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ARCHAEOLOGICAL ASSESSMENT OF AN ERODING SITE COMPLEX (NO. I44/21) AT PURAKAUNUI INLET, OTAGO

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Recent archaeological survey and recording work by University of Otago students Tucker and Christie (2001) at Watsons Beach, South Otago, calls attention to the adverse effects of erosion on coastal archaeological site complexes (see also Jacomb and Darmody 2002).

The larger problem of information loss from southern archaeological sites is further demonstrated from the results of a University of Otago project at Purakaunui Inlet (formerly Purakanui) about 10km west of the Otago Harbour mouth (Figure 1). In accordance with standard archaeological resource management conventions this document presents an assessment of an eroding archaeological site (NZAA metric record no. I44/21, replacing no. S164/18) at the western side of the inlet (Figures 2, 3, 4 and 5). We describe site values and research potential, and the erosion effects upon those values and the site condition generally. We then present an overview of recent work carried out to mitigate the results of information loss by authorised salvage investigation.

Background

The intertidal area of Purakaunui Inlet has been subject to significant coastal landform change since the 19th century (Anderson 1981: 202). This is most evident in a comparison of the present coastline and the cadastral borders for land parcels first defined in the later 19th century. As indicated at Figure 2, in places the difference represents a retreat of 25m or more.

With respect to site complex I44/21, an undated draft "site reference form" in the NZAA site recording scheme is reported by Peter Gathercole ("P.G") who

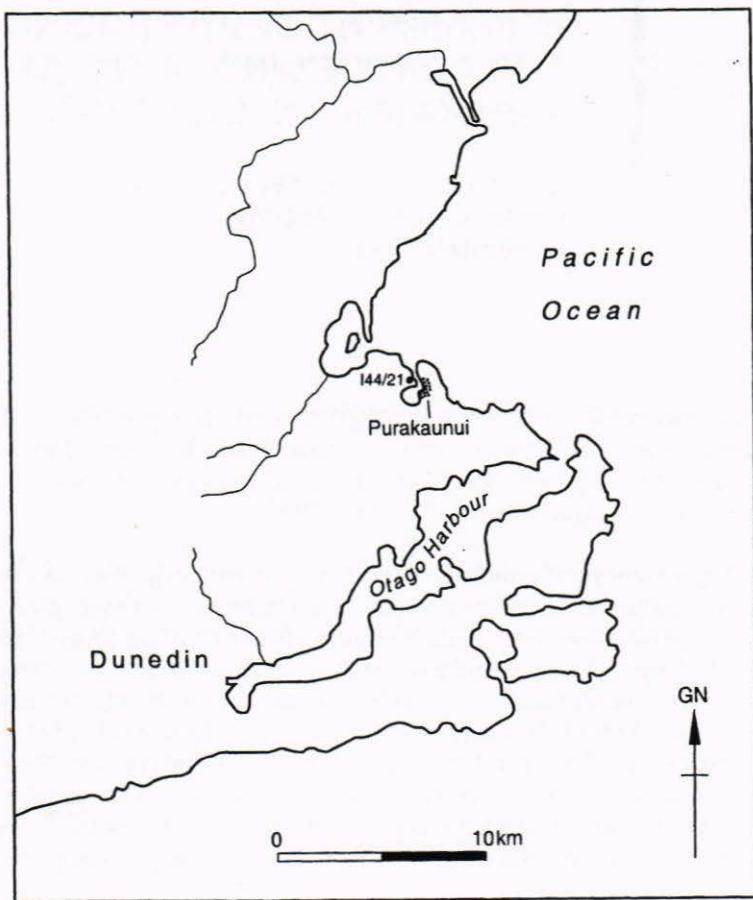


Figure 1. Location map of the coast around Otago Harbour (South Island east coast), identifying site No. 144/21. The area of the township of Purakaunui is also shown.

was at the University of Otago from 1958 to 1968 (Gathercole 2000). Under the heading "State of site" Gathercole notes: "Continually eroding, and fossicked in the summer by holiday makers".

