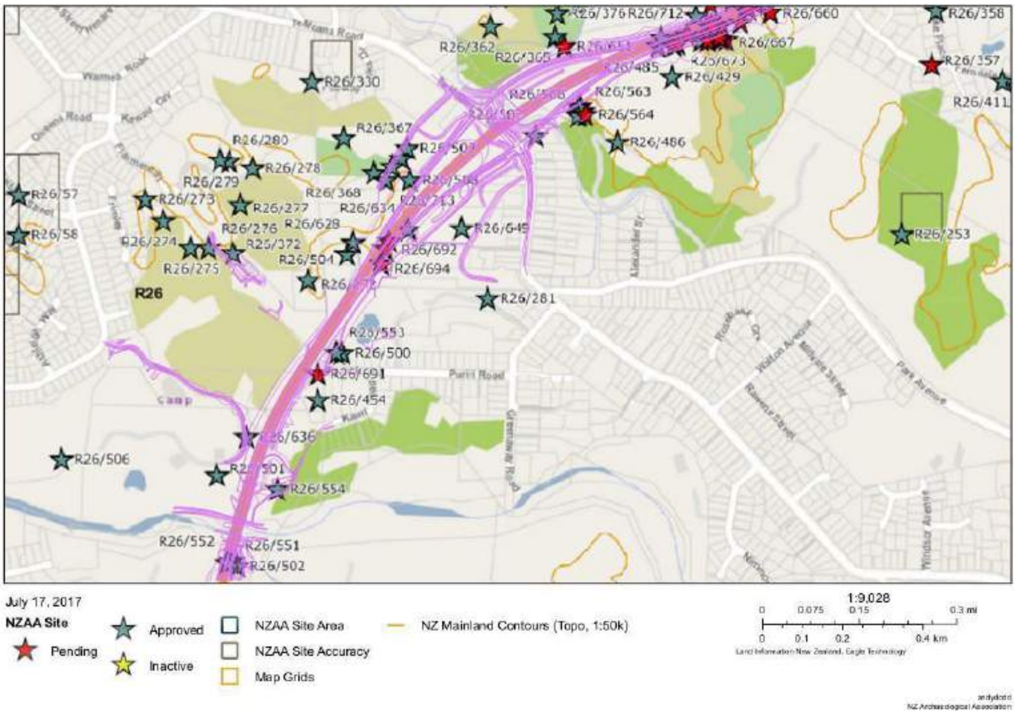

Figure 6: Archsite map generated 17 July 2017 showing recorded archaeological sites in relation to M2PP alignment (in purple)

SITE SUMMARIES

Individual sites are described further below.

R26/368 Midden

Grid ref: NZTM E1771167 N5473738 ±3m

Recorded: Chris Jacomb, 2006 Updated: Pending

Condition: Preserved in insitu

This site was recorded by Chris Jacomb during an archaeological assessment for the Western Link designation in 2006. It was described as a sparse scatter of midden down the boundary fence line, and in the adjoining paddock to the south. At the time of first recording a small surface scatter of tuatua was also noted in the adjacent paddock on the south side of the fence, and another surface scatter of tuatua shells was observed by the author in January 2016 beneath some Eucalyptus trees approximately 25 metres to the south of the main deposit as originally recorded.

While the deposit on the north side of the fence as described by Jacomb in 2006 has not been affected, earthworks did take place in the saddle to the southeast as part of the construction of the internal access road through the Ahu Whenua block in October 2016. A large pit for the burial of pine slash and modern rubbish was exposed during these earthworks suggesting that the saddle area, at least, was heavily disturbed in recent years. The extent to which shell midden deposits survive insitu to the south of the fence remains unknown. The removal of pine slash and the subsequent backfilling of the pit were not monitored by an archaeologist, and on a subsequent visit to the area the exposed shell beneath the Eucalyptus trees was no longer visible having been obscured by topsoil/fill spread back over the excavation.

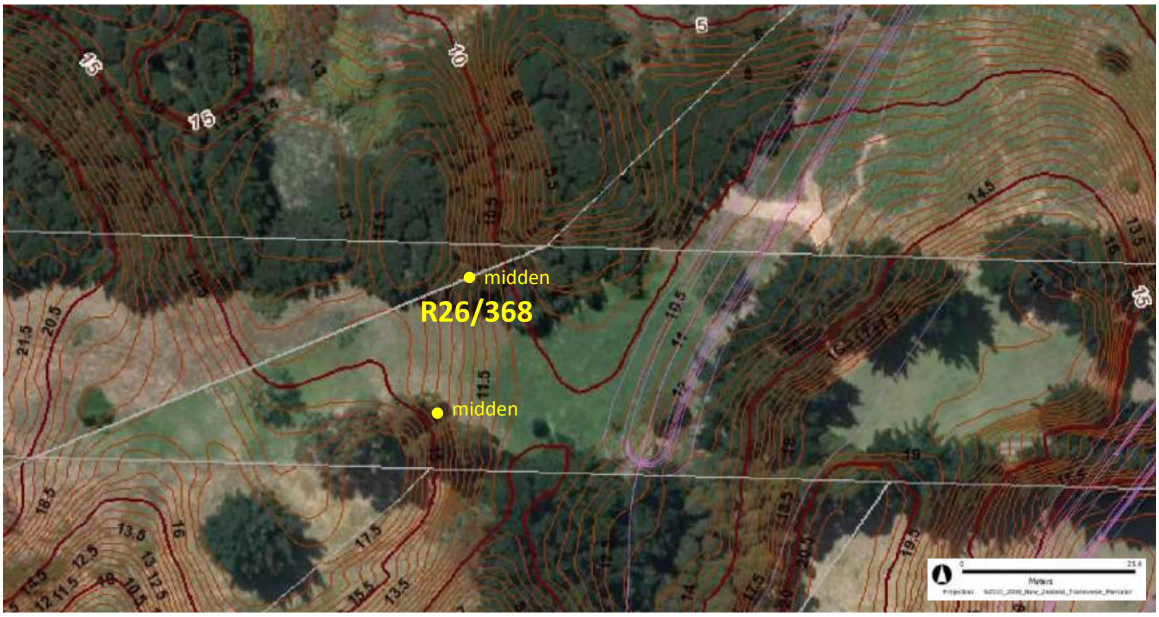

Figure 7: Recorded location R26/368

Figure 8: Looking west from saddle. R26/368 is located beneath pine trees in right of frame (29 January 2016)

Figure 9: Shell fragments observed on the ground surface in this location. Looking southwest from access road (29 January 2016)

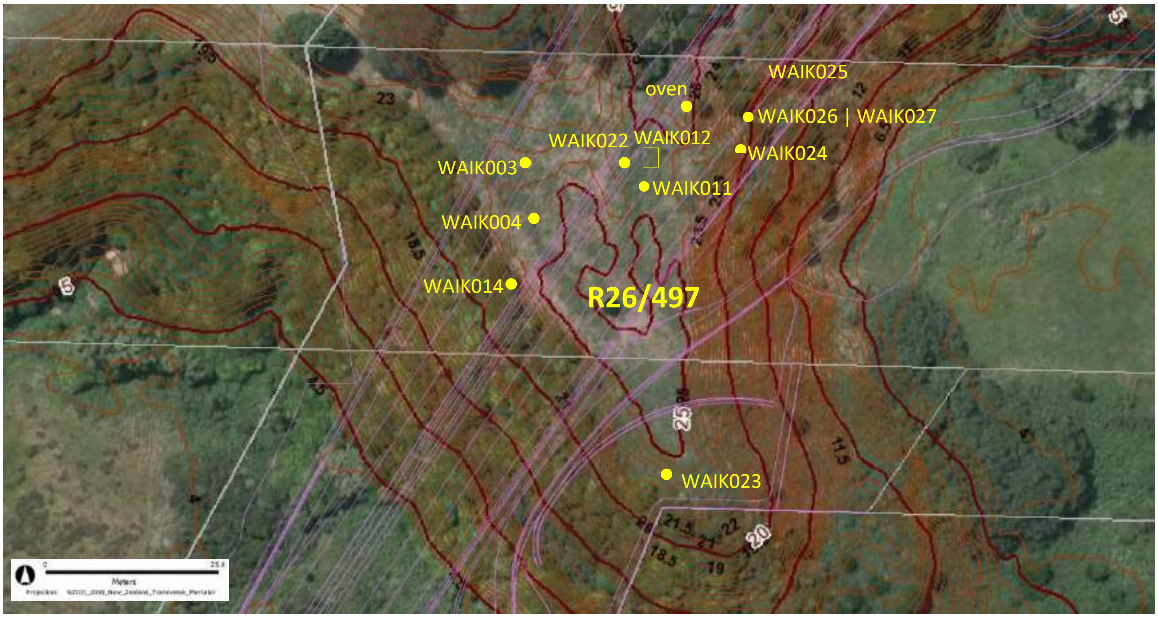

Figure 10: Recorded location R26/497, and locations of samples collected during monitoring

R26/497 Midden/ovens

Grid ref: NZTM E1771184 N5473514 ±3m

Recorded: Susan Thorpe, 2014

Updated: August 2014, November 2015 Condition: Destroyed

Evidence: The due ridge has been removed except for that portion retained behind the Grace retaining wall. All features described in this report have been investigated and removed

This site was located on the eastern end of the crescent dune opposite the Takamore urupā . The dune ridge which extends to the north had, over the years, been subject to earthworks for the creation of building platforms and vehicle access tracks, and it was unclear from surface observations to what extent archaeological deposits survived insitu. R26/497 was first recorded as an area of deflated tuatua midden by Susan Thorpe in February 2014. She considered that further investigation would be warranted after the clearance of scrub.

Prior to this, the dune ridge had been the subject of limited magnetometer survey in July 2011 (Bader 2011). The alignment of the geophysical survey was subsequently stripped of topsoil, and the single anomaly reported by Bader was investigated by SPAR during their May 2013 investigations (Brooks et.al:2016:36). The anomaly was found to be a small midden feature (Brooks pers. com. 2014).

Further assessment of the site was commissioned by the M2PP Alliance in advance of the haul road construction and undertaken by the author in June 2014. This included a visual inspection as well as limited auger testing and probing. No further evidence archaeological features were found at this time, but the presence of the features reported in 2014 was confirmed and the stated grid coordinates were corrected to conform with the existing written and photographic records (Dodd 2014).

On 31 July 2014, further investigation was carried out by the author which involved stripping back the topsoil from the top of the ridge in areas where shell had been observed on the surface. This uncovered an insitu hā ngi/oven feature, of dimensions

0.6 x 0.8 metres, approximately 0.4 – 0.5 metres below surface deposited into Foxton dune sand. Two small areas of tuatua midden were also uncovered at this time.

Archaeological monitoring of the haul road construction in August 2014 provided for the recording of a further three middendeposits and one hā ngi/oven feature.

The remaining features were uncovered during the construction of the main expressway alignment in September 2015. In total thirteen features including eleven midden deposits and two oven features were investigated and recorded. The features recorded under the site record number R26/497 are shown in the photos and summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK003	1771164	5473540	Oven	A concentrated deposit of hāngi/oven stones in an area 600 x 800 mm with charcoal stained sand (10YR2/1) covering an area 1600 x 850 mm. Feature was an estimated 500 mm below the ground surface. Deposited on light yellowish-brown sand (10YR6/4). Feature was half-section with insitu remainder then taken as a 5 litre bulk sample (WAIK003).	31.07.2014
WAIK004	1771164	5473529	Midden	A small deposit of midden in dark sand (10YR2/1) covering an area 1100 x 1300 mm, max thickness approximately 120 mm. Deposited on light yellowish-brown sand (10YR6/4). An 11 litre bulk sample taken for analysis (WAIK004).	31.07.2014
WAIK005	1771175	5473513	Midden	A small deposit of midden in dark sand (10YR2/1) covering an area 1600 x 1600 mm, max thickness approximately 100 mm. Deposited on light yellowish-brown sand (10YR6/4). 15 litre bulk sample taken analysis (WAIK005).	31.07.2014
WAIK011	1771184	5473537	Midden	A small deposit of midden covering an area 500 x 300 mm. Deposited on sand ranging from light yellowish-brown sand (10YR6/4) to very pale brown (10YR7/2).	18.08.2014
WAIK012	1771183	5473541	Midden	Deposit of midden in dark sand (10YR2/1) covering an area 2 x 1.5 m. Depth below surface estimated to be approximately 0.5 m. Deposited on sand ranging from light yellowish-brown sand (10YR6/4) to very pale brown (10YR7/2)	18.08.2014
	1771192	5473550	Oven	A concentrated deposit of hāngi/oven stones in dark sand (10YR2/1) in an area 700 x 400 mm. Encountered on the shoulder of the dune, approximately 100 - 200 mm below the ground surface in light yellowish-brown sand (10YR6/4). Not sampled.	18.08.2014
WAIK014	1771160	5473521	Midden	A thin lens of shell in darkened sand (10YR/3/1), deposit covered an area 500 x 500 mm. Deposited on to grayish brown sand (10YR5/2).	20.08.2014
WAIK022	1771181	5473540	Midden	A small deposit of midden in dark sand (10YR2/1) covering an area 300 x 300 mm. Predominantly triangle shell and FCR. 100% sample taken for analysis. Deposited on pale brown sand (10YR6/3).	08.09.2015

WAIK023	1771191	5473484	Oven	A concentrated deposit of hāngi/oven stones in dark sand (10YR2/1) in an area 800 x 400 mm. Maximum depth 100 mm. Included a couple of *dosinia* fragments. Deposited on pale brown sand (10YR6/3). 100% sample taken for analysis	14.09.2015
WAIK024	1771201	5473543	Midden	Redeposited midden. Loosely packed shell and blackened sand (10YR3/1) overlying more densely compacted sand (10YR6/3). Appears to have been eroded from further upslope	14.09.2015
WAIK025	1771203	5473557	Midden	Small patches of loosely compacted *dosinia* and tuatua shell with small amounts of fishbone over 3 x 3 metre area	14.09.2015
WAIK026	1771203	5473549	Midden	Midden in very dark grayish-brown sand (10YR3/2) deposited onto light brownish gray sand (10YR6/2). 600 x 300 mm. Remaining insitu material taken as 100% sample, includes tuatua, fishbone, charcoal and FCR.	17.09.2015
WAIK027	1771203	5473549	Midden	Archaeological sample collected from around WAIK026 but was not insitu.	17.09.2015

Figure 11: Hāngi/oven WAIK003. Half-sectioned, scales 1.0+0.5 metres (31 July 2014).

