NOTICE OF GENERAL MEETING

The sixth General Meeting of the Society for 1980 will be held in the Museum Education Building, North Terrace, Adelaide at

8.00PM MONDAY 22ND SEPTEMBER, 1980

AGENDA

1. Apologies.

2. Minutes of Previous General Meeting.
   Minutes of previous General Meeting, held on Monday 25th August, 1980, to be confirmed. A copy of these minutes is attached.

3. New Members.
   There were no new members to be elected to the Society.

4. Papers and Journals.
   Papers and Journals from other Societies and Organizations will be tabled at the meeting.

5. Business.

6. Speaker.
   Mr. PETER DONOVAN, who has just completed a 6 month course at the International Centre for the Conservation and Restoration of Monuments in Italy, will give an address to the society entitled:-

   "The Work of I.C.C.R.O.M."

   and particularly as related to Archaeological monuments.

7. Supper.

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EXCAVATION OF A SMALL HEARTH SITE

AT

MOANA BEACH, SOUTH OF ADELAIDE.

VALERIE M. CAMPBELL

AN INVESTIGATION CARRIED OUT BY THE

ANTHROPOLOGICAL SOCIETY OF SOUTH AUSTRALIA, FOR

THE DEPARTMENT OF THE ENVIRONMENT,

SOUTH AUSTRALIA.

MAY, 1980.
EXCAVATION OF A SMALL HEARTH SITE
AT
MOANA BEACH, SOUTH OF ADELAIDE.

BACKGROUND

W. Howchin was the first scientific investigator to draw attention to the archaeological material in the Adelaide area generally, when he addressed the Adelaide meeting of the Australian Association for the Advancement of Science in 1893. Released forty years later as a separate publication (Howchin, 1934), the address described sites (in the vicinity of Adelaide) and attempted to systematize the stone implements located on them. In that paper Howchin refers to the site at Pedler's Creek, now known as Moana, in the following way:

Pedler's Creek ... has the greatest development of sand-dunes at its outlet that occur within the limits of Gulf St. Vincent. They have a frontage to the sea of about a mile in length, and on the southern side of the stream they are a travelling mass up to 80 feet in height. The gradual encroachment of these wind-blown sands, has driven the outlet of the stream in a northerly direction. On the southern side a considerable area has been basied by the wind giving evidences of the former presence of the aborigines in numerous hearths, chipped stones, and broken shells of Turbo, Fasciolaria and other molluscs, the remains of their feasts.

In 1926 Tindale (Tindale, 1926) described a burial on the banks of Pedler's Creek and the following year Stapleton and Mountford drew attention to the site again when they presented the results of their investigations in the area to a meeting of the Royal Society. Again the publication of the address was delayed. This time until 1939 when Mountford (Mountford, 1939) published a brief description of a stone arrangement located south of Pedler's Creek, close to the beach (M5 on Map).

By the twenties the large number of implements found at Moana had begun to attract other collectors. The most notable were T.D. Campbell and N.B. Tindale who both investigated the area in detail and produced hand-drawn maps of the area. Campbell's map, drawn in the twenties provides valuable information regarding the condition of the dunes at that time. Tindale's more recent map is a wealth of data regarding his interpretation of this complex site.

Much more recently, in 1975, V. and Helen Tolcher prepared a brief report assessing the archaeological significance of the area prior to Government plans to buy the site. This latter action has been accomplished with the acquisition of the main dune area, late in 1979.

The present state of the site is one of advanced destruction. The dune system may well have never been completely stabilised but the process of deflation and sand-movement were doubtless hastened early in the European stage by the destruction of dune vegetation by imported animals. Obviously the system was badly disturbed when Howchin made his report. The large scale excavation of sand in more recent times has had a far more devastating effect on the dune system which is now almost non-existent in the southern area. Where once hearths and midden remains were reported (as late as the 1950's) only the red base sands remain over most of the area. Despite the large amount of stone already collected from this area, and the extensive quantities which must have been removed during the sand extraction, flakes, blades and
retouched pieces of quartzite, and small flakes of quartz are still common. They appear to be still eroding from the reddish yellow sand of small outliers on the margin of the main cleared area (See Map).

