Burrill Lake and Currarong

R.J. Lampert

TERRA AUSTRALIS

1

Department of Prehistory
Research School of Pacific Studies
The Australian National University
Terra Australis reports the results of archaeological research, in the main of staff and students of the Department of Prehistory, Research School of Pacific Studies, The Australian National University.

Its region is the lands south and east of Asia, though mainly Australia, New Guinea and Island Melanesia, that were terra australis incognita to generations of European geographers before Cook and are largely so to prehistorians today.

Its subject is the settlement of the diverse environments in this isolated quarter of the globe by peoples who have maintained their discrete and traditional ways of life into the recent recorded or remembered past and at times into the observable present.

Attention is drawn to an error which occurred during production of this volume, whereby the odd numbered pages were printed on the left hand side, thus upsetting the planned integration of tables, illustrations and text. We ask the indulgence of our readers towards the complications expectable at a new birth.
Terra Australis

BURRILL LAKE AND CURRARONG
Coastal sites in southern New South Wales

R. J. Lampert

Department of Prehistory
Research School of Pacific Studies
The Australian National University
Canberra
1971
FOREWORD

The last twelve years have seen a rapid expansion of archaeological teaching and research in Australia and the initiation of both in Papua-New Guinea, two areas in which the Department of Prehistory of the Research School of Pacific Studies, The Australian National University, is deeply involved. To the list of new or reorganised publications which are catering for the results of this expanding effort, *Terra Australis* is the most recent addition. Its aim is to provide in a continuing series of monographs the basic data of some of the archaeological research being carried out in the region, with all that is necessary in the way of documentation and illustration. In the main the published research will be that done in the Department of Prehistory itself and involve the longer-term projects undertaken there. It will be particularly important as a means of making more quickly known the work of research scholars in the Department, whose unpublished dissertations represent the results of three to four years of basic research effort.

This first volume reports some results from a continuing programme of work on the south coast of New South Wales carried out, as his other duties permit, by Mr R.J. Lampert, Archaeological Field Officer in the Department. Beginning in a modest way in 1964, Lampert is now completing a survey of archaeological sites along a 100-mile stretch of coastline affected by industrial or residential development. In this work of reconnaissance and record, and in the excavations to which it has given rise, Lampert has been able increasingly to interest and associate students and public from Sydney and Canberra as well as people within the region of research itself. As a result, his activities are at the same time laying the basis for a great variety of smaller or more specific research projects and discovering the personnel to undertake them. With the parallel work of the University of Sydney to the north of Lampert's area, the New South Wales south coast is becoming one of the archaeologically best known regions in Australia. For the understanding of its Aboriginal occupation the archaeological data can be combined with the sparse ethnographic record and sparser ethnographic collections made by early European explorers and residents, and with the ecological knowledge that, as Lampert has recently discovered, persists with some members of the few Aboriginal settlements in the region after many generations of intensive Europeanisation. Together with these lines of evidence, the archaeological resources of the area as now made known afford the opportunity for a promising reconstruction of an ill known and unfamiliar aspect of traditional Australian Aboriginal life, the coastal adaptations of temperate zone hunter-gatherers.

Ronald Lampert was born in Devonshire, England, in 1927 and first came to Australia in 1950. He developed his archaeological interests on a return visit to England in 1961 and stayed on to work for two years as a field archaeologist with the Ancient Monuments branch of the British Ministry of Public Buildings and Works. He returned to Australia in 1963 and took up his present appointment in 1964. In this capacity he has made a number of archaeological reconnaissances in Australia and New Guinea and undertaken salvage work there and in the Pacific Islands. He has in addition developed a number of research projects of his own, of which the present publication is an example. It is fitting that as one of the earliest members of his Department, he should initiate its publication series.

Jack Golson
CONTENTS

FOREWORD v

I INTRODUCTION 1

II THE BURRILL LAKE SITE 5
Environment 5
Excavations 5
  Previous excavation 5
  Excavations in 1967-8 7
Site Stratigraphy and Depositional History 7
Palaeoecological Implications of the Lower Deposits 9
Burrill Lake Fauna 11
Volumetric Change through Time 13
The Stone Industry 13
Stone from Trenches A and B 14
  Waste material 14
  Distribution of stone 14
Analysis of Scrapers 16
  Definition 16
  Observations and measurements 16
  Change through time 20
  Typological analysis 23
  General considerations 26
  Specific types of scraper 27
Other Implements 28
  Pre-Bondaian 28
  Bondaian 28
Artifacts from Site M 30

III THE CURRARONG SITES 31
Environment 31
Excavation 32
Site Stratigraphy and Depositional History 34
  Shelter 1 34
  Shelters 2 and 3 34
The Stone Industry 38
  Distribution of stone 38
  Scrapers 38
  Backed blades 42
  Fabricators or scalar cores 43
  Use-polished artifacts 47
  Other utilised flakes 48
  Eloueras 48
  Other stone artifacts 49
Artifacts of Bone and Shell 50
  Bone points 50
  Other bone artifacts 54
  Fish hooks 55
  Artifacts of vegetable material 55
Human Burials in Shelter 1 56
Currarong Fauna 56
  General comments 59

IV GENERAL DISCUSSION AND CONCLUSIONS 62
Environment and Economy 62
  Economic specialisation 63
The Burrill-Currarong Sequence 64
  The phase I/II transition 65
  The phase II/III transition 67

V ACKNOWLEDGEMENTS 71
APPENDICES

1 Sediments in the Lake Embayment at the Burrill Lake Site  
   J.N. Jennings  73

2 Botanical Report  
   H.J. Hewson  76

3 Human Remains from Curraong  
   P.W. Thompson  77

BIBLIOGRAPHY  81

TABLES

1 Burrill Lake: radiocarbon dates  9
2 Burrill Lake: minimum numbers of fauna  12
3 Burrill Lake: distribution of implements  15
4 Burrill Lake: distribution of (a) waste stone  
   (b) implements  17
5 Burrill Lake: percentage distribution for  
   size and stone type of waste  17
6 Burrill Lake: percentage frequency distributions  
   of scraper characteristics according to levels  
   (a) characteristics 1-6  21
6 Burrill Lake: percentage frequency distributions  
   of scraper characteristics according to levels  
   (b) characteristics 7-10  22
7 Burrill Lake: correlation coefficients between  
   selected pairs of scraper characteristics  24
8 Burrill Lake: characteristics of scraper groups 1-8  25
9 Burrill Lake: differences between scraper groups 1-8  26
10 Burrill Lake: scraper groups expressed as percentages  28
11 Burrill Lake: distribution through depth of  
   numbers of scrapers in minor categories  28
12 Burrill Lake: characteristics of saws  29
13 Burrill Lake: backed blade dimensions  29
14 Curraong: radiocarbon dates  34
15 Curraong: distribution of implements  39
16 Curraong shelter 1: distribution of cores and  
   waste flakes  38
17 Curraong shelter 1: percentage frequency  
   distributions for scraper characteristics  40
18 Curraong: dimensions of backed blades  43
19 Curraong shelter 1: mean and standard deviation  
   values for bipolar artifacts  44
20 Curraong shelter 1: distribution of unmodified  
   flakes  45
21 Curraong shelter 1: distribution of bipolar  
   artifacts and non-scalar cores  45
22 Curraong shelters 2 and 3: distribution of  
   unmodified flakes  45
23 Curraong: mean and standard deviation values for  
   specific artifacts  49
24 Curraong shelter 1: characteristics of fish hook  
   files  50
25 Curraong: minimum numbers of fauna  57
26 Curraong: bone weights  58
TEXT FIGURES

1 Australia: places mentioned in text 2
2 Burrill Lake: locality map 3
3 Burrill Lake: plan of shelter 6
4 Burrill Lake: section 8
5 Burrill Lake: implements and key 18
6 Burrill Lake: scrapers, retouch length/thickness 24
7 Curraong: locality map 31
8 Curraong: plan of excavations 33
9 Curraong shelter 1: section 35
10 Curraong shelter 3: section 35
11 Curraong: stone implements and key 36
12 Curraong shelter 1: distribution for log weights of scrapers, thumbnail scrapers and core-scrapers 41
13 Curraong: distributions for breadth and length of backed blades 42
14 Curraong: bone points 57
15 Curraong: shell fish hooks and fish hook blanks 55
16 Curraong: changes in shell fish through time 60
17 Burrill Lake: stratigraphy of embayment 72
18 Curraong shelter 1: human burials 78

PLATES

1 (1) Upper left: edge of saw from Burrill Lake
(2) Upper right: use-polished flake from Curraong shelter 2
(3) Lower left: use-polished elouera from Burrill Lake
(4) Lower right: use-polished fabricator from Curraong shelter 3

2 (1) Upper left: edge of saw from Burrill Lake
(2) Upper right: use-polished flake from Curraong shelter 2
(3) Lower left: use-polished elouera from Burrill Lake
(4) Lower right: use-polished fabricator from Curraong shelter 3

3 (1) Lower left: flake with hafting gum from Curraong shelter 1
(2) Upper right: utilised wallaby bone from Curraong shelter 1
(3) Upper middle: cut macropod bone from Curraong shelter 2
(4) Upper left: lizard jaw with gum from Curraong shelter 1
(5) Lower right: wad of plant fibre from Curraong shelter 1
(6) Lower middle: knotted piece of string from Curraong shelter 1

ix
I INTRODUCTION

Work by the Department of Prehistory, ANU, on the south coast of New South Wales began in 1964 with a preliminary survey of archaeological sites reported to us by two local residents, Mr G.E. Turnbull of Milton and Mr P.H. Wooley of Nowra. With little previous work in the area the problems posed then were elementary. To some extent we were asking how the local prehistory matched what was then known for other parts of Australia, a more specific comparison being between a possible south coast cultural succession and the three phase Eastern Regional Sequence, proposed by McCarthy (1967) on the basis of evidence from the stratified sites, Lapstone Creek (McCarthy 1948) and Capertee (McCarthy 1964), both on the Dividing Range, and supported to some extent by a site at Curracurang (Megaw 1965, 1966, 1967, 1968a; Nippard and Megaw 1966; Bragan and Megaw 1969) on the coast just south of Sydney.

The coast between Durras North and Bass Point (fig. 1) was chosen for intensive research for several reasons. It is a logical extension of the area south of Sydney being investigated under the direction of Mr J.V.S. Megaw, University of Sydney. The preliminary survey located enough sites to warrant a long term programme. Because the area is within easy reach of Canberra, research can be pursued with the assistance of a voluntary labour force during weekends and university vacations. Perhaps the most important reason, however, is the threat to sites and their environment by rapid commercial development of the coastline.

A more general aim was to provide, through the excavation of sites, a basic knowledge of local prehistory, particularly the nature of economic exploitation of coastal and near-coastal environments. Such knowledge we saw as being more than an end in itself; it was expected to generate more sophisticated questions about Aboriginal man and his relationship to the NSW coastal environment which might in turn be answered by more precisely oriented future research involving the investigation of occupation sites obviously plentiful on the coast and potentially so in the archaeologically unexplored hinterland.

From Durras North, the first site excavated (Lampert 1966), the evidence was all less than 500 years old but had wide-ranging ecological implications. Illuminated by historical observations of the central south coast in the early years of contact, the excavated evidence provided a detailed picture of economic life at the Durras North site. Even allowing for the foreshore location of the site, its economy was surprisingly specialised to the use of the resources of the sea and its shore. This raised the question whether this was the whole economy of the Aboriginal occupants or whether the site was merely used to pursue a specialised aspect of a more broadly based economy.

