ABORIGINAL FISHING STATIONS ON THE NEWCASTLE COASTLINE, NEW SOUTH WALES

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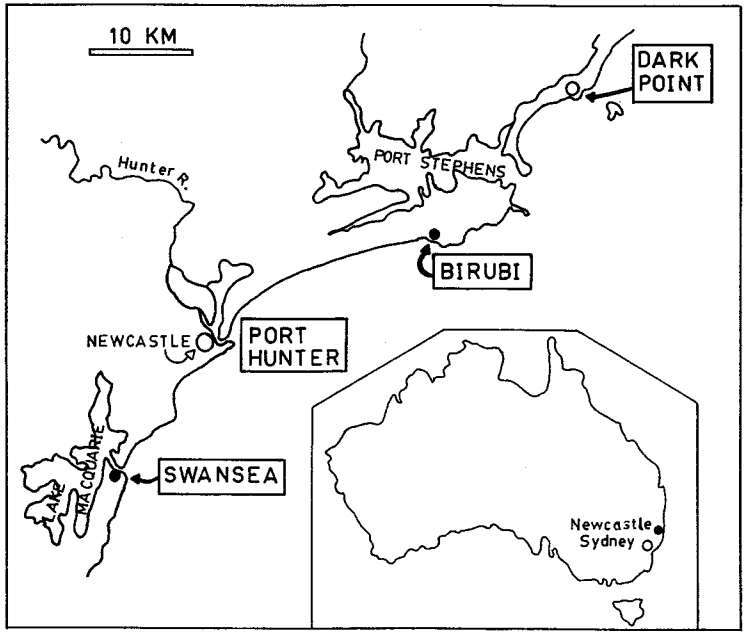
INTRODUCTION

For the last 10 years I have been studying shell middens along the coastline near Newcastle, New South Wales. One of my interests - and the subject of this paper - is in Aboriginal fishing methods. Most of the data presented here is drawn from my 1978/79 salvage excavations at Birubi (grid reference 136719, Morna Point map 9332-III-N, scale 1:25,000). Some mention will be made of 1972 excavations at Swansea (grid reference 747376, Swansea map 9231-IV-N, scale 1:25,000), and to surface collections from a disintegrating midden at Dark Point (grid reference 313927, Bombah Point map 9332-I-N, scale 1:25,000). The locations are shown on Map 1.

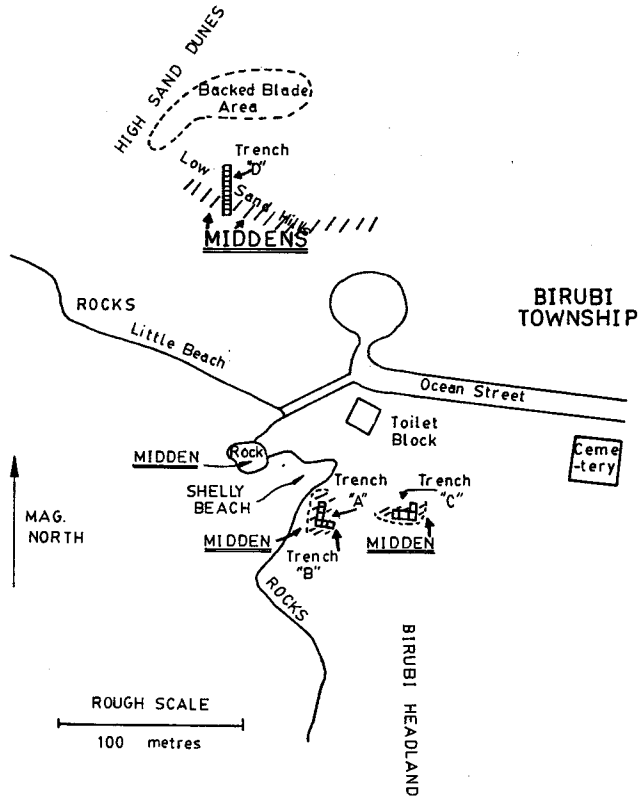


Map 1. Locations mentioned in text

THE BIRUBI EXCAVATIONS

The shell middens at Birubi (a location at the junction of an ocean beach 32 km long with a rocky headland) covered about 5 ha as recently as 1965. Since that time, much of the midden has been destroyed by residential developments, and damage by off-road vehicles has allowed the boisterous southerly gales of the summer months to collapse and scatter nearly all the shell heaps. In late 1978 we began salvage excavations designed to sample the remnants.

