8

Pancake Creek Site Complex

Introduction

This chapter reports the results of archaeological excavations undertaken at the Pancake Creek Site Complex. The large size, linear structure and recent chronology of this site are features common to other major archaeological deposits identified on the lower margins of the main estuaries in the region. Similar sites investigated in this study include the Ironbark Site Complex on Middle Creek (Chapter 9) and Eurimbula Site 1 on Round Hill Creek (Chapter 12). The excavations and analyses reported in this chapter demonstrate that although the cultural deposits at the Pancake Creek Site Complex are of a relatively low density, the large extent and shallow chronology of the deposits indicate that a large quantity of material was discarded over a relatively short period of time.

Site description and setting

The Pancake Creek Site Complex is a large multiple-component linear shell midden located on the north bank of Pancake Creek, on the south coast of Rodds Peninsula (Latitude: 24°02'25"S; Longitude: 151°43'00"E) (Fig. 8.1). Extensive shell midden is exposed as a thin, discontinuous layer between 20–30cm below the ground surface in two low (c.1–3m high) erosion banks which border Pancake Creek and are separated by a small (c.100m long) unnamed mangrove-lined tidal inlet, oriented roughly north-south (Fig. 8.2). Shell is visible on or near the frontal beach ridge, often in crab burrow spoil, east to a large area of tidal flats southwest of Pancake Point. The present configuration of Pancake Point and its immediate hinterland appears to be very recent, with southeasterly progradation of the area evident in aerial photographs dating to 1948. Abundant shell is also evident at the base of the erosion bank and in the adjacent intertidal zone. Large trees in growth position on the beach up to 15m south of the present erosion bank reflect significant bank recession in this area. Densities of shell appear to decrease dramatically in the eastern section of the site complex, although this may simply be a function of differential visibility as there is no

erosion bank in this part of the site and the height of the frontal dune is much lower. The inland extent of the shell was not determined but surface shell was observed up to 100m inland from the erosion bank and varies widely along its c.1.5km creek frontage. The entire area of shell exposure is referred to as the Pancake Creek Site Complex.

Vegetation over the area of the shell deposits is dominated by red bloodwood (*Corymbia intermedia*) tall woodland with shrub/heath mid-stratum and cloudy teatree (*Melaleuca dealbata*) open forest (Fig. 8.2). The understorey is generally open, with occasional introduced weeds including prickly pear (*Opuntia stricta*). Mangrove vegetation in Pancake Creek is dominated by dense stands of spotted mangroves *(Rhizopora stylosa*), with patches of grey mangroves (*Avicennia marina*) and yellow mangroves (*Ceriops tagal*) in the minor estuaries/inlets in the middle and at either end of the site area (Olsen 1980a:18). A bank of live hard coral, unique in the region, occurs in Pancake Creek towards Bustard Head (Olsen 1980a:18). Extensive sandy to muddy intertidal flats adjoin the site, supporting populations of hercules club whelk (*Pyrazus ebininus*) and oyster (*Saccostrea glomerata*) attached to mangrove substrates. Small rock/shell debris beds occur at the top margin of the subtidal zone, exhibiting a wide range of shellfish taxa including hairy mussel (*Trichomya hirsutus*). At least some of the shell present in these debris beds is likely to have originated from the adjacent eroding middens.

Material evidence for non-Indigenous use of the site area is limited. Although shipping on the southern Curtis Coast increased throughout the 1850s, the establishment of a permanent settlement at Gladstone saw Pancake Creek used as a regular anchorage only in the late 1860s with the construction of the Bustard Head Lightstation. Permanent navigation beacons were erected in the creek in 1883, reflecting the increased use of the area as a safe anchorage. By the early 1900s, oyster leases were being worked at Bustard Head and *bêche-de-mer* harvested in Pancake Creek (Buchannan 1999:76). In 1899, the Kettlewell family built a slab hut at Pancake Point immediately east of the site complex (Buchannan 1999:76), marking the first recorded permanent non-Indigenous presence on Rodds Peninsula. In 1993 Christine Burke noted a squat in the same location as scattered surface shell material at the site. This structure has since been removed by the Queensland Parks and Wildlife Service (Denis Dray, Queensland Parks and Wildlife Service, pers. comm., 2000). It is unclear whether the structure recorded by Burke (1993) is the 'Kettlewell' hut referred to by Buchannan (1999), as squats constructed by professional and recreational fishing people are common in the area. A designated Queensland Parks and Wildlife Service (QPWS) camping area (accessible to the public only by boat) is currently situated towards the western end of the visible shell exposure.

This site was originally recorded by Burke (1993) as six separate sites (CC094–CC099). Burke noted shell deposits and occasional stone artefacts covering an area of at least 22,500m^2 and up to 50m inland. These original descriptions were conflated into five sites when registered by the Queensland Environmental Protection Agency (KE:A44–KE:A48). The site was briefly inspected during 1994 as part of the Gooreng Gooreng Cultural Heritage Project (Lilley et al. 1997). This initial inspection suggested that all of the apparently discrete exposures of shell recorded by Burke would more usefully be considered as parts of a single site complex. The site was subsequently registered as Queensland Museum Scientific Collection Number S865. Burke (1993:Table 17) identified part of the Pancake Creek Site Complex (registered as KE:A46) as one of only 10 sites of 'extremely high significance' documented for the 160km stretch of coast between Round Hill Head and Raglan Creek at Port Alma. This assessment was made on the basis of the site's Aboriginal significance, research potential (reflected in the presence of charcoal and depth of deposit), the large size and good condition of the site and the fact that it was atypical of middens found in the area as it contained a quite dense cultural layer (Burke 1993:Table 17). Burke (1993:Table 18, Table 19) also noted that parts of the site (registered as KE:A45 and KE:A46) were threatened by tidal bank erosion and recommended monitoring to establish the rate of erosion (Fig. 8.3). To date no such monitoring program has been implemented and it remains uncertain to what extent bank recession has impacted on the integrity of the site.

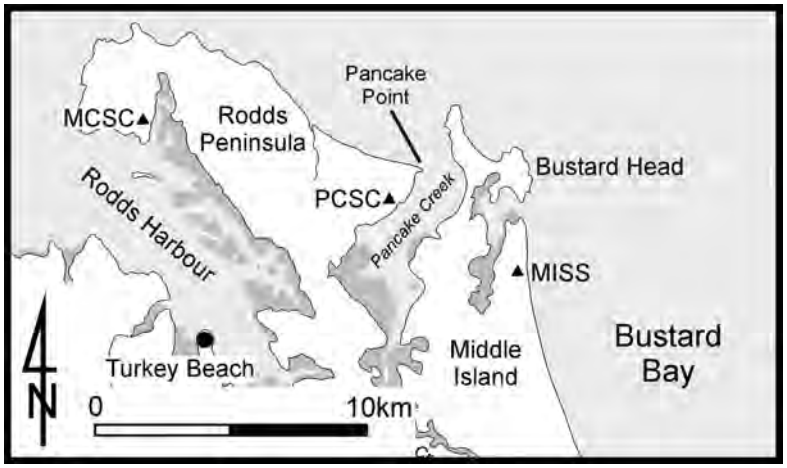

Figure 8.1 The Pancake Creek catchment area showing the location of the Pancake Creek Site Complex. Dark grey shading indicates the general extent of mangrove, saltflats and claypans.