Partly to elucidate this specific problem, partly to pursue further the general questions previously asked, sites were investigated at Burrill Lake and Currarong. Less prominently foreshore in location but from surface observation still containing within their deposits cultural materials of coastal origin, they seemed sites likely to evidence any terrestrial elements of an economy still obviously coastal in orientation.

At a seminar series in 1968 the interim results of excavations at Burrill and Currarong were presented within a context of the prehistory of southeastern Australia as revealed by both archaeological and historical sources (Lampert 1971). Based on a preliminary examination of the excavated material, my seminar paper claimed for both Burrill and Currarong a mixed economy exploiting the resources of land and shore, with technological as well as economic links with foreshore sites such as Durras North. This interpretation was preferred to several alternative hypotheses. Historical accounts suggested to me an economic dichotomy with the resources of land and sea shore exploited by different groups of people using methods highly specialised to either hunting or fishing. Though admittedly nearly all such evidence is from the better documented Sydney district over 100 miles (160 km) north of the research area, there are some obvious similarities between widespread sites which suggest cultural continuity along the coast connecting the two areas. Alternating seasonal use of shore and more inland resources by a group of people is not suggested by either the ethnographic observations of local Aboriginal life or the lack of marked seasonality in the mid-latitute marine climate, while there
is no local fauna whose archaeological presence can be unequivocally accepted as evidence for seasonal occupation. I also examined the possibility that the seemingly mixed economy evidenced by the Burrill and Currarong sites could result from their dual use by groups of people with polarised marine and non-marine economic interests, but I tentatively concluded this was not the case and saw the sites as the total representation of a diverse but essentially single economy, of which foreshore sites such as Durras North were a specialised component.

Another ecological question is raised by Mulvaney who suggests that sites on the NSW south coast will be useful to test his hypothesis of an 'Adaptive Phase', the most recent expression of Aboriginal life in southeastern Australia (Mulvaney 1969:91).

The above questions are considered when examining the evidence from the Burrill and Currarong sites. However, this is a report only on the second stage of a continuing piece of research and it is not therefore intended to be final. While more rock shelters with deep deposits will be excavated in the future, this is not the most urgent form of research. Such sites are by their nature reasonably well protected and the Burrill, Currarong and Durras rock shelters already provide a basic industrial sequence.
Current fieldwork concentrates on two different themes. The first is to glean the remnants of knowledge about traditional economy possessed by a few old Aboriginal informants, while the second is a systematic survey of sites in the research area. The survey not only locates sites suitable for excavation but records the maximum of information about the nature of the archaeological deposit, as indicated by surface evidence, as well as the site's ecological setting. Where many of the more vulnerable surface sites are concerned, particularly those whose immediate excavation is not justified, this information may be the only record. However, the more general aim of the survey is, through detailed plotting of the characteristics of both sites and their local environments, to show the pattern of Aboriginal man's use of the coastal landscape. The results of the above research will be reported in due course.
Plate 1

Upper: Burrill Lake shelter with transverse trench marked out for excavation; white pegs 1 m apart
Lower: Currarong shelter 1 during excavation of trench 1
II THE BURRILL LAKE SITE

ENVIRONMENT (fig.2)

Burrill Lake is a coastal lagoon (Bird 1964), usually open to the sea through a narrow channel which at intervals is blocked by a sand bar forming part of the ocean beach. Therefore the lake is ecologically estuarine, with a salt-water tidal zone near its entrance (cf. Bird 1964:116).

The main site is a rock shelter (35° 23'36" S.Lat., 150° 27'12" E.Long.) beneath an overhanging ledge in the horizontally bedded Nowra Sandstone (Geol.Map:SL56-13). Facing east, it is situated at the head of a short, densely wooded gully whose outlet is an embayment in the southern shore of Burrill Lake some 200 yd (180 m) from the site and within the salt-water tidal zone of the lake.

A small semi-permanent stream cascades over the southern end of the rock ledge and flows through the gully to the lake. This stream is fed by runoff from a piece of elevated, gently sloping land about two square miles in area and slightly higher than 100 ft (30 m) asl at its highest point. The top of the rock ledge, under which the shelter is situated, is just below the 50 ft (15 m) contour, at which point several axe grinding grooves are incised into the sandstone bed of the stream. Within the shelter, the floor formed by the top of the occupation deposits is 10-12 ft (3-3.5 m) asl.

Predominant forms of vegetation growing near the shelter were identified by Dr H.J. Hewson, Department of Botany, ANU, whose report follows as Appendix 2. Hewson considers that the vegetation is much disturbed by European activity. This opinion receives support from a photograph taken in 1931, held in the Australian Museum, which shows the now wooded gully below the shelter as almost devoid of trees. Within the shelter the presence of liverwort and fern prothalli on the shelter floor suggests to Hewson fairly continual dampness, a condition that is consistent with my observations made on regular visits during the past four years.

Although the shelter appears unattractively damp, it has other qualities making it desirable for occupation. Some 140 ft (43 m) long, nearly 40 ft (12 m) wide and with about 10 ft (3 m) ceiling height above most of the present floor level, it is the largest shelter known on the south coast of NSW. Enclosed within a narrow valley, it is in a position sheltered from both onshore and prevailing southerly weather. Close at hand are fresh water and the varied resources of woodland, estuary and sea shore.

Another site investigated is site M (fig. 2), an open midden 750 yd (700 m) from the Burrill shelter. It is on a low sand spit, well stabilised by vegetation and flanking the inlet between Burrill Lake and the sea.

EXCAVATIONS

Previous Excavation

The Burrill Lake rock shelter had previously been excavated in 1931 by members of the Anthropological Society of New South Wales. Three brief reports (Thorpe 1931, 1932a, 1932b) describe respectively the excavation, excavated artifacts and faunal remains.

By today's standards the work was poorly executed. In 15 days, by a party averaging six in number, 'upwards of thirty tons of material were removed, sieved through a half inch screen' (Thorpe 1931:54). Excavation was confined to the upper deposit, described as midden having a depth ranging between 18 and 38 in. (0.5 to 1 m). Some time before the 1931 excavation, a quantity of the top deposit had been removed by the landowner for garden soil. Though the excavators were aware that below the midden lay some 3 ft (1 m) of sand they apparently assumed this lower material was sterile.

 Implements unearthed in 1931 include eloueras and large scrapers of which several are described as 'tasmanoids'. The excavated stone was re-examined some years later by McCarthy who, from the presence of eloueras without smaller backed blades (bondi points and geometric microliths), saw the site as exemplifying the Eloueran phase (McCarthy 1943:151, 1948:30) of his Eastern Regional Sequence (McCarthy 1967:91). Apart from Burrill, only the upper
Fig. 3 Burrill Lake: plan of shelter
level at Lapstone Creek (McCarthy 1948) was reputed to have a 'pure'
Elouera assemblage; elsewhere in eastern NSW, eloueras are associated
with the smaller backed blades (bondi points and geometric microliths),
typical of McCarthy's Bondalan phase.

In 1967 I decided to re-excavate the site for the following reasons:
1. I suspected that the apparent absence of backed blades might result
   from using a sieve with mesh too large.
2. The deep sand below the midden should be more thoroughly tested
   for evidence of occupation.
3. From the midden better faunal samples should be obtained to establish
   the economic character of the site.

Excavations in 1967-8

The area excavated is divisible into four parts, each investigated with
a separate aim (fig. 3). In 1967 a 1 m wide transverse trench (A), extending
from the back wall of the shelter to just outside the drip line, was cut
to examine the distribution of cultural remains both vertically and from
front to back of the shelter. An extension of A is test pit A', cut to seek
cultural material outside the shelter but abandoned at a depth of 0.5 m when
massive fallen rock prevented deeper excavation. Trench B covered the area
of shell midden undisturbed by the 1931 excavation to obtain the largest
possible samples of material from layers I and II, below which excavation
continued for a further 20 cm only. To test the deposit towards the
northern end of the shelter a narrow test trench (C) was cut to the bottom of
the disturbed material and extended northward until bedrock was found just
below the surface, at which point it was abandoned. Guided by the
distribution of stone artifacts in the transverse trench, an area (D) was
opened up in 1968 in a position that best promised a large sample of
implements, particularly from the lower levels (IV and V).

Each trench was divided horizontally into 1 m squares which were
excavated in spits (excavation units) of thicknesses varying from 5-15 cm
(2-6 in.) according to particular stratigraphic requirements. In table 3
and fig. 4 spits are grouped into what I term 'depth units', which are units
large enough to contain valid numbers of artifacts for comparison, yet
sufficiently fine to show possible depth changes within stratigraphic levels.

At site M two test cuttings totalling 3 m² in area exposed a layer of
shell midden less than 5 cm in thickness and some 15 cm below present ground
surface.

The deposits of both sites were sieved through a 3/16 in. (5 mm) mesh.

SITE STRATIGRAPHY AND DEPOSITIONAL HISTORY
(fig. 4)

Stratigraphically the deposit has four main components. Within one of
these there is a major cultural division between an early scraper/core-tool
stone industry and a later Bondalan industry characterised by bondi points
and other small tools. With one stratigraphic unit subdivided at this point
of obvious cultural change, there are five main, temporally ordered,
depositional components or 'levels' between which the archaeological evidence
may be more closely compared. These are described in order of deposition.

Level V is a basal layer of coarse yellow sand containing a clay fraction
throughout and clay lumps towards the top where it merges with overlying clay
of level IV. On bedrock at the bottom of V are many naturally fractured
small pebbles which apparently originate from weathering of the shelter roof,
since in the sandstone forming the shelter similar pebbles can be seen both
in conglomerate bands and more intermittently scattered. Their concentration
at the bottom of V suggests that the finer elements of cavernous weathering
earlier than level V sand had been washed from the shelter before its mouth
was effectively sealed (Jennings Appendix I).

Charcoal is rare in V. The dated sample (ANU-137) was taken from a
volume of sand 3 x 1 x 0.2 m, the basal excavation unit in three adjacent
1 m squares.
Burrill Lake

Trench A: section of south face

**KEY**

1. Shell midden
2. Disturbed in 1931
3. Orange-brown fine sand
4. Bright yellow-brown fine sand
5. Dark, charcoal rich, brown sand
6. Pale buff sandy clay
7. Slightly mottled sandy clay
8. Pale buff clay, sandier than 6
9. Chocolate-brown sandy clay with yellow blotches and charcoal throughout
10. Same as 9 except for being less blotched
11. Rich chocolate-brown sandy clay with charcoal throughout, less blotched than 9
12. Brown clayey sand
13. Coarse yellow sand with slight clay fraction
14. Lens of dull red sand
15. Lens of brown sand
16. Brown clayey sand

Fig. 4 Burrill Lake: section
Level IV is a wedge of sandy clay, thickest at the shelter mouth where it extends downward to bedrock, thinning inside the shelter where it overlies the basal sand V, and petering out before the back wall is reached. Towards the mouth there is an increase in the coarser fraction.

The top 12-18 cm of IV, a pale buff coloured sandy clay, is apparently a zone of weathering signifying a sudden slowing down in rate of deposition after the formation of IV. This is consistent with the distribution of carbon dates.