The northern end of the system has received much of the wind transported sand and the effects of mining are less obvious here. In this northern area, within 75 metres of Pedler's Creek in situ material still exists. A small outlier (Moana 1 = M1 hereafter) showed in its slumping section a dense concentration of charcoal, hearth stones and food remains. This midden deposit is, in fact, cementing the sand and slowing its rate of deflation. A number of hearths exist nearby (Moana 2 = M2) which are still well preserved, only the circular pattern of the hearth stones being exposed on the surface. Two deflation hollows (Moana 3 = M3) close to the creek bear signs of midden material having been present previously.

The Moana area was visited during the course of the Anthropological Society of South Australia's survey of sites along the Lower Fleurieu Peninsula. The aim of this project was to locate new sites and document them, and to ascertain the condition of already known archaeological sites. As the brief outline of the history of the interest in Moana attests it is an area of considerable importance, both historically and scientifically.

Tindale" suggests that sites became progressively younger following the northerly migration of Pedler's Creek. Sites ranged in age from pre-Pirrian sites in the southern section to European contact sites in the northern section close to the present course of Pedler's Creek. Certainly some material exposed on the clay base in the southern area is markedly different from stone material at M3. Function could explain the difference. However, the dune sequence discernible at Moana appears to add support to the broad principle of Tindale's theory. (The finer details probably can be no longer tested.)

Red sand, with a high clay content is overlain by reddish yellow sand (around 7.5yr 7/6 on the Munsell Soil Chart). The upper white sands belong to a third period of dune development. It is generally accepted that the red sands are of Pleistocene origin with the reddish yellow forming in the later stages of that period, or in early Holocene times. It is from these sands that the southern archaeological material appears to be originating, so it is evident that an early Holocene date for these materials is possible. As microlithic material has been discovered in considerable amounts from the reddish sands on the site the geomorphological picture outlined above may well be too simplistic. A recent date is expected for the most northerly sites developed in the white dunes. These should be no older than 4,000 B.P. and could be considerably younger (J. Firman, Mines Department pers. com. November 1979).

The situation outlined above is by no means unique to Moana. Other areas in the survey have produced the sequence of microlithic material associated with the reddish yellow sand (at Aldinga Beach and "Waldeila" for example). Stone material associated with the white dune sands appears to have a higher proportion of quartz material and has failed to produce many microliths. These sites are all very disturbed and so the situation is a very confused and uncertain one, requiring excavation for clarification. Moana seemed to be a suitable starting point.

1. Data from records held in the South Australian Museum, and personal communication from N.B. Tindale (3.3.80).
The final decision to excavate was prompted by the advanced state of erosion of the northerly outlier. It apparently contained a wealth of data relating to resource exploitation, for which there is almost no archaeological documentation in the Adelaide area, and only meagre ethnographic records. Yet in the course of a few months winter storms, stock and vehicles caused it to recede considerably, so that it appeared that in the ensuing twelve months the site would disappear entirely. With these imperatives in mind a grant was sought by the Society to employ an archaeologist to sample the site and attempt to preserve it.

In the interim the Aboriginal and Historic Relics Unit erected a protective fence around the site to prevent further damage by stock and vehicles.

THE SITE AND EXCAVATION

The outlier is located 75 metres south of Pedler’s Creek and approximately 200 metres from the sandy beach which forms the coastline in this area. Irregularly shaped it stood at its highest point one metre above the surrounding area, built up of sand, hearth and midden material eroded from the once larger structure. Large numbers of fire-shattered stones, lumps of charcoal and a wide range of food debris, including otooliths (Mullaway and Bream), crustacea shell and small pieces of bone, were scattered over an area of 80 metres². The outlier was no more than 1.5 metres in length along the westerly profile and its surface sloped abruptly in a north-easterly direction to disappear beneath the sand 2 metres to the east. (Plate 1).

The conical area surrounding the outlier was laid out in 2 metre grids which were numbered, and a surface collection was made from four of these squares to allow comparison of this material with that from the excavation. (Plan 1) In this way it was hoped to widen the sample and thus increase the chances of locating widely dispersed and sparse objects, thus avoiding some of the worst problems of small sampling. (Treganza and Cook, 1948: 292-3). It was recognised that even the total excavation of the outlier would still only represent a small sample of the once far more extensive site. Time and resources were insufficient, (a month for the excavation, analysis and presentation of the report), to allow even that.