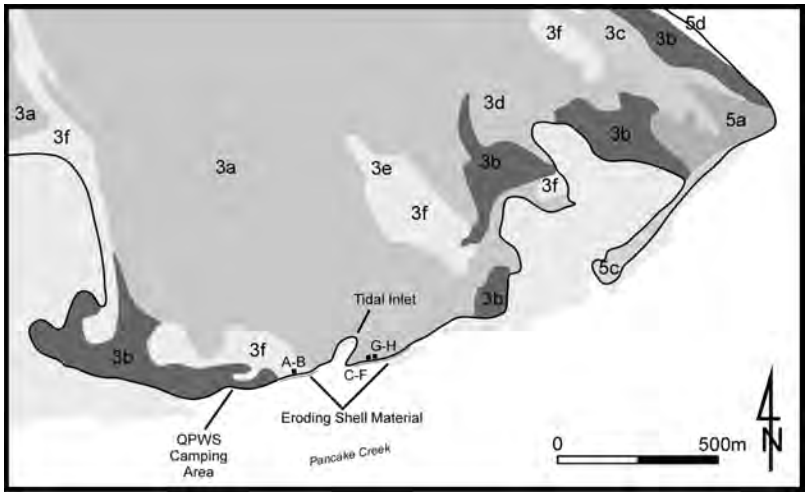

Figure 8.2 Detail of the site area showing the location of excavated squares and beach ridge vegetation units. 3a=*Corymbia intermedia* tall woodland with shrub/heath midstratum; 3b=*C. tessellaris, C. intermedia* tall to very tall woodland with *Livistona decipiens/Melaleuca dealbata* and shrub understorey; 3c=*L. decipiens/Melaleuca* tall forest/tall open forest with emergent *Eucalyptus tereticornis/C. intermedia*; 3d=*L. decipiens* open forest; 3e=*Acacia julifera/A. flavescens* tall shrubland; 3f=*M. dealbata* open forest; 5a=*C. tessellaris* woodland with understorey of low microphyll vine thicket; 5c=*Casuarina equisetifolia* low open woodland; 5d=Tall open shrubland (windsheared vegetation) (after QDEH 1997).

Excavation methods

Three areas were selected, coinciding with the densest exposures of shell observed in section in the erosion bank. A total of 8 × 50cm × 50cm pits (Squares A–H) were excavated to form 2 × 1m × 50cm trenches (Squares A–B and Squares G–H) and a single 1m^2 (Squares C–F). A total of 1,728.8kg of sediment was excavated at the site. All squares were excavated to 60–70cm below ground surface. Excavations were conducted between 5 November and 20 November 1998. The excavation squares were situated close to the visible erosion bank profile to facilitate reference to stratigraphic features during excavation.

Squares A–B were situated adjacent to the first major exposure of shell encountered to the east of the QPWS camping area. In this area, *in situ* shell was visible as a layer c.20cm below

ground surface adjacent to a deflation area containing large quantities of shell, dominated by mud ark. The excavation grid was oriented at right angles to the erosion bank and situated c.190cm northwest of the edge of the bank. The erosion bank in this area is oriented northwest-southeast. Excavation proceeded in shallow, arbitrary excavation units averaging 3.67cm in depth and 12.73kg in weight. Excavation ceased at a maximum depth of 68.32cm below ground surface after several units of unambiguously culturally-sterile sediments had been removed. A total of 37 XUs was removed, distributed as follows: Square A (19 XUs), Square B (18 XUs). A total of 471.1kg of sediment was excavated. Excavated sediments were gently dry-sieved through 3mm screens onto a plastic tarpaulin located 10m northwest of the excavation to prevent contamination of underlying strata. Stone (n=4), charcoal (n=12) and shell (n=14) specimens encountered *in situ* during excavation were plotted three-dimensionally.

Squares C–F were located 250m northeast of Squares A–B (Fig. 8.2). There is evidence for extensive erosion in this area, with large tree roots protruding from the erosion bank and the stump of a large tree in growth position located on the beach 8.5m from the current erosion face. Oyster is the dominant taxon visible in both the *in situ* cultural layer and material eroded down the bank, with minor representation of mud ark and whelk. The excavation grid was situated 40–45cm northwest of the edge of the erosion bank (Fig. 8.4). Excavation proceeded in shallow, arbitrary excavation units averaging 4.72cm in depth and 16.03kg in weight. Excavation ceased at a maximum depth of 61.7cm below ground surface after several units of unambiguously culturally-sterile sediments had been removed. A total of 51 XUs was removed, distributed as follows: Square C (13 XUs), Square D (13 XUs), Square E (12 XUs), Square F (13 XUs). A total of 817.7kg of sediment was excavated. Excavated sediments were gently dry-sieved through 3mm screens onto a plastic tarpaulin located 5m west of the excavation. Stone (n=3), charcoal (n=1) and shell (n=1) specimens encountered *in situ* during excavation were plotted three-dimensionally.

Squares G–H were located c.20m northeast of Squares C–F (Fig. 8.2). The shell layer exposed in the erosion bank in this area is continuous with that targetted in the excavation of Squares C-F although the shell layer visible in section appears to be less dense and deeper in extent. A 1m × 0.5m excavation grid was oriented at right angles to the erosion bank and situated c.50–60cm northwest of the bank margin. The erosion face here is slightly slumped and undercut in this area. Excavation proceeded in shallow, arbitrary excavation units averaging 3.7cm in depth and 12.22kg in weight. Excavation ceased at a maximum depth of 67.56cm below ground surface after several units of unambiguously culturally-sterile sediments had been removed (Fig. 8.5). A total of 36 XUs was removed, distributed as follows: Square G (18 XUs), Square H (18 XUs). A total of 440kg of sediment was excavated. Excavated sediments were gently dry-sieved through 3mm screens onto a plastic tarpaulin located 5m east of the excavation. Charcoal (n=1) and shell (n=2) specimens encountered *in situ* during excavation were plotted three-dimensionally.

Figure 8.3 Eroding bank in the vicinity of Squares G–H showing displaced trees and shell. Facing southwest.

A layer of plastic sample bags was placed over the base of all excavated squares and c.50l of sterile yellow sand from the adjacent beach placed in the base of each excavation area. The remainder was backfilled with the sediments which passed through the 3mm sieve. A subsequent inspection of the site in early 2000 revealed that further bank recession has caused the erosion bank to migrate further north, actually exposing the area of the Squares C–F and G–H excavations in the erosion bank section.

Figure 8.4 General view of completed excavation at Squares C–F. Facing south.

Figure 8.5 Close-up view of concentration of *A. trapezia* valves encountered in Square H, XU9, at a depth of 26–30cm. These shells date to around 600 years ago and include a single valve conjoin. Facing southeast.