Below the zone of weathering, level IV sandy clay is chocolate-brown in colour with yellow blotches. Around the greatest depth of deposit towards the shelter mouth, the colour of the sandy clay deepens to a rich chocolate-brown with fewer blotches, possibly as a result of enrichment by iron oxide leached from the weathered upper horizon.

Throughout IV pieces of charred wood up to 5 cm across are thickly scattered in a haphazard manner.

Level III consists of orange-brown fine sand, mostly medium in tone but darkening upward through the level. Towards the shelter mouth the sand is slightly yellow.

Level II containing culturally significant backed blades, is the upward continuation of the brown sand seen in III. Though darker in tone, it is divided from III for cultural rather than stratigraphic reasons.

Level I contains within its dark sandy matrix the only non-fossilised faunal remains found in the shelter. Because shell fish remains predominate, the level is termed 'shell midden'. Only a small portion of this level was found undisturbed in 1967-8: the 10 m² where the 1931 excavation team had a fireplace.

<table>
<thead>
<tr>
<th>Depth cm</th>
<th>Depth Unit</th>
<th>Level</th>
<th>ANU no.</th>
<th>C14 Age in Years BP</th>
<th>Cultural/Stratigraphic Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>2</td>
<td>II</td>
<td>139</td>
<td>1660 ± 70</td>
<td>Bondaian; immediately below earliest preserved shell and bone</td>
</tr>
<tr>
<td>56</td>
<td>3</td>
<td>II</td>
<td>335</td>
<td>5320 ± 150</td>
<td>Bondaian; earliest backed blades at site</td>
</tr>
<tr>
<td>80</td>
<td>4</td>
<td>III</td>
<td>336</td>
<td>12450 ± 160</td>
<td>Pre-Bondaian; later than clay wedge (IV)</td>
</tr>
<tr>
<td>120</td>
<td>7</td>
<td>IV</td>
<td>138</td>
<td>20830 ± 810</td>
<td>Pre-Bondaian; upper part of clay wedge</td>
</tr>
<tr>
<td>140</td>
<td>13</td>
<td>V</td>
<td>137</td>
<td>20760 ± 800</td>
<td>Pre-Bondaian; basal sand below clay wedge (IV)</td>
</tr>
</tbody>
</table>

Table 1 Burrill Lake: radiocarbon dates

PALAEOECOLOGICAL IMPLICATIONS OF THE LOWER DEPOSITS

Levels IV and V were formed around 20,000 years ago, the time of the last glacial maximum when the sea level was some 400 ft (125 m) lower than at present (Bird 1968:44). Assuming no tectonic movement since then, the nearest shore was 8-10 miles (13-16 km) further away (R.A.N. hydrographic chart - AUS-22) and consequently estuarine conditions would also have been more distant from the site than at present. Soundings shown on the chart give no indication of a submerged valley off the present shore, so it is presumed that no major tidal inlet existed earlier.

A discovery in level IV that is therefore unexpected was a cast, in the sandy clay, of a marine shell similar to *Anadara trapezia*, an estuarine species found today in the nearby lake and predominant among shell fish remains in level I. The cast has been examined at the Australian Museum by the Curator of Molluscs, Dr W. Ponder, who feels that with the limited morphological
evidence provided the shell can be confidently determined only at the
generic level, *Anadara* sp. However, *A. trapezia* is the only member of
the genus at present living on the southeast Australian coast. Because
(a) it is a single specimen of a genus whose use as an artifact is known
for recent times on the NSW coast both ethnographically (Péron 1807-16:
pl. XXI, 2a) and archaeologically (Lampert 1966:94) and (b) marine shell
artifacts have been carried inland for greater distances (Mulvaney 1969:
95-6), the Burrill specimen could have been brought to the site as an
artifact rather than for food. Whatever its purpose, the presence of
this shell in the site suggests that early occupants had an economic link
with the estuarine environment even though this was a few miles away.

Bracketed by two age determinations each around 20,000 BP, level IV
has obviously accumulated rapidly relative to other deposition at the site.
This seems supported by the uniformity in texture of the sandy clay from
top to bottom of the level, with charred wood evenly scattered throughout.
The colour changes through depth seem to have post-depositional causes.

As the presence of the clay demanded explanation, relevant
glaciomorphological aspects of the site and its environment were examined by
Mr J.N. Jennings whose report follows as Appendix 1. Briefly, the clay
is seen by Jennings as fluvial in origin, being carried in by water
running off slopes somewhere above the shelter. The rapidity of
deposition does not readily elicit a long-term climatic explanation, such
as possible increased slope runoff caused by more effective precipitation
during the last glaciation.

Climatically induced deposition on the NSW south coast in the Quaternary
is discussed by Walker (1962a, b) from the evidence of soil layering near
Nowra, 37 miles (60 km) north of Burrill. Successive soil layers there and
elsewhere in southeast Australia, known as the K cycle, are seen as
erosional - depositional responses to periods of slope instability induced by
climatic change. Particular to this discussion is the unstable phase of the
K3 cycle represented in the Nowra soils by a period of deposition beginning
about 29,000 BP (Walker 1962:183), roughly the onset of colder climatic
conditions (Costin 1971). Evidence from elsewhere in southeast Australia
suggests that this period of instability was perhaps largely over by 20,000
BP the time of rapid clay deposition in the Burrill shelter, but may have
continued until 15,000 BP (Costin 1971). Though the termination of K3 soil
deposition as seen locally at Nowra is poorly and then only indirectly dated,
the evidence on hand does not readily lend support to a theory of rapid clay
deposition suddenly occurring as late as 20,000 BP. More attractive is
Jenning's view (Appendix 1) that the clay in the shelter was deposited in
response to short-term local, rather than long-term climatic factors.

A possible explanation in local terms is that on the slopes above the
shelter fire destroyed the vegetation with resulting destabilisation and
erosion of the slope surface. Some of the material removed by slope runoff
- soil and charred wood - was subsequently redeposited behind the barrier of
fallen rock at the shelter mouth. The abundance of charred wood throughout
the level IV sandy clay makes this an attractive hypothesis.

If identified, vegetation growing locally at 20,000 BP could provide
evidence for climatic conditions at that time. Samples of charred wood from
level IV were independently examined by Mr H.D. Ingle, Division of Forest
Products, CSIRO, and Mr R.K. Bamber, Division of Wood Technology, Forestry
Commission of NSW, who both found the specimens too structurally degraded to
give the close identification required for palaeoclimatic interpretations.
Some of the samples, however, have been determined at the family level,
Myrtaceae. A sample of the level IV clay was investigated for its possible
pollen content under the supervision of Professor D. Walker, Department of
Biogeography and Geomorphology, ANU, but insufficient pollen was present for
analysis.

The formation of level IV ceased when it reached the top of the rock
barrier at the shelter mouth (fig. 17). The sand which is the natural
component of later deposition (III-I) accumulated slowly and probably
originated from cavernous weathering of the cave roof (Jennings Appendix 1; cf. Lampert 1966:90 and Twidale 1964). Mechanical analysis shows no
significant difference between this material and the slightly coarser
basal sand (V).
Faunal remains were found only in level I, that is the top 25 cm of deposit, which in appearance is typically shell midden as found elsewhere along the coast. All fauna represented at Burrill is more recent than 1660 ± 70 BP, the carbon date from immediately below the deepest preserved bone and shell. During excavation of the small remnant of undisturbed shell midden, bone seemed rare, so to increase the sample the surrounding disturbed midden - the spoil of the 1931 excavation - was resieved. Because this disturbed material was a mixture of shell midden (I) and the upper part of the underlying dark soil (II), no accurate estimate could be made of the volume of original shell midden thus resieved. However, it is thought to be 2-3 m³, which, added to the excavated volume of undisturbed shell midden, gives a figure of 4-5 m³ for total deposit samples for vertebrate fauna. From the minimum numbers represented the density of this fauna is low in terms of deposit volume.

**Mammals**  The suite of mammals in the Burrill shelter is as expected in a forested area with mature trees for *Petaurus australis* and *P. breviceps* (gliders) and well developed undergrowth which is damp in places for *Potorous tridactylus* (potoroo), *Rattus lutreolus* (eastern swamp rat) and *R. fuscipes assimilis* (bush rat). This interpretation, made by Mr J.H. Calaby, Division of Wildlife, CSIRO, Canberra, solely on the evidence of the mammalian species present, exactly describes elements of the environment immediate to the site. Although the number of animals is low, the list of species is long enough to qualify as a fairly representative sample of the expected local mammalian population, thus suggesting non-selective exploitation of species in the shelter's immediate surroundings. Besides being few in number, most of the mammals are small and they could not therefore have contributed very substantially to the total food supply. Unlike Durras North and Currarong there are no sea mammals.

**Birds**  Very few birds are represented. Although sea birds seem proportionately well represented they are, compared with Durras North and Currarong, much fewer both in numbers and in species. Noticeably rare too are the implements made of bird bone which are found in quantity at the other sites.

**Fish**  The paucity of bone points of fish spears and, apart from one fish hook file, the absence of implements used in line fishing accord with the low number of fish. About half of these, belonging to estuarine species, were almost certainly caught in the nearby intermittently tidal lake. At the Currarong sites, which are not much nearer the sea, fish of estuarine species account for only about a quarter of total fish numbers. It might seem that these differing proportions are more environmental than cultural in origin, merely reflecting the more extensive estuarine waters adjacent to the Burrill site. Despite this, however, fishing as a whole seems to have been less popular than at Currarong.

**Shell Fish**  Samples of shell fish remains were taken and analysed in the manner described later for Currarong. At Burrill, even in the remnant of shell midden not disturbed in 1931, the maximum depth of shell was only 25 cm, possibly because much of the upper deposit had been removed before that date. Nevertheless this remnant was sampled in three spots as widely separated as possible. At the extreme northern end of trench C the disturbed midden was sampled. In all, 13 samples were collected.

By weight, the proportion of deposit made up of shell retained by the 1/8 in. (3 mm) mesh sieve used varies from about 40% at the top to approximately 15% at the bottom of level I, 27% being a mean value for the 13 samples. Because poor preservation is thought to be the reason for the comparative scarcity of shell in the bottom sample, 40% is more likely to be a correct figure. At Durras the range is 13-37% with a mean of 22%, while five samples from the top level at Currarong shelter 1 have a range of 39-63% with a mean of 44%. Thus, compared with two other coastal rock shelters, shell fish are well represented at the Burrill shelter.
Species proportions throughout the 13 samples do not appreciably alter. The estuarine *Anadara trapezia* (Sydney cockle) predominates with 80 ± 7% of the total shells. This species combined with *Pyrazus ebininus* (Hercules club whelk), the only other estuarine shell, gives a total of 86 ± 7% of shells whose habitat was obviously the near-by lake shore. The remaining 14% of shells are species which normally frequent a rocky shore. They were probably gathered from the intertidal rock platform fringing Burrill Headland, 1 mile (1.6 km) from the shelter. They are much the same types as those taken from the Currarong headland (group 3a), discussed later.

Though nearer the sea than the shelter, the open shell midden (site M) evidences shell fish gathering almost entirely restricted to the lake shore, with *A. trapezia* and *P. ebininus* together accounting for about 99% of shell fish.