The strategy adopted was to clean back the western facing profile (Section zy, Plate 1) which was being undercut by the prevailing winter winds and slumping. A rectangle (designated square z, and abbreviated to M1(d)z) 1 metre in length along zy and .5 metre in width was excavated stratigraphically using hand trowels and nylon brushes. Volume of the deposit was established by carefully filling buckets of a known volume and keeping count of these. During excavation new bags for sieved material were used for every two buckets providing close vertical control of the material. The material from the site was sieved through a .2 mm sieve and all debris caught, was sieved at the site and sorted into its various components during analysis.

After the initial rectangle, M1(d)z was reduced to 66 cms below the surface, two column samples .25 metres² were collected immediately to the south (Sample 1) and to the north (Sample 2) of the excavated area on Section zy. Taken in 10 cm spits this material was bagged and may be subjected to more sophisticated analysis than time and facilities permitted in 1979.

Some problems regarding the interpretation of the complex Hearth 7 remained so the trench was extended southwards to remove the remainder of the outlier (M1(d)y) and produce a new western facing profile. The section drawing is for this extended profile.
PLAN 1: Moana I, showing outlier and grid.

LEGEND:

- **collected**
- **excavated**
During excavation four levels were identified. Level I consisted of pale, wind-blown sand and vegetation. Level II was the main occupational layer and was divided into Spit (i) (20 to 48 cms) and Spit (ii) (48 to 73 cms). The first spit contained the greatest concentration of hearths, having nine in all, whilst only two were located in Spit (ii). Level III was almost sterile, containing no hearths and only 36.3 gms per cubic metre of food debris. Level IV contained a single hearth and showed a marked increase in food remains compared to Level III (60.24 gms/cub. metre). Both Levels, however, were markedly less productive than Level II. (For details of densities see Table V.)

In all twelve hearths were identified during the excavation, the first 20 cms beneath the datum, but in fact almost on the surface in the north-west portion of M1(d)z. It consisted of a quadrant of small, blackened stones with a radius of 30 to 40 cms. These stones encircled an area of deeply stained sand (5 yr. 2.5/1 on Munsell Chart) which contrasted markedly with the very light grey sand outside. The stones were removed and the area carefully cleared back. By 24 cms light sand was reached. This feature appeared to be a quadrant of a wide hearth, possibly 60 cms in diameter, whose outline was marked by a single row of loosely packed stones. It was no more than 4.5 cms in depth.

The next five hearths followed very similar patterns, although minor variations were noted. (Table I) Hearth 2 consisted of an area of darkened sand, large pieces of charcoal intermixed with charred hearth stones. No definite outline was evident giving the impression that it had been disturbed, although its outline was more definite in M1(d)y. Hearths 3, 4, and 5 were very similar and had an interesting feature in that all contained twigs and branchlets which were carbonised but still retained their original form. These were collected intact, where possible, and wrapped in alfoil. It is hoped identification of the original timbers may be possible but initial enquiries have not been hopeful. Hearth 6 was a small, complete hearth encountered at 41 cms. It was only 30 cms in diameter and developed as a concave lens of fragmented charcoal less than 7 cms in depth and totally lacking hearth stones.

Hearths 7, 8 and 10 were different and are discussed later, but Hearth 9 was similar to Hearth 6, its outline consisting of a quadrant of intact carbonised wood (Plate 2). Hearth 11 was a small oval feature (estimated to be 25 cms by 40 cms) located at 60 cms in M1(d)y. It consisted of a semi-circle of charcoal and once again no stones were present.

Hearth 7 (Plate 2, Plan 2, Section zy) was the largest and most complex feature excavated, being 60 cms in diameter and 29 cms in depth. At 31 cms scattered hearth stones were encountered beneath which was consolidated carbonaceous material. This very dark grey material (5 yr. 3/1 on the Munsell Soil Chart) was quite consistent to the trowel and unlike most of the site did not break-up after exposure to the sun.