Cultural deposit and stratigraphy

Excavations revealed a sequence of low density cultural material, concentrated between 20–30cm below ground surface, deposited in beach ridge sands overlying culturally-sterile sediments continuing beyond the base of excavations at 60–70cm (Table 8.1). The concentration of shell between 20–30cm corresponds with the depth of the shell layer observed in the adjacent erosion bank. Only occasional shell was encountered below this zone, reinforcing the impression of discreteness evident in the erosion section. All sediments comprise grey-brown sands, with slightly acidic to slightly alkaline pH values throughout (6.5–7.5). Squares A–B exhibited only small quantities of shell (consisting almost entirely of oyster), despite the proximity of the excavation to a dense exposure of shell on the adjacent erosion bank. Large quantities of charcoal were recovered, particularly towards the base of the excavation. This material is thought to be largely of natural origin. The deposit can be divided into four major stratigraphic units (SUs) on the basis of sediment colour and texture (Table 8.2, Fig. 8.6). The upper unit is dominated by humic material with roots common in the upper two units.

Squares C–F revealed a fairly continuous layer of shell across the excavation c.20cm below the surface. The deposit can be divided into five main stratigraphic units (Table 8.3, Fig. 8.7).

Squares G–H revealed several apparently discrete concentrations of whelk and mud ark up to 42cm below ground surface, with occasional shell recovered below these features. The deposit can be divided into five stratigraphic units (Table 8.4, Fig. 8.8). SUIII contains virtually all the shell recovered, again coincident with the depth of the shell layer observed in the erosion section.

With the exception of Square A, all pits excavated immediately adjacent to the erosion bank (Squares C, F, G) exhibited much higher densities of cultural material than squares located on the inland margin of excavation grids. This raises the possibility that the densest deposits of midden material located towards the creek margin of the site complex have been removed by erosion.

Table 8.1 Pancake Creek Site Complex, Squares A–H: summary excavation data and dominant materials.

SQUARE	XUs (#)	DEPTH (cm)	WEIGHT (kg)	SHELL (g)	BONE (g)	CHARCOAL (g)	ARTEFACTS (g)	STONE (g)	ORGANIC (g)
A	19	68.32	247.75	120.58	0.01	252.84	0.03	468.71	387.34
B	18	67.40	223.30	293.81	0.49	220.27	0.02	149.85	557.38
C	13	61.70	190.30	1918.53	0.14	158.22	0	109.61	400.00
D	13	60.64	204.70	663.11	0	93.68	12.82	16.72	789.00
E	12	58.64	196.70	609.88	0	171.15	0	62.93	474.20
F	13	59.92	226.00	1200.95	2.30	281.75	0.18	45.47	608.80
G	18	65.64	212.30	1274.08	0	201.73	0	217.31	643.16
H	18	67.56	227.70	535.92	0.01	338.55	0.43	65.01	354.99
Total	124	–	1728.75	6616.86	2.95	1718.19	13.48	1135.61	4214.87

Table 8.2 Stratigraphic Unit descriptions, Pancake Creek Site Complex, Squares A–B.

SU	DESCRIPTION
I	Extends across the entire trench with an average depth of 5cm and a maximum depth of 10cm below the surface. The unit comprises dry, loosely consolidated fine poorly-sorted subrounded light grey (7.5YR-7/1) sediments. A thick fibrous mat of humic material occurs across the upper extremity of the unit. Small quantities of fragmented shell and charcoal are present. pH values are slightly acidic (6.5).
II	Extends across the entire trench with a maximum thickness of 30cm and a maximum depth of 36cm below the surface. It consists of fine, poorly-sorted subrounded grey (7.5YR-5/1) sandy sediments which are interspersed with numerous roots and fine rootlets. This unit is moister than the previous one and therefore more consolidated. Occasional shell (dominated by oyster and mud ark) occurs throughout, with some whole shell encountered towards the base of the unit. Small blocky fragments of charcoal are common. pH values are slightly acidic to acidic (5.5–6.5), with values increasing with depth.
III	Extends across the entire trench with a maximum thickness of 33cm and a maximum depth of 55cm below the surface. The sediments change distinctly at this interface of stratigraphic units. Sediments comprise light brownish grey (10YR-6/2) to brown (10YR-5/3) sands. Sediments are moist and well-consolidated. Concentrations of blocky charcoal and scattered fragments are abundant (especially in Square A). Shell is virtually absent from this unit. Small quantities of non-artefactual stone dominate the sieve residues. pH values are slightly acidic (6.5).
IV	Unit extends across the entire trench with a maximum thickness of 22cm and maximum depth of at least 68cm below the surface. The base of this unit was not reached. Sediments are well-consolidated, well-sorted, fine and subrounded. The unit exhibits distinctive mottling with the greyish brown (10YR-5/2) frequently interspersed with more yellow sediments. This mottling may relate to burrowing or root penetration. This unit appears to be culturally-sterile with occasional non-artefactual stone, pumice and large quantities of charcoal recovered (especially in Square A). Occasional roots occur throughout. pH values remain slightly acidic (6.5).

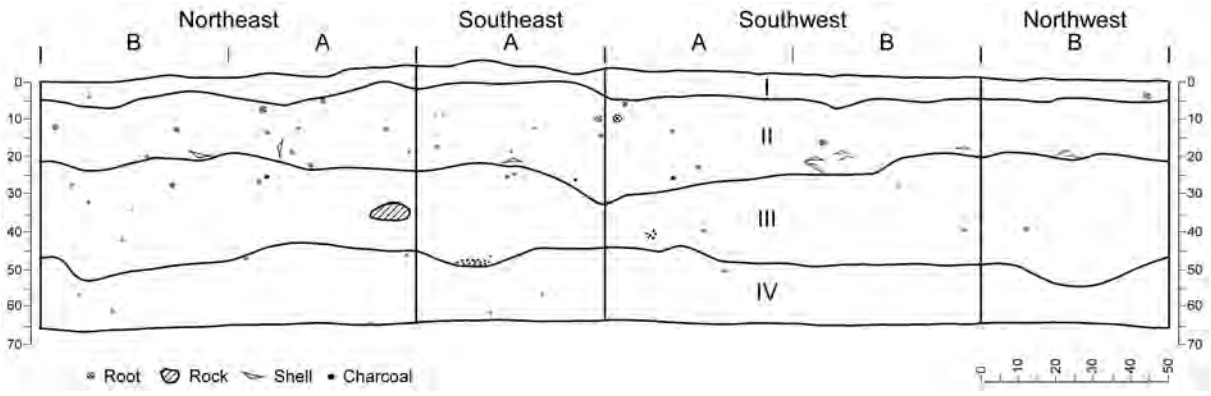

Figure 8.6 Stratigraphic section, Pancake Creek Site Complex, Squares A–B.

Table 8.3 Stratigraphic Unit descriptions, Pancake Creek Site Complex, Squares C–F.