The faunal remains indicate a mixed economy with woodland, lake shore and sea shore all being exploited. However, there is a heavy emphasis on the fauna in the shelter's immediate vicinity: the lake side and woodland, rather than the sea shore. From the extant remains, only estuarine shell fish appear as a major source of protein food, mammals, birds and fish being either too small or too few to have been a substantial component.
A noticeable variation in the deposit is the decrease in organic matter with increasing age. Level I is rich in shell, bone and charcoal, levels II-IV contain charcoal only, while level V is clean sand with a few small charcoal flecks. The site was certainly occupied during its earlier depositional history and it seems certain that accompanying such occupation would be an accumulation of discarded food remains and other organic debris on the shelter floor as in the most recent level. The most likely explanation is that organic materials were present in the lower occupation levels but have failed to survive. If this is so, the lower levels will have decreased in volume according to the amount of organic material lost. They will ultimately be represented only by their imperishable components: stone artifacts and naturally deposited sand. Therefore the possibility of volumetric change should be considered if vertical variation in implement or waste flake densities are to be interpreted to suggest temporal change in either the intensity or type of human activity.

To assess the possible amount of volumetric change a sample of level I was treated to remove its rich organic content: shell with HCl, charcoal by combustion in a laboratory furnace. The residue was a pale orange-brown sand only 26% by weight of the original sample. For comparison a sample from level V, a sand similar in appearance to the residue from I, was identically treated but remained unchanged both in weight and appearance. Because charcoal is less dense than either shell or sand (which are roughly equal) the volumetric change must be slightly greater than the change in weight, but how much greater cannot be exactly calculated from a laboratory sample because the amount of compaction underground is not known.

If we now apply to level V the rough estimate for decrease in volume likely to occur in level I, we arrive at the conclusion that the level V sand once formed the naturally deposited component of an organically rich occupation level approximately four times as great in volume. This assumes that deposition by both natural and human agencies in I was the same in character as that in V. To test for variation in natural deposition, sand fractions from levels I, III and V were compared by mechanical analysis. There is no significant difference. Hence we can assume that, apart from the level IV clay, natural deposition did not radically alter in character throughout the site's history. However, in the case of cultural accumulation in V, with no direct evidence to show the type of economic exploitation then practised, neither the character of the vanished organic component nor its bulk can be assessed. The useful information from these tests is that deposits do vary volumetrically according to the preservation of organic material, perhaps by a ratio as large as three to one. Therefore it would be erroneous to suggest that changes in artifact density per unit of deposit, either between sites or between site levels, necessarily mean changes in intensity of occupation, unless the organic contents of the deposits are also considered.

The rates and causes of the decay of organic material are being investigated at this and other sites by Mr W.R. Ambrose, Department of Prehistory, ANU.

THE STONE INDUSTRY

A preliminary examination of the stone showed an industrial sequence having two major components. In the first, apart from a few finely dentated saws, all secondarily worked implements are simple scrapers. This industry was present in the earliest deposit (ca. 20,000 BP) and persisted until just before 5000 BP, when a range of small tools appeared, notable among which is the characteristic bondi point which gives the name Bondaian to the incoming industry.

The earlier industry cannot readily be defined, although the later is distinctive. However, definition of the lower industry is essential if the scrapers are to be compared with those in the Bondaian, or if relationships between Burrill and other early sites are to be examined.

To this end the detailed examination of the Burrill assemblage which follows stresses the analysis of scrapers. First, change through time is looked for by comparing scraper characteristics between levels. Then groups of shared characteristics which might denote types are sought. Because the second step involves division of the material,
scrapers from all levels are dealt with together to provide an adequate sample. The integration of these two sets of results is then attempted by plotting the distribution of scraper groups through the levels.

In the following examination, implements from the total 1967-8 excavation are considered (table 3), but waste stone, and hence implement/waste ratios, from trenches A and B only.

**STONE FROM TRENCHES A AND B**

This sample of the stone industry comprises 6509 pieces, but not all are from contexts reliable enough for analysis aimed at revealing possible technological change through time. Not included in the analysis are 14 implements from parts of the deposit disturbed in 1931, and 17 implements and 141 waste flakes from squares D and F at the very back of the shelter where the deposit is shallow and stratigraphically undifferentiated.

From the rest of the deposit, where levels are clearly defined, came the 6337 pieces of stone on which the analysis is based. These include 221 implements of which 134 are secondarily worked and 87 are unretouched but show some form of use wear. The remaining 6116, with neither retouch nor use wear, are termed waste material.

Raw materials favoured were milky quartz, rhyolite, rhyolite-porphyry, quartz-felspar-porphyry and fine grain quartzite. These were identified by Dr D.F. Branagan, University of Sydney. Their source is the local quartz sandstone where they appear as pebbles in conglomerate bands, an outcrop being visible on the ground surface of the rock overhang forming the shelter roof. Sparsely distributed pebbles are exposed in the ceiling and walls of the shelter.

Probably the most that analysis of rock types can reveal at Burrill is any change in preference for local stone. To test this, rocks were grouped into categories based on rock structure since this affects flaking characteristics, the most obvious criterion for preference. The categories are: (a) quartz; (b) medium grain rock, subjectively distinguished from (c) fine grain rock; (d) porphyry.

**Waste Material**

This includes flakes, cores and miscellaneous pieces of stone. Where the raw material is quartz, which does not show flaking characteristics well, there are cases where small pieces called 'waste' may really be chips from quartz pebbles naturally fractured as a result of roof fall, since such pebbles are embedded in the sandstone roof. This is particularly so at the very bottom of the deposit towards the back of the shelter (level V) where fallen stone also was concentrated. Included in this were quartz pebbles, many of which appear naturally broken. Although recognisable, naturally fractured stone was culled out in two sortings, the quartz fraction - and hence the whole - of the smaller waste in level V is probably still an overestimate, in the light of the extremely high waste per implement ratio for this level.

**Distribution of Stone (table 4)**

Two things are significant.

1. There is a sharp, consistent decrease in the amount of stone towards the front of the shelter, while in level III there is a gradual decrease towards the back. Thus the occupants favoured a sheltered position at least 2 m inside the drip line for stone working. The back of the shelter was unpopular probably because of the low ceiling and poor light.

   Not shown in table 4, as previously mentioned, are stone counts for the back of the shelter: 141 waste flakes (104 per m³) and 17 implements (12.5 per m³) making 8.3 waste flakes per implement. The lack of uniform trend for waste stone in level V may be due to the suspected inclusions of naturally fractured quartz.

2. In terms of deposit volume the maximum vertical concentration of stone is in level II. Downward from II there is a steady decrease until V where the apparent increase in waste may at least partly result from the overestimate of small quartz.
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C14 age determination (BP)  
1660 ± 70  12450 ± 160  5320 ± 150  20760 ± 800  20830 ± 810

Table 3  Burrill Lake: distribution of implements
If we assume as valid the hypothesis that the destruction of organic matter in the lower levels has caused volumetric shrinkage with time, the downward decrease in density of stone must be sharper than the figures suggest. The vertical distribution of both stone implements and waste suggests a trend towards more intensive use of the site.

Table 5 shows the distribution of waste stone according to size and type. Squared paper was used to measure the area of the flakes (see White, J.P. 1967:53). Rock types are (a) quartz, (b) medium grain rock, (c) fine grain rock and (d) porphyry. Noteworthy are the high proportion of small stone in level II and the low proportion of small stone in IV. These coincide respectively with the highest and lowest densities for waste stone in the deposit (table 4).

For Kenniff Cave, Queensland, another site with a large-tool/small-tool succession, Mulvaney tests the hypothesis that smaller implements are found with smaller waste flakes but finds the reverse is true (Mulvaney and Joyce 1965:178). At Burrill on the other hand the two do coincide and a case for causal relationship between small flakes, fabricators and quartz (i.e. stone type (a) in table 5) is argued later in this report. Irrespective of this, a higher incidence of small waste could relate simply to more intensive flaking on the spot. In this case a higher waste flake per implement ratio might also be expected. At Burrill the vertical trend of the waste/implement ratio (table 4) does in this sense follow that of waste flake size (table 5), though only in a very general way. At Kenniff there is a similar general relationship. Thus in the small-tool ('microlithic') level there (2'0-4'0), where the proportion of small waste flakes is low, waste/implement ratio is 21.1:1 compared with 28.8:1 in earlier levels (below 4'6") where the proportion of small waste is higher (cf. Mulvaney and Joyce 1965:table 3).

ANALYSIS OF SCRAPERS
(fig. 5:1-39)

Definition

A scraper is initially defined as a piece of stone with all or part of its margin unifacially and systematically retouched to form a working edge that could have been used for scraping. With the Burrill assemblage I used standard typology to cull out implements obviously not scrapers, i.e. saws, backed blades, eloueras, fabricators, trimming flakes and used stone without retouch. With these excluded, all systematically retouched pieces of stone, including core-scrapers (e.g. horsehoof cores) and pebble tools, were assigned to the scraper category.

Despite the name given to them the implements thus selected were not necessarily used for scraping. Their employment for other specific tasks such as cutting, or as general purpose tools, is just as possible. However the name 'scraper' for such implements is a convention accepted by most archaeologists. That some Mousterian scrapers could have been used for cutting equally as well as scraping has been suggested by Mellars (Dakaris et al. 1964:232). The Australian tula, before resharpennig, could have been classified as a scraper, had its use as a chisel (i.e. a cutting tool) not been ethnographically observed (Cooper 1954). However, the analysis is applied to all implements usually classified by archaeologists as scrapers, whatever their actual use might have been.

Observations and Measurements

In the main I follow Mulvaney (Mulvaney and Joyce 1965:176-8) in his analysis of the scrapers from Kenniff Cave. I have also attempted some techniques employed experimentally by White, J.P. (1969) and White, C. (1967a) for describing the characteristics of working edges.

Length, breadth, thickness  These were recorded on a measuring board with the implement resting on its base (i.e. the unretouched surface adjacent to the working edge). Length and breadth are respectively the longest and shortest axes in the horizontal plane, irrespective of the position of striking platform on flake and blade tools. Thickness is the maximum possible measurement perpendicular to the horizontal plane.
### (a) Distribution of waste stone

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<th>Square</th>
<th>Total</th>
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<td>K</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>I</td>
<td>52</td>
<td>71</td>
<td>220</td>
</tr>
<tr>
<td>II</td>
<td>164</td>
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<td>975</td>
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<td>III</td>
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<td>V</td>
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<td>Per m³</td>
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<td>445</td>
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### (b) Distribution of implements

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<th>Level</th>
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<td>Total</td>
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<td>Per m³</td>
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</table>

### Table 4 Burrill Lake: distribution of (a) waste stone, (b) implements

NB Counts for squares NT, PU and QV (trench B) are respectively included with counts for squares K, I and M in levels I-III

### Table 5 Burrill Lake: percentage distribution for size and stone type of waste
1-5  Group 1 scrapers  
Levels: II-3; III-4,5; IV-1,2  
6-8  Group 2 pebble tools  
Levels: III-6,8; IV-7  
9-14 Group 3 scrapers: 9,10 discoidal  
Levels: III-10; IV-9,11,12,13,14  
15-19 Group 4 core-scrapers: 18,19 horsehoof cores  
Levels: I-17; III-16,19; IV-15; V-18  

Fig 5  Burrill Lake: implements
20-21 Group 5 scrapers: 20 angular-concave
Levels: III-20; IV-21
22-25 Group 6 scrapers: 22, 23 angular-concave; 24 thumbnail
Level: III
26-30 Group 7 scrapers: 26, 29, 30 angular-concave; 27 thumbnail; 28 discoidal
Levels: III-27, 28, 29; IV-30; V-26
31-39 Group 8 end-scrapers: 38, 39 thumbnail
Levels: I-II-32, 33, 39; III-31, 34, 36, 38; IV-35, 37
40-44 Use-polish (fine stippling): 40, 42, 43, 44 flakes; 41 fabricator
Levels: I-43; II-40, 41, 42, 44
45-46 Elooreras: 45 use-polish along chord; 46 lightly retouched along chord;
47 heavy use-wear along chord
Levels: I-45, 47; II-46
48-51 Bondi points
Level: II
52 Fabricator
Level: II
53, 54 Bone points
Level: I
Breadth-length ratio (B/L) Breadth as a percentage of length is used as a rough indication of shape, i.e. 'narrowness' as opposed to 'squatness'.