1. All measurements are beneath the datum. It marked the highest surface level of the site.

2. It was unfortunate that the hearth lay so close to the southern edge of M1(d)z, for although subsequently the entire hearth was excavated the full development of the feature was established on paper afterwards rather than under the trowel. Column Sample 1 was collected through the centre of the hearth and its detailed analysis may provide some valuable data on this feature.
This material formed a semi-circle 'hob' 55 cms in diameter at its greatest extent (at a depth of 35 cms). It had a marked inner margin so that the 'hob' was generally 10 cms wide, encircling a 35 cms cavity, filled with grey sand with large lumps of charcoal dispersed throughout. The consolidated carbonaceous material disappeared by 42 cms except in the northern position. It was never present in the eastern portion of the hearth. The feature was still clearly visible, its dark grey sand in definite contrast to the light sand of the rest of the site. Its diminishing size, with increased depth confirmed the shape of the feature as being basin-like. Its base consisted of the same dark grey sandy matrix with charcoal that had characterised most of the fill of this hearth.

The construction of Hearth 7, and the area of slump, had almost completely destroyed a very similar feature to the north-west. This hearth was designated Hearth 8 but may possibly have been two hearths built almost on top of each other. Some of the consolidated material forming the inner circle of the Hearth was present but was only a few centimetres thick.

Study of Section xy suggests that Hearth 7 may have intersected yet another Hearth to the east, the consolidated material of the two hearths mingling, their hearth stones indistinguishable. Such a situation suggests the two features are synchronous. Because of the limitations on the size of the excavation this possible hearth was not investigated further and was not given a separate designation.

Hearth 10 (Plate 3) belongs to the same class as 7 and 8 and was the deepest of the three, lying between 47 and 57 cms below the surface. Its circumference was in the order of 60 cms and it was 10 cms thick. It was one of the most completely excavated hearths, its circular outline, made up of discrete pieces of charcoal, was almost complete at 48 cms, except for a tangent where the section transversed it. Four hearth stones, less than 3 cms in diameter were scattered near it. Charcoal continued in a matrix of very dark grey sand (5 yr 3/1 on the Munsell Soil Chart) to a depth of 50 cms, at which point the consolidated carbonaceous material, already encountered in 7 and 8, was reached. It formed a circular pattern on the southern and western portion of the hearth. The 'hobs' were 25 cms wide and sloped rapidly towards the inner circle of the hearth. Although the southern and eastern portions of the hearth had been quite clear in the upper levels they did not develop into the consolidated 'hobs'. Its base was composed of dark sand and fragments of charcoal similar to Hearth 7.

Dark stains appeared in Section xy at 1 metre some days after work on the site. Loose surface sand had been scuffed away to reveal the now familiar lens of dark sand showing on the section wall. When M1(d)z and M1(d)y were both reduced to 73 cms excavation was resumed in M1(d)z, but only for a width of 25 cms. Level III was removed (73 cms to 99 cms) until fragments of charcoal began to be encountered at 99 cms, the depth taken as the top of Level IV. The excavation was now extended out in a 1 metre² to the west of M1(d)z to form a trench designated M2(d)m (Plate 3). Removal of sand over the whole area began, revealing carbonaceous material in two areas west of the old slump line. These features were only a centimetre thick and seem to have been old slump surfaces preserved. Whilst Hearth 12 was definitely in situ the presence of slumped material renders the food residues from this level of dubious stratigraphic origin.

Hearth 12 developed in the accustomed pattern already outlined. Small stones and large pieces of charcoal outlined a feature 30 cms in diameter at 135 cms. It was removed at 138 cms.
Excavation for a further 10 cms revealed no further signs of human activity so the trench was filled in with screenings and built up against the new profile to within 30 cms of the top. It is hoped this extensive covering will reduce the rate of undercutting which is causing the slumping of the occupation levels. Ideally brush should be pegged over this surface to help catch wind-blown sand.

**ANALYSIS**

Analysis of the material was most elementary due to the limited time and facilities. The material from the sieves were sorted into their various components, although their highly fragmented condition often made positive identification difficult. These components were:

- Charcoal
- Bone
- Fish bone and otoliths
- Crustacea
- Shell
- Inedible shell
- Small stone - usually quartz flakes
- Hearth stones: < 3 cms.
- > 3 cms.

All components were weighed (Tables II, III and IV) and finally expressed as Kilogrammes per cubic metre of deposit (Table V). The few identifiable remains were selected and distributed to experts for identification, whilst carbon samples from Hearths 3 and 12 were prepared for dating determinations from Gakashuin Radiocarbon Laboratory.