A page of artefact drawings (including a clay pipe) attached to this form refers to the year 1967. A form dated 5 October 1977 was compiled by then NZAA

filekeeper G. S. Park "from Gathercole's draft SRF". A note describing a site visit on 14 August 1976 and a "small collection of eroded midden" from this visit is also on file.

The first systematic archaeological investigation of this site was planned in response to concerns over erosion effects during the 1970s. Anderson (1981: 203-204) describes the background to this work:

"In 1978 the channel edge of the northern part of S164/18 began to erode more rapidly than it had hitherto. Following discussions between archaeologists and representatives of local Maori authorities it was decided that part of this area should be excavated in order to ascertain its nature and significance".

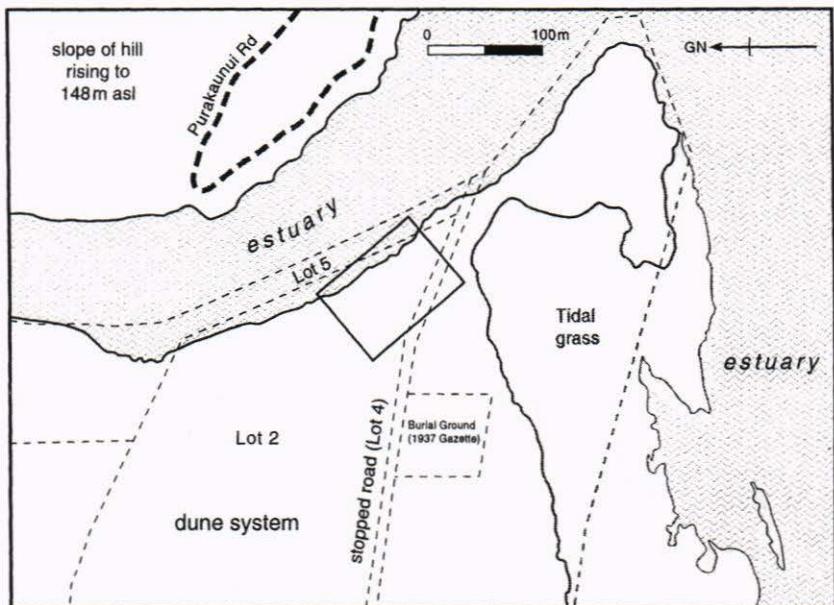


Figure 2. Purakaunui Inlet showing land parcels (broken lines) associated with the area of I44/21 under investigation (off-set square over Lots 2, 4 and 5). The map is based on a Dunedin City Council and Terralink International Ltd Aerial photography map (1:3,000 photographed 2000/2001) with cadastral data from Dunedin City Council and LINZ (Crown Copyright reserved), and appended note that that parcel lines shown "can vary from legal parcel boundaries".

Anderson (1981: 202-203) reported the northern part of the site (Figure 5) as an exposed channel section of cultural material 43m long and up to 1.5m thick associated with high dune ridges. This northern site area is "stratigraphically unconnected" to a lower southern area of midden and oven stone patches beyond the higher dunes (Anderson 1981: 203). The southern area is not discussed further in the present report.

By 1978 the northern part of the site had been "recently planted" in pines (Anderson 1981: 204). From 1989 to the mid-1990s the exposed northern channel section was inspected by one of the writers at least annually (IB). In the course of these visits archaeological sediments and materials were observed among the exposed roots of the now-large *Pinus* trees growing at the dune edge, and eroding down-slope. Scattered midden components and discrete concentrations of eroded oven stones were noted at the base of the dune.

A fire in the mid-1990s destroyed the large trees growing over I44/21. Replacement pines have been planted since. Residual stumps and exposed roots are still visible at the estuarine-facing dune edge (Figure 4).

Archaeological Values

Purakaunui Inlet has significant historical and other Maori values (e.g. Anderson 1998: 48, 50, 108, 167, 172, 190; Shortland 1851: 119-123). This report is confined to an assessment of physical archaeological remains from the northern area of I44/21 only.