Figure 12: Midden WAIK004. Exposed following removal of topsoil, scales 1.0+0.5 metres (31 July 2014).

Figure 13: Midden WAIK005. Exposed following removal of topsoil, scales 1.0+0.5 metres (31 July 2014).

Figure 14: Midden WAIK012. Exposed in profile, scale 1.0 metre (18 August 2014).

Figure 15: Hāngi/oven feature. Half-sectioned, scale 1.0 metre (18 August 2014).

Figure 16: Midden WAIK014, scale 1.0 metre (20 August 2014).

Figure 17: Midden WAIK022, scale 1.0 metre (08 September 2015).

Figure 18: Hāngi/oven WAIK023. Position shown at eastern edge of excavation (14 September 2015).

Figure 19: Hāngi/oven WAIK023. Half-sectioned, scale 1.0 metre (14 September 2015).

Figure 20: Midden WAIK025. East facing profile, scales 1.0 + 0.5 metres (14 September 2015).

Figure 21: WAIK025. East facing profile, scales 1.0 + 0.5 metres (14 September 2015).

Figure 22: Midden WAIK025. East facing profile, scales 1.0 + 0.5 metres (14 September 2015).

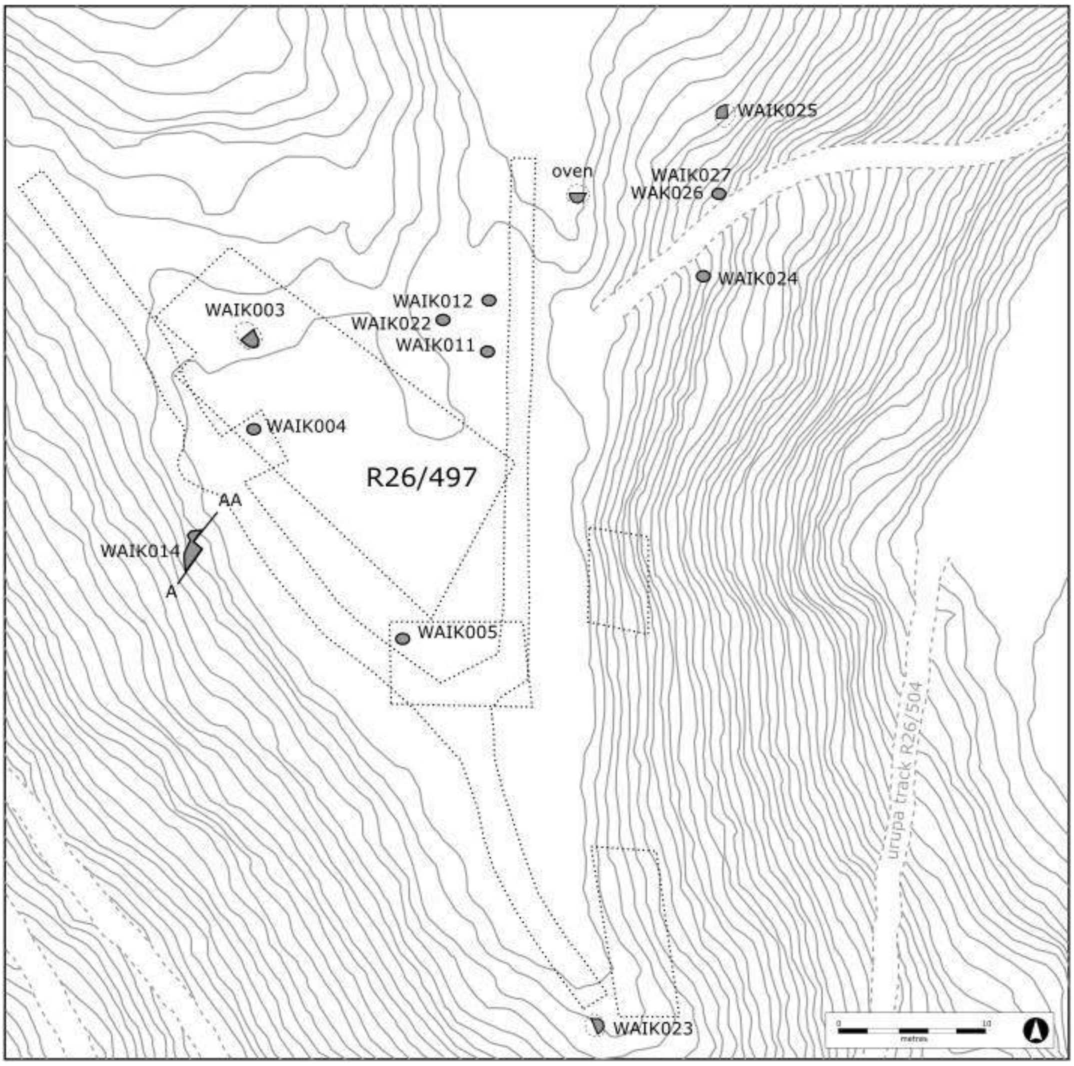

Figure 23: Site plan R26/497. Dotted lines show locations of 2013 and 2014 investigations.

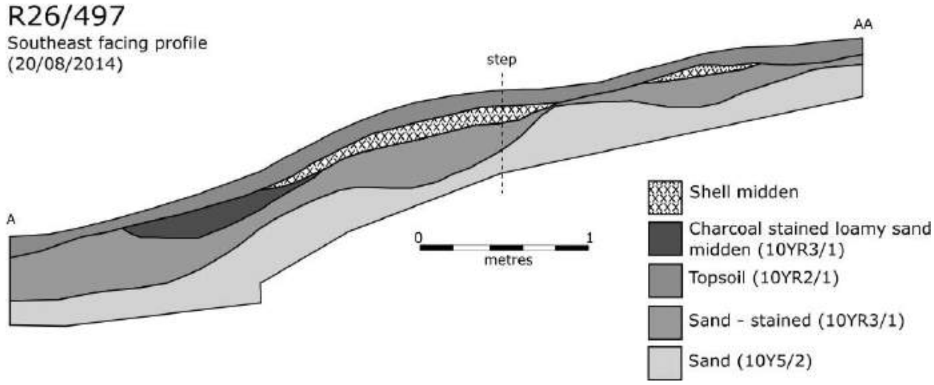

Figure 24: Profile drawing WAIK014 – R26/497

Figure 25: Recorded location R26/501

R26/501 Midden

Grid ref: NZTM E1770776 N5472985 ±3m

Recorded by: Andy Dodd, 2014 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site was a small area of midden located on a former flood plain of the Waikanae River on the south side of the old Kauri Road access to the Waikanae Christian Holiday Park. It was uncovered during topsoil stripping in April 2014. A service trench had already cut through the feature prior to it being exposed for M2PP construction works. A bulk sample of remaining material was recovered from this feature.

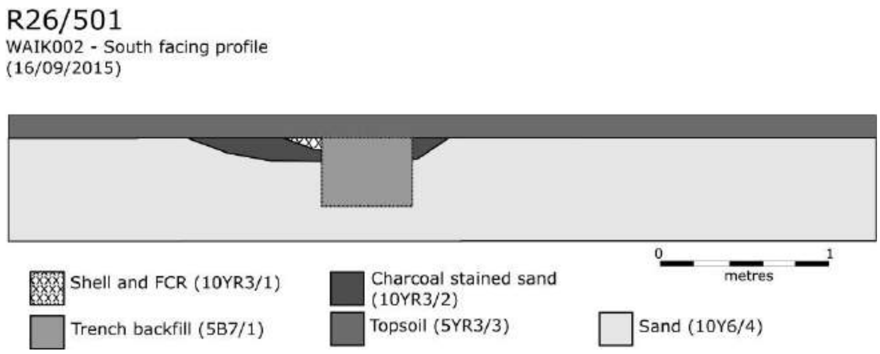

Figure 26: R26/501 profile

Figure 27: Midden remnant WAIK002 following topsoil removal, scales 1.0 + 0.5 metres (08 April 2014).

Figure 28: Half-sectioned feature following hand cleaning showing service trench line excavated through midden, scales 1.0 + 0.5 metres (08 April 2014).

Figure 29: Recorded location R26/503

R26/503 Find spot

Grid ref: NZTM E1771570 N5473830 ±3m

Recorded by: Andy Dodd, 2013 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This was the location of four pumice net floats found following the demolition of the house at 143 Te Moana Road in December 2013. The site was heavily disturbed due to the house construction and demolition and there were no insitu features visible after the demolition. The finds were reported to the Ministry for Culture and Heritage as Taonga Tuturu under the Protected Object Act and given the numbers Z11325-1 to Z11325-4. Dimensions as follows:

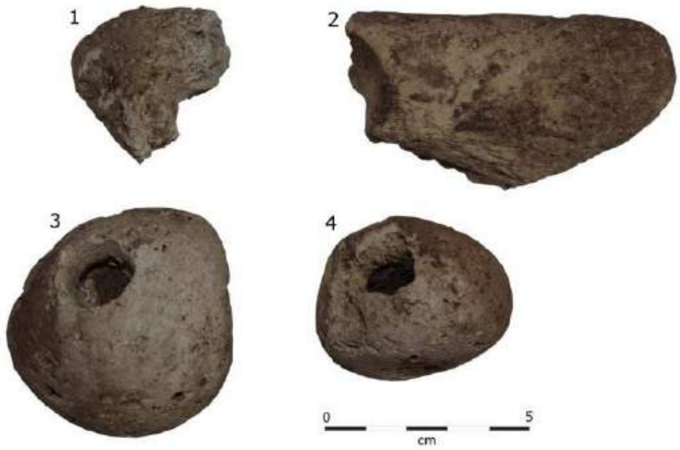

Figure 30: Pumice artefacts

1. 30 x 23 x 39 mm, 7 grams
2. 77 x 32 x 41 mm, 13 grams
3. 54 x 46 x 51 mm, 32 grams
4. 46 x 41 x 34 mm, 11 grams

R26/504 Urupā track

Grid ref: NZTM E1771100 N5473535 ±3m

Recorded by: Andy Dodd, 2014 Updated: 07 September 2015

Condition: Partially destroyed

This feature was a two-metre wide benched track, with cuttings up to 1 metre deep on the upslope side which connected the Takamore urupā (R26/272) with the properties to the west including those which were formerly the location of Tuku Rakau village (R26/281).

Starting from the northern end of the urupā, it traversed along the southern face of the crescent dune for about 75 metres before splitting into upper and lower tracks. The lower track continued for another 125 metres to connect with the property at 45 Puriri Road, while the upper track passed through the Grace and former Ahu Whenua Trust properties terminating at the property at 190 Te Moana Road.

The expressway alignment cuts through the track. Sections of the track which have been preserved include the section to thewest of the expressway alignment adjoining the urupā and the section behind the retaining wall on the Grace property.

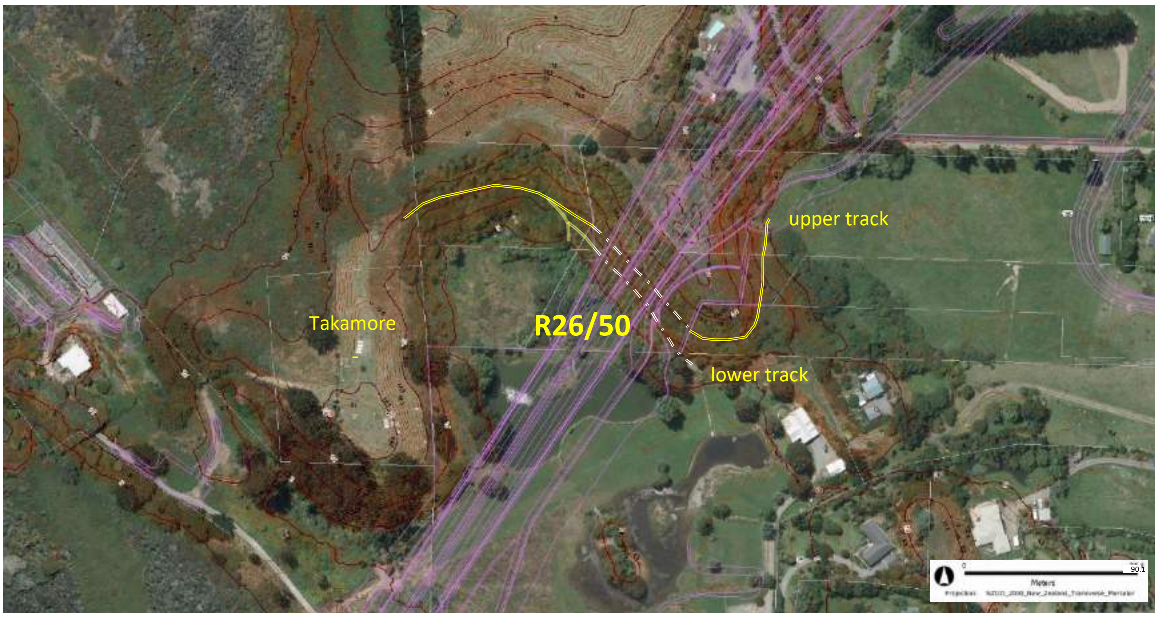

Figure 31: Recorded location of urupā track R26/504 bisected by expressway alignment. Extant sections shown in yellow. White dashed sections have been removed.