Thickness-breath ratio (T/B) This ratio roughly indicates shape in the vertical plane, i.e. whether a scraper is 'flat' or 'high-backed'.

Weight Weight indicates overall mass and volume irrespective of shape.

Retouch length (RL) Measured circumferentially, this is the total length of retouch adjacent to a given base.

Percentage of retouch This expresses retouch length as a percentage of total base perimeter.

Angle of retouch Retouch angle is the average of several measurements made with a goniometer along the retouch length. Because the angle varies considerably along most retouched margins, no great accuracy is claimed for the results.

Disposition of retouch McCarthy (McCarthy et al. 1946) and others have classified scrapers into categories that include 'side-scrapers' and 'end-scrapers', according to the manner in which retouch is distributed. I placed the Burrill scrapers into categories derived from various combinations of 'side' (S) and 'end' (E). Thus 'S' alone refers to the category containing scrapers retouched along one margin parallel to the longitudinal axis, while in category 'SSE' retouch occurs along one margin parallel to the lateral axis and both margins parallel to the longitudinal. Scrapers whose length and breadth axes are approximately the same cannot be thus classified. The unclassified category, which is 26% of the total, comprises all scrapers whose breadth-length ratio exceeds 90%.

Working edge characteristics Using White's criteria (White, J. P. 1969:24), I divided each length of retouched margin into a number of edges and for each made separate observations. However, with the coarse-grained rocks used for the majority of Burrill scrapers, I found I could not achieve consistent results and, apart from edge shape, I abandoned this procedure.

Change through Time From the 1967-8 excavations, the total number of scrapers is only 160. Divisions of these according to the five stratigraphic components of the deposit would have given in some levels samples too small for useful statistical comparisons. Accordingly, since they have similar carbon dates, level IV and V are combined to give a sample size of 62; level III is unchanged with 65 scrapers; levels I and II, being both Bondaian, are combined to give a sample of 33. The combined levels may be conveniently thought of as bottom (IV-V = early pre-Bondaian), middle (III = late pre-Bondaian) and top (I-II = Bondaian).

Table 6 shows frequency distributions in percentages for measurements and observations in the three levels. Also shown are the mean (X) and standard deviation (s) for each set of measurements in each level. On the assumption that the samples represent normal populations, tests were applied to investigate the significance of any difference between levels: for continuous variables a small sample test statistic treated as a student-t variable (Hoel 1966:177), for discrete variables $\chi^2$ contingency. In the following discussion, 'significant' denotes a difference that could have arisen by chance in less than 1% of cases, while for between 1% and 5% 'probably significant' is used (Moroney 1962:230).

Length decreases with time. Between bottom and middle levels the difference is probably significant; between bottom and top it is significant.

Breadth and thickness both decrease less markedly. Between bottom and top levels the difference is probably significant.

The B/L ratio increases slightly. Between bottom and top levels the difference is probably significant.
### % distribution

#### 1. Length in mm

<table>
<thead>
<tr>
<th>Level No.</th>
<th>16</th>
<th>23</th>
<th>30</th>
<th>37</th>
<th>44</th>
<th>51</th>
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<th>65</th>
<th>72</th>
<th>79</th>
<th>86</th>
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<tr>
<td>I-II</td>
<td>33</td>
<td>6.1</td>
<td>18.2</td>
<td>27.3</td>
<td>12.1</td>
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<td>9.1</td>
<td>12.1</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>III</td>
<td>65</td>
<td>1.5</td>
<td>13.9</td>
<td>16.9</td>
<td>20.0</td>
<td>16.9</td>
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<td>3.1</td>
<td>3.1</td>
<td>4.6</td>
<td>1.5</td>
</tr>
<tr>
<td>IV-V</td>
<td>62</td>
<td>9.7</td>
<td>22.6</td>
<td>30.6</td>
<td>14.5</td>
<td>9.7</td>
<td>4.8</td>
<td>1.6</td>
<td>3.2</td>
<td>3.2</td>
<td>47.8</td>
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<tr>
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<td>16.3</td>
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<td>20.6</td>
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#### 2. Breadth in mm

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<th>65</th>
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<th>86</th>
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<td>3.0</td>
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<tr>
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<td>3.2</td>
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<tr>
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<td>25.0</td>
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#### 3. Thickness in mm

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<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
<th>27</th>
<th>30</th>
<th>33</th>
<th>36</th>
<th>39+</th>
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<td>I-II</td>
<td>33</td>
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<td>21.2</td>
<td>21.2</td>
<td>18.2</td>
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<td>9.1</td>
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<tr>
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<td>10.8</td>
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<td>1.5</td>
<td>1.5</td>
<td>17.6</td>
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<tr>
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<td>14.5</td>
<td>9.7</td>
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<td>16.1</td>
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<td>1.6</td>
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</tr>
<tr>
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<td>15.6</td>
<td>18.1</td>
<td>13.8</td>
<td>15.0</td>
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#### 4. Breadth-length ratio

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<th>68</th>
<th>73</th>
<th>78</th>
<th>83</th>
<th>88</th>
<th>93</th>
<th>98+</th>
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<td>3.0</td>
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<td>18.2</td>
<td>15.2</td>
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<td>9.1</td>
<td>21.2</td>
</tr>
<tr>
<td>III</td>
<td>65</td>
<td>4.6</td>
<td>4.6</td>
<td>10.1</td>
<td>3.1</td>
<td>9.2</td>
<td>10.8</td>
<td>16.9</td>
<td>20.0</td>
<td>12.3</td>
</tr>
<tr>
<td>IV-V</td>
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<td>8.1</td>
<td>8.1</td>
<td>4.8</td>
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<td>21.0</td>
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<td>6.4</td>
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<tr>
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<td>160</td>
<td>5.6</td>
<td>5.0</td>
<td>6.9</td>
<td>8.1</td>
<td>13.1</td>
<td>12.5</td>
<td>17.5</td>
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<td>9.4</td>
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</table>

#### 5. Thickness-breath ratio

<table>
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<tr>
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<th>45</th>
<th>55</th>
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<th>75</th>
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<td>9.1</td>
<td>3.0</td>
</tr>
<tr>
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<td>21.6</td>
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<td>7.7</td>
<td>3.1</td>
<td>9.2</td>
</tr>
<tr>
<td>IV-V</td>
<td>62</td>
<td>9.7</td>
<td>6.4</td>
<td>24.2</td>
<td>24.2</td>
<td>16.1</td>
<td>1.6</td>
<td>8.1</td>
<td>4.8</td>
</tr>
<tr>
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<td>160</td>
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<td>13.8</td>
<td>25.6</td>
<td>21.2</td>
<td>11.9</td>
<td>5.0</td>
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#### % distribution

#### 6. Weight in gm

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<th>22.5</th>
<th>30.5</th>
<th>38.5</th>
<th>46.5</th>
<th>54.5</th>
<th>62.5</th>
<th>70.5</th>
<th>78.5+</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-II</td>
<td>33</td>
<td>15.2</td>
<td>27.3</td>
<td>12.1</td>
<td>12.1</td>
<td>9.1</td>
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<td>3.0</td>
<td>3.0</td>
<td>15.2</td>
<td>31.9</td>
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<tr>
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<td>23.1</td>
<td>4.6</td>
<td>4.6</td>
<td>3.1</td>
<td>4.6</td>
<td>10.8</td>
<td>37.5</td>
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<tr>
<td>IV-V</td>
<td>62</td>
<td>9.7</td>
<td>21.0</td>
<td>14.5</td>
<td>12.8</td>
<td>8.1</td>
<td>6.4</td>
<td>4.8</td>
<td>4.8</td>
<td>3.2</td>
<td>14.5</td>
</tr>
<tr>
<td>All</td>
<td>160</td>
<td>3.7</td>
<td>16.9</td>
<td>22.5</td>
<td>17.5</td>
<td>8.7</td>
<td>5.0</td>
<td>4.4</td>
<td>3.7</td>
<td>2.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Table 6 Burrill Lake: percentage frequency distributions of scraper characteristics according to levels (a) characteristics 1–6
The T/B ratio does not differ significantly between levels.

Weight, from the mean values, appears to decrease, but differences are not statistically significant because of the large standard deviations. However, decreases in all three linear dimensions may indicate a real change to lighter implements.

Retouch length and percentage of retouch do not differ significantly between levels.

Angle of retouch increases significantly in the top level.

Disposition of retouch does not differ significantly between levels. Side scrapers, retouched along one longitudinal margin, predominate throughout.

Concave working edges expressed as a percentage of the total number of working edges in each level, are distributed as follows: bottom, 28.9%; middle, 24.1%; top 14.8%. Between bottom and top levels the decrease in concave edges is probably significant.
In sum, scrapers used at Burrill Lake became smaller with the passage of time; they became a little broader for their length while concave working edges decreased in popularity. These differences were slow and steady, being only slight between consecutive levels. The introduction of small Bondaian stone tools was not therefore accompanied by a significant modification of scraper fashion. Such small changes as did occur at that time are seen merely as the continuation of earlier trends which thus bridge the pre-Bondaian/Bondaian transition. The overall picture for scrapers at Burrill is one of conservatism, little influenced either by the passing of nearly 20,000 years or by a major technological change.

In order to increase the sample size, the scrapers excavated in 1931 were examined at the Australian Museum. Thorpe's report (1931) and the stratigraphic evidence for the 1931 trench both suggested that all Burrill scrapers in the Museum collection marked 'A' or 'B' could be assigned with reasonable certainty to my top level. However, when the 1931 scrapers were subjected to the same measurements and observations as those from the 1967-8 excavations, they were found to be more like those from my early levels in most characteristics, notably those concerning size. Only in T/B ratio and the percentage of concave working edges (16.6%) is the 1931 sample more akin to the scrapers from the top level of 1967-8. A likely explanation for this apparent inconsistency is that, like other small artifacts many of the smaller scrapers were missed by the excavators in 1931, giving a sample which overemphasises the larger segment of the size range. Because the data obtained are therefore suspect they are not given in table 6.

Typological Analysis

Basically I have used McCarthy's typology (McCarthy et al. 1946; McCarthy 1967) augmented by groupings of the observations and measurements made previously. The following discussion describes the methods used to find groups of characteristics which best portray the industry.

Very few of the 160 scrapers are finely made and these have so few morphological traits in common that they will be described individually rather than tortured into unrealistic categories. By 'finely made' I mean extensive, regular, evenly spaced secondary working often producing a symmetrical form. Overall there is considerable aesthetic appeal. The stone is usually fine-grained, otherwise the above traits cannot be easily observed.