SU	DESCRIPTION
I	Extends across the entire square with an average depth of 4cm and a maximum depth of 14cm below the surface. The unit consists of dry, loosely consolidated fine poorly-sorted subrounded light grey (10YR-7/1) sediments. Occasional tufts of grass penetrate the surface with numerous small fibrous roots. Large quantities of charcoal and occasional shell fragments are present. pH values are neutral to slightly acidic (6.5–7.0).
II	Extends across the entire square with a maximum thickness of 26cm and a maximum depth of 28cm below the surface. The unit comprises fine, poorly-sorted subrounded greyish brown (10YR-5/2) sediments with mottling to lighter shades of grey. Occasional oyster shell fragments occur throughout, with whole shell exposed at the base of the unit. Small blocky fragments of charcoal are common. pH values are neutral to slightly acidic (6.0–7.0).
IIa	Concentration of shell, charcoal and stone exposed across the southwest of Squares C and D. The unit has a maximum thickness of 14cm and maximum depth of 28cm below the surface. The concentration of shell in this unit is restricted specifically to the centre of the southwest section. The matrix is poorly-consolidated, but otherwise similar to SUII.
III	Extends across the entire square with a maximum thickness of 18cm and a maximum depth of 39cm below the surface. Sediments are poorly consolidated and remain greyish brown (10YR-5/2), exhibiting some mottling to lighter grey and yellow sand in places. Sediments are fine, poorly-sorted and subrounded. Shell is abundant across the upper margin of this unit with numerous roots and rootlets evident. Scattered blocky charcoal is common. Several stone artefacts were noted. pH values are alkaline to slightly acidic (6.5–8.0).
IV	Extends across the entire square with a maximum thickness of 17cm and a maximum depth of 53cm below the surface. The unit comprises mottled, light brownish grey (10YR-6/2) sediments which are generally fine, poorly-sorted and subrounded. Large roots occur throughout the matrix. Shell is virtually absent from this unit. Occasional large blocky charcoal fragments occur. pH values are slightly acidic to slightly alkaline (6.5–7.5).
V	Unit extends across the entire square with a minimum thickness of 18cm and maximum depth of at least 62cm below the surface. The base of this unit was not reached. The matrix remains light brownish grey (10YR-6/2) to light grey (10YR-7/1), but mottles to yellow, brown grey and white. This unit appears to be culturally-sterile with occasional non-artefactual stone, pumice and numerous pieces of blocky charcoal recovered. Occasional roots occur throughout. A void from an animal burrow was encountered immediately below the base of excavations. pH values are neutral to slightly alkaline (7.0–7.5).

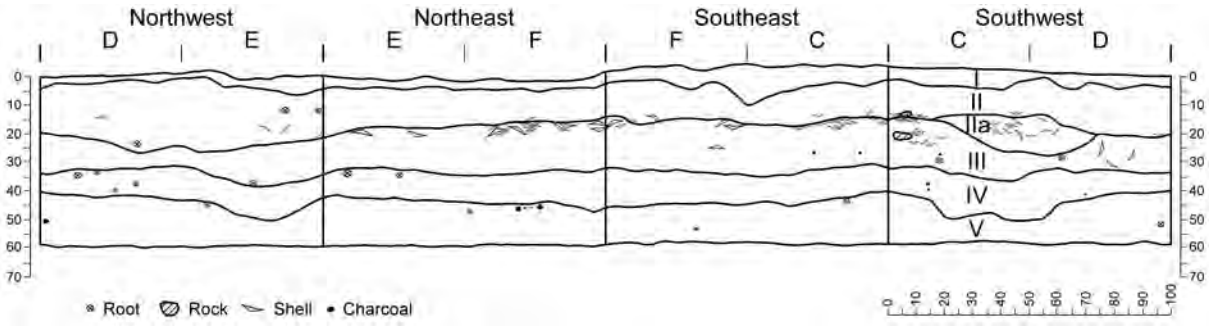

Figure 8.7 Stratigraphic section, Pancake Creek Site Complex, Squares C–F.

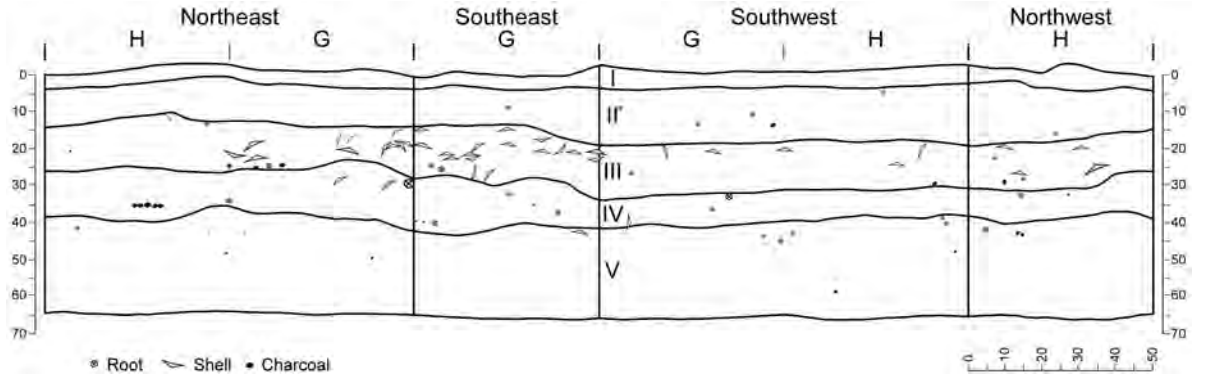

Figure 8.8 Stratigraphic section, Pancake Creek Site Complex, Squares G–H.

Table 8.4 Stratigraphic Unit descriptions, Pancake Creek Site Complex, Squares G–H.

SU	DESCRIPTION
I	Extends across the entire trench with an average depth of 5cm and a maximum depth of 7cm below the surface. The unit consists of dry, loosely consolidated, fine, poorly-sorted subrounded light grey (10YR-7/1) sediments. Occasional tuffs of grass penetrate the surface with numerous small fibrous roots. Occasional shell and charcoal fragments are present. pH values are slightly acidic to acidic (6.0–6.5).
II	Extends across the entire trench with a maximum thickness of 17cm and a maximum depth of 22cm below the surface. The unit comprises fine, poorly-sorted subrounded light brownish grey (10YR-6/2) sediments. Occasional oyster shell fragments and charcoal blocks occur throughout. Numerous roots and rootlets are evident. Occasional small pieces of ironstone were recovered. pH values are slightly acidic (6.0).
III	Extends across the entire trench with a maximum thickness of 17cm and a maximum depth of 36cm below the surface. Sediments are moist and well-consolidated and remain light brownish grey (10YR-6/2). Sediments are fine, well-sorted and subrounded. This unit is defined by the abundance of shell throughout, and contains virtually all the shell recovered from the excavation. Numerous roots and rootlets continue to be abundant. Scattered blocky charcoal is common. Several stone artefacts were noted. pH values are neutral to slightly acidic (6.0–7.0).
IV	Extends across the entire trench with a maximum thickness of 16cm and a maximum depth of 44cm below the surface. The unit comprises moist greyish brown (10YR-5/2) sediments, mottling to light brown and white. Sediments are fine, well-sorted and subrounded. Large roots occur throughout the matrix. Occasional shell was recovered but at much reduced densities to SUIII. Large pieces of blocky charcoal are abundant. pH values are neutral (7.0).
V	Unit extends across the entire trench with a minimum thickness of 28cm and maximum depth of at least 67cm below the surface. The base of this unit was not reached. The matrix remains greyish brown (10YR-5/2) to brown (10YR-5/3), with distinct mottling noted. Sediments are moist and well-consolidated. This unit appears to be culturally-sterile with occasional non-artefactual stone, pumice and numerous pieces of blocky charcoal recovered. Occasional roots occur throughout, but much less numerous than SUIV. pH values are neutral (7.0).