Anderson (1981:204) describes a "typical cultural stratigraphy" of "black sand and midden", up to about 50cm thick in places (Layer 2), overlying a generally thinner layer (3) of "dense and compact" burnt midden. Shellfish valves identified from the 1978 investigation are predominantly pipi (*Paphies australis*), cockle/tuangi (*Austrovenus stutchburyi*), blue mussel (*Mytilus edulis*) and mud snail (*Amphibola crenata*). Fish species are predominantly red cod (*Pseudophycis bachus*) and barracouta (*Thysites atun*). Occasional bird (including moa), dog and very occasional seal bones are identified.

A material culture assemblage is identified with strong Archaic indications, especially for fishing gear. South Island stone flake implements are reported, mainly of quartzite and chert rock, along with North Island obsidian flakes (Anderson 1981: 209-213). Consistently, Anderson (1981: 204-205) reports two secure radiocarbon dates on marine shell samples for the 14th century AD.

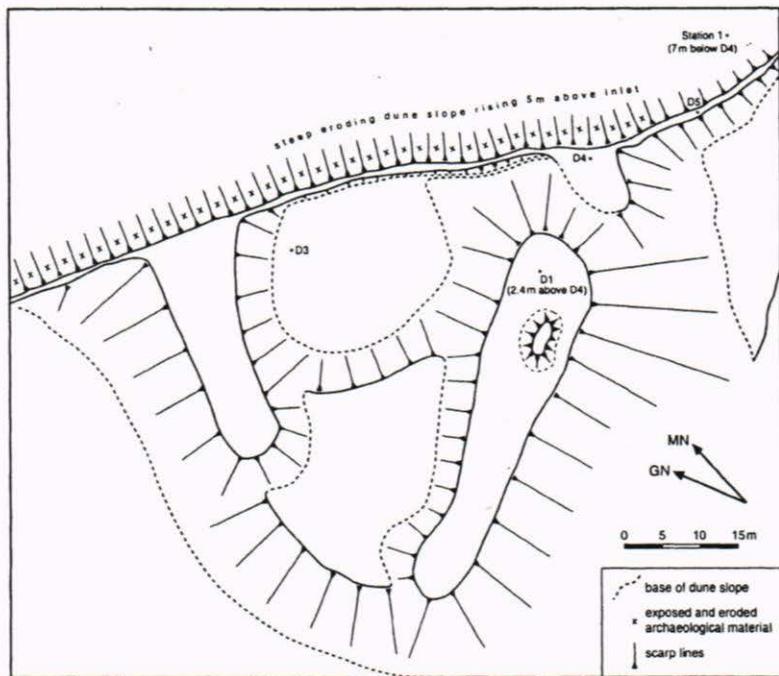


Figure 3. Preliminary relief map of dune system behind the estuary face showing eroding archaeological materials from northern I44/21 and primary datum points. See Fig. 2 for location within Purakaunui Inlet.

Anderson (1981: 217) encountered "no evidence" for "the construction of houses or other such major structures". He concludes that the site evidence represents a "specialised" Archaic fishing camp "occupied for only a few years", challenging an orthodox archaeological view that fishing specialisation was a later southern adaptation (Anderson 1981: 217-219).

Further work by the writers (described in more detail subsequently) identifies structural archaeological features in at least one area of the site complex as well. These include postholes and two cut features. The eastern-most cut feature is interpreted as a rectangular pit with slightly rounded sides (Figure 6). This feature and its associated postholes have been substantially investigated (Figures 6 and 7). In stratigraphic context its construction can be placed within the local archaeological sequence.

In summary we note the following archaeological research values for this site:

- From Anderson's work and subsequent investigation, evidence for the targeted coastal processing of fish and shellfish representing several visits. Following Anderson, these remains may be (in part) the result of a seldom-identified or recognised strategy of specialised fishing within the Archaic.
- Evidence of cut features and associated structures as suggested by postholes, indicative of a sustained level of occupation during the archaeological sequence.