This large Aboriginal campsite is far from homogeneous in terms of the archaeological material exposed on its surface. One obvious question to attempt to answer is whether the variations are due to different contemporary activities at different parts of the camp, or to relocations of the camp during its span of occupation.



Map 2. Sketch map of Birubi locality

We chose to sample the middens with three widely separated trenches (see Map 2), as follows:

1. The L-shaped A/B trench in a beachside midden at the foot of the Birubi headland. This midden was made up of lenses of ash, sand and shell under a capping of shell, and was spilling impressive quantities of fish bone onto a trackway alongside Shelly Beach. There appeared to be very few stone artefacts in it.
2. Another L-shaped trench (C), higher up on the headland than A/B. The surface indications were that this shell midden contained a high level of fish bone, and a modest number of stone flakes. The presence of mud whelks (*Pyrazus ebeninus*) was of interest, there being no estuarine habitat at Birubi today.
3. Trench D was cut into a compacted midden of pipi shell (*Plebidonax deltoides*) on top of a low sand ridge some 80 m back from the beach. This midden had appreciable levels of stone material (including elouera scrapers) eroding from it. While the faunal remains (apart from shell) did not appear to be at a high level, they did include scores of slivers of mammalian long bone; this feature might be associated with the manufacture of fish spears. Unfortunately, this midden was virtually destroyed by heavy gales just before its excavation was begun. We sampled what was left but appear to have insufficient recovery of faunal remains. This midden is probably one of those from which Hall (1928) made surface collections of stone artefacts.

There was once a fourth area of interest - a scatter of bondi points and geometrics on sand dunes behind the trench D area - but this was not a stratified deposit. Anyway, it had disappeared without trace (amateur collectors?) several years before we came to site our trenches.

My excavations were conducted with a volunteer team whose membership changed frequently. In order to maintain a consistent level in competence of sorting sieve residues we bagged all residues at the site, and I have been sorting them ever since. I am restricting nearly all of my remarks to square A-2 of the A/B trench, because I have not finished enough sorting on the other material to be able to draw firm conclusions.

RESULTS FOR SQUARE A-2, TRENCH A/B (BIRUBI)

The stratigraphy of the A/B site involved numerous lenses whose colour changed with moisture content. In the hot and blustery conditions we met in the field, it proved impossible to excavate lens by lens, so we resorted to arbitrary 10 cm spits within each 1 m square.

In square A-2 there was compacted shell on top of the midden. Lower down the shell was diluted with ash and drift sand. Table 1 demonstrates that substantial occupation of the site extended to a depth of 85 cm. There is some Aboriginal material down to 105 cm, but that may well have been trodden down into the sand dune surface by the first occupants of the site. I assumed that the 75-85 cm spit represents the earliest occupation of the site; it has been dated to 940 ± 90 BP (SUA-1160, *Plebidonax deltoides* shell). The surface of the midden has not yet been dated.

The state of preservation of the bone remains was remarkably good, due at least in part to the slightly alkaline soil conditions. (Various soil samples gave pH values from 7.6 to 8.9.) I shall now summarise the data I have obtained from the midden and make a number of comments on identification of fish bone in a later section.

Depth (cm)	Bone weight (gm)	Minimum no. of identified fish[1]	Minimum no. of edible shells[2]	Charcoal weight (gm)
0-5[3]	30	7	457	15
5-15	487	51	2214	356
15-25	300	33	817	125
25-35	149	35	389	50
35-45	393	45	584	57
45-55	644	76	493	93
55-65	872	105	665	88
65-75	819	80	469	64
75-85	313	46	506	96
85-95	10	3	80	4.3
95-105	0.5	0	3	0.2
Total	4018	481	6677	949

[1] Defined as the minimum number of individual fish (taking account of both species and size) which could account for the identified fish-bone from that spit.

[2] Shellfish are counted as edible if their diameter exceeds 1 cm or (for mussels) if their length exceeds 2 cm.

[3] The surface was cleaned off to a depth of 5 cm to remove the effects of modern foot traffic and our own disturbance caused by clearing bitou bush.