Radiocarbon dating and chronology

Six radiocarbon dates are available for the deposit, comprising one from Squares A–B, two from Squares C–F and three from Squares G–H. All are conventional determinations with five obtained on samples of *Anadara trapezia* and one on charcoal (Table 8.5). A shell/charcoal pair (Wk-6992/Wk-6993) was obtained from a discrete concentration of *A. trapezia* valves in Square H, XU8 (Fig. 8.5). It exhibited an apparent age difference of 100 ^{14}C years with $\Delta R = -259 \pm 137$ years (see Chapter 4 for further discussion of this pair). The large error estimate associated with this value makes it indistinguishable from the generalised local open ocean value of $\Delta R = +10 \pm 7$. The paired sample consisted of a valve of *A. trapezia* tightly packed with blocky charcoal fragments, suggesting a secure stratigraphic association. This site is also located close to the broad entrance of the creek, which currently exhibits good tidal flushing and no obvious large terrestrial water input (Olsen 1980a). It is possible that terrestrial CO_2 dissolved in water stored in the beach ridges lining the north bank of the creek (possibly with long residence times) may have been introduced into shellfish beds in the intertidal zone. Although the large error estimate associated with the ΔR value introduces considerable ambiguity, and only a single paired result is available for this estuary, a $\Delta R = -259 \pm 137$ years is adopted as a first approximation in calibrating radiocarbon dates obtained on marine shell from the site.

All of the dated samples come from the approximate level of the shell layer observed in the erosion bank. The calibrated ages are broadly consistent, all overlapping at 2σ, and suggest that the major period of occupation at the site occurred between 500–700 cal BP. The apparent range of the three dates from a depth of 25cm in Square G–H, XU8, may be associated with rapid formation of the deposit, with both the radiocarbon and calibrated ages overlapping at one standard deviation. There is little evidence for major use of the site over the last 500 years, with observed surface shell associated with deflation surfaces, disturbed areas and crab burrows, suggesting a subsurface origin. It is possible that more recent deposits located seaward of those investigated were removed by erosion.

Table 8.5 Radiocarbon dates from the Pancake Creek Site Complex (see Appendix 1 for full radiometric data for each determination).

SQUARE	XU	DEPTH (cm)	LAB. NO.	SAMPLE	$\delta^{13}C$ (‰)	^{14}C AGE	CALIBRATED AGE/S
A	9	22	Wk-7837	*A. trapezia*	−1.1±0.2	670±50	750(523)280
E	7	25	Wk-6989	*A. trapezia*	−0.1±0.2	870±130	1051(667)414
F	6	20	Wk-6990	*A. trapezia*	−0.4±0.2	630±70	726(504)254
G	8	25	Wk-6991	*A. trapezia*	0.5±0.2	740±60	865(564)316
H	8	25	Wk-6992	*A. trapezia*	−0.3±0.2	800±80	921(635)406
H	8	25	Wk-6993	charcoal	−26.8±0.2	700±140	910(651,576,574)467

Stratigraphic integrity and disturbance

Several lines of evidence indicate that the deposits exhibit a reasonable degree of stratigraphic integrity. Recovered cultural materials are consistent with the distribution observed in section in the erosion bank. The consistent radiocarbon dates for the excavated material and its narrow vertical range lend further support to the idea that most, if not all, cultural material derives from a shell layer located 20–30cm below the modern ground surface. The fact that little shell was recovered outside this zone suggests that there has been little movement of materials within the deposit.

Conjoin analysis of the *A. trapezia* assemblage was limited by the small number of excavated valves and their generally poor preservation. Out of a total dataset of 53 measured broken valves, 24 were discarded from consideration owing to an absence of hinge length. This left 29 valves to be considered in the conjoin analysis, distributed as follows: Squares A–B (12 valves); Squares C–F (9 valves); Squares G–H (32 valves). Methods proceeded as described in Chapter 5. A single conjoin was identified. The conjoining valves came from the shell concentration encountered in Square H, XU9, located 26–30cm below ground surface (see Fig. 8.5). The identification of this conjoin suggests that this concentration of *A. trapezia* exhibits considerable integrity and was probably discarded as part of a single event.

Root penetration and crab burrowing (probably the smooth-handed ghost crab, *Ocypode cordimanus*, which is common at the site today) appear to be the major sources of post-depositional disturbance in all squares. Fragments of oyster shell were recovered from the basal excavation units of both Squares C–F and G–H in a mottled unit which appears to be otherwise culturally-sterile. The mottled appearance of this stratigraphic unit indicates that these are likely to be infilled crab burrows or even root voids. Only a single active burrow was encountered at the base of Square D, where a large cavity (c.15cm in diameter) exposed after excavation had ceased indicated a burrow originating from the erosion bank.

Laboratory methods

Owing to the relatively low density of cultural material recovered from the Pancake Creek Site Complex all squares were analysed to maximise the available sample (see Chapter 3 for a detailed discussion of the standard laboratory methods employed at all sites). In the sections below, the results from all squares are summarised although only the data from Square G is illustrated in Figures 8.9–8.16. This approach has been adopted to minimise repetition. Square G has been selected as it yielded the densest cultural material, the general distribution of which is broadly consistent across the site. Further summary results for all excavated squares are available in Appendix 4.

Cultural materials

Invertebrate remains

Thirty-four taxa of shellfish weighing a total of 6,617g were recovered from Squares A–H, consisting of 12 marine bivalves, 17 marine gastropods, four terrestrial gastropods and a freshwater bivalve (Table 8.6). The shell deposit is dominated by rock oyster (*S. glomerata*), making up 78.5% of the shell assemblage by weight (Fig. 8.9), followed by mud ark (*A. trapezia*) (10.5%) (Fig. 8.10) and hercules club whelk (*P. ebininus*) (10%) (Fig. 8.11). The remaining 31 taxa are relatively rare, each contributing less than 0.5% of the shell assemblage by weight. The assemblage exhibits relatively high diversity with a calculated Shannon-Weaver Function (H') of 1.21 and Simpson's Index of Diversity (1–D) of 0.445. Virtually all of the shell was recovered from between 20–30cm below ground surface. Occasional small shell fragments were recovered to the base of excavations and are thought to have been displaced by crab burrowing (see above). Many of the smaller taxa represented, particularly many of the gastropods, are likely to have entered the deposit attached to larger shellfish taxa.

The vertical distribution of specific taxa shows distinct patterning suggestive of focussed species selection. In Square G (Figs 8.9–8.13), there are distinct almost mono-specific concentrations of mud ark (XU12–13) and scallop (XU8–10), while oyster appears to co-occur with hairy mussel and whelk (XU5–7). The most diverse shellfish assemblages are consistently recovered from units dominated by rock oyster. Oyster was recovered attached to both rock (Square A) and shell (Square E) platforms, indicating that at least some oyster gathering occurred on debris beds such as that currently located at the top of the subtidal zone. Excavation units exhibiting high densities of oyster are coincident with high densities of non-artefactual stone, raising the possibility that much of the latter entered the site attached to rock platform species. Oysters occupy habitats favoured by other taxa such as debris beds and the aerial prop roots of mangroves where associated taxa can be incidentally harvested and thus enter cultural deposits.