In a resource management evaluation, the possibility of unique period values such as rare evidence of Archaic specialisation would identify this site complex as a place of southern Maori research significance. (See Walton 1999: 11-15 on the assessment of archaeological significance in a New Zealand context.) Potentially, given the rarity of such period evidence in general, Purakaunui could be evaluated as a place of research significance for a broader understanding of Archaic economic strategies as well. The identification of structural evidence within a Maori archaeological sequence is also unusual for a southern site. On the criteria of rarity values alone, this would strengthen the case for southern regional research significance.



Figure 4. Purakaunui Inlet dune system showing principal area of erosion at I44/21 between points A & B. The area around D4 (at Fig. 3) is above point A.

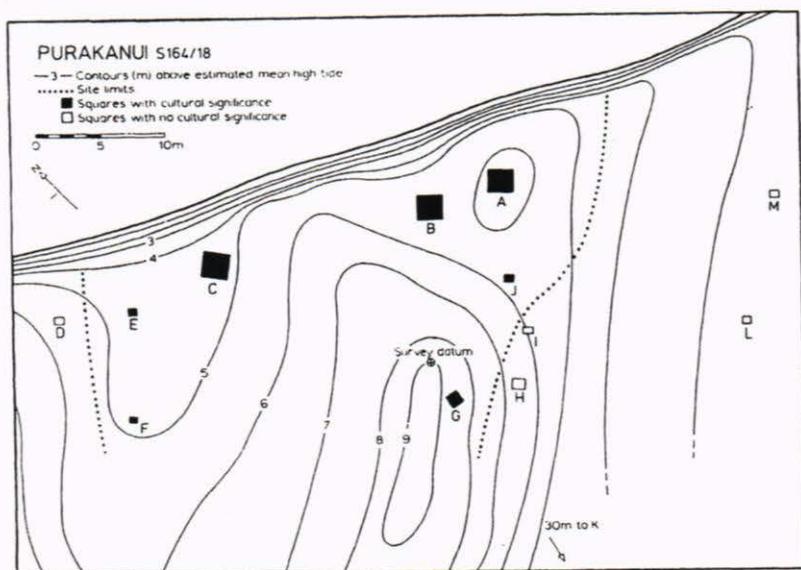


Figure 5. Contour plan of northern I44/21 (S164/18) showing the location of the 1978 excavation squares after Anderson 1981: fig. 2.

Field Assessment of Site Condition and Effects

The writers inspected the area of the site complex on several occasions in 2000 and 2001. Evidence of displaced stumps and substantial archaeological site erosion was noted at the channel face on each visit. Eroded archaeological material identified at the slope base included shellfish and fish bone (occasionally in clumps of very dark sand with much charcoal), fractured oven stones and scattered stone flake tools or fragments.

An extensive contour map of the investigation area is in preparation. A simplified interim version of this map showing the area of eroded archaeological materials and relevant datum elevation points is at Figure 3.

It is instructive to compare the 2001 site plan (Figure 3) with Anderson's relief plan of the 1978 excavation units and estuary face (Figure 5). Allowing for differences in scale and the preliminary representation of Figure 3, it is apparent still that both maps incorporate a similar area of investigation. Anderson's contour lines can be correlated approximately with the relief information represented on the 2001 map as scarp lines. The same central ridge presents with

a primarily west to east orientation. The base 1978 survey datum and the corresponding 2001 'Datum 1' are both at the eastern end of this ridge (cf. Figures 3 and 5). Anderson's 1978 excavation units lie in relatively flat to gently undulating benches between the base of this ridge and the eroded edge of the dune. These benches lie on western and eastern sides of the ridge respectively. Anderson's squares A and B and the 2001-2002 excavation grid are all on the eastern bench.