Table 1. Data on occupation density in square A-2

ARTEFACTS

Shell fish-hooks

This midden can fairly be described as a fish-hook factory; we recovered 35 from this single square, as well as examples of all the stages in the manufacture of them (Fig.1).

The hooks are invariably made from the heavy turban shell, *Ninella torquata*. From each shell, several spade-shaped 'blanks' were levered out of the spiral tube. The outer (convex) surface of the blank was then ground down, apparently on a flat stone, till its centre was worn through, and the hole was enlarged by chipping out the thinned area of shell until only the annulus remained.

The rough shape of the final hook was then formed by chipping out part of the annulus, and the job was finished by filing. Possibly this filing was done with the so-called 'fish-hook file'; one such stone file was recovered from square A-2, and two others from the nearby deflated midden.

This method of manufacture matches that described from the south coast of New South Wales by Lampert and Turnbull (1970). There are two types of finished hooks at Birubi (Fig.1), the difference being in the way the shank is shaped for the attachment of the line. The dimensions (measured from the shank end to the outer curve) vary from 19-36 mm. Both the dimensions, and the two hook types (C-shaped and J-shaped), match the shell hooks described from the south coast (Wooley 1966).

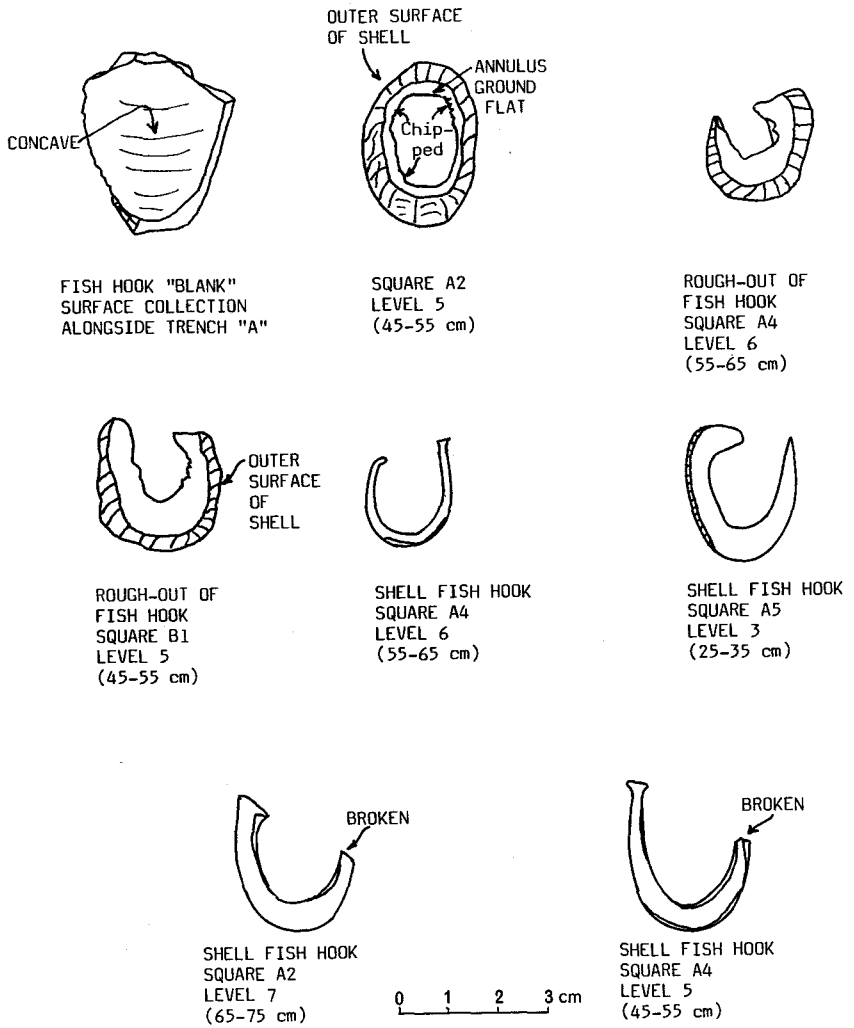


Figure 1. Stages in fish-hook manufacture at Birubi

Shell hooks occur throughout this Birubi midden. There were seven of them in the spit representing the earliest occupation. The shell date for this earliest occupation (940 ± 90 BP) can be corrected for the 'environmental effect' (Gillespie and Polach 1979) to 490 BP. As a result of this excavation I believe we could recognise a fish-hook manufacturing site even in the absence of the actual hooks. The blanks, the turban shells from which they have been detached, and the chips removed in shaping the annulus, are all characteristic.