The range of shellfish recovered indicate gathering activities focussed on the broad intertidal zone adjacent to the site. The small quantity of the freshwater bivalve *Corbicula (Corbiculina) australis* recovered from Square G, which inhabits coastal rivers and streams, probably reflects incidental gathering from shell debris beds. Although shell sizing was undertaken on the shell assemblage the small sample makes results unreliable and so they are not discussed further.

Vertebrate remains

Occasional fish bone was recovered totalling 1.28g and consisting of 15 pieces of bone. A single specimen was recovered from Square A, four from Square C and 10 from Square F. This material was highly fragmented and none could be identified to taxon. A small vertebrae was recovered from Square H, XU11, which may originate from a small reptile (see Vale 2004 for further details).

Stone artefacts

Stone artefacts were recovered from each excavation area. Twelve stone artefacts weighing 13.4g were identified (Table 8.7). All of these were recovered from the sieve residue. The assemblage is manufactured on a variety of materials, including microgranite (n=5), quartz (n=4), rhyolitic tuff (n=2) and one unknown rock type. All artefacts are flaked pieces. Although no rock occurs naturally in the beach ridge system where the Pancake Creek Site Complex is situated, microgranite and quartz are available nearby in the hills in the centre of Rodds Peninsula or on Bustard Head across Pancake Creek. The nearest recorded source of rhyolitic tuff is at the Ironbark Site Complex on Middle Creek, some 11.5km southeast. Most artefacts are extremely small, with an average maximum dimension of 9.5mm and average weight of 1g.

Table 8.6 Presence/absence of shellfish identified in the Pancake Creek Site Complex, Squares A–H.

FAMILY	TAXON	A	B	C	D	E	F	G	H	TOTAL (g)
					MARINE BIVALVIA					
Arcidae	*Anadara trapezia*	X	X	X	X	X	X	X	X	681.8826
Chamidae	*Chama fibula*				X					1.9244
Donacidae	*Donax deltoides*		X							0.0046
Mytilidae	*Trichomya hirsutus*		X	X	X	X	X	X		10.1011
Noetiidae	*Arcopsis symmetrica*							X		0.1648
Ostreidae	*Saccostrea glomerata*	X	X	X	X	X	X	X	X	5190.3799
Pteriidae	*Pinctada albina sugillata*	X	X	X	X	X		X	X	30.6987
Tellinidae	*Tellina* sp.			X	X	X	X	X	X	1.1518
Veneridae	*Gafrarium australe*						X			0.8874
Veneridae	*Irus* sp.	X		X						0.0795
Veneridae	*Placamen* sp.							X		0.0551
Veneridae	*Venerid* sp.						X			0.5171
					MARINE GASTROPODA					
Batillariidae	*Pyrazus ebininus*		X	X	X	X	X	X	X	663.1323
Batillariidae	*Velacumantus australis*			X		X	X		X	1.4083
Cerithiidae	*Cerithiid* sp.		X	X				X	X	0.5652
Cerithiidae	*Cerithium* sp.				X					0.0490
Cerithiidae	*Clypeomorus bifasciata*			X	X		X	X		0.5137
Costellariidae	*Vexillum* sp.			X						0.4337
Cypraeidae	*Cypraea* sp.							X		1.7554
Lottiidae	*Acmaeid* sp.			X			X	X	X	0.4323
Littorinidae	*Bembicium nanum*			X		X	X			0.2794
Littorinidae	*Littoraria* sp.						X			0.0845
Muricidae	*Bedeva paivae*						X	X		0.2465
Muricidae	*Morula marginalba*		X	X	X	X	X	X	X	14.8585
Nassariidae	*Nassarious burchardi*				X					0.0278
Neritidae	*Nerita squamulata*				X					0.9361
Planaxidae	*Planaxis sulcatus*					X				0.0716
Trochidae	*Herpetopoma atrata*			X			X			0.8750
Trochidae	*Thalotia* sp.			X	X		X	X		1.9965
					TERRESTRIAL GASTROPODA					
Camaenidae	*Figuladra* sp.		X	X	X	X	X	X	X	4.9309
Camaenidae	*Trachiopsis mucosa*	X	X	X	X	X	X	X	X	5.7908
Pupillidae	*Pupoides pacificus*			X	X	X		X		0.2765
Subulinidae	*Eremopeas tuckeri*			X	X	X	X			0.2863
					FRESHWATER BIVALVIA					
Corbiculidae	*Corbicula australis*							X		0.0684

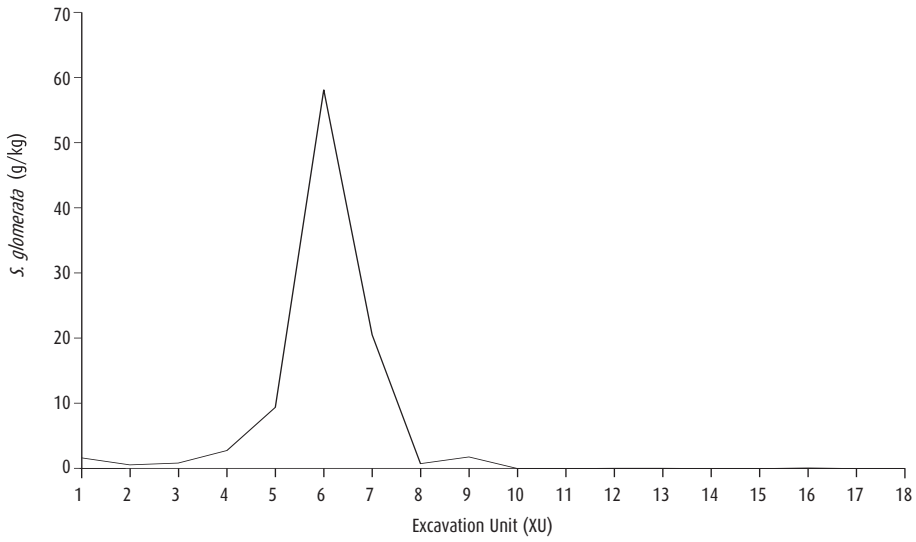

Figure 8.9 Abundance of oyster (*S. glomerata*).

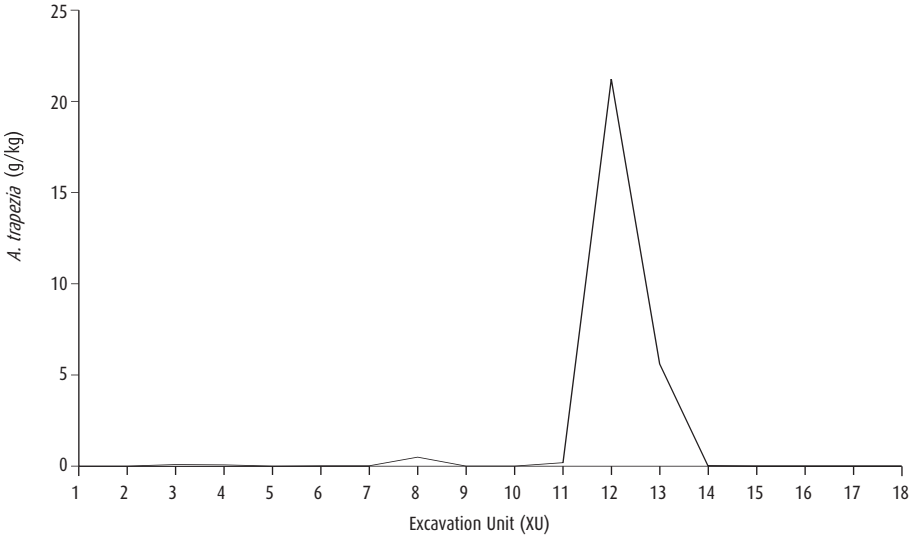

Figure 8.10 Abundance of mud ark (*A. trapezia*).