Figure 32 Start of track at northern end of urupā (09 June 2014).

Figure 33: Eastern end of urupā track after clearance of vegetation (30 July 2014).

Figure 34: Upper track exposed in profile during haul road construction, scales 1.0+0.5 metres (25 August 2014).

Figure 35: Lower track exposed in profile during haul road construction, scales 1.0+0.5 metres (25 August 2014).

Figure 36: Upper and lower tracks exposed on western edge of expressway alignment (12 June 2015).

Figure 37: Lower track exposed on western edge of expressway alignment, 1 metre scale (12 June 2015).

Figure 38: Upper track in eastern edge of alignment, shows deposit of fill to form track bench, 1 metre scale (17 September 2015).

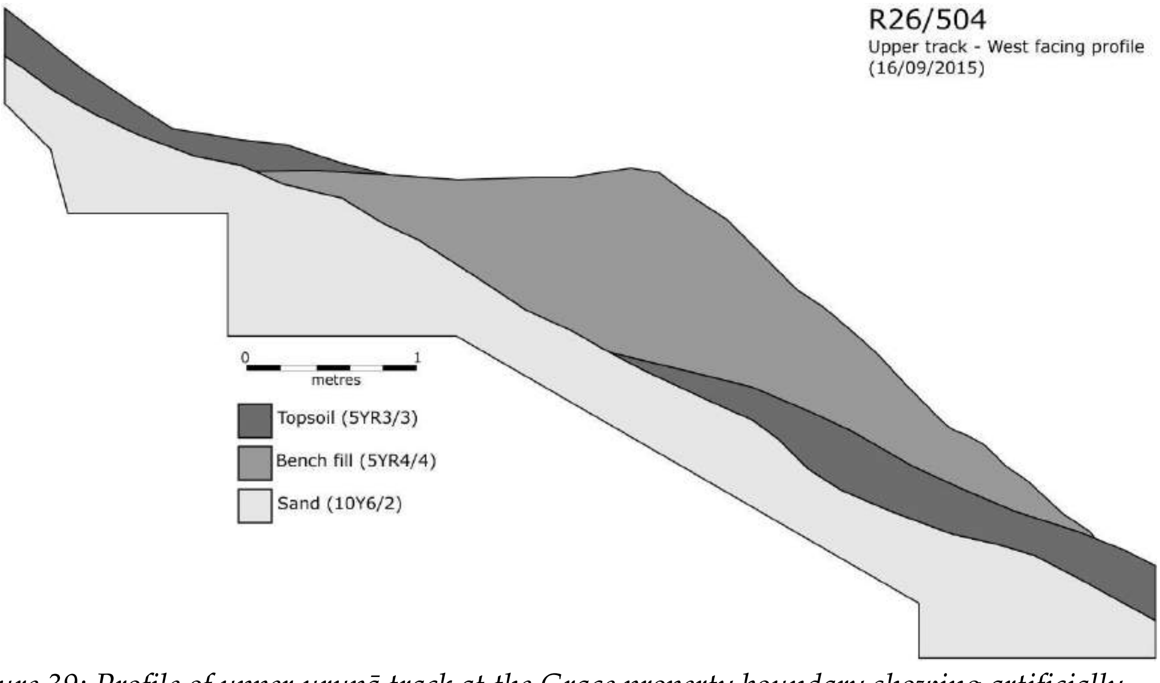

Figure 39: Profile of upper urupā track at the Grace property boundary showing artificially constructed bench.

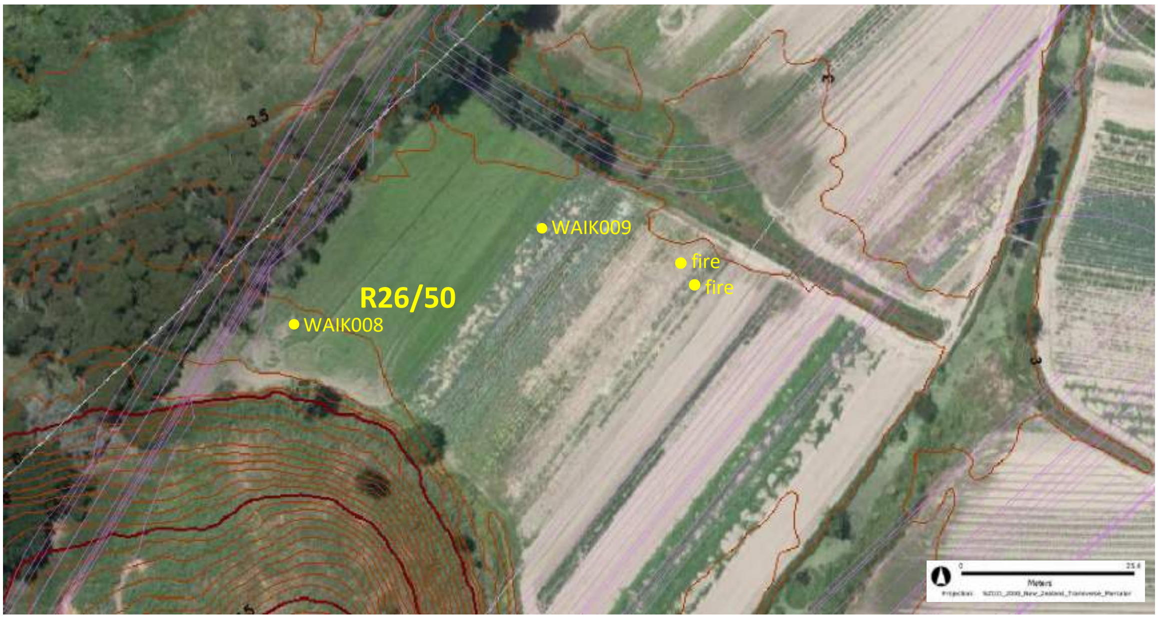

Figure 40: Recorded location R26/507

R26/507 Midden/ovens

Grid ref: NZTM E1771250 N5473799 ±3m

Recorded by: Andy Dodd, 2014 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site comprised a number of features exposed following the removal of former market garden topsoil in August 2014. These comprised a tuatua midden, the truncated base of an oven, and two areas of burnt ground. Samples were taken from the midden (WAIK008) and the oven (WAIK009).

Feature	Easting	Northing	Type	Description	Date
WAIK008	1771250	5473799	Midden	A small deposit of midden deposited in dark sandy clay (10YR2/1) covering an area 2.0 x 1.0 metres, approximately 200 -300 mm thick. Species composition included tuatua, *dosinia*, triangle shell, trough shell, pāua with charcoal and FCR also present. A 27 litre bulk sample taken for analysis (WAIK008).	08.08.2014
WAIK009	1771294	5473816	Oven	A truncated deposit of hāngi/oven stones in dark sandy clay (10YR2/1) exposed below the market garden soils suggestive of a fire in this location. Sample taken for analysis (WAIK009).	08.08.2014

No sample	1771318	5473811	Fire	A small area of charcoal stained sandy clay (10YR3/1) exposed below the market garden soils suggestive of a fire in this location. Not sampled.	08.08.2014
No sample	1771321	5473806	Fire	A small area of charcoal stained sandy clay (10YR3/1) exposed below the market garden soils suggestive of a fire in this location. Not sampled.	08.08.2014

Figure 41: Midden WAIK008 deposited in sandy clay, scale 1 metre (08 August 2014).

Figure 42: Hangi/oven feature WAIK009 exposed after removal of garden soils, scale 1 metre (07 August 2014).

Figure 43: Approximate locations of features visible from slope of dune ridge to the south (11 August 2014)

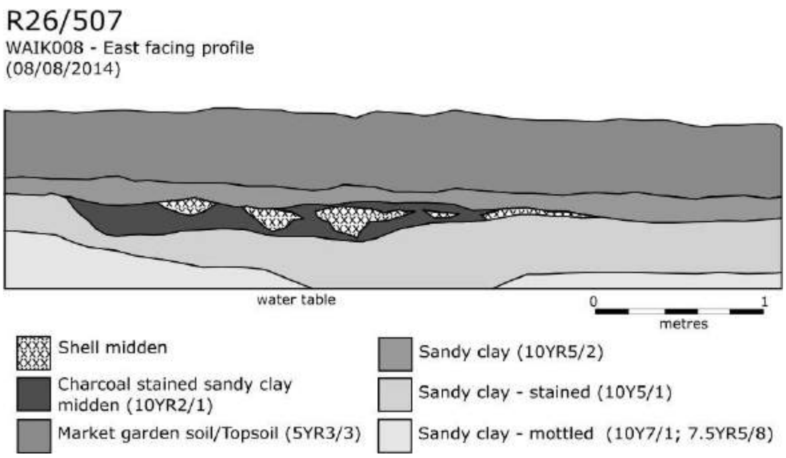

Figure 44: Profile drawing WAIK008 – R26/507

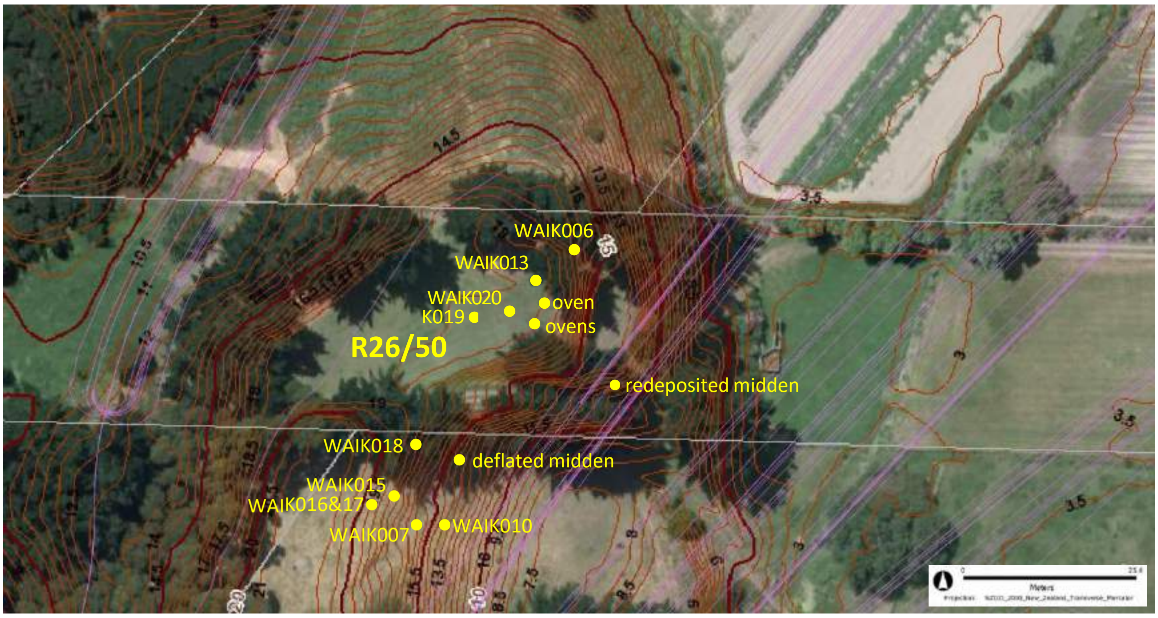

Figure 45: Recorded location of R26/508

R26/508 Midden/ovens

Grid ref: NZTM E1771256 N5473720 ±3m

Recorded by: Andy Dodd, 2014 Updated: November 2015

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site comprised a number of features towards the northern end of a prominent dune ridge. The top of the ridge had been previously levelled and vehicle access tracks cut into the eastern and northern slopes. Ten features including five midden deposits and five oven features were investigated and recorded following visits during the haul road construction in August 2014, and battering for the main expressway alignment in July 2015. These features are summarised in the table below:

Feature	**Easting**	**Northing**	**Type**	**Description**	**Date**
WAIK006	1771267	5473727	Midden	Redeposited midden in dark sand (10YR3/1) pushed over the edge of the dune crest. Contents include tuatua, *dosinia*, triangle shell and FCR Midden sieved on site, 5 litre sample taken for analysis	01.08.2014
WAIK007	1771239	5473679	Midden	Insitu midden in dark sand (10YR3/1) bisected by farm track – upper portion. Deposited on brown sand (10YR5/3). 25 litre sample taken for analysis	01.08.2014
WAIK010	1771241	5473679	Midden	Insitu midden in dark sand (10YR3/1) bisected by farm track – lower portion. Deposited on brown sand (10YR5/3). Dimensions 1 x 0.6 m. 12 litre sample taken for analysis	11.08.2014
WAIK013	1771256	5473721	Oven	Large in-situ oven in dark sand (10YR2/1). Deposited on pale brown sand (10YR6/3). Dimensions 1.3 x 1.2 m. 25 litre sample taken for analysis.	14.08.2014
	1771258	5473718	Oven	Small insitu oven in dark sand (10YR2/1). Deposited on pale brown sand (10YR6/3). Not sampled.	14.08.2014
	1771258	5473716	Midden	Sparsely spread midden immediately over 2 x 3 m area	14.08.2014
WAIK015	1771230	5473684	Midden	1.5x1m. 25 litre sample taken for analysis	28.07.2015
WAIK016	1771228	5473683	Oven	Small insitu oven feature in dark sand (10YR2/1). Deposited on pale brown sand (10YR6/3). Dimensions 0.67 x 0.43 x 0.7 m.	28.07.2015
WAIK017	1771227	5473683	Oven	Small insitu oven feature in dark sand (10YR2/1) deposited on pale brown sand (10YR6/3). Dimensions 1.6 x 1.2 x 0.2 metres	28.07.2015
WAIK018	1771236	5473694	Oven	Small insitu oven feature in dark sand (10YR2/1) deposited on very pale brown sand (10YR7/3). Dimensions 0.94 x 0.82 x 0.22 metres	30.07.2015
WAIK019	1771251	5473717	Midden	Insitu midden in very dark grayish brown sand (10YR3/2) deposited on brown sand (10YR5/3). Dimensions 1.0 x 0.65 x 0.1 m. 6 litre sample taken for analysis	31.07.2015
WAIK020	1771244	5473717	Oven	Small insitu oven feature in dark sand (10YR2/1) deposited on very pale brown sand (10YR7/3). Dimensions 1.0 x 0.6 m. 4 litre sample taken for analysis	31.07.2015

Figure 46: Re-deposited midden WAIK006 above old track cutting, 1.0 + 0.5 metre scale (1 August 2014).

Figure 47: Re-deposited midden (not sampled) between track cuttings 1.0 + 0.5 metre scale (1 August 2014).

Figure 48: Midden WAIK007 bisected by farm track - upper portion 1.0 + 0.5 metre scale (1 August 2014).

Figure 49: Deflated midden (not sampled) 1.0 metre scale (12 August 2014).

Figure 50: In-situ midden WAIK010 bisected by farm track - lower portion 1.0 metre scale (11 August 2014)

Figure 51: In-situ midden and ovens WAIK013 preserved beneath modern fill – 0.5m scale (14 August 2014).

Figure 52: Dune ridge (same view as above) following removal of trees showing locations of features (29 July 2014).

Figure 53: Midden and oven features WAIK015, WAIK016, WAIK017 exposed during bulk sand removal, 1.0- metre scale (29 July 2015).

Figure 54: Close up of midden WAIK017, 1.0 + 0.5-metre scale (29 July 2015).

Figure 55: Oven feature WAIK018 exposed during bulk sand removal, looking south (30 July 2015).

Figure 56: Midden WAIK019 and oven WAIK018 features, 1.0-metre scale (31 July 2015).

Figure 57: Close up of oven feature WAIK018. 1.0-metre scale (30 July 2015).

Figure 58: Close up of oven feature WAIK020, 1.0 metre scale (31 July 2015).

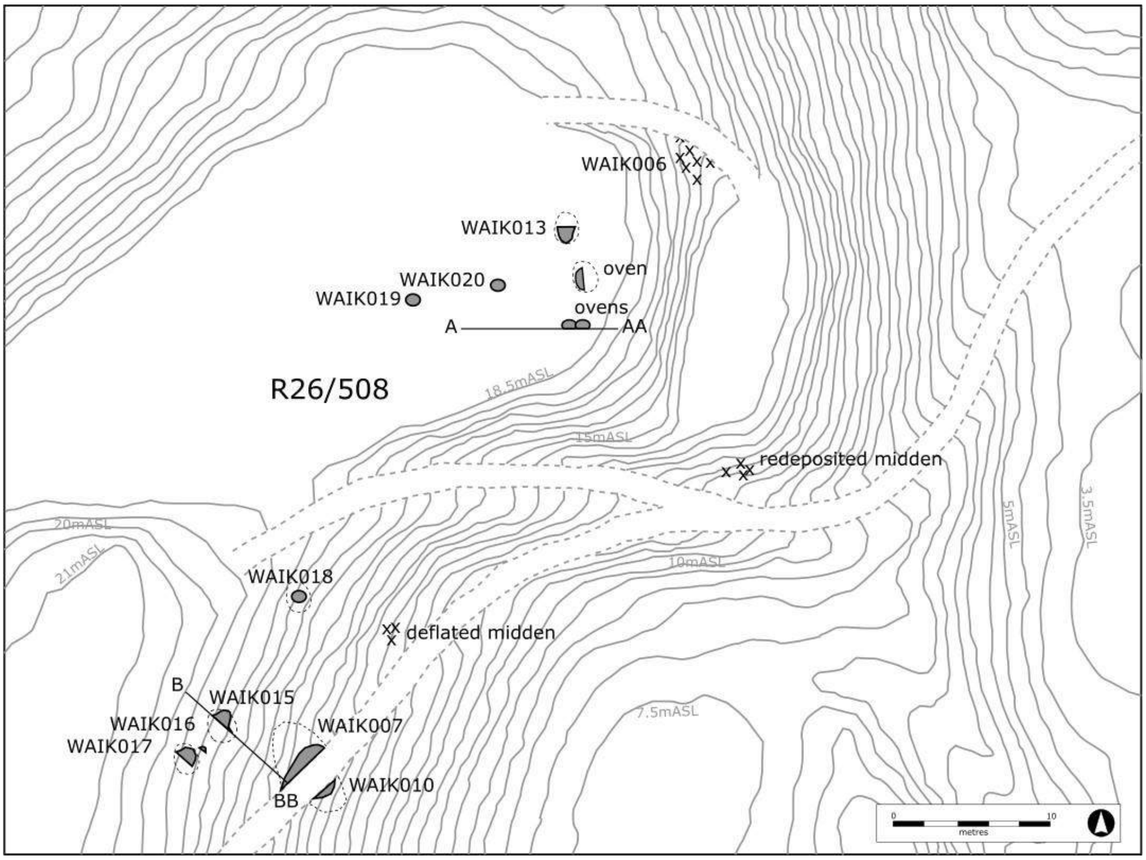

Figure 59: Site plan R26/508

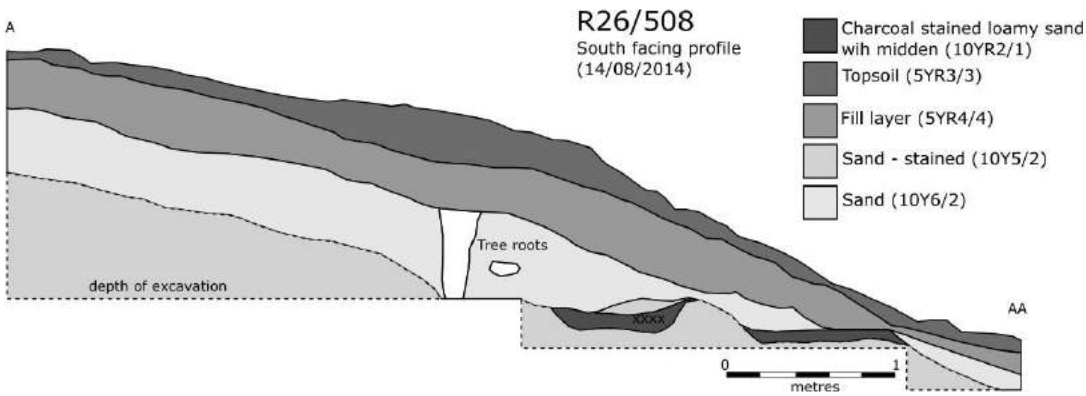

Figure 60: Profile drawing ovens – R26/508

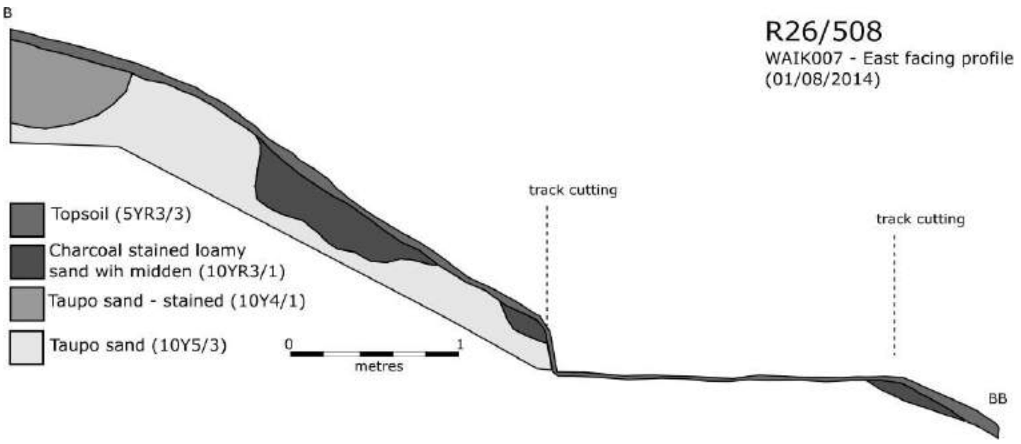

Figure 61: Profile drawing WAIK007 – R26/508

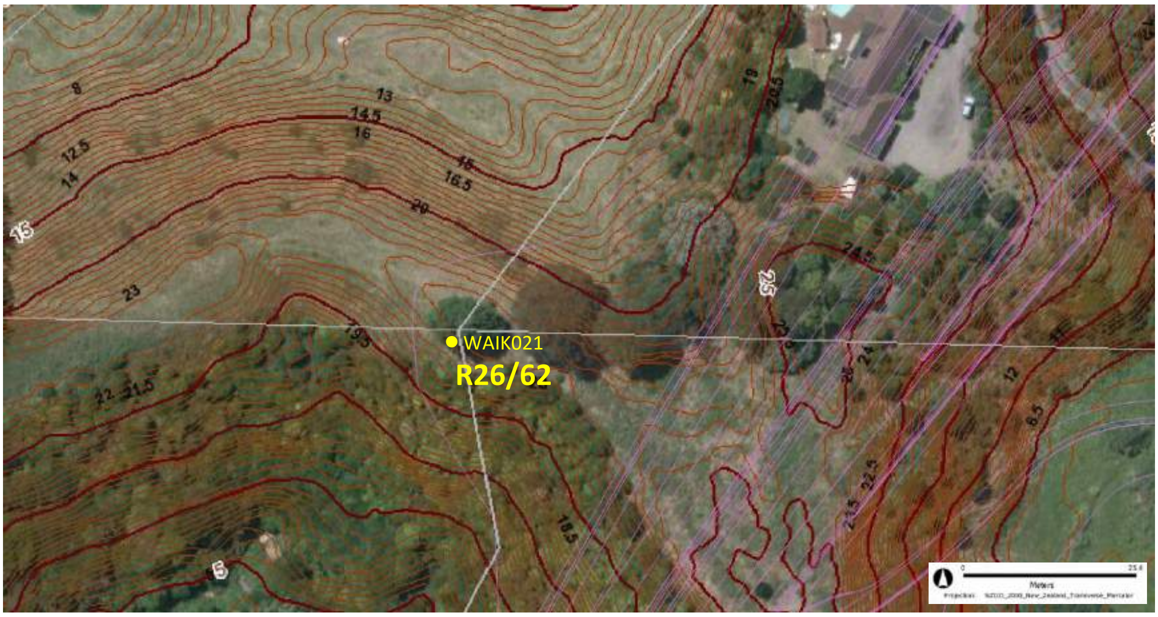

Figure 62: Recorded location of R26/628

R26/628 Midden

Grid ref: NZTM E1771115 N5473565 ±3m

Recorded by: Andy Dodd, 2015 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site comprised several patches of shell midden on the crescent dune ridge to the northwest of R26/497. They were evident in the 2011 geophysical survey on this area (Bader 2011c). The dune was battered back to the edge of the alignment in August 2015. The features encountered are summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK021	1771123	5473559	Midden	Scattered pockets of midden in the topsoil (5YR3/3), mostly in thin lenses. Some historic material including a fragment of glass from a case gin bottle was also present.	25.08.2015

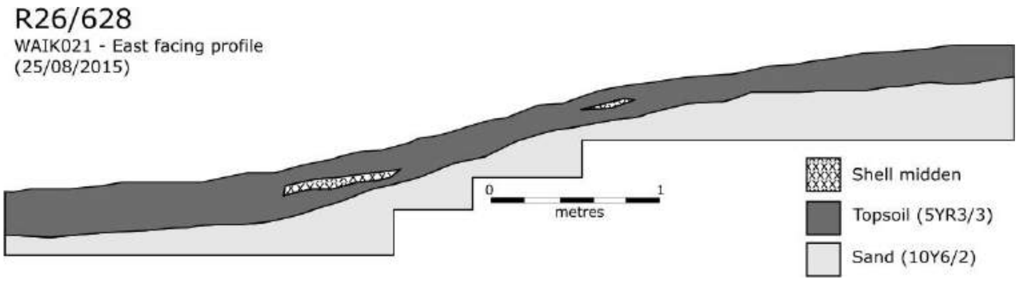

Figure 63: Profile along western edge of cut. 1 metre scale (25 August 2015)