Sparidae		Reef fish		Miscellaneous	
Snapper	82	Black drummer	5	Catfish	1
Bream	31	Estuary cod	1	Flathead	2
Tarwhine	3	Groper	31	Jewfish	7
		Kelpfish	124	Leather-jacket	16
		Red rock cod	29	Mullet	2
		Wirrah cod	26	Salmon trout	5
		Wrasse	80	Shark[2]	7
				Sweep	4
				Tailor	1
				Toado	6
				Trevally	8
				Whiting	10

Total number: 481
Number of species: 23

[1] Scientific names are given in Table 3.

[2] Six of the sharks are the Port Jackson species, the other is an Orectoloboid shark (either nurse or wobbegong).

Table 2. Minimum numbers of identified[1] fish at Birubi: square A-2

Common name	Scientific name
Black bream	*Acanthopagrus australis*
Black drummer	*Girella elevata*
Estuary catfish	*Cnidoglanis macrocephalus*
Estuary cod	*Epinephelus tauvina*
Flathead	*Platycephalus* sp.
Groper	*Achoerodus gouldii*
Jewfish	*Sciaena antarctica*
Kelpfish	*Chironemus aboriginalis*
Leather-jacket	Aluteridae
Mullet	*Mugil cephalus*
Port Jackson shark	*Heterodontus portusjacksoni*
Red rock cod	*Scorpaena cardinalus*
Salmon trout	*Arripis*
Snapper	*Chrysophrys guttulatus*
Sweep	*Scorpis lineolatus*
Tailor	*Pomatomus saltator*
Tarwhine	*Rhabdosargus sarba*
Toado	Tetrodonts
Trevally	*Usacaranx georgianus*
Whiting	*Sillago* sp.
Wirrah cod	*Acanthistius serratus*
Wrasse	Labridae

Table 3. List of common and scientific names of fish identified in square A-2 at Birubi

There can of course be no doubt that angling was a major fishing method at this site.

Bone points

There is only one example of a sliver of mammalian long bone from square A-2. From square A-4 we have two examples of bone points ground on macropodid fibulae.

Stone material

While there are some hundreds of stone flakes in square A-2, most of them do not seem to come from attempts to strike blades or usable flakes. Rather, they are thin chips of the acid volcanics of the headland, and might have formed accidentally during hammering activities. There were only three recognisable stone implements: a heavy cleaver, a used flake, and a fish-hook file.

The A/B trenches did however uncover several hearths, as well as small elongated boulders set on end. Possibly the latter may have served as a workbench.

FOOD SOURCES

Fish

The very large number of individual fish (481) we have identified from square A-2 shows that the trench A/B midden was primarily a fishing station. The list of species, and minimum numbers of each, are given in Table 2. Scientific names of the fish are given in Table 3. In view of my own experiences of hand-line fishing off rocky headlands in this area, I am quite satisfied that nearly all these fish were caught by angling off the edge of the rocky headland. The target species were probably snapper and groper, but all manner of other fish which come around the rocks and take similar baits were also caught. The majority of the catches were those 'trash fish' which are the bane of the modern rock fisherman: kelp-fish and wrasse. Both are edible.

It is not clear whether the fish spear was used. Certainly the spear would have been a useful method of getting really large hooked fish out of the water: some of the snapper, groper and Port Jackson sharks weighed over 10 kg. Two species shown in Table 2 (leather-jacket and mullet) are much easier to spear than to hook. However, it is possible to 'jag' such fish with a hook. Around Easter, when the mullet shoals move close inshore at Birubi, modern-day fishermen use the jagging technique very successfully.

It is worth noting that I have often seen fish (some of 1 kg weight) stranded in rock pools on Birubi headland, especially after high tide in rough weather. Some of the fish caught by the Aborigines may have been trapped in tide pools; it is not necessary to postulate special fishing techniques (e.g. nets and fish traps) to explain the presence in the midden of bones from fish of about 50 gm weight which could not have taken any of the hooks we discovered.