The majority of scrapers, however, comprises amorphous lumps of fairly coarse-grained stone with only short lengths of retouch. Inspection of the assemblage suggested a thick side-scraper as the most common form, more specifically a thick, fairly large flake or block with a comparatively short length of retouch along one longitudinal margin. Using thickness and retouch length as the main criteria, I explored the possibility of distinguishing this putative type by statistical means. From this analysis I excluded core-scrapers of the horsehoof and similar varieties, which have a high percentage of retouch, and also end-scrapers, which have other obvious characteristics to distinguish them from the form whose definition was sought. Pebble tools on the other hand were included because they appeared to have the specified features in common with other thick scrapers in the assemblage.

To analyse the 136 scrapers remaining, two methods were used:

1. Product moment correlation coefficients were calculated for pairs of variables thought to be diagnostic, particularly pairings with retouch length and thickness. The statistical significance of these results was investigated using a test statistic treated as a student-t variable (Moroney 1962:311). Noteworthy among the results (table 7) is the negative correlation between percentage of retouch and thickness. In other words, retouch length tends to be shorter for a given base perimeter on thicker scrapers. Since thickness shows strong and fairly equal positive correlations with both breadth and length, and hence scrapers tend to increase in size uniformly in three dimensions, percentage of retouch may be considered as decreasing with size. This is consistent with a major group of thick, fairly large scrapers with proportionately short retouched margins. Actual length of retouch on the other hand correlates positively with thickness, and hence with size. Also worthy
of note is the positive correlation between thickness and angle of retouch. The Kenniff Cave scrapers have this trait (Mulvaney and Joyce 1965:186).

<table>
<thead>
<tr>
<th>Pair</th>
<th>r</th>
<th>Remarks</th>
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</thead>
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</tr>
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<td>Thickness</td>
<td>.56</td>
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<td>Thickness</td>
<td>.62</td>
<td>Positive - significant</td>
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<td>Thickness</td>
<td>-.18</td>
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<tr>
<td>Base perimeter</td>
<td>-.12</td>
<td>Not significant</td>
</tr>
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</table>

Table 7 Burrill Lake: correlation coefficients between selected pairs of scraper characteristics

2. Retouch length as a percentage of thickness was calculated and two frequency distribution histograms plotted: one for scrapers of thickness less than 18 mm (approximately the mean thickness); the other for scrapers of thickness equal to or greater than 18 mm (fig. 6). While the histogram for thin scrapers is symmetrical and fairly flat, the distribution for thick scrapers is strongly skewed in favour of low retouch length/thickness (RL/T) values. This mode was further investigated by extracting all implements with RL/T equal to or less than 28% (the mean value). Examination of the scrapers showed that this group coincided almost exactly with the group of thick, fairly large scrapers with proportionately short working edges previously identified by inspection, though admittedly judgement in both cases used the same basic criteria.

![Retouch length vs Thickness](image)

Fig.6 Burrill Lake: scrapers, retouch length/thickness

For the sake of clarity I will refer to these scrapers as group 1. Originally the group contained all implements I would call pebble tools (cf. White, J.P. 1967:60-5). To allow comparison of these with other members of group 1, I assigned all obvious pebble tools to a separate category, group 2, using as a criterion the proportion of pebble cortex, the division being drawn around 30% - 40%.

Group 3 contains all thick scrapers with RL/T greater than 28%. Core-scrapers were designated group 4. Thin scrapers were placed in
groups 5-7 in ascending order of RL/T values, the divisions being arbitrarily spaced to give three equal intervals of RL/T. Group 8 comprises all end-scrapers.

Characteristics for each of the eight groups are shown in table 8. Differences and likenesses shown in table 9 must, for at least the two following reasons, be interpreted with caution:

1. Not all the groups are thought to represent 'types', though I claim this for:
   (i) the minor groups 2, 4 and 8 on the grounds that they have easily recognizable traits that both separate them from other groups within the assemblage and match those put forward by McCarthy (McCarthy et al. 1946) and other authors as characteristic of specific implements;
   (ii) group 1 because this is a large group with internally consistent traits which separate it from other groups. This does not mean however that any one specimen is a distinctive 'type fossil'; rather the group should be considered as a mode in a continuous range, defined by certain criteria, and with this definition strengthened by other characteristics.

The other groups (3, 5, 6 and 7) result from uniform application of the criteria by which group 1 was separated, so that the latter group can be compared with the others. Also the groups are a convenient way - though only one of many possible ways - of ordering the data for descriptive purposes.

<table>
<thead>
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<th>4</th>
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<th>6</th>
<th>7</th>
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<td>7</td>
<td>18</td>
<td>35</td>
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<td>18</td>
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<td>Length in mm</td>
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Table 8 Burrill Lake: characteristics of scraper groups 1-8

2. The characteristics tabulated are not always entirely independent of the criteria by which the groups are defined. Only in few cases can they be considered independently corroborative. For example, no importance can be claimed for a significant increase in retouch length in group 3, compared with group 1, when group 3 is established on the basis of a greater RL/T ratio. Also the characteristics are not always independent of each other. For example, there are positive correlations between those expressing attributes of size, i.e. length, breadth, thickness, weight and retouch length, which should therefore be considered as a set.
### Characteristics

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**Table 9** Burrill Lake: scraper groups 1-8 compared, using characteristics listed in table 8; probably significant differences underlined; significant differences not underlined

### General Considerations

**Size characteristics** Because of the intercorrelation of size characteristics, scrapers in groups 1-4 are larger than those in 5-8, since the division was made according to thickness. Pebble tools (2) and core-scrapers (4) do not differ significantly from each other in size, though this similarity may result from the small sample of each. However, each is larger in at least one size attribute than any other group.

**Retouch length and percentage of retouch** Since retouch length and size are positively correlated, significant differences in both usually accompany each other. There is a reversal of this trend when groups 1 and 7 are compared; thin scrapers, with extensive retouch proportionate to their thickness and hence size, have significantly greater retouch than the larger, thicker scrapers with minor retouch proportionate to their thickness. In several cases smaller scrapers have a higher percentage of retouch than larger, but the general tendency is for differences in both length and percentage of retouch to accompany each other.

26
Retouch angle  Retouch angle and thickness are positively correlated; hence groups 1-4 have steeper retouch than 5-8. Core-scrappers (4) have significantly steeper retouch than all other scraper groups, except pebble tools (2).

Breadth/length ratio  End-scrappers (8) have lower B/L ratios, i.e. they have greater length for a given breadth than several other scraper groups.

Thickness/breadth ratio  Core-scrappers (4) are thicker for a given breadth than all other scraper groups. Thin, extensively retouched scrapers (7) are thinner per unit of breadth than other scraper groups.

Disposition of retouch  I have not applied tests of significance to the figures for this characteristic but suggest they show a fairly obvious general trend for scrapers with minor retouch to be simple side-scrappers.

Specific Types of Scraper

Group 1  The preceding lines of evidence together suggest that in the Burrill assemblage fairly large, thick side-scrappers with proportionately short retouch are a real and numerically predominant type. Retouch is usually 'crude', fairly large, irregular secondary flakes having been removed. They are thinner and less steeply retouched than core-scrappers, less massive than pebble tools. They are very unlike end-scrappers which are lighter, have their major retouch parallel to the lateral axis, and are usually delicately retouched. Comparisons of group 1 with the other, less well-defined groups (3, 5, 6 and 7) show no differences really independent of the criteria by which the groups were separated at fairly arbitrary points. These groups should be looked upon as part of a continuous range of which, in frequency distribution terminology, they form the tails and group 1 the mode.

Core-scrappers (4)  These I defined according to the canons of standard typology. Hence, though I have shown metrically that, compared with other scrapers, core-scrappers are thicker for a given width and they have steeper retouch and a higher percentage of retouch, some of these are the criteria by which, with less mathematical rigour, the group was defined. The metrical data, though not therefore independently corroborative, do nevertheless substantiate the validity of the original observations. We must however appreciate that the sample is very small and the independence of the type may be questioned in future.

Pebble tools (8)  Though these are more massive and have a greater proportion of pebble cortex than group 1 scrapers, they are alike in other traits. At first glance, size and proportion of pebble cortex could seem to be two independently corroborative traits indicating a real typological difference. However, nearly all Burrill implements are made from pebbles. Thus larger implements will tend to resemble their parent pebbles more closely than smaller and retain a greater proportion of pebble cortex. On this assumption, the amount of cortex will not be independent of size. There is thus no strong case for separating the two groups. Group 2 might only be the more massive end of a continuous range in which group 1 is the mode.

Extensively retouched scrapers (3, 6 and 7) and end-scrappers (8)  Extensively retouched scrapers include most of those I previously described as 'finely made', of which the remainder are end-scrappers. Many finely made scrapers are delicately retouched, including some which many prehistorians would classify as 'thumbnail' scrapers (Hale and Tindale 1930:189; McCarthy et al. 1946:42). These small scrapers, common in Bondaian assemblages of eastern NSW, are well described by Wright (1970:87) as having a 'convex scraper edge shaped like a thumbnail ... placed opposite the striking platform of a small flake'. At Burrill, seven thumbnail scrapers are from the top level, four from the middle, while even from the bottom level (depth unit 8) there is one small, delicately retouched end-scraper only a little too large to be classified as a thumbnail scraper (fig. 5:37).
Other than thumbnail scrapers, I can see no strong general pattern or categories within groups 3, 6 and 7, even though there are many scrapers finely made and symmetrical in form. Some are discoidal or tend towards this form; some are more angular, often with concave working edges between their projections; others are so varied that they cannot be grouped, however loosely. Even in the 'discoidal' and 'angular/concave' categories there is considerable variation and overlap, and such categories are anyway too small numerically to stand as valid types within this assemblage. Rather than forcing them into a typology I put scrapers in groups 3, 6 and 7 on record as individuals by drawing and describing all better finished pieces. Group 8 (end-scrapers) on the other hand is an internally consistent group of reasonable size. End-scrapers have a finely retouched convex edge at the distal end of a blade or longish flake.

Tables 10 and 11, showing distribution through depth of scraper groups and minor categories, add little to the previous data and discussion on change through time. The increase in the number of end-scrapers is already recorded in table 6. Between bottom and middle levels there is a sharp drop in group 1 in favour of thinner more extensively retouched scrapers, but from middle to top levels the percentage of group 1 rises at the expense of other thick scrapers. There is no consistent pattern of change through time perhaps because the sample from each level is too small to be divided among so many groups.

<table>
<thead>
<tr>
<th>Level</th>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-II</td>
<td>32.2</td>
<td>3.2</td>
<td>6.5</td>
<td>35.5</td>
<td>3.2</td>
<td>19.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>14.1</td>
<td>8.8</td>
<td>7.0</td>
<td>5.3</td>
<td>12.3</td>
<td>29.9</td>
<td>12.3</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>IV-V</td>
<td>37.5</td>
<td>3.1</td>
<td>15.6</td>
<td>4.7</td>
<td>12.5</td>
<td>7.8</td>
<td>10.9</td>
<td>7.8</td>
<td></td>
</tr>
</tbody>
</table>

Table 10 Burrill Lake: scraper groups expressed as percentages of total scrapers in each level

<table>
<thead>
<tr>
<th>Category</th>
<th>Discoidal</th>
<th>Angular/concave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>I-II</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 11 Burrill Lake: distribution through depth of numbers of scrapers in minor categories within groups 3,6,7

OTHER IMPLEMENTS

Pre-Bondaian

Saws with finely dentated edges (table 12) were found only in pre-Bondaian levels, two in IV and three in III. All are on flakes. The angles of the saw-edges are fairly acute. Teeth are separated by tiny pressure-flaked notches regularly spaced at intervals of about 2 mm (pl. 2:1). Three saws are double edged, each having its two edges adjacent to a common face but notched from opposite directions.