In 1978 the eastern bench was marked by a relatively small incursion on the northern side only between the 2 and 4 metre contour lines. A broader indentation between 3 and 4 metres characterised the western bench. The estuarine slope otherwise appeared fairly linear and regular (Figure 5). The 2001 map by contrast shows a substantially greater incursion into the eastern bench around D4 (Figure 3). This appears to be the result of tidal action channelled along the dune edge, washing out the dune base and causing upper slope collapse.

The assessment prepared by the writers in 2000 summarised the site situation and long-term prospects for conservation.

"It is unlikely that the steep eroding dune face can be stabilised permanently. The relevant erosion process appears to represent the widening of the inlet channel ... In this process the base of the northern dune face is undermined tidally, causing the collapse of the larger dune system ... If this process continues the more substantial northern part of the Purakaunui site may be entirely lost within a few years."

(Barber and Walter 2000: 4).

Regrettably the field observations presented above reinforce those views. Throughout 2001, displacement of archaeological materials down the slope has continued, while archaeological deposits are generally no longer visible along the exposed dune edge to the east of D4. Furthermore, a comparison of datum points around D4 recorded during February 2001 (Figure 3) and February 2002 (Figure 6) indicates that the eroding edge has receded by between one and two metres over 2001 alone. A February 2002 photograph of the slope below D4 (Figure 8) illustrates the active nature of erosion in this area.

Mitigation

There is no reason to believe that there will be any halt to the rate and effect of erosion at this site, especially since the tidal channel is the primary agent of

impact. Consequently, mitigation is effectively limited to the option of preservation by record.

In 2000 and 2001 consent was given by appropriate parties for the writers to excavate threatened archaeological deposits at I44/21 (see acknowledgments for details). The application stage set out a research design guided by problems identified from recognised and potential site values. These are summarised below.

- Achieving a robust framework of sequential occupation from paired marine and identified terrestrial samples as well as period materials where applicable. (Anderson (1981: 204) reported five radiocarbon results of which three were described as "suspect", with two acceptable dates on marine shell only.)
- Clarification of the horizontal relationship of features within the larger site complex, including ovens, specialist activity or processing areas, and possible structures.

Site assessment and mapping has involved Otago students at various levels since 2000. Salvage excavation work has been integrated into the University of Otago field school paper ANTH 405 (Archaeological Excavation). Following the identification of erosion processes and effects it was determined that initial excavations should be targeted towards the small and clearly threatened eastern bench remnant. Two excavation field schools were held during February-March 2001 and 2002 respectively, along with follow-up work. Further salvage excavation is planned for the current field season.

Stratigraphy

Detailed stratigraphic records are still being correlated and prepared from the excavation. A series of generalised preliminary layers are described below.

Layer 1 (topsoil). Highly variable depth (generally >10cm). Light brown wind deposited sand, relatively sterile.

Layer 2a. Variable but generally 10-20cm thick. Very dark grey-black sand incorporating scattered shell midden or thin (<10 cm thick) discrete shell midden lenses.

Layer 2b. Generally 10-20 cm thick. Dense shell midden in black sand with abundant fish bone.

Layer 3. Generally 20-25 cm thick. Greyish brown sand layer incorporating scattered charcoal, oven stones and midden.

Layer 4. Variable (depending on feature disturbance) but generally 20 cm thick. Discontinuous dark brown/ greyish brown sand with scattered charcoal, oven stones, midden, and occasional umu.

Layer 5. Light brown sand; sterile except for leaching or cultural intrusion.

Layer 1 is a recent, non-cultural dune sand deposit (Anderson 1981: 203). Layer 2a is the uppermost soil unit of the archaeological stratigraphy. Occasional post-contact or early historic artefacts have been recovered from this layer, including clay pipe stems, an entire clay pipe (from 2002 work), and glass fragments (cf. Anderson 1981: 213). Layer 2a does not present in places, and may have been truncated by wind erosion.

Immediately below Layer 2a, Layer 2b includes conjoined and/or densely bedded shellfish valves and articulated fish bones. This suggests it is the product of primary coastal processing.