Figure 64: Patches of midden on southern side of dune ridge. 1 metre scale (25 August 2015)

Figure 65: Close up of previous image. 1 metre scale (25 August 2015)

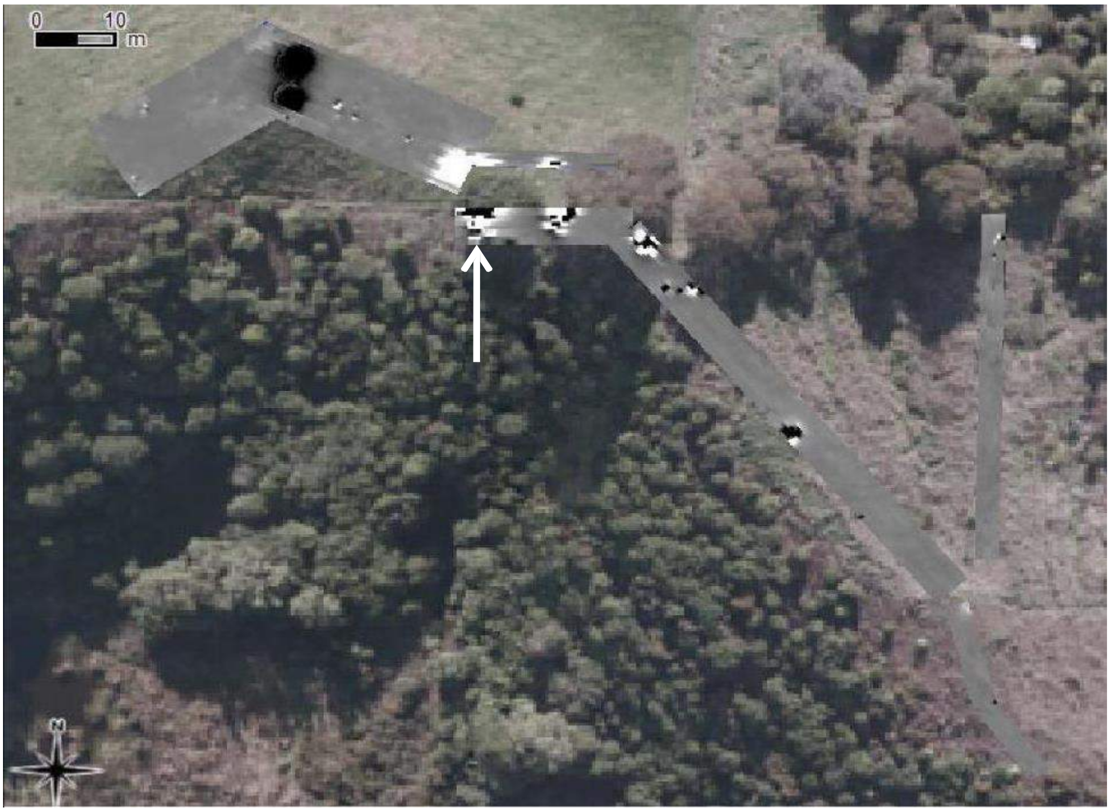

Figure 66: Image from Bader 2011 showing magnetic anomalies in the location where midden was encountered

Figure 67: Recorded location of features associated with R26/633

R26/633 Midden/ovens

Grid ref: NZTM E1771236 N5473774 ±3m

Recorded by: Andy Dodd, 2015 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site comprised several patches of shell midden, and insitu oven features on the northern flank of the dune overlooking what is now the Ahu Whenua access road. These features were to the south of R26/507, and north of R26/508. The battering of this part of the dune took place in October 2015. The features encountered are summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK028	1771238	5473768	Midden	3 x 2 metre area of midden deposited in very dark grayish brown sand (10YR3/2) deposited onto pale brown sand (10YR6/3), 140 mm thick immediately below the topsoil. Contained tuatua, triangle shell, *dosinia* and FCR.	05.10.2015
WAIK029	1771236	5473754	Oven	Oven and rake out in dark sand (10YR/2/1) spread over area approximately 1 x 1.2 metres, up to 140 mm thick. Contained *dosinia*, tuatua, triangle shell, whelk, volute, fish bone and FCR. Sample taken of shell. Half section of oven contained approximately 35 litres of FCR (not sampled)	05.10.2015
WAIK033	1771245	5437766	Midden	2 x 2 x 0.2 metre area of midden located upslope from WAIK028 and WAIK029. 20 litre sample taken for analysis	04.07.2016

Figure 68: Midden feature WAIK028 (environmental bund right of frame) 1 metre scale (5 October 2015).

Figure 69: Midden WAIK028 and oven feature WAIK029. 1 metre scale (5 October 2015)

Figure 70: Profile of oven feature WAIK029. 1 metre scale (5 October 2015)

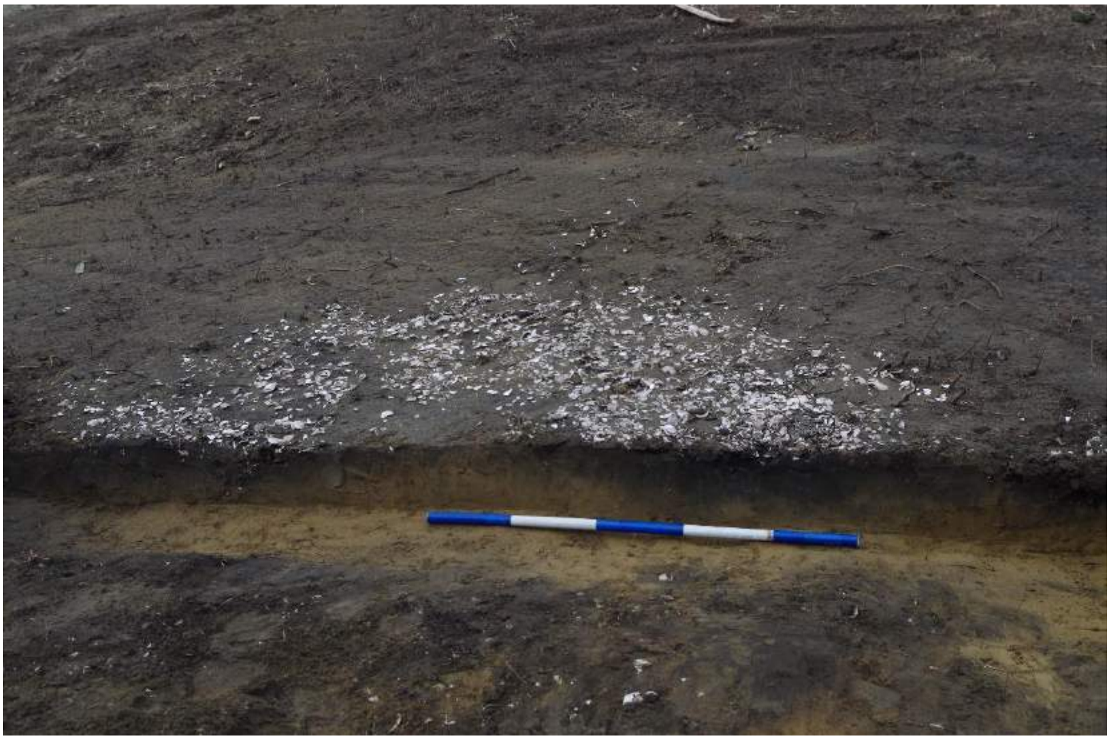

Figure 71: Midden WAIK033 profile, scale 1 metre (04 July 2016).

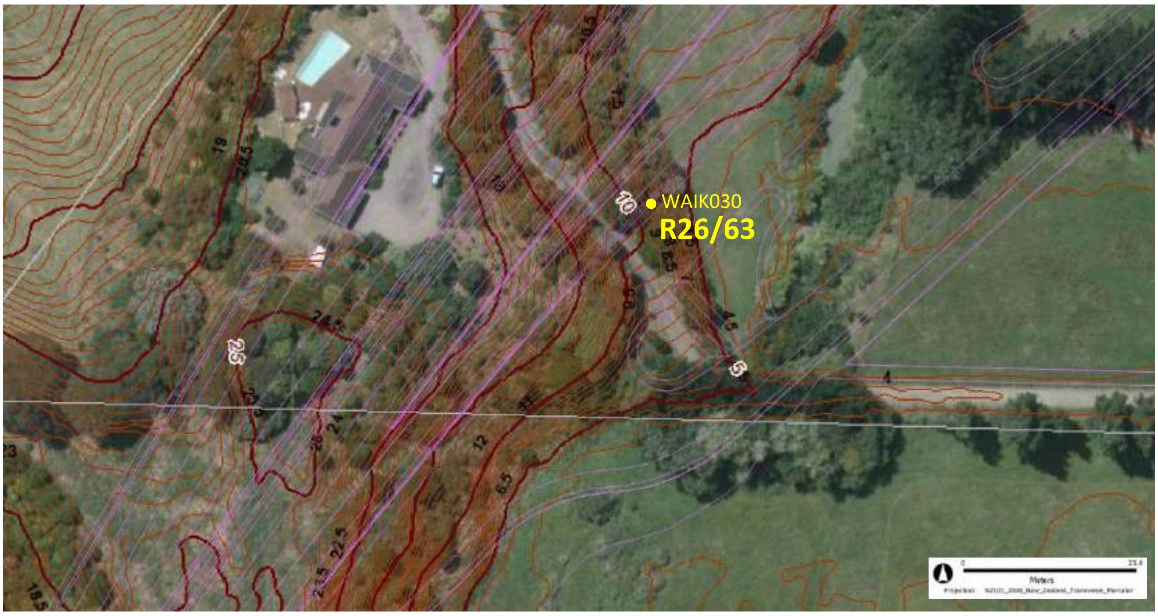

Figure 72: Recorded location of features associated with R26/634

R26/634 Midden

Grid ref: NZTM E1771252 N5473597 ±3m

Recorded by: Andy Dodd, 2015 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site comprised a small insitu oven feature, on the lower east facing flank of the dune, below the driveway to the former house site and northeast of R26/497. It was uncovered on 3 November 2015. The features encountered are summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK030	1771252	5473597	Midden	Small midden/oven feature in dark sand (10YR2/1), deposited on pale brown sand (10YR6/3). Half sectioned feature was 850 x 400 x 200 mm	03.11.2015

Figure 73: Half sectioned oven feature. 1 metre scale (3 November 2015).

Figure 74: Half sectioned oven feature showing proximity to ground surface (3 November 2015).

Figure 75: Location of R26/634. Looking southeast (3 November 2015).

Figure 76: Recorded locations of features associated with R26/649

R26/649 Ovens

Grid ref: NZTM E1771385 N5473600 ±3m

Recorded by: Andy Dodd, 2016 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site comprised two large hā ngi/oven features on a slightly elevated area, surrounded by low-lying flood prone land. The first oven was uncovered on 4 May 2016, and reported to the project archaeologist. The second oven was uncovered while the archaeologist was on site on 9 May 2016. The features encountered are summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK031	1771385	5473360	Oven	Large oven feature in dark sand (10YR2/1), deposited on pale brown sand (10YR6/3). Dimensions 1.6 x 1.7 x 0.3 metres. 10 litre bulk sample taken for analysis.	09.05.2016
WAIK032	1771387	5473601	Oven	Large oven feature in dark sand (10YR2/1), deposited on pale brown sand (10YR6/3). Dimensions 1.1 x 1.35 x 0.2 metres. 10 litre bulk sample taken for analysis.	09.05.2016

Figure 77: Half sectioned oven features. 1 metre scale (9 May 2016).

Figure 78: Close up of larger oven feature (WAIK031). Scales 1 metre and 0.3 metres (9 May 2016).

Figure 79: Close up of smaller oven feature (WAIK032). Scales 1 metre and 0.3 metres (9 May 2016).