Bondaian

Use-polish occurs along the margins of six flakes (e.g. fig. 5:40, 42, 43 and 44), the otherwise unmodified margins of two fabricators (e.g. 5:41), and the chord of an elouera (5:45). Discussion of these is included in the section dealing with implements of this type from Currarong.
Fabricators are also discussed under Curraong. Fabricators from that site were analysed in the light of J.P. White’s 1968 paper, whereas the Burrill stone had been examined earlier. Some of the Burrill material was subsequently re-examined, but I have not thought it worthwhile to extend this treatment to the whole sample because there are fewer fabricators from Burrill and the data obtained are similar enough to those from Curraong to suggest that detailed re-examination would be repetitious.

Pertinent to my discussion of the material from Curraong are the following characteristics of the Burrill flaked stone and fabricators:

1. Level II in which fabricators are most common (table 3) has the highest incidence of quartz flakes and flakes less than 0.5 in. (1 cm) square (table 5).

2. Waste stone from one randomly chosen excavation unit in level II was re-examined in the light of White’s paper and my experience with the Curraong material. There came to light six additional quartz flakes bearing evidence for bipolar flaking, from a total sample of 58 flakes, 42 of which are quartz. There are doubtless further examples unrecorded amongst the Burrill waste stone.

3. The mean length of the 15 tabulated fabricators excavated in 1967-8 is 2.0 ± 0.6 cm.

Backed blades All backed blades found at Burrill are unexceptional examples of the asymmetric bondi point. In Glover’s terms they belong to group B in that their length/breadth ratios are not less than 2:1 (Glover 1967). The 19 complete bondi points have the measurements shown in table 13. In size and shape the bondi points from Burrill Lake are not different from those from other sites in eastern NSW (Curraong, Curracurrang, Lapstone Creek and Sassafras) or further afield (Glover 1967:424).

<table>
<thead>
<tr>
<th>Level</th>
<th>Length (mm)</th>
<th>Breadth (mm)</th>
<th>Thickness (mm)</th>
<th>Edge angle (degrees)</th>
<th>Edge length (mm)</th>
<th>Number of teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>33</td>
<td>28</td>
<td>15</td>
<td>61</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>IV</td>
<td>44</td>
<td>24</td>
<td>11</td>
<td>57</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>III</td>
<td>41</td>
<td>28</td>
<td>11</td>
<td>50</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>III</td>
<td>62</td>
<td>56</td>
<td>14</td>
<td>44</td>
<td>40</td>
<td>17</td>
</tr>
<tr>
<td>III</td>
<td>31</td>
<td>15</td>
<td>11</td>
<td>67</td>
<td>20</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 12 Burrill Lake: characteristics of saws

Backed blades All backed blades found at Burrill are unexceptional examples of the asymmetric bondi point. In Glover’s terms they belong to group B in that their length/breadth ratios are not less than 2:1 (Glover 1967). The 19 complete bondi points have the measurements shown in table 13. In size and shape the bondi points from Burrill Lake are not different from those from other sites in eastern NSW (Curraong, Curracurrang, Lapstone Creek and Sassafras) or further afield (Glover 1967:424).

<table>
<thead>
<tr>
<th>Length (mm)</th>
<th>Breadth (mm)</th>
<th>L/B ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>25.7 ± 4.2</td>
<td>8.1 ± 1.3</td>
</tr>
<tr>
<td>Range</td>
<td>19 - 35</td>
<td>6 - 10.5</td>
</tr>
</tbody>
</table>

Table 13 Burrill Lake: backed blade dimensions N=19

Eloueras Of the six eloueras, five show evidence for use along the chord edge. On two the use-wear is ‘chattering’, i.e. the removal of small flakes from one face; one (fig. 5:47) has bruising, similar to bruising on a fabricator in that it invades both faces; another (fig. 5:45) has use-polish as already described; the last has light retouch along the chord (fig. 5:46).

From the 1931 excavation the eloueras identified by McCarthy (1943:151; 1948:30) were recently examined by me at the Australian Museum. All 18 show use-wear in the form of chattering along the chord edge; on five this is accompanied by use-polish.
Bone points  Bone points from south coast sites are more fully discussed later in this report when the larger sample from Currajong is described. In the terms of this description the four bone points from Burrill are listed in the following categories:

A. One bipoind of split bone with tips finely ground. One tip is broken but the length of the implement is about 27 mm.

B. Two short unipoints of split bird bone with tips finely ground and polished (fig. 5:54). Lengths 28 and 29 mm.

C. A piece of unsplitted kangaroo fibula ground to a fairly blunt unipoint having at its extreme tip use-polish that diminishes rapidly away from the tip (fig. 5:53). Length 107 mm.

As well as these definite implements, there are four point-shaped pieces of split bird bone.

ARTIFACTS FROM SITE M

Three m² of the thin shell midden layer contained 102 waste flakes, one bondi point and one elouera. The elouera has along its chord edge use-polish of a type seen on an elouera and other implements recovered from the Burrill shelter. The implement types show that site M was used contemporary with a more recent phase of occupation at the nearby shelter.
The Beecroft Peninsula, some 20 square miles (50 km²) in area, is a plateau of Nowra Sandstone with a maximum altitude of 300 ft (91 m) at its southern end. At its northwestern corner the plateau is joined to the mainland by a low-lying isthmus slightly less than a mile (1.6 km) wide. The northern and southern ends of the peninsula are dissected by gullies carrying streams from the plateau to the sea. Vegetation on the plateau top is fairly open and heathlike with shrubs and dry sclerophyll, while the gullies are often densely wooded. Dr Hewson's report on the more common flora near the excavated sites follows in Appendix 2.

While archaeological sites are rare on the central part of the peninsula, over a dozen occupied rock shelters have been located in the gullies at the northern and southern ends. This clustering of sites is partly explained by the nature of the gullies, which have a number of characteristics favouring human occupation. There are rock overhangs suitable for occupation; they are less exposed to the weather than either the open plateau or the steep-cliffed eastern shore of the peninsula; they have ample supplies of fresh water and firewood; they provide a habitat favoured by certain land fauna,
while several creeks have estuarine conditions in their lower reaches; they allow easy access to either the plateau top or the sea-shore. They are thus suitably situated to optimise exploitation of the varied local resources. Additionally, intertidal rock platforms and near-shore reefs, rich in marine foods, are more extensive at the northern and southern ends than elsewhere along the shore of the peninsula. The sites are all in the lower gullies near the sea and well represented in their deposits are species of shell fish inhabiting a rocky intertidal zone.

At the northern end of the peninsula four such rock shelters (35° 1'37" S.Lat., 150° 49'20" E.Long.) are in a gully whose stream is a tributary of Currarong Creek (fig. 7). One map names this tributary Blacks Cave Creek, indicating European recognition of Aboriginal associations. The four shelters, which were brought to my notice by Mr P.H. Wooley of Nowra, NSW, are beneath overhanging ledges of the plateau top, which at this point is below the 50 ft (15 m) contour. All the shelter floors are at approximately the same altitude. For shelter 1 the datum point (fig. 9) is 28 ft (8.5 m) asl and the top of the deposit is about 22 ft (6.7 m) asl.

A part of the plateau some 1200 yd (1100 m) to the south of the shelters is the origin of the nearby creek. The flow of water appears permanent and it is unlikely that even severe drought would dry out a deep water hole in the stream bed near shelter 3. Below the shelters the creek has a tidal zone some 600 yd (550 m) in length before reaching the sea. The outlet is flanked to the east by an extensive intertidal reef while to the west stretches a long sandy beach.

As the estuarine lower reaches of the creek begin less than 100 yd (90 m) north of shelter 1, the four sites are in an optimum ecological position, being located very close to fresh water yet within easy reach of the varied food resources of sea shore, estuary, gully and plateau top.

Three of the sites were chosen for excavation. Initial inspection suggested shelter 1 as having the greatest archaeological potential, because it is the largest shelter and appeared to have the deepest deposit. Though smaller, shelter 2 was also chosen because of its apparently deep mound of occupation refuse. As the potential of shelter 3 could not be easily assessed by visual inspection, its deposits were tested by a small cutting. Shelter 4, in which the occupation deposit is a scatter of loose shells thinly covering bedrock, was not thought suitable for excavation.

EXCAVATION
(fig.8)

As at Burrill, cuttings were divided horizontally into 1 m squares from which the deposit was removed in spits ranging in depth from 5-15 cm according to particular stratigraphic circumstances. The spits were later grouped to form depth units as recorded in table 15. Spits and depth units follow the deposit slope indicated by the underlying bedrock, the junction of levels III and II and the modern turf line. As the stratigraphy is uncomplicated I have not thought it worthwhile to show diagrammatically either spits or depth units. Table 15 records the average depth below the surface for depth units.

Shelter 1  Before our arrival the upper deposit had been disturbed. Loose shell midden (fig. 9:2), removed presumably from the back of the shelter, had been redeposited at the shelter mouth over modern turf in which were found cigarette butts and matchsticks.

The main excavation in shelter 1 was a 2 m wide transverse cutting (trenches 1 and 2) extending from the back of the shelter to a point outside the major area of cultural deposition. Because within this area part of the upper deposit towards the back of the shelter had been removed, a second cutting (trenches 6 and 7) was made at the western end of the shelter to sample an undisturbed section of shell midden beneath the overhang.

Shelter 2  was undisturbed. Because cultural remains other than shell were scarce outside the shelter, the 1 m wide transverse trench was not extended northward to include all the mound of occupation refuse. Overlying the bedrock towards the back of the shelter was a thin layer of recent deposit (area X), investigated because it contained well preserved organic remains.
Fig. 8 Currarong: plans of excavations
Shelter 3 was disturbed to an unknown depth at the northern end. Because the site was found to be not rich in useful cultural material, the small cutting was not extended.

SITE STRATIGRAPHY AND DEPOSITIONAL HISTORY

Shelter 1 (fig. 9)
Level III (fig. 9:8-10), directly above bedrock, is a greyish-white coarse sand containing a large amount of sandstone rubble. Towards the back of the shelter the sand is yellow and contains less rubble. There is a stone industry in the level but no charcoal or other organic materials. Many of the flakes have smoothed edges, giving them a water-worn appearance, though the cause of this phenomenon is not known. As the level is composed of depositional elements that are both fairly heavy and indestructible, it seems probable that both organic materials and finer particles of deposition were originally present but have disappeared, causing volumetric shrinkage of the deposit since it was laid down.

Level II (fig. 9:7) is a dark brown sandy soil marked off from III by a clear stratigraphic break. Upwards through II the deposit becomes progressively darker in tone until it merges with very dark brown topsoil.

Level I comprises three elements: top soil (fig. 9:6), mainly outside the shelter and containing a fairly small amount of bone and shell; all loose shell midden, whether obviously disturbed as at the shelter mouth (fig. 9:2), or undisturbed as at the back of the shelter and infilling the small pit containing burial 2 (fig. 9:1); and compact shell midden forming the whole volume excavated in trenches 6 and 7.