The more diffuse distribution of archaeological material within Layer 3 may represent cultural activities occurring close by rather than within the immediate area of the excavation, or at least a less intensive pattern of coastal processing. The basal cultural Layer 4 incorporates cooking evidence and in places, much charcoal. In Squares K7, K6, and J6 for example basal umu are recorded, as characterised by concentrations of large, beach-rounded stones. Scattered shell and fish remains only are associated with the Layer 4 matrix. This could mean that primary coastal processing or dumping occurred elsewhere.

Anderson's (1981: fig. 3) Layer 2 (black sand and midden) is tentatively correlated with the Layer 2b midden deposit described above. Anderson's discrete Layer 3 of "compact burnt midden" (*ibid.*) has not been identified clearly, although in places Layer 3 to 4 midden deposits (above) do present burnt shellfish valves and bone, as do some pit-fill lenses (discussed below).

Features

In 2001 the eastern aspect of a 2.6m long cut feature oriented north-south was identified between Squares K8 and K10. This feature is up to 75 cm in total depth from rim to base. In profile its upper aspect truncates a Layer 2 midden (Figure 9). The fill matrix as excavated to date is very dark grey, black or brown sand. It presents well scattered midden components and areas of lighter greyish-brown mottle or lenses. At present no archaeological horizon has been identified which securely seals or even post-dates this feature.

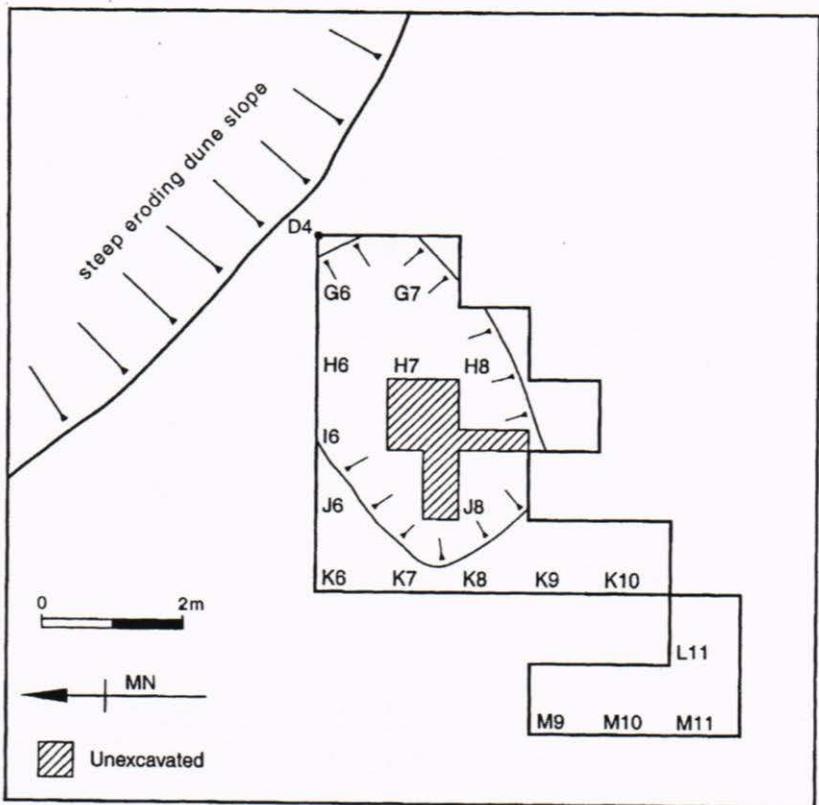


Figure 6. Excavation grid from 2001 and 2002 field school investigations at I44/21. The outline of the large eastern pit only is indicated by standard scarp lines. For the location of the grid cf. D4 at Figure 3.