Some additional colour readings of soil samples were made, and pH determinations were also obtained\(^1\). Initial investigation of the consolidated carbonaceous material was made along with enquiries into more sophisticated analytical methods.

**DISCUSSION**

Despite the appearance of the site in its eroding condition, once excavation began, it was soon clear that Moana 1 was much more than a midden consisting of randomly distributed residues from fires and meals. Rather, densely packed, but quite distinct hearths were preserved with the surrounding infilling containing many fragments of food remains, much of it in a charred condition. Tables II, III and IV summarise the results of the excavation and require little explanation. It is pertinent, nevertheless to point out how the dense concentration of hearths in the upper spit of Level II is reflected in the density for that level, but whilst density for hearth material drops away sharply in the second spit the density of food remains is much more stable, and actually rises in M1(d)\(^1\). This was consistent with observations during the excavation that very little in the way of food remains was recovered from the hearths themselves, and was, generally charred. Presumably, as for campers everywhere, the fire provided a useful place to dispose of refuse that the dogs could not cope with - crustacea claws and discarded shells.

\(^1\) These indicated extremely alkaline conditions throughout the site.
As the description under the excavation section of the hearths, and the summary of their characteristics in Table I illustrates, the hearths were of two types, A and B. The first type, including hearths 1 - 6, 9, 11 and 12, consisted of an outlining circle, usually of stones, surrounding a shallow (4 - 7 cms) lens of charcoal and in four, pieces of only partially consumed wood were found. From these characteristics it would seem that these hearths served to cook comparatively small food items, generally at fairly low temperatures as so many pieces of only partially consumed wood remain. That these remained undisturbed at the base of the hearth suggests that food may have been cooked by being placed directly on the glowing embers, or on top of a fine layer of sand. As most of the foods represented on the site are small they could have been "well done" when cooked on this kind of hearth. The shell-fish would have opened readily when exposed to these fires, the crustacean would be quickly grilled, whilst the small animals and lizards would similarly have required only a hearth of such diminutive size for adequate preparation. Likewise the small fish, whose presence is established by a number of very small vertebrae, distributed through the deposit, could have been cooked in these hearths. Certainly this method of cooking is in keeping with the techniques recorded by early European observers, who record that smaller game was "roasted on the ashes" (Edwards, 1972 : 11). It is the remains of these smaller food sources that dominate the record at Moana 1.

A few specimens of greater size were found. Some fragments of bone were sufficiently large to have been the femur of an animal at least the size of a wallaby. Some large fish vertebrae and one Mullahay otolith show that larger prey was bought home occasionally. Were the second type of hearth (Hearths 7, 8 and 10) built to roast these catches? Both Teichelmann and Cawthorne provide detailed descriptions of the cooking of larger game which are substantially the same. Teichelmann (quoted Ellis & Houston, 1976 : 38) writes:

Kanyandi; v.a., to stew or steam in a native oven, which is a mere hole in the ground. Before they learnt the art of cooking from Européans, all their larger game, as Kangaroo, wild dogs, emu, emu eggs and different vegetables were prepared in this way for eating. The whole process is done in the following manner: They dig a hole in the ground, kindle a fire in it, and then add a sufficient quantity of stones to be heated by the fire. During the time these are heated, they prepare the game or vegetables; when this work is done, they removed the stones and the larger remains of the wood, and if they stew a kangaroo, they first fill the inside with part of the hot stones and leaves of the gum tree. The kangaroo is then put into the hole and covered with leaves, the remaining hot stones, bark and earth; it remains there for an hour or more, until steam escapes from different parts; and when this takes place, the meat, or whatever is cooking, is sufficiently done.

In most details the Type B hearths seem compatible with this account. Brown, writing in 1897 (quoted Ellis and Houston, 1976 : 36) adds the detail that the hole dug was circular, "two feet deep by three feet in diameter" which is larger than the Moana hearths, but presumably the hole was tailored to suit the size of the item for steaming. Hearth 7 was the only one which contained stones, and their distribution in the upper part of the hearth is compatible with the three descriptions. Hearths 8 and 10 did not have stones present. Judging from the description this could be explained by their
removal with the carcase, or a second possibility is that they were appropriated by later chefs, wishing to save themselves the two hundred metre walk to the nearest supply of pebbles.