The presence of Tetrodonts ('toadoes') in the midden calls for comment. These fish contain a toxin and cannot be safely eaten unless the gonads and liver are carefully removed. It is unwise to eat them at all during the summer breeding season. It would seem that the Aborigines understood how to eat these fish. We have also identified Tetrodonts at Swansea, where they made up five of the 1011 minimum number of identified fish. Interestingly, the Aborigines have eschewed the common green reef eel, whose dentaries should be able to survive in a midden.

Our large numbers of fish identifications suggest statistical treatments to determine whether the Aborigines preferred specific marine habitats for their angling and the use of certain baits. One might also hope to determine the seasons of the year when the Birubi camp was occupied. We shall, hopefully, reach some conclusions about seasons at a later date; for instance, the Port Jackson shark is reported to come inshore only in late winter and early spring. The other matters, however, are much more problematical and are taken up in a later section of this paper.

Shellfish

These are strongly represented (minimum number 6677). The species distribution varies randomly from spit to spit, and there is considerable variation (e.g. pipi from 20-53%). The averages for the whole square are 42% pipi, 16% limpets, 21% nerites, and 21% other reef types (cartrut, chiton, turban, triton, mussel, etc.). Thus, the Aborigines exploited both of the available habitats, the pipi coming from the swash zones of the beaches and the others from the rocky headland. I do not know whether some of the shellfish were used as fish bait.

Other marine life

Sea-urchin spines (usually burned) and test fragments, and crustacea claws occur throughout the midden. There is no whalebone in square A-2 but appreciable amounts of it had been exposed nearby by wind action on the face of the midden.

Birds, mammals and reptiles

While the midden obviously represents a marine-based food economy, the level of terrestrial fauna is not negligible. Mammalian remains have not yet had expert appraisal but I estimate there to be at least 15 mammals represented; they range in size from bandicoots and other small marsupials to dogs and macropods. I have also identified seven lizards and at least 12 birds, most of them the short-tailed shearwater, *Puffinus tenuirostris*. The shearwater nests on small islands offshore from nearby Port Stephens, and no doubt the Aborigines caught exhausted birds during stormy weather.

FURTHER WORK AT BIRUBI

We are hoping to retrieve a lot more information from further studies of our excavated material. Already we note that the shell fish-hook technology so abundantly represented in trench A/B is absent from trench D. The base date for trench D (1895 ± 70 BP, *Plebidonax deltoides* shell, SUA-1161) is significantly older than the base date for square A-2 of trench A/B. The arrival of the shell-hook technology should be pinpointed by a surface date from trench D. The Birubi evidence is consistent with that from Swansea, where there are no shell-hooks in the midden, whose surface date is 1965 ± 85 BP (SUA-238, charcoal).

There are many aspects of the fishing technology which require further study. One obvious experiment to try is some fishing with shell hooks to see how they stand up to the strain of a big fish. More work should also be done with the archaeological material: it may prove possible to identify the sinkers used, and the preferred baits.

IDENTIFICATION OF FISH SPECIES

I have made the identifications referred to in this paper on a purely empirical basis, using direct comparison of the midden bone with the skeletons of fish caught locally. The method depends for its reliability on having an adequate reference collection. Mine consists of 53 species (plus various stages of growth of many of them) and most of the specimens were caught by a method the Aborigines must have used, namely, with a hand-line off headland rocks and in estuarine waters. If one believes that reasonably complete dentaries and otoliths of fish should always be identifiable, then my collection is better than 99% effective when applied to midden bone at Swansea, Birubi and Dark Point.

There are certain other parts of some fish skeletons which can be positively identified, for example the cranial bones of snapper, the dorsal spine of the leather-jacket, the canines of the blue groper. In addition there are various other identifications of a less certain nature which can be attempted. The fish bone at Birubi was both well preserved and plentiful, and it turned out that there was no point in making these less certain identifications as I was simply counting the same fish over and over again. The fish numbers given in this paper are the minimum which would account for the range of species and sizes.

The gathering of a large collection of fish species by handling was not only useful in terms of building up a good reference collection, it also gave me invaluable experience of fishing. I learned, for instance, that most of the fish one catches off the rocks do not appear in books about fishing; apparently the true sportsman is supposed to ignore the very existence of 'trash fish'. Above all, one should avoid following the books and dividing a list of identified fish from a midden into 'rock platform species', 'estuarine type', 'probably caught with a net', and so on. The fishing books tell one the *best* way to catch a certain species; in practice, fish are sometimes caught in other ways and at other habitats. I find it better to form a general impression of how the fish assemblage was caught and then ask if the minor species *might* have been caught that way.