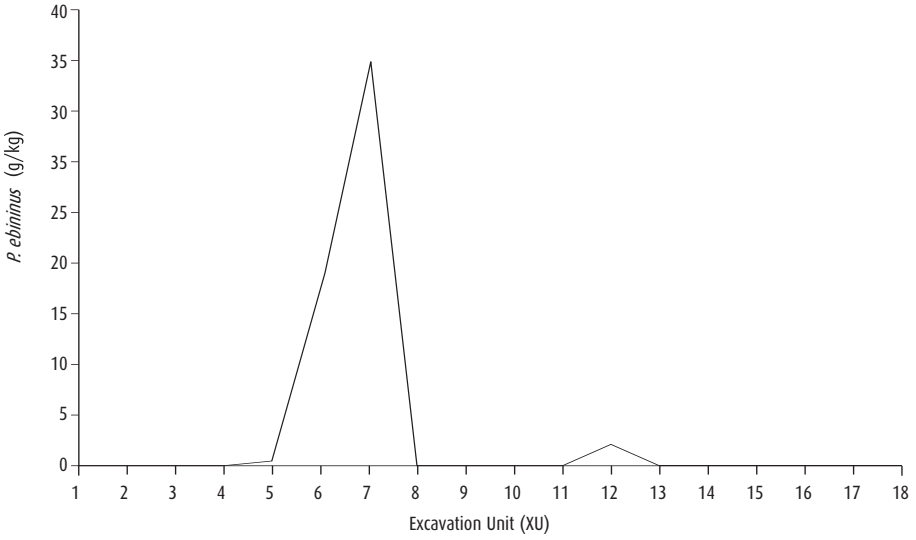

Figure 8.11 Abundance of whelk (*P. ebininus*).

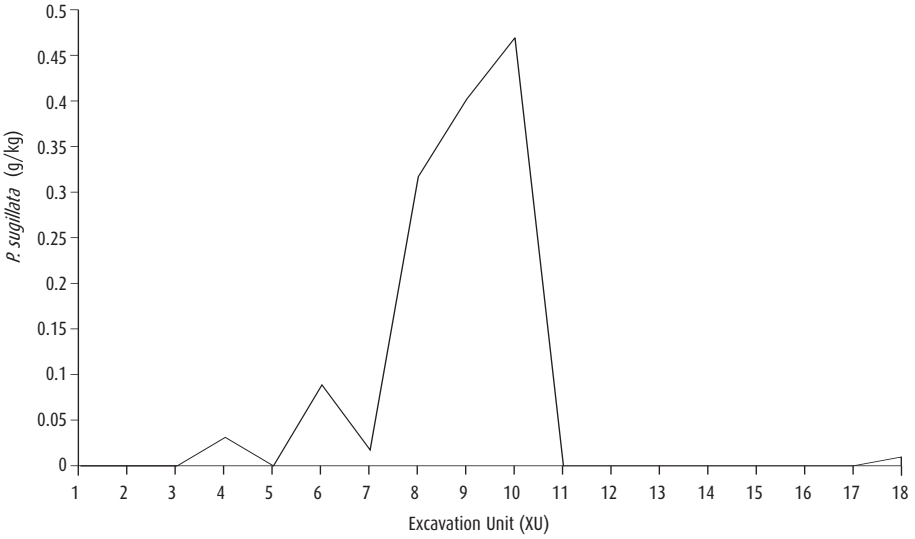

Figure 8.12 Abundance of scallop (*P. sugillata*).

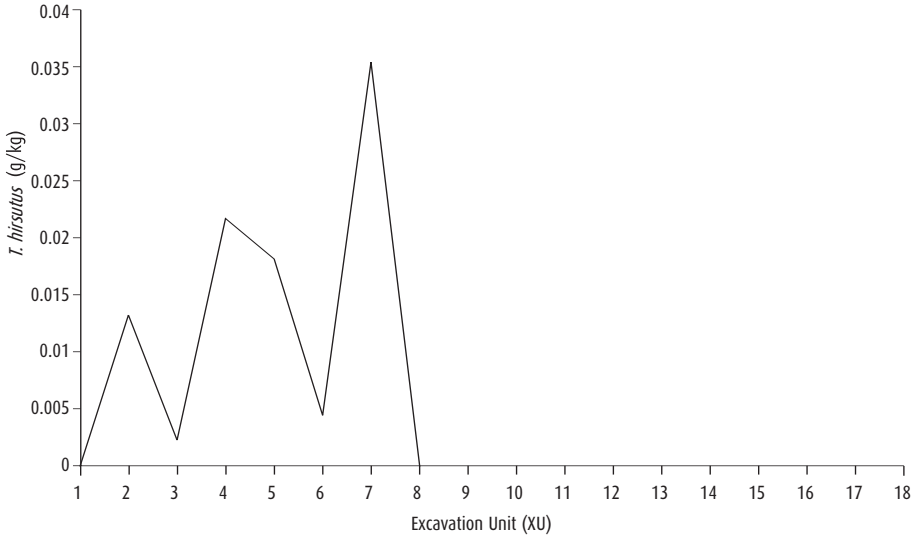

Figure 8.13 Abundance of hairy mussel (*T. hirsutus*).

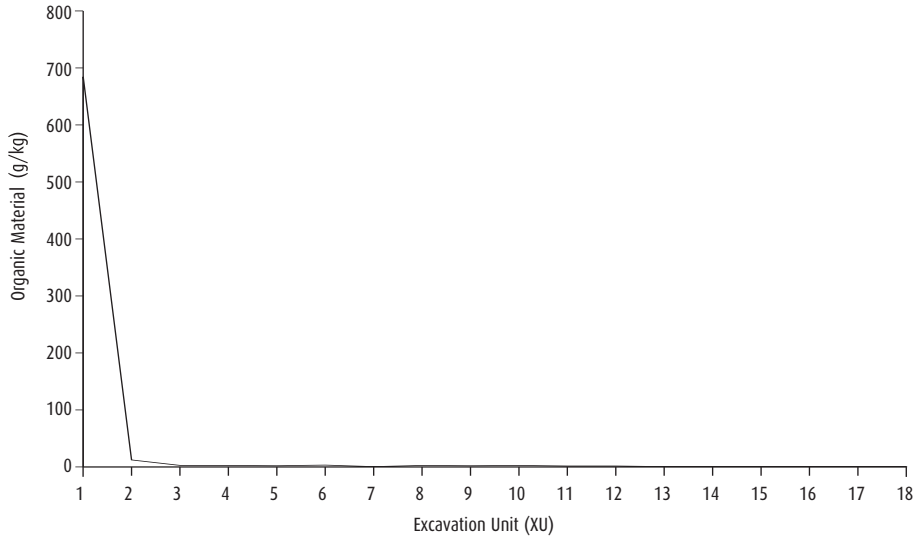

Figure 8.14 Abundance of organic material.