The densely consolidated 'hobs' of the Type B hearths remain unexplained. When oven dried the material broke up and consisted of sand and finely divided charcoal, between 1 and 2 mm in size. Such fine division of the charcoal seems compatible with a fire generating a lot of heat, such as the larger game would need. Obviously an additional agent was present, binding the two elements together. Two possibilities exist, which can be best tested on a gaschromatograph programmed in the appropriate way. Sadly this project did not encompass access to such equipment. The more obvious is that fats exuded by the cooking game penetrated the surrounding sand cementing it together. A second explanation is that the 'combusting grasses exuded the cementing agent.'

A common characteristic of all three Type B hearths is the incomplete 'hob', already described. This appears to be consistent with the view that as the roasted game was scraped from the glowing embers the circle of sand surrounding it, soaked with liquid produced during the steaming process, was disturbed. Thus the break in the 'hobs' indicates the direction in which the roast was dragged from the oven when it was served.

The data discussed above should prove of value in assessing a series of hearths located along the coast of the Lower Fleurieu Peninsula. Meanwhile another possible area of investigation was opened up by studying the hearth stones themselves.

For instance, based on the weight of stones in the excavation from a known number of hearths, it was hoped to estimate the total number of hearths in the original site. In all, portions of twelve hearths were located during excavation. Weights of hearth stones relating to each hearth are listed in Table 1. From this data the total stone for the complete hearth was estimated. Based on the seven hearths which contained stone this produced a mean of 3.47 Kgms ± 1.15 of stone per hearth.

Another 9.275 Kgms of hearth stones were excavated but were not related to specific hearths. One possible explanation of this material was that it was derived from those four hearths lacking stones. The appropriate division indicates that if this were the case these hearths would have contained 2.32 Kgms of stone per hearth. This figure is just within the Standard Error of the first set of hearths and therefore tends to support the theory. It also allows an estimate of the total hearths in the area to be made with greater confidence. To produce this estimate, the weight of surface stone from the eroded part of the site was used.

Collections were made from the gridded area from 4 squares. 2(d) was that area of 2 m. 2 immediately to the west of the excavation and included a considerable depth of newly slumped material. When collecting, the upper levels and surface were collected as 2(d) i and the deeper material adjacent to the area of excavation as 2(d) ii. As Table VI shows the two spits produced a total of 29.813 Kgms of hearth stones. Using the estimation derived from the excavation this indicates the presence of a further 8.5 hearths in its immediate vicinity. As shown on the plan the

2. Hearth 5 was ill defined and was omitted from calculations.
three remaining squares were further from the extant site. The mass of stones became slighter with increasing distance from it. Nevertheless these grids produced a total of 50.3 Kgms, or an average of 16.766 Kgms per square. Using the same estimated weight as before this could mean that the whole deflated area once contained the remains of 87 hearths. 3.

Totalling the estimates from the excavated, slumped and eroded sections of the site indicates some 107 hearths. In addition the unexcavated portion of the site appeared to contain a similar density of hearths so possibly contained another 24. Whilst the calculations obviously involve wide margins of error, they still indicate a great concentration of cooking activity in this comparatively restricted area. Irresistably the question arises: why?

A number of explanations could be evoked. Of these the availability of water and good food supplies is the most obvious. Yet these are not attributes unique to Moana. Any of the coastal localities possessed these qualities; did these, now badly eroded sites, have similar areas of hearths which have vanished either undetected, or un-documented? There is no way we can ever be certain now, although collectors suggest that M1 was unusual. There is one element at Moana which appears to render the area unique amongst the coastal sites, and that is the stone arrangement reported by Mountford (Mountford, 1939). According to Campbell's map it lay less than two hundred metres to the seaward of these hearths, so they may well reflect the repeated ceremonial gatherings enjoined at the arrangement, representing the "feasts" that were an important aspect of such ceremonies.

Until detailed identifications are completed only generalisations can be made about the foods eaten. Shellfish were part of the diet, but probably only a minor element of it. Only a handful of valves were recovered in complete form and are listed in Table IV. Interestingly, although cockle (one of the Matra species) pipi (Plebodonax deltoides) and abalone (Haliotis sp.) are all represented, the most consistently recurring species is the freshwater Murray Mussel (Veleumia ambiguous). This suggests that whilst beach species were collected fewer found their way back to M1 than the riverine species collected in nearby Pedler's Creek. It will be interesting to see if this pattern is repeated in the crustacea.