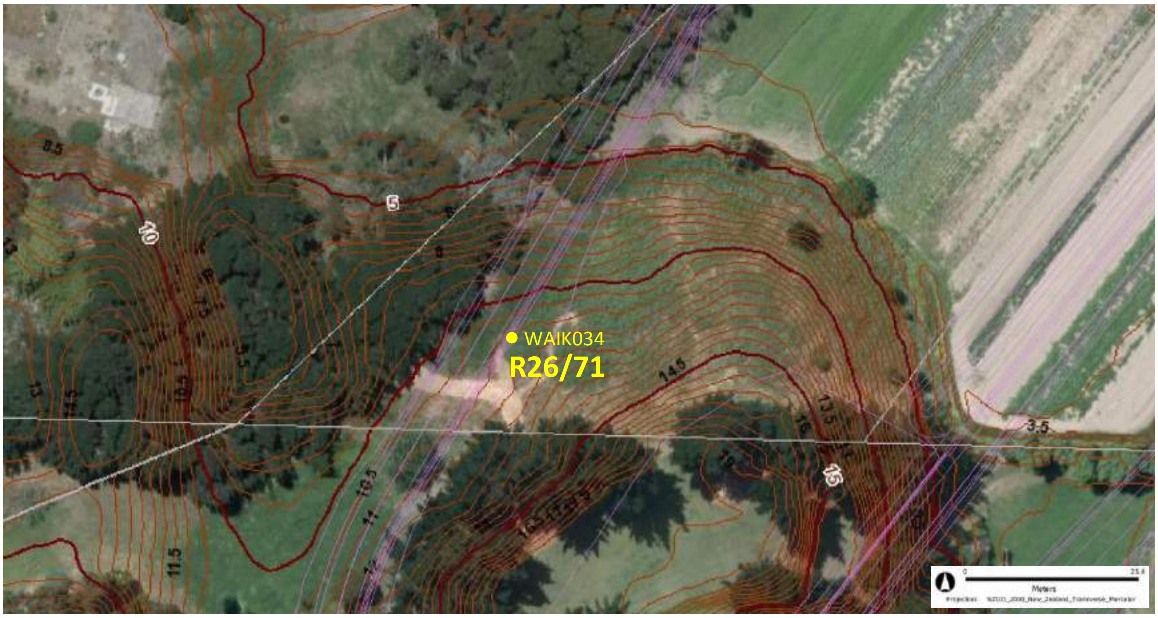

Figure 80: Location of R26/711

R26/711 Oven

Grid ref: NZTM E1771212 N5473754 ±3m

Recorded by: Andy Dodd, 2016 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site was a hāngi/oven feature measuring 1.6 x 1.45 metres, 0.25 metres deep. It was excavated on 10 October 2016 during earthworks along the alignment of the urupā access road for the Ahu Whenua block. A fifteen-litre bulk sample was taken for analysis (WAIK034). While excavating the half-section, the shattered oven stones were weighed before being discarded. The stone in this half of the feature accounted for just over 80 kilograms, so it is estimated that the whole feature is likely to have contained approximately 160 kilograms of oven stones. The location of this feature corresponds with an anomaly recorded during the magnetometer survey (Bader 2016). The features encountered are summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK034	1771212	5473754	Oven	Oven feature in dark sand (10YR3/1), dimensions 1.6 x 1.45 x 0.25 metres, corresponding top anomaly in geophysical report. Densely packed with FCR but no shell or fishbone. 15 litre bulk sample taken for	10.10.2016

				analysis.	

Figure 81: Half sectioned oven feature. Scale 1 metre (10 October 2016)

Figure 82: Oven feature prior to half sectioning. Scale 1 metre (10 October 2016)

Figure 83: Oven feature as first uncovered. Scales 1 metre and 0.5 metres (10 October 2015).

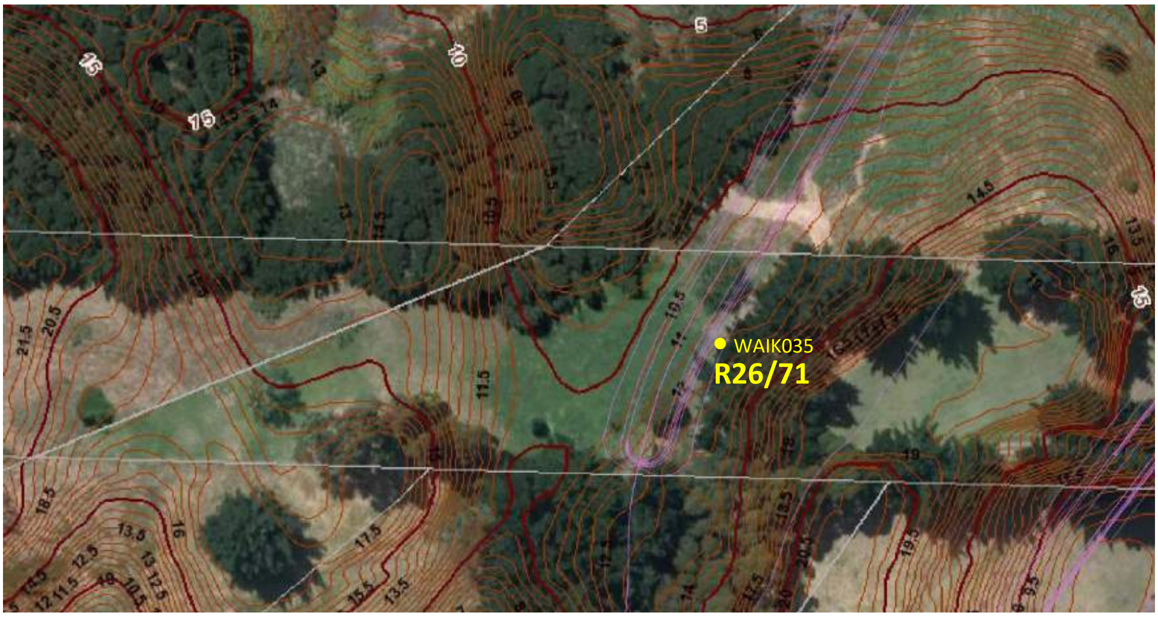

Figure 84: Location of R26/713

R26/713 Midden

Grid ref: NZTM E1771198 N5473715 ±3m

Recorded by: Andy Dodd, 2016 Updated:

Condition: Destroyed

Evidence: This feature and the area immediately around it has been completely excavated. Further unrecorded subsurface features may still be present in the general vicinity.

This site was a tuatua midden deposit excavated on 13 October 2016 during earthworks along the alignment of the urupā access road for the Ahu Whenua block. A twenty-litre bulk sample was taken for analysis (WAIK035). This site is located to the east of R26/368 and south of R26/711. The area between R26/368 band R26/713 had been previously excavated and back filled with pine slash. The features encountered are summarised in the table below:

Feature	Easting	Northing	Type	Description	Date
WAIK035	1771198	5473715	Midden	In situ midden in pockets of dark sand (10YR3/1)just below the topsoil, along the fence line. Twenty litre sample taken for analysis. Adjacent to this area a large pit had been excavated and backfilled with pine slash, so the immediate area had been substantially modified.	13.10.2016

Figure 85: Profile of midden feature below topsoil. Looking southeast. 1 metre scale (13 October 2016)

Figure 86: Profile of midden feature below topsoil. 1 metre scale (13 October 2016)

Figure 87: Looking south towards site prior to excavation for road cutting (07 October 2016)

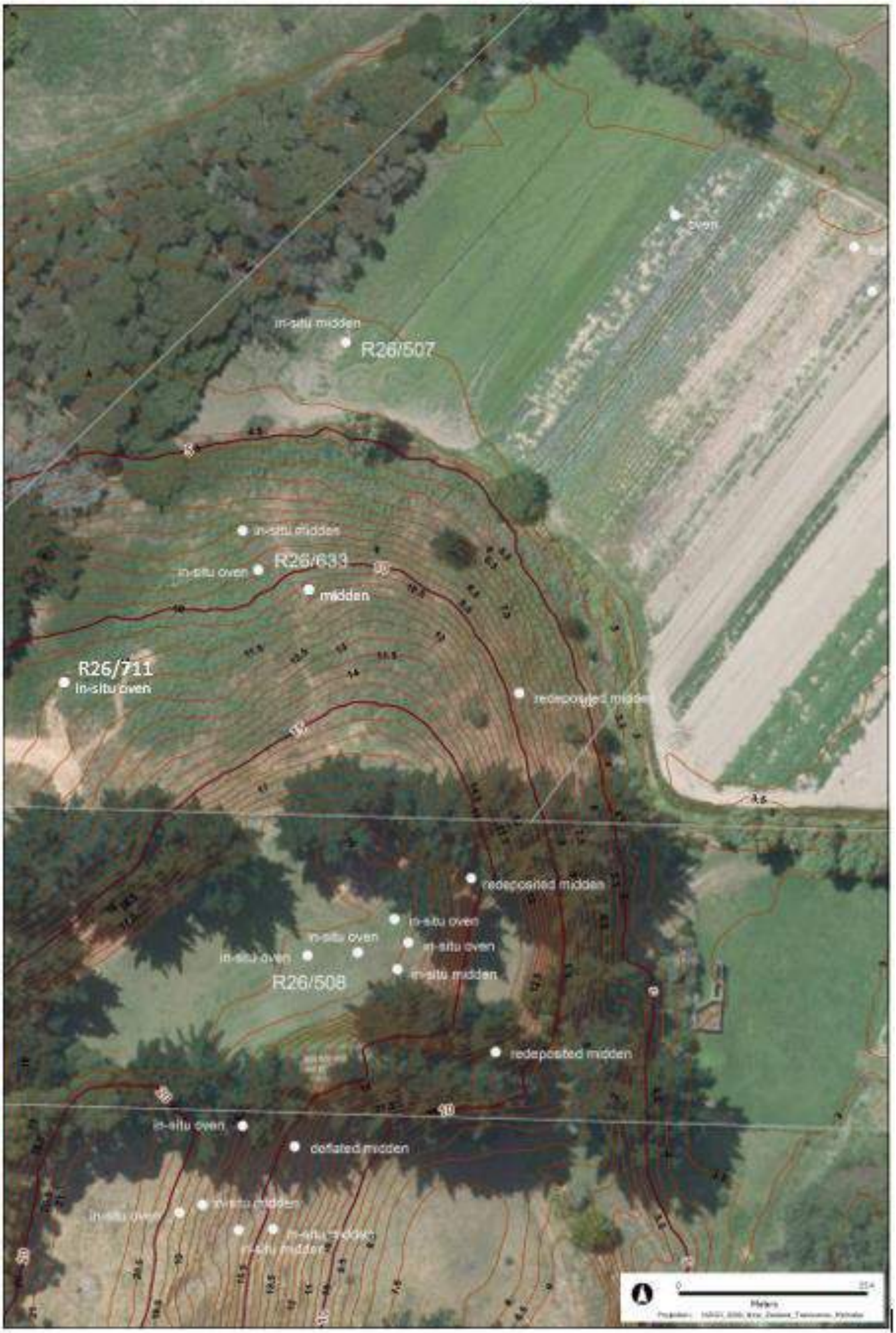

Figure 88: Features associated with sites R26/508, R26/633 and R26/711

Figure 89: Features associated with R26/497 and R26/634

SUMMARY OF SAMPLES

Samples were taken as bulk samples, so that landsnails and charcoal could be recovered by floatation and 1mm mesh sieving.

ID	NZTM GR ±3m	Site	Date	Indicative contents	Sample size	
					kg	lt
WAIK001	E1770826 N5472759	R26/487	31.03.2014	Clay pipe stems, nails, bottle glass		
WAIK002	E1770776 N5472985	R26/501	08.04.2014	Tuatua, dosinia, charcoal, FCR (100% sample)	11	10
WAIK003	E1771164 N5473540	R26/497	31.07.2014	Charcoal, FCR (50% sample)	8	5
WAIK004	E1771164 N5473540	R26/497	31.07.2014	Tuatua, dosinia, triangle, whelk, charcoal	14	11
WAIK005	E1771175 N5473513	R26/497	31.07.2014	Tuatua, dosinia, triangle, trough, whelk, pāua	22	15
WAIK006	E1771267 N5473727	R26/508	01.08.2014	Tuatua, dosinia, FCR	8.7	5
WAIK007	E1771239 N5473679	R26/508	01.08.2014	Tuatua, dosina, FCR	28	25
WAIK008	E1771250 N5473799	R26/507	08.08.2014	Tuatua, FCR	45	27.5
WAIK009	E1771294 N5473816	R26/507	08.08.2014	FCR, charcoal		
WAIK010	E1771241 N5473679	R26/508	11.08.2014	Tuatua, dosinia, FCR	15	12
WAIK011	E1771184 N5473537	R26/497	18.08.2014	Tuatua, triangle shell (100% sample)	7	5
WAIK012	E1771183 N5473541	R26/497	18.08.2014	Tuatua, triangle shell	18	16
WAIK013	E1771256 N5473721	R26/508	14.08.2014	Tuatua, FCR	31	25
WAIK014	E1771160 N5473521	R26/497	20.08.2014	Tuatua, dosinia, charcoal, FCR	24	25
WAIK015	E1771230 N5473684	R26/508	28.07.2015	Tuatua, dosinia, triangle shell, whelk, bone, FCR	26.6	25
WAIK016	E1771228 N5473683	R26/508	28.07.2015	Charcoal		
WAIK017	E1771227 N5473683	R26/508	28.07.2015	Charcoal		
WAIK018	E1771236 N5473694	R26/508	30.07.2015	FCR, charcoal		
WAIK019	E1771251 N5473717	R26/508	31.07.2015	Tuatua, dosinia, triangle shell, whelk, fishbone	8	6
WAIK020	E1771244 N5473717	R26/508	31.07.2015	Trough shell, bird bone, charcoal	6	4
WAIK021	E1771123 N5473559	R26/628	25.08.2015	Tuatua, bottle glass	9.2	10
WAIK022	E1771181 N5473540	R26/497	08.09.2015	Tuatua, triangle shell, dosinia, whelk (100%)	5.5	4.5
WAIK023	E1771191 N5473484	R26/497	14.09.2015	FCR, charcoal, dosinia	8	
WAIK024	E1771201 N5473543	R26/497	14.09.2015	Tuatua, dosinia, whelk, cake urchin	8	7
WAIK025	E1771203 N5473557	R26/497	14.09.2015	Tuatua, dosinia	22.1	19
WAIK026	E1771203 N5473549	R26/497	17.09.2015	Tuatua, whelk	2	2
WAIK027	E1771203 N5473549	R26/497	17.09.2015	Tuatua, dosinia, mussel, charcoal	0.5	0.5
WAIK028	E1771236 N5473754	R26/633	05.10.2015	Tuatua, triangle shell, dosinia, FCR	31	26
WAIK029	E1771238 N5473768	R26/633	05.10.2015	Tuatua, dosinia, FCR	16	15
WAIK030	E1771252 N5473597	R26/634	03.11.2015	FCR, charcoal	1.4	1
WAIK031	E1771385 N5473600	R26/649	09.05.2016	FCR, charcoal	14.32	10
WAIK032	E1771387 N5473601	R26/649	09.05.2016	FCR, charcoal	11.2	10
WAIK033	E1771245 N5473766	R26/633	04.07.2016	Tuatua, triangle shell, dosinia, whelk, fishbone,	22.49	20

				charcoal, FCR		
WAIK034	E1771212 N5473754	R26/711	10.10.2016	Oven 1.6 x 1.45 m	20	15
WAIK035	E1771198 N5473720	R26/713	13.10.2016	Tuatua, charcoal, FCR	19.85	20
WAIK036	E1771227 N5473774	R26/633	13.10.2016	Possible modified soil		
WAIK037	E1771970 N5474129	R26/712	01.11.2016	Adze (notification Z20393)		