The eastern cut feature (introduced earlier as a pit) extends over the excavation squares between K and G to D4 at the eroding dune edge (Figure 6). This eastern feature is 4.5m long and 3m wide as excavated to date. In profile the sides are often nearly vertical (Figures 7 and 10). The presence of a relatively straight edge in a mobile dune sand environment suggests this was a lined pit. Occasional postholes extend some tens of centimetres below the pit base (e.g. Figure 7). In places the pit side appears to have collapsed, perhaps as supporting structures were removed. This pit is generally between 70-80cm deep from rim to base.

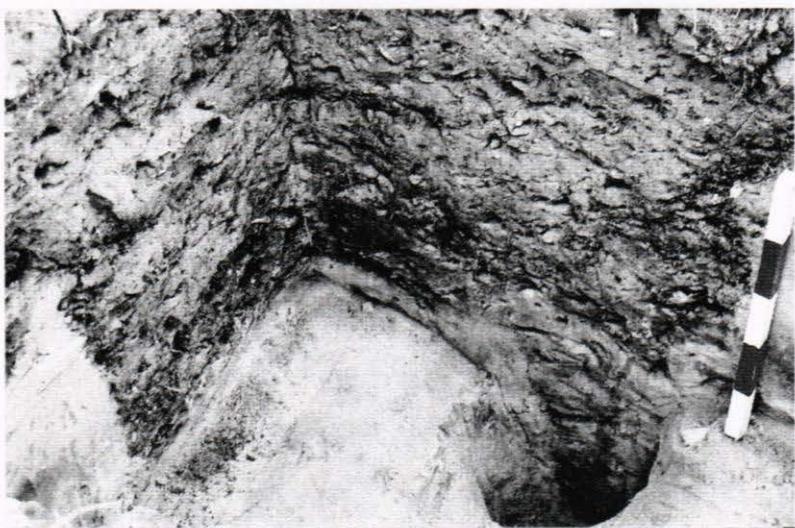


Figure 7. Oblique view onto excavated pit profile at NE corner of Square K8. Note posthole in the lower right of photograph on the southern side of the pit.



Figure 8. Displaced vegetation and archaeological material demonstrating the active nature of dune erosion at I44/21 below D4 (at crest of dune below levelling rod). The rod is extended 2m.

The fill of the eastern pit is brownish or greyish sand with discrete midden lenses (some with very burnt shell), scattered midden components and occasional oven stones and artefacts, including worked moa bone. In places near-horizontal lenses of relatively diffuse shell midden (Layer 2a at least) present above the pit and spill over its sides (Figure 11). No *in situ* post-contact material culture items have been identified from the fill of the pit to date, other than a glass fragment at the base of G6 near a probable rabbit hole (Figure 10).

In the pit profile along the eastern side of Square K7 an intact Layer 2a shell lens which post-dates the pit is particularly notable and important (Figure 11). This lens extends over the pit rim and includes conjoined valves. Radiocarbon samples from this lens will be vital to a robust interpretation of the age and nature of pit construction. Conjoining shells represent food killed close to the time of deposition and therefore a primary processing dump, rather than potentially disturbed or redeposited midden.

Midden analysis

Primary midden components from every square have been retained above a screen size of 3.2mm. Selected unscreened samples were collected also. These have all been transported to University of Otago laboratories for student sorting, identification and further research.

The general proportions of subsistence species agree with Anderson's results, where midden deposits are dominated by soft shore estuarine pipi and tuangi/cockle and hard shore mussel. From the 2001-2002 work we observe that occasional whole paua (*Haliotis* sp.) valves are especially notable within the eastern pit. In further agreement with Anderson's results finfish recovered between 2001-2002 are predominantly red cod (*Pseudophycis bachus*) and barracouta (*Thyrsites atun*). Ling (*Genypterus blacodes*) remains are much less frequent but are notable for their robustness and relatively large size compared to modern reference samples. This is consistent with reports of large ling elements from other South Island (including coastal Otago) archaeological sites (cf. Barber 1999: 141, 144; Leach and Hamel 1978: 247). Cranial and post-cranial fish remains are identified, including otoliths.