The presence of the Pond Snail (Physastra tenuistratia) and probably Planorbis (identification is not certain) throughout the deposit raises other questions about the utilisation of the creek. Were these incorporated into the deposit when the weeds on which they feed were brought from the stream? And for what purpose? Is it possible they were used in the steaming process in the Type B hearths? Brown (quoted Ellis and Houston, 1936 : 36) mentions the use of reeds in this context.

It seems that the creek, small and unprepossessing as it appears today was far more to the Aborigines than just a source of water. This is not an insignificant finding for almost all of the known coastal sites are located within a few hundred metres of a stream.

Fish vertebræ were present at all levels of the excavation, evenly distributed at the rate of one every two buckets of matrix. Most are tiny, indicating that the majority of fish belonged to the smaller size range. The occasional large vertebræ argues for the inclusion of some larger fish as well. One Mulloway (Slaeena antarctica) otolith (M1(d)y Level II (i))

3. This estimate could drop to 65 or rise to 130 if the extremes of the Standard Error are used for the calculation.
indicates this fish may be the larger species caught. Mawtay otoliths have been reported from this site over the years.

Crustacea remains, in the form of claw tips and thin fragments of carapace, formed the bulkiest remain from the site. If not providing the major protein at the site, at least crustacea was a regular part of the diet.

The bone from the site indicates that the surrounding sand-dunes were utilised as well as the creek and beach-front. Several jawbones from small land mammals were found. Whilst identification is incomplete it can only be stated that they probably belonged to mice and marsupials of similar dimensions. Two types of lizard jaw were observed on the site during one of the visits during the winter. Again they represented very small creatures whose overall contribution to the protein level of the inhabitants would not be great, but their presence does indicate the exploitation of the sand-hills.

One or two bones may have belonged to birds, whilst a few fragments of larger bone suggest that something the size of a wallaby had been caught. Unfortunately, this and all other material is so fragmented that it does not lend itself to detailed studies.

Although no shell was excavated emu shell was collected from the surface areas in nearby blowouts.

Stone material from the site consisted almost entirely of hearth stones. However, small numbers of very tiny quartz flakes occurred throughout the deposit and their presence remains something of a mystery. They may represent some minor repairs made to hunting equipment whilst waiting for the meal. Certainly any evidence of major stone-working such as cones or larger flakes was almost totally absent. Small pieces of ochre were noted at times.

More explicable were the pieces of broken grindstone that had been re-used as hearth stones. These made up the bulk of the Worked Stone and were common on the eroded area of the site as well. They provide the only evidence of the vegetable component of the diet, indicating that grass seeds or fruits of some kind were available for grinding into a paste or flour. The fruits of the dune hugging *mysembreanthemon* is one of the most likely candidates, although by no means the only one.

To summarise Moana 1 appears to have been an intensively occupied area used chiefly for cooking purposes, by a group of Aborigines drawing on a wide range of locally available food resources. The presence of two types of hearths suggest two different modes of cooking at the site, perhaps determined by the size of the item to be cooked. Apart from the data provided on the protein elements of the diet at the site, the presence of broken hearth stones indicates the preparation of vegetable foods as well.

The density of hearths at this site appears to be unusual along the Fleurieu Peninsula. Whilst this may just reflect the poor records of its archaeology it is possible that the banks of Fedler's Creek saw unusual concentrations of Aborigines as they came together to carry out the ceremonies associated with the stone-arrangement nearby. If this were the case it is particularly fitting that the area has now reverted to the State with the aim of commemorating its significance in prehistoric times.
ACKNOWLEDGEMENTS

The writer gratefully acknowledges the funding to the Anthropological Society of South Australia from the State Government which made this excavation possible. However, even with this assistance, without the many unpaid hours of work by members of the Society it could still not have occurred. Conspicuous in this regard was Mrs. Margaret Nobbs, who also acted as photographer. (Additional help was forthcoming from Mrs. Eunice Robinson, the Radford family, Mr. R. Weathersbee and Mrs. Gladys Byfield.)