PRELIMINARY OBSERVATIONS

The majority of archaeological features encountered between the Waikanae River and the Waimeha Stream were midden and oven features. This is typical of the Kāpiti dune belt. This area straddles the landward edge of the Taupō dunes which advanced over and buried the older Foxton dunes from ca. 1720-450BP (McFadgen 1997:11). The Foxton dunes were stable and forested by the time of human arrival, so it is perhaps not surprising that the archaeological features were all encountered near within about a metre of the ground surface. The Taupō dunes would have been nearing the end of their active phase at the time of human arrival.

The midden deposits were dominated by tuatua shell, with triangle shell and ringed venus also occurring in significant proportions in some deposits. This is characteristic of shell middens in the Waikanae area, and reflects the species that are typically available at local beaches. Also present in smaller numbers were other sandy shore species including *Arabica volute*, whelk, and cake urchin. Toheroa, now locally rare (if not extinct on Waikanae beaches), is also likely to be present in samples although juvenile toheroa shell is similar in appearance to tuatua, so these are likely to be identified in the laboratory rather than in the field.

The deepest deposits encountered in this section of the expressway were those where additional fill had been added over the top of the ground surface in more recent times. An example of this was the midden and fire features associated with R26/507 which had been buried beneath the soils used for the market gardens along Te Moana Road.

Midden and oven features are more commonly encountered on elevated ground, but a number of features were located on the flood prone low-lying ground between Te Moana Road and the Taupō dune. R26/507 was deposited just above the present day water table, although it was in close proximity to a number of other features on the Taupō dune, which had a number of midden and oven deposits at higher elevations. Two large hāngi features (R26/649) were recorded some 125 metres east of the dune, but they were also on a low sand ridge about one metre higher in elevation than the surrounding low-lying ground.

Parts of the Taupō dune had been heavily modified by earthworks prior to the construction of the expressway. The construction works for the house and driveway at 178 Te Moana Road would have required the removal of much of the top of the dune in that location. The density of archaeological features at the northern and southern ends of this ridge, encountered during M2PP earthworks (R26/497 and R26/508), suggests that archaeological features were probably present all the way along the ridge at one time. The northern end of the ridge had also been heavily modified for a house platform and archaeological deposits associated with R26/508 had been pushed over the side of the ridge to create a level platform. This was evident as some plastic debris was mixed in with some of the redeposited midden.

Archaeological deposits associated with nineteenth century Māori settlements are of particular interest on the Kāpiti Coast, but few have been investigated archaeologically. A few of the midden deposits contained historic artefacts such as bottle glass and clay pipe fragments (eg. R26/508, and R26/628). While the available archaeological evidence from these sites is still scant, they are potentially interesting as they have potential to provide information about the speed and extent to which the material culture and cultural practices of European immigrants were adopted (and adapted) by Māori in the Waikanae area, or to which traditional practices were continued despite the available alternatives. They are also important as the traditional sites and cultural remains of the people who descendants hold mana whenua status today. The archaeological remains of the village of Tuku Rākau (R26/281), the Takamore urupā (R26/272), the urupā track (R26/504) and the Maketu dune (R26/454) are all tangible remains of the nineteenth century cultural landscape.

The large majority of sites investigated during the preliminary archaeological work were from a relatively short time duration in the fifteenth and sixteenth centuries (Brooks et al 2016). This result was unexpected given the wealth of historical information about Māori settlement in the Waikanae area. The archaeological deposits containing nineteenth century material may present an opportunity to address this unintentional bias.

In the Taupō and Foxton phase dunes on the Kāpiti Coast, midden and hāngi/oven features have been more frequently encountered on elevated ground near to the coast. In this location, however, a number of these features were also encountered on the low-lying flood prone land between the Waikanae River and Waimeha Stream. Two sites (R26/507 and R26/649), comprising the remains of at least three oven features and one shell midden, were uncovered by earthworks in this area. Both series of dunes were stable and forested by the time of human arrival (McFadgen 1997). Archaeological features deposited onto Foxton dunes were generally at shallow depth (within 0.5 metres of the ground surface) except where additional fill layers were evident above older ground surfaces.

While the features exposed by earthworks have all been excavated and thereby destroyed, it is still necessary to exercise a degree of caution in adjacent areas which have not been subject to recent earthworks. At least two sites (R26/711 and R26/713) were encountered on the edge of the alignment, so earthworks may not have removed all of the archaeological evidence in these areas. In the case of the former, the 2016 magnetometer survey has identified an anomaly outside of the earthworks footprint which appears similar to the large hāngi/oven feature that was excavated during earthworks.

The information gained from the analysis and reporting on the samples taken from these features can be considered in the context of other archaeological deposits around Waikanae and along the M2PP expressway. They can contribute to a broader overall picture of past human activity in the Kāpiti District.

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S:/Arch/2013-639

New Zealand Historic Places Trust
Pouhere Taonga

HP 11013/11036-019
In reply please quote 2013/639

10 April 2013

New Zealand Transport Agency
C/- Boffa Miskell
PO Box 11340
WELLINGTON 6142

Attn: Greg Vossler

Tena koe Greg

APPLICATION FOR AUTHORITY: Section 14, *Historic Places Act* 1993

Authority No:	2013/639
Archaeological Sites:	R26/368, R26/281 and unrecorded sites.
Location:	MacKays to Peka Peka Expressway between the Waikanae River and Waimeha Stream, Kapiti Coast
Proposal:	Earthworks for the MacKays to Peka Peka expressway project between the Waikanae River and Waimeha Stream, Kapiti Coast

DECISION

I am writing to inform you that the above authority has been granted.

The authority **attached** to this letter is an authority under the *Historic Places Act* 1993 to undertake the work specified in your application that may affect an archaeological sites. Please read the conditions imposed on this authority carefully.

ASSESSMENT AND ADVICE

In considering this application, the NZHPT notes that you wish to construct an expressway between MacKays Crossing and Peka Peka, on the Kapiti Coast. The expressway has been divided into 6 sections for the purposes of authority applications and this application covers part of Sector 4, the section between the Waikanae River and Waimeha Stream. This activity will affect two recorded archaeological sites and also has the potential to affect unrecorded archaeological sites.

This sector of the expressway passes through the Takamore Wahi Tapu Area, and may disturb remains of Tuku Rakau village, a significant post-contact kainga. The expressway also passes very close to the Takamore Urupa and the Maketu tree, which is possibly also an urupa. Therefore there is the possibility of encountering graves on the fringes of these sites. These sites are of significance to Ngati Toa Rangatira, Te Ati Awa ki Whakarongotai, the Takamore Trustees, Ngati Raukawa and Muaupoko.

The NZHPT appreciates the effort you have made to consult with Ngati Toa Rangatira, Te Ati Awa ki Whakarongotai, the Takamore Trustees, Ngati Raukawa and Muaupoko.

Antrim House, 63 Boulcott Street, PO Box 2629, Wellington, New Zealand.
Ph: 64 4 472 4341, Fax: 64 4 499 0669, E-Mail: information@historic.org.nz
"Saving Our Past For Our Future"

It is the view of the NZHPT that an authority may be granted in this case on standard conditions of archaeological recording, investigation, sampling, analysis, reporting, and tangata whenua involvement as appropriate.

The authority holder, in consultation with the project archaeologist, will explore opportunities for on-site interpretation of materials recovered or features exposed during the course of the investigations as part of the final development.

Please note that the reporting conditions in this authority differ from those usually included in archaeological authorities. This is due to the fact that the expressway has been divided into multiple sectors, the results of which will be combined into a single document. This authority is for Sector 4 of the MacKays to Peka Peka Expressway.

This application has been referred to the Maori Heritage Council of the NZHPT pursuant to section 14 (3) of the Act. The Council considers that the conditions notified under this authority and the consultation undertaken with tangata whenua are appropriate.

An appeal to the Environment Court may be made by any directly affected person against this decision or condition, or review of a condition. The notice of appeal should state the reasons for the appeal and the relief sought and any matters referred to in section 20 of the *Historic Places Act* 1993. The notice of appeal must be lodged with the Environment Court and served on the NZHPT within 15 working days of receiving the NZHPT's decision, and served on the applicant or owner within five working days of lodging the appeal.

The holder of an authority may apply to the NZHPT for the change or cancellation of any condition of the authority. The NZHPT may also initiate a review of all or any conditions of an authority.

Please note in particular Condition 1, that this authority may not be exercised during the appeal period of 15 working days or until any appeal that has been lodged is resolved.

The granting of this authority by the New Zealand Historic Places Trust does not constitute affected party approval under the Resource Management Act or in any way prejudice its response to any other consent processes in respect of the proposed MacKays to Peka Peka Expressway.

The NZHPT looks forward to receiving a report on the work done, which will make a valuable contribution to the knowledge of New Zealand's past.

If you have any queries please direct your response in the first instance to:

David Rudd
Central Region Archaeologist
New Zealand Historic Places Trust
PO Box 2629
WELLINGTON 6140
(04) 494 8323
drudd@historic.org.nz

Kia ora

Pam Bain
Senior Archaeologist

2

cc: Mary O'Keeffe
56 View Road
Houghton Bay
WELLINGTON 6023

cc: Chris Jacomb
South Pacific Archaeological Research
Anthropology Department
University of Otago
PO Box 56
DUNEDIN

cc: Hemi Sundgren
Te Ati Awa ki Whakarongotai Charitable Trust Board
PO Box 509
WAIKANAE 5250

cc: Jennie Smeaton
Te Runanga o Toa Rangitira Inc
PO Box 50355
PORIRUA 5240

cc: Ben Ngaia
The Takamore Trust
C/- Port Nicholson Settlement Trust
PO Box 12-164
Thorndon
WELLINGTON 6144

cc: Muaupoko
c/- Steve Hirini
306 Oxford Street
LEVIN 5510

cc: Ngati Raukawa
c/- Te Waari Carkeek
51 Main Street
OTAKI 5512

cc: NZHPT Regional Archaeologist (David Rudd)

cc: NZHPT Central Region General Manager, Ann Neill

cc: Planning Manager
Kapiti Coast District Council
Private Bag 60601
PARAPARAUMU 5254

Pursuant to Section 14 (9) *Historic Places Act* 1993 the NZHPT must notify TLAs of any decision made on an application to damage, modify or destroy an archaeological site. We recommend that this advice is placed on the appropriate property file for future reference.

cc: Heritage Operations
Ministry for Culture and Heritage
PO Box 5364
WELLINGTON 6145

Section 19 *Historic Places Act* 1993 refers

cc: NZAA Central Filekeeper,
c/o DOC, WELLINGTON

Attn: Nicola Molloy via email at nmolloy@doc.govt.nz

3

AUTHORITY
HISTORIC PLACES ACT 1993

AUTHORITY NO: 2013/639 **NZHPT File No.: 11013/11036-019**

DECISION DATE: 10 April 2013 **EXPIRY DATE: 10 April 2018**

AUTHORITY HOLDER: New Zealand Transport Agency

**POSTAL ADDRESS: PO Box 5084
Lambton Quay
WELLINGTON 6145**

ARCHAEOLOGICAL SITES: R26/368, R26/281 and unrecorded sites.

LOCATION: MacKays to Peka Peka Expressway between the Waikanae River and Waimeha Stream, Kapiti Coast

APPROVED ARCHAEOLOGIST: Mary O'Keeffe & Chris Jacomb

DECISION

Pursuant to section 14 (1) of the *Historic Places Act* 1993 and in respect of the archaeological sites described above, within the area specified in Figure 1 (legal descriptions appended to authority), the New Zealand Historic Places Trust grants a general authority in whole to the New Zealand Transport Agency for the proposal to conduct earthworks for the MacKays to Peka Peka expressway project between the Waikanae River and Waimeha Stream, Kapiti Coast, subject to the following conditions:

CONDITIONS OF AUTHORITY

1. This authority may not be exercised for fifteen working days from the date of receipt or until any appeal has been resolved.