SELECTIVE LOSS OF FISH BONE

The real difficulty about interpreting midden fish bone in terms of fishing methods is that there have been losses of fish bone through decay processes in the midden. These losses may have been selective; it is quite possible that some fish species disappear from the midden record altogether.

Some informative numbers on selective decay are gathered together in Table 4. The Birubi data indicate that the otoliths of bream have a poor survival rate compared with those of snapper, even though the two species are closely related and the otoliths are of comparable size. This fish bone is all fairly recent, the base date of the midden being 940 ± 90 BP (*Plebidonax deltoides* shell sample). At Swansea, the midden is much older, ranging from a surface date of 1965 ± 85 BP (SUA-238, charcoal) to a base date of 7870 ± 115 BP (SUA-150, charcoal). No bream otoliths survived at Swansea, and only three snapper otoliths were identified.

The data in Table 4 also indicate that whiting otoliths survive better than the dentaries. However, at Swansea all these whiting otoliths were in the most recent parts of the midden. It seems more probable that the otoliths have decayed completely in the older midden than that Aborigines in those older times did not catch whiting.

Table 4 also points up the enhanced probability of species with

Site	Species	Identified bone	Number of identifications
Birubi	Black bream	Upper dentaries	26
		Otoliths	2
	Snapper	Upper dentaries	82
		Otoliths	99
Swansea	Black bream	Upper dentaries	243
		Otoliths	0
	Tarwhine	Upper dentaries	19
		Otoliths	1
		Molars	262
	Snapper	Upper dentaries	20
		Otoliths	3
		Frontals	49
	Whiting	Upper dentaries	2
		Otoliths	43

Table 4. Selective loss of identifiable fish bone

durable skeletal components to get identified. Thus, tarwhine (whose four large flat molars are distinctive) and snapper (with their massive frontal bones) have a distinct advantage over species with flimsier bones. The tailor is a readily hooked fish on these shores but is not often identified in middens, probably because it has fragile dentaries and no detectable otoliths.

I strongly suspect that mullet skeletons have a very poor survival rate. Large mullet shoals frequently pass through Swansea Channel and must have been spotted by the Aborigines from their camp 10 m above the beach. The channel is only 700 m wide at that point. The Aborigines exploited a wide range of marine and terrestrial fauna but only three of the 1011 identified fish are mullet. I simply cannot believe that the Aborigines could occupy that camp during 6000 years without devising some way to exploit the mullet shoals.

If excavated midden fish bone poses its problems, then fish bone which has spilled out of eroding middens poses more difficult ones. Not only must we worry about selective decay in the midden, but also about selective fretting away of the exposed bone on the sandhill slope below the midden. I looked at this problem at the Dark Point midden, using total collections of fish bone over the same area on four separate visits. The ratios of snapper to bream identifications were successively 2:1, 1:1, 1:4 and 1:4. The variability is simply due to the durability of the massive skull bones of snapper, one does not approach the species distribution in newly eroded bone until the accumulation of old snapper bone has been cleared away. There is a lesson to be drawn here; one should not draw detailed conclusions about fish species distributions from a single visit to a deflating midden.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the help given by Sue and Boris Sokoloff in directing the Birubi excavations, and the financial assistance given by the Board of Environmental Studies of the University of Newcastle. Dr John Paxton of the Australian Museum has been most helpful with advice on fish identifications.

The Swansea excavation was co-directed by Mrs Frances Bentley.

BIBLIOGRAPHY

Gillespie, R. and H.A. Polach 1979 The suitability of marine shells for radiocarbon dating of Australian prehistory. *In* R. Berger and H. Suess (eds) *Radiocarbon dating: Proceedings of the 9th international conference on radiocarbon dating*, pp.404-421. University of California Press: Los Angeles and La Jolla

Hall, L.D. 1928 Some Aboriginal flakes from Morna Point, New South Wales. *Records of the Australian Museum* 16:254-279

Lampert, R.J. and G.E. Turnbull 1970 The manufacture of shell fish hooks on the south coast of New South Wales. *Mankind* 7:312-313

Wooley, P.H. 1966 Notes on an Aboriginal fishing site at Lake Wollumboola. *Mankind* 6:318-319