Small numbers of other animal bones recovered include elements of dog (cranial and post-cranial parts, including adults and sub-adults or juveniles), rat and bird. Among bird remains large elements of *Diomedea* sp. and moa are notable. In the last case these are generally fragmentary elements only, apparently the result or by-product of manufacture. There are no indications of primary moa-processing on site.



Figure 9. Upper aspect of western cut feature at I44/21 from Square M11 north side, excavated to about 30cm only below the light sand topsoil of Layer 1.



Figure 10. Profile of eastern-pit at I44/21 as sectioned between Squares I6 and G6, north sides. Base of tape sits on a feature which is probably a rabbit hole.



Figure 11. Rim of the eastern pit at I44/21 from Square K7 east side. A thin lower midden lens spills from Layer 2 over the pit rim down the edge of the pit cavity. The actual width of the section in this photograph is about 70 cm.

Artefact remains are well scattered throughout the site. A few examples of fishing gear such as points were recovered both in field and since from laboratory washed and sorted samples. Stone remains identified to date are generally relatively small flake fragments, predominantly of quartzite or chert rock. Larger chert flakes were recovered from 2002 work, including a single chert blade 103 mm long. Occasional obsidian flakes and a single adze blade end fragment of nephrite (pounamu) are identified.

Discussion

At one level the approved resource management investigation of site I44/21 has provided an opportunity to extend Anderson's important 1978 investigation. Several results of the 2001-2002 investigation agree with Anderson's work. From both projects it is apparent that midden deposits are relatively uniform. People appear to have been reliant on local estuarine and hard shore shellfish as well as red cod and barracouta primarily among available finfish. From the 1978 and 2001-2002 results it is clear that mammal and bird remains are a minor midden component. These results are consistent with an interpretation of fishing specialisation.

One of the most significant contributions of the 2001-2002 investigation is the identification of structural and cut features. The partly excavated western cut feature is too poorly understood as yet for us to suggest any definite interpretation (except that it is relatively recent). The eastern pit and its associated postholes at least can be placed within the local archaeological sequence. As such this pit represents a previously unrecorded feature class from a southern South Island site. Pits of similar size and shape between 50 cm -100 cm deep with evidence of postholes are common in coastal dunes of the north-western South Island. In that region the site class is identified as the cultigen storage pit (e.g. Barber 1994; 1999). The interpretation of possible 'house pits' of similar depth in South Island archaeology remains speculative (Davidson 1984: 159-160), and in any case would seem less likely in high dune environments. At I44/21 the association of posts with the eastern pit, some of fairly massive size and depth, implies the erection of substantial wooden structures around and above the excavation. A covered store interpretation is attractive to us. We hope that shellfish samples from the discrete midden lenses above this large eastern pit will provide useful radiocarbon determinations.

Conclusion

Tucker and Christie (2001: 292) call for a "formal, regular monitoring programme" for archaeological sites affected by erosion in southern New Zealand. We endorse this call. We also agree with Tucker and Christie (*ibid.*) that data on erosion processes need to become part of the modelling and planning processes for coastal archaeology. The Purakaunui work calls attention to the problem of the loss of significant information. In particular it should be noted that the important evidence of the eastern pit now lies virtually at the progressively eroding dune face. It is likely that the area of this feature will be lost to erosion entirely within the next five to ten years.

Two further resource management implications of this work are noted.

- We acknowledge that the salvage recovery of midden samples from a threatened site complex such as I44/21 for component analysis is important. However, we would argue that this is not sufficient data recovery mitigation for the loss of such spatial and structural information as we have encountered. Adequate institutional and professional resources must be available to enable an investigation of such features "to be satisfactorily carried out" (following the language of section 18 (2) of the *Historic Places Act 1993*). This must take place within the framework of an informed understanding of erosion processes and effects.

- We suggest that the generic inventory classification of a site complex such as I44/21 as a 'midden' may obscure the archaeological research potential and value of such places. This underscores the importance of informed significance evaluations within archaeological assessments prepared for inventory and management purposes.

Acknowledgements

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