2. Prior to the start of any on-site archaeological work, the Authority Holder must ensure that the NZHPT Regional Archaeologist is advised of the date when work will begin.

   This advice must be provided at least 48 hours before work starts, either by telephone (04 494 8323) or email (drudd@historic.org.nz), and must include the Authority Number, and address of the property.

   The Authority Holder must also ensure the NZHPT Regional Archaeologist is advised of the completion of the on-site archaeological work, by telephone or email, within 5 working days of completion.

3. The authority must be exercised in accordance with a Management Plan commissioned, or prepared with archaeological advice, by the Authority Holder. The Management Plan shall provide operational guidelines and procedures for day to day activities that may affect

archaeological sites during earthworks for the MacKays to Peka Peka expressway project for this section of works between the Waikanae River and Waimeha Stream.

The Plan shall include, but is not limited to, the following:

a) the role, responsibility and level of authority of the approved archaeologists,

b) timeframes for archaeological work,

c) protocols for the unexpected discovery of archaeological material,

d) protocols for the discovery of koiwi, including removal procedure and potential for analysis,

e) on-site briefing by Project Archaeologist for contractors about the archaeological work required and how to identify archaeological sites during works,

f) the responsibilities of contractors with regard to notification of archaeological sites,

g) requirements for stand down periods to enable archaeological work,

h) mechanisms for dispute resolution, and

i) emergency contact details for the Project Archaeologist, NZHPT Regional Archaeologist and Iwi.

The Plan must be submitted to the NZHPT Regional Archaeologist for approval prior to the commencement of any earthworks. No earthworks shall commence until the NZHPT has given its written approval of the Plan.

4. The Authority Holder must ensure that allowance is made in the work schedule for any archaeological work required as a condition of this authority. This shall be determined in consultation with the approved archaeologist.

5. Archaeological investigation and monitoring works are to be undertaken according to the Management Plan required in condition 3 and the Archaeological Research Strategy for the MacKays to Peka Peka Expressway Project (Jacomb and O'Keeffe, Sep 2012) provided with the authority application.

6. An investigation under Section 15 is required for those areas to be investigated prior to works commencing (Fig. 1). The aims of the investigation shall be to investigate, research and analyse archaeological stratigraphy, features and remains in accordance with current archaeological practice to gather information about the historical and cultural heritage of New Zealand.

This investigation must be carried out in accordance with the Archaeological Research Strategy for the MacKays to Peka Peka Expressway Project (Jacomb and O'Keeffe, Sep 2012) submitted with the authority application.

This investigation must be carried out by an archaeologist approved by NZHPT.

7. This authority may be exercised in association with, or without delay, following the carrying out of the Section 15 investigation required by condition 6, provided that the NZHPT is satisfied with the completion of the investigation and has given its written approval before further archaeological site evidence is destroyed. This response will be given within 5 working days.

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8. Earthworks in areas not investigated in the Section 15 investigation required by condition 6 (Fig. 1) are to be monitored by an archaeologist approved by NZHPT.

9. Any archaeological evidence encountered outside of the area of the Section 15 investigation during the exercise of this authority must be investigated, recorded and analysed in accordance with the Management Plan required by condition 3 and as outlined in the Archaeological Research Strategy for the MacKays to Peka Peka Expressway Project (Jacomb and O'Keeffe, Sep 2012) submitted with the authority application.

This work must be carried out by an archaeologist approved by NZHPT.

10. The Authority Holder must ensure that the NZHPT Regional Archaeologist is informed if any circumstances arise during the exercise of the monitoring section of this authority where an archaeological investigation of any site(s) encountered could provide significant information as to the historical and cultural heritage of New Zealand (in relation to section 15(1) of the Act). Any works affecting such a site must cease until the NZHPT has given its response (this response will be given within 3 working days).

Such circumstances may include, but are not limited to, the discovery of sites from an early or significant period in New Zealand's history, the discovery of unusual or rare artefacts or other archaeological material or features, or the discovery of large, complex or unusual features not identified in the archaeological assessment provided with the authority application.

11. Any archaeological work must be undertaken in conformity with any tikanga Maori protocols or monitoring requirements agreed to by the Authority Holder and NZ Police, Ngati Toa Rangatira, Te Ati Awa ki Whakarongotai, the Takamore Trustees, Ngati Raukawa and Muaupoko so long as the legal requirements of the authority are met.

12. If any koiwi tangata (human remains) are encountered, all work should cease within 20 metres of the discovery. The NZHPT Regional Archaeologist, NZ Police, Ngati Toa Rangatira, Te Ati Awa ki Whakarongotai, the Takamore Trustees, Ngati Raukawa and Muaupoko must be advised immediately, in accordance with Guidelines for Koiwi Tangata/Human Remains (NZHPT Archaeological Guideline Series No. 8), and no further work in the area may take place until they have responded.

13. Within 20 working days of the completion of the on-site archaeological work Site Record Forms must be updated or submitted to the NZAA Site Recording Scheme by the approved archaeologist. Copies of any forms or updates must be provided with the 20 day report.

14. Within 20 working days of the completion of the on-site archaeological work associated with this authority, a written summary outlining the archaeological work undertaken, the preliminary results, and the approximate percentage of archaeological material remaining *in-situ*, and a plan showing areas subject to earthworks, areas monitored and the location and extent or any archaeological sites affected or avoided must be submitted to the NZHPT Regional Archaeologist.

This report must be prepared by an archaeologist approved by the NZHPT.

15. The Authority Holder must ensure that within 6 months of the completion of the on-site archaeological work a sector report covering the works conducted under this authority, completed to the satisfaction of the NZHPT, is submitted to the NZHPT Regional Archaeologist, Ngati Toa Rangatira, Te Ati Awa ki Whakarongotai, the Takamore Trustees, Ngati Raukawa and Muaupoko.

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This report shall include, but may not be limited to, site plans, section drawings, photographs, inventory of material recovered, including a catalogue of artefacts and location of where the material is currently held. The authority number must be included in the report title.

This report must be prepared by an archaeologist approved by the NZHPT.

16. The Authority Holder must ensure that within 12 months of the completion of the on-site archaeological work of the last of the MacKays to Peka Peka Archaeological Authorities, a combined final report, completed to the satisfaction of the NZHPT, is submitted to the NZHPT Regional Archaeologist.

    This combined report shall collate and analyse the information from the various sector reports, and include, but may not be limited to, site plans, section drawings, photographs, inventory of material recovered, including a catalogue of artefacts; location of where the material is currently held, and analysis of recovered material in accordance with accepted archaeological practice. The authority numbers must be included in the report title.

    This report must be prepared by an archaeologist approved by the NZHPT.

17. The Authority Holder shall ensure that one hard copy of the final report is sent to the NZHPT Regional Archaeologist. A digital copy must also be sent to the NZHPT's National Office for inclusion in the Digital Library.

    Unless the institution indicates that a digital copy is sufficient, hard copies of the final report must also be sent to:

    NZAA Central Filekeeper

    Special Collections Department, University of Auckland Library

    The Librarian, Anthropology Department, University of Otago

    Museum of New Zealand

    Kapiti Coast Museum

    Pataka - Porirua Museum of Arts and Cultures

    Ngati Toa Rangatira

    Te Ati Awa ki Whakarongotai

    Takamore Trustees

    Ngati Raukawa

    Muaupoko.

APPROVED ARCHAEOLOGIST

Pursuant to section 17 of the Act, Mary O'Keeffe & Chris Jacomb, with such assistants as may be necessary, is approved by NZHPT to carry out any archaeological work required as a condition of this authority, and to compile and submit a report on the work done.

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ADVICE NOTES

Contact details for NZHPT Regional Archaeologist

David Rudd
Central Region Archaeologist
New Zealand Historic Places Trust
PO Box 2629
WELLINGTON 6140

(04) 494 8323
drudd@historic.org.nz

Costs
The Authority Holder shall meet all costs incurred during the exercise of this authority. This includes all on-site work (monitoring and excavation by the archaeologist or extended field crew), post fieldwork analysis (midden and artefact sorting and identification), radiocarbon dates, specialist analysis (pollen identification, wood identification, artefact conservation), and preparation of interim and final reports.

Final report
Hard copies of reports must include all information, including appendices, in printed form. Digital reports must be submitted in PDF format as a single file, including appendices.

Expiry
An authority lapses five years after the date of the granting of that authority.

NZHPT Guideline Series
Guidelines referred to in this document are available for download from the NZHPT website: http://www.historic.org.nz/ProtectingOurHeritage/Archaeology/Arch_Guidelines.aspx

Results of section 15 investigation
In accordance with current archaeological practice and archaeological ethics, the NZHPT expects that the results of the section 15 investigation will be published in the *Journal of Pacific Archaeology* or *Archaeology in New Zealand*.

Non-compliance with conditions
Note that failure to comply with any of the conditions of this authority is a criminal offence and is liable to a penalty of up to $40,000 (*Historic Places Act* 1993, section 100).

Protected Objects Act
The Ministry for Culture and Heritage administers the *Protected Objects Act* 1975 which protects antiquities in New Zealand. An artefact is a specific category of antiquity that forms part of the cultural tradition of Māori. The *Protected Objects Act* 1975 requires that any finds of Māori artefacts are notified to the Ministry for Culture and Heritage or the nearest public museum within 28 days of finding. For more information contact:

The Antiquities Officer:
antiquities@mch.govt.nz
Phone (04) 499-4229
Fax (04) 499-4490
www.mch.govt.nz/antiquities/index.html#content

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The following resolution was approved by the Maori Heritage Council for and on behalf of NZHPT.

The Maori Heritage Council having considered the application (No. 2013/639) made by the New Zealand Transport Agency for an authority to modify, damage or destroy archaeological sites of interest to Maori within the project area between the Waikanae River and Waimeha Stream, Kapiti Coast, for the purposes of the Mackays to Peka Peka Expressway, noted the consultation procedures and recommended conditions, and advised that:

(a) consultation was adequate, and an authority **is** capable of being granted to the New Zealand Transport Agency subject to the conditions proposed in paper no. MHC-AC-2013/04/RR.

Maori Heritage Council
New Zealand Historic Places Trust
PO Box 2629
WELLINGTON 6140

Date: 10 April 2013

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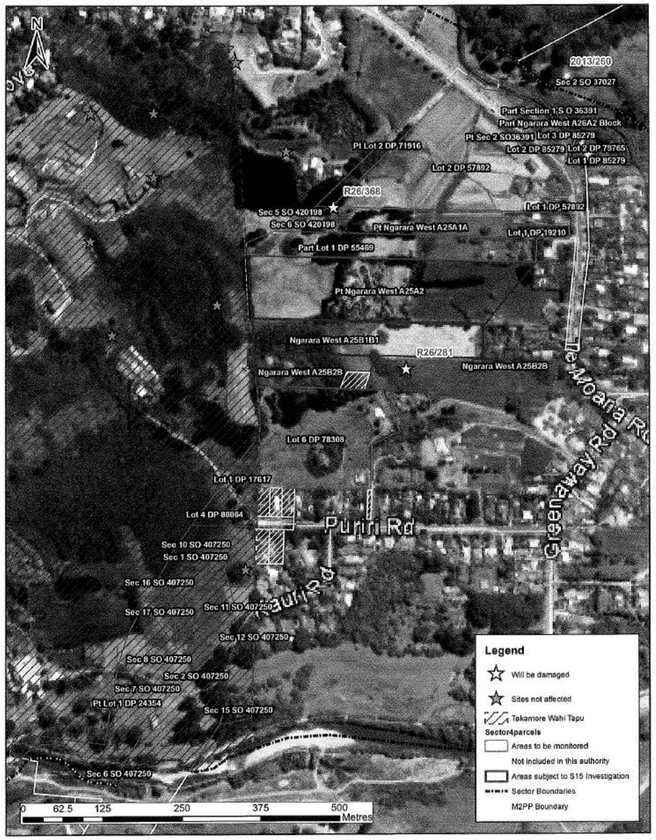

Figure 1. Map of land parcels covered by 2013/639.

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Legal Descriptions of Land Affected by Authority 2013/639

1 Sec 6 SO 407250
2 Sec 7 SO 407250
3 Sec 15 SO 407250
4 Pt Lot 1 DP 24354
5 Sec 2 SO 407250
6 Sec 8 SO 407250
7 Sec 12 SO 407250
8 Sec 17 SO 407250
9 Sec 11 SO 407250
10 Sec 16 SO 407250
11 Sec 1 SO 407250
12 Sec 10 SO 407250
13 Lot 4 DP 88064
14 Lot 1 DP 17617
15 Lot 6 DP 78308
16 Ngarara West A25B2B
17 Ngarara West A25B1B1
18 Pt Ngarara West A25A2
19 Part Lot 1 DP 55469
20 Lot 1 DP 19210
21 Pt Ngarara West A25A1A
22 Sec 6 SO 420198
23 Sec 5 SO 420198
24 Lot 1 DP 57892
25 Lot 2 DP 57892
26 Pt Lot 2 DP 71916
27 Lot 2 DP 79765
28 Lot 1 DP 85279
29 Lot 2 DP 85279
30 Pt Sec 2 SO36391
31 Lot 3 DP 85279
32 Part Ngarara West A26A2 Block
33 Part Section 1 S O 36391
34 Sec 2 SO 37027

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