Chris Whipp and Rob Graham, who first drew attention to the site worked unstintingly on its excavation and analysis. S. Tolcher surveyed in the grid and Roger Luebbers of the Aboriginal and Historic Relics Unit gave generously of his time and equipment. Various curators at the South Australian Museum have undertaken identification of material and Graeme Pretty made his facilities available for analysis. Professor Prescott of the Physics Department provided a balance at short notice. Mr. Tony Wallis, Soil Science Muresk and Mr. John Firman of the Mines Department gave advice on the analysis and geomorphology of the site respectively.

In short, the list is very long because of the unstinting help so many people gave in a purely voluntary capacity.

BIBLIOGRAPHY


Archival Documents for Moana : South Australian Museum.
### TABLE I: CHARACTERISTICS OF HEARTHS

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Hearth</th>
<th>Amount Excavated</th>
<th>Depth in cms</th>
<th>Estimated Diameter</th>
<th>Stone in Kgms</th>
<th>Carbon</th>
<th>Hearth Type</th>
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<td>M1(d)y</td>
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<td>Hearth Stones</td>
<td>Worked Stone</td>
<td>Quartz</td>
<td>Total Stone</td>
<td>Charcoal</td>
<td>Hearth Stones</td>
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**TABLE II: DISTRIBUTION OF STONE MATERIAL & CHARCOAL**

(Weight in Kilogrammes)
<table>
<thead>
<tr>
<th>Stratum</th>
<th>M(d)X</th>
<th>M(d)Z</th>
<th>M2(d)M</th>
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<tbody>
<tr>
<td></td>
<td>Bone</td>
<td>Fish</td>
<td>Shell</td>
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<tr>
<td>I</td>
<td>1-19 cm</td>
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<td>5.06</td>
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<tr>
<td>II (i)</td>
<td>20-48 cm</td>
<td>7.8</td>
<td>49.5</td>
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<tr>
<td>II (ii)</td>
<td>49-73 cm</td>
<td>.17</td>
<td>30.71</td>
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<td>III</td>
<td>74-98 cm</td>
<td>.455</td>
<td>5.95</td>
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<td>IV</td>
<td>99-148 cm</td>
<td>.83</td>
<td>1.05</td>
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(Weight in Grams)
### TABLE IV: DISTRIBUTION OF SHELLFISH

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Murray Mussel (Velesunio ambiguus)</th>
<th>Fond Snail (Ptychatra tenuatriata)</th>
<th>Planarbis (Mactra sp.)</th>
<th>Cockle (Plebius deltoides)</th>
<th>Pipi</th>
<th>Abalone</th>
<th>Unidentifiable</th>
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<tr>
<td>I 1-19 cms</td>
<td>x</td>
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<td>x</td>
<td>x</td>
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<td>M1(d)z</td>
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<tr>
<td>M1(d)y</td>
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<td>IV 99-148 cms</td>
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<td>x</td>
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<td>Stratum</td>
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<td>Charcoal Kgm</td>
<td>Combined Hearth Kgm</td>
<td>Food gms</td>
<td>Stone Kgm</td>
<td>Charcoal Kgm</td>
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<tr>
<td>(i) 20-48 cms</td>
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<td>(ii) 49-73 cms</td>
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TABLE VI: WEIGHT OF HEARTH STONES FPJM GRIDDED AREA
(Weight in Kgms)

<table>
<thead>
<tr>
<th>Grid No.</th>
<th>Hearth Stones</th>
<th>Total</th>
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<tr>
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<tr>
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<td>14.860 7.675</td>
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<tr>
<td>4(e)</td>
<td>8.255 9.090</td>
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<tr>
<td>2(b)</td>
<td>6.125 4.295</td>
<td>10.420</td>
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<td>Moana 4</td>
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<td>4.275</td>
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</table>
Moana 1: Prior to excavation showing slumping of western margin of the outlier.

Section zy prior to final preparation for excavation.
Square 2, 43 cms showing large pieces of charcoal associated with Hearth 9 at rear of excavation and Hearth 7 at left section. Hearth 8 in section zy.

Square y, 32 cms showing clustering of hearth stones at top of Hearth 7.
Square z, 50 cms showing the wide 'hobs' of Hearth 10 and its basin-like depression.

Excavation at 1 metre below datum, showing area of dark material in square m.