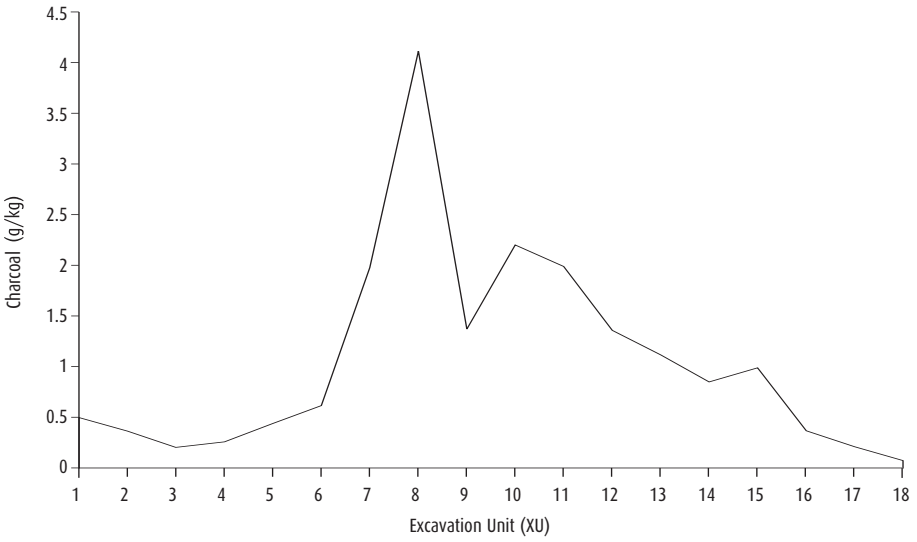

Figure 8.15 Abundance of charcoal.

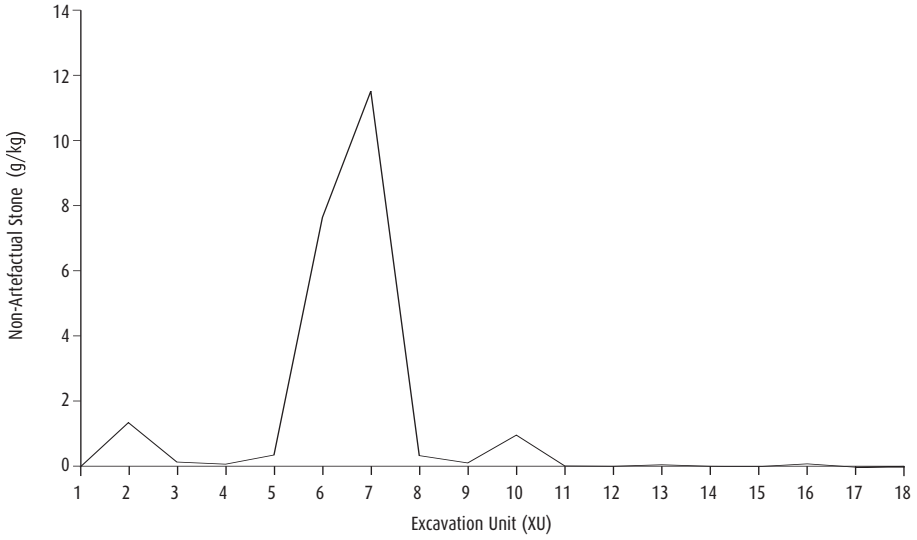

Figure 8.16 Abundance of non-artefactual stone.

Table 8.7 Stone artefacts from the Pancake Creek Site Complex, Squares A–H.

RAW MATERIAL	ARTEFACT TYPE	NUMBER	WEIGHT (g)	SQUARES
Quartz	Flaked Piece	4	0.1	A, B, D, H
Microgranite	Flaked Piece	5	12.9	D, F, H
Rhyolitic Tuff	Flaked Piece	2	0.2	D, H
Unknown	Flaked Piece	1	0.2	F
Total	–	12	13.4	–

Other remains

Abundant blocky charcoal was recovered from throughout all squares (1,718.2g), including the basal deposits which are otherwise culturally-sterile (Fig. 8.15). This material almost certainly derives from bushfires as it is not directly associated with any shell or other definitively cultural material. Pumice, totalling 56.4g, occurs throughout the deposits but is most abundant in the basal units. Small quantities of coral were recovered from Squares C and G (8.1g). It could have entered the deposit incidentally as part of debris attached to platform shellfish, been collected deliberately or entered the site naturally.

Discussion

Excavation revealed highly variable distribution of cultural material across the site area. Only minor quantities of shellfish were recovered from Squares A and B despite dense exposures of mud ark and oyster on the adjacent erosion bank. Squares C–F and G–H, on the other hand, revealed quantities of shellfish remains dominated by mud ark (*A. trapezia*) and oyster (*S. glomerata*), with lesser quantities of hercules club whelk (*P. ebininus*) and minor representation of other shellfish species. Variations in the vertical distribution of various species was also noted, which may relate to patterns of predation, mobility or resource availability.

The excavations and analyses reported above demonstrate that although the cultural deposits at the Pancake Creek Site Complex are generally of a relatively low density (compared, for example, to those at the Seven Mile Creek Mound), the extent and recent chronology of the deposits indicate that a large quantity of cultural material was discarded over a relatively short period of time. To put this into perspective, we can extrapolate from the figures available from the analysed excavations to the estimated site area. Burke (1993) estimated the deposits to be in excess of 22,500m^2. Excavation of Squares A–H indicated that the density of shell recovered varied from 482.32g/m^2 (Square A) to 7,674.12g/m^2 (Square C). Even if the lowest density figure is taken as a basis for calculations, the entire site area is likely to exhibit a minimum of 10,850kg of shell. These figures become more plausible when it is considered that an unknown quantity of possibly denser deposits once located seaward of the current site has been removed by erosion. If the known chronology can be extrapolated to the deposits as a whole, the entire deposit may have accumulated over a period of less than 500 years between 300–800 years ago.

The low density and highly variable structure of such extensive cultural deposits raise critical sampling issues. The linear form of many sites and their exposure along eroding creek sections mitigated this to some degree, although it was shown in some squares (A–B) at the Pancake Creek Site Complex that apparent concentrations of material in the eroding section were not encountered in excavated deposits situated <1m inland.

This general site form appears to be the principal manifestation of settlement and subsistence systems in place over the last 1,000 years in the region, and indeed for southeast Queensland generally (e.g. Sandstone Point, Toulkerrie, NRS, Maroochy River Mouth, Corroboree Beach). The results from this site should act as a cautionary tale for assessments of the scientific significance of sites which rely too heavily on the density of visible cultural material to establish significance values.

Summary

The Pancake Creek Site Complex was occupied for a period of at least 200 years between c.300–800 cal BP. There is little evidence for major use of the area over the last 500 years although more recent deposits which may have been located seaward of those investigated may have been lost to erosion. Low density deposits dominated by shellfish occur over a very large area, emphasising the need to examine sites in context. The patterning and chronology of site use at the Pancake Creek Site Complex appear to be associated with a more recent phase of land-use than that evident at the Seven Mile Creek Mound and Mort Creek Site Complex.