At the back of the shelter trenches 1 and 2 exposed a large pit filled with compact shell midden (fig. 9:3-5). It was dug late in the site's history: both the stratigraphy and the nature of its infilling suggest it was dug and filled during the level I period of deposition. The purpose of this pit is unknown. The deepest human skeleton in its fill (burial 1) was too near the top of the pit for this to have been cut primarily as a grave. To explain a pit towards the back of a rock shelter at Curracurrag, Megaw suggests the clearing out of accumulated debris to increase the shelter's useful life (Megaw 1968a:326).

Shelters 2 and 3 (fig. 10)

As neither site has a useful stratigraphic division within its deposit, I have used depth units alone for the analysis of the cultural contents of shelters 2 and 3. Deposition in shelter 2 is mostly shell giving way laterally to ash just beneath the overhang. In shelter 3 shell is sparse in a matrix of very dark sandy soil.

<table>
<thead>
<tr>
<th>Shelter no.</th>
<th>Depth cm</th>
<th>Depth unit</th>
<th>Level</th>
<th>ANU no.</th>
<th>C14 age in years BP</th>
<th>Cultural/stratigraphic association</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>110</td>
<td>7</td>
<td>II</td>
<td>243</td>
<td>1970 ± 80</td>
<td>Junction of levels II and III; about mid-point of transition from backed blades to fabricators</td>
</tr>
<tr>
<td>2</td>
<td>105</td>
<td>4</td>
<td></td>
<td>386</td>
<td>3740 ± 100</td>
<td>Nearly basal; shell still preserved</td>
</tr>
</tbody>
</table>

Table 14 Currarong: radiocarbon dates

34
**CURRARONG**

**SECTIONS**

**SHELTER 1**

Trench 1:
Section of west face

- Squares: A - B - C - D - E - F

**Curra rong 1: key to section**

1. Loose shell; contents of most recent pit
2. Loose shell; recently disturbed
3. Compact grey ash with shell
4. Compact dark soil with shell
5. Compact fragmented shell in dark soil matrix
6. Turf and topsoil with little shell
7. Compact dark brown sandy soil
8. Greyish-white coarse sand with sandstone rubble
9. Yellowish sand
10. Yellow sand

---

**SHELTER 3**

Section of north face

---

**SHELTER 2**

West face KL; east face CD

---

**Fig. 9 (upper) and 10 (lower) Curra rong: sections**
1, 2  Pebble core-scrappers
Shelter 1: level III

3-13  Scrappers
Shelter 1: level III-4, 5, 6, 7, 9, 10, 11, 12, 13
Shelter 2: 14, 15,

14, 15  Thumbnail scrappers
Shelter 1: level III-14
Shelter 2: 15

16-18  Eloueras
Shelter 1: level II-18
Shelter 2: 16, 17

Fig 11  Curraong: stone implements
19-21 Use-polished flakes
Shelter 1: level I-20
Shelter 2: 21
Shelter 3: 19

22-23 Use-polished fabricators
Shelter 1: level I-22
Shelter 3: 23

24-31 Fabricators and other bipolar artifacts as described in text

32-34 Geometric microliths
Shelter 1: level III

35-39 Bondi points
Shelter 1: level III-35,36,38
Shelter 2: 39
Shelter 3: 37

40 Edge-ground axe
Shelter 2

41-44 Fish hook files
Shelter 1: level I-41,42,44; level III-43

45,46 Possible fish hook files
Shelter 1: level I-45; level III-46
Enough stone for detailed analysis was found only in shelter 1. Preliminary examination of this showed a two-phase industrial sequence. The Bondaiian industry, which appears only in the upper deposits at Burrill, was found to be basal (level III) at Currajong 1. In later levels (II and I), however, backed blades no longer predominate in the small-tool component and are overshadowed numerically by fabricators. Scrapers, though present throughout, were found to be most abundant in level III.

Shelters 2 and 3 both contain backed blades and fabricators, but neither site has sufficient to say whether their distribution results from causes other than chance. Both shelters, in terms of their technological products, are related to shelter 1 but specific associations with the two-phase sequence there are uncertain.

Distribution of Stone

Because shelter 1 is fairly rich in stone, I have presented the distribution of waste flakes and cores through the site (table 16) in terms of weight per unit volume instead of numbers, which would have involved more labour. I have not shown distributions of this type for shelters 2 and 3 in which excavation cuttings were small and stone is sparse.

<table>
<thead>
<tr>
<th>Level</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>978</td>
<td>916</td>
<td>212</td>
<td>1158</td>
<td>1878</td>
<td>873</td>
<td>1000</td>
</tr>
<tr>
<td>II</td>
<td>690</td>
<td>784</td>
<td>3652</td>
<td>1045</td>
<td>1350</td>
<td>1674</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>4978</td>
<td>1087</td>
<td>8829</td>
<td>1999</td>
<td>2354</td>
<td>3658</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>978</td>
<td>916</td>
<td>1940</td>
<td>905</td>
<td>4501</td>
<td>1333</td>
<td>1616</td>
</tr>
</tbody>
</table>

Table 16: Currajong shelter 1: distribution of cores and waste flakes in gm per m³

Table 16 shows that in all levels stone is most frequent in square D at the mouth of shelter 1. As stone is concentrated just inside the mouth of the Burrill shelter, perhaps this part of a rock shelter was generally favoured as a working area. It is a position with maximum daylight while still being sheltered.

As the Currajong sites are in the same series of quartz sandstones as the Burrill rock shelter, there are similar sources of stone available in each locality. At both, quartz, rhyolite and quartzite were used extensively; porphyry is absent from the Currajong industry, though common at Burrill; a non-local red chert, used fairly extensively at Currajong, is absent from Burrill.

Distributions of waste flake size and stone type at Currajong are shown in a later section (tables 20 and 22) where the data are germane to the discussion.

Scrapers (fig. 11:1-15)

Shelter 1 As there are only 42 scrapers from shelter 1, I have not attempted to analyse their characteristics according to depth distribution. Instead the sample is examined as a whole (table 17) and compared with the Burrill Lake scrapers which are made of similar stone.

Compared with the various levels at Burrill the Currajong shelter 1 scrapers are:

1. more like the middle and bottom levels at Burrill in edge angle;
2. most like the middle level in percentage of margin retouched, percentage of simple side scrapers in the sample, and B/L ratio;
<table>
<thead>
<tr>
<th>Maximum depth (cm)</th>
<th>Shelter 1</th>
<th>Shelter 2</th>
<th>Shelter 3</th>
<th>Grand total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26 48 60 72 83 98 107 115 133 148</td>
<td>30 60 90 120</td>
<td>30 60 90</td>
<td></td>
</tr>
<tr>
<td>Depth unit</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>1 2 3 4</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Stratigraphic level</td>
<td>I II III Pit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scraper</td>
<td>3 1 1 4 10 8 3 31 2</td>
<td>2 3 5 1 1 2</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>Scraper, pebble-core</td>
<td>1 2 2 2 1 1 9</td>
<td>1 1</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Scraper, thumbnail</td>
<td>1 7 4 1 1 14</td>
<td>1 3 1 5</td>
<td>2 2</td>
<td>21</td>
</tr>
<tr>
<td>Backed blade, asymmetric</td>
<td>1 1 5 2 2 2 12</td>
<td>1 1</td>
<td>2 1</td>
<td>15</td>
</tr>
<tr>
<td>Backed blade, geometric</td>
<td>1 1 5 1 1 9</td>
<td>1 1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Elouera</td>
<td>2 2 1 1 1? 1 9</td>
<td>2 2</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Fabricator</td>
<td>4 5 4 6 4 10 2 1</td>
<td>1 37 2 1</td>
<td>2 7</td>
<td>104</td>
</tr>
<tr>
<td>Other bipolar artifact</td>
<td>5 11 8 10 18 19 3 7 5</td>
<td>2 16 1</td>
<td>1 1 2</td>
<td>20</td>
</tr>
<tr>
<td>Use-polished</td>
<td>2 1 1 1 3 2 2 1 1</td>
<td>2</td>
<td>1 1</td>
<td>4</td>
</tr>
<tr>
<td>Flake with gum</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Fish hook file</td>
<td>3 1</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Axe, ground</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other ground stone</td>
<td>1 1 1 3</td>
<td>1</td>
<td>19</td>
<td>3</td>
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<tr>
<td>Hammer</td>
<td>1 1 2 3 1 1 1 1 16 1 1</td>
<td>2 1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Anvil</td>
<td>1 1 1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ochre pencil</td>
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<td>2</td>
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<td>2</td>
</tr>
<tr>
<td>Fish hook</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Fish hook blank</td>
<td>4</td>
<td>1 5 2 2</td>
<td>1 1</td>
<td>8</td>
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<tr>
<td>Bone point: A</td>
<td>6</td>
<td>14</td>
<td>1 2 2 5</td>
<td>6 1 7</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>1 2 2</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>2</td>
<td>1 1</td>
<td></td>
</tr>
<tr>
<td>Other bone artifact</td>
<td>2</td>
<td>2</td>
<td>1 1</td>
<td>1 1</td>
</tr>
</tbody>
</table>

Table 15 Currawong: distribution of implements
### Table 17 Curramong shelter 1: percentage frequency distributions for scraper characteristics

<table>
<thead>
<tr>
<th>1. Length in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Breadth in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Thickness in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Breadth/length ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Thickness/breadth ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Weight in gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Length of retouch in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. % of retouch</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Retouch angle in degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. Disposition of retouch</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Thumbnail</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

40
3. in all attributes related to size, more like the middle to top levels;
4. most like the top level in T/B ratio and percentage of working edges that are concave (4.6% at Curraong);
5. unlike Burrill in the low percentage of simple end scrapers, which are replaced at Curraong by composite side-end categories.

The above comparisons do not show conclusively that Curraong scrapers are linked more strongly to scrapers from contemporary rather than earlier levels at Burrill. However, this is hardly surprising since the Burrill scrapers show little real change through time. On metrical evidence alone, Curraong scrapers fit exactly into the Burrill range drawn from all levels.

Some differences however are revealed by standard typological and other non-metrical observations. At Curraong there are:
1. less concave working edges than even the top level at Burrill;
2. no end scrapers made on longish flakes or blades which seem a distinct type in all levels at Burrill;
3. apart from thumbnail scrapers, no other finely made scrapers which are present if rare in all Burrill levels.

Because of the small sample, differences 2 and 3 could have arisen by chance. The overall impression is that the majority of scrapers from both Burrill and Curraong are fairly amorphous and made on poor quality stone.

With the absence of other finely made scrapers at Curraong, thumbnail scrapers stand out clearly as a group. They are small, uniform in shape, delicately retouched and often made of the same fine-grained quartzites and rhyolites used for backed blades. Retouch is usually at the distal end and extends from there along part of the two adjacent margins. Their status as a type apart from other scrapers in the assemblage is supported by the frequency distribution of scraper weight (fig. 12), which shows at the lighter end of the range a distinct mode coincident with the thumbnail scraper class. At Burrill, on the other hand, they are less distinct as a type, both in terms of size and in retouch characteristics. Thumbnail scrapers have been classified as 'microlithic' (McCarthy 1964:208), though scrapers with their characteristics are not rigidly confined to microlithic levels as defined by the presence of backed blades (Glover and Lampert 1969). At Burrill there is at least one small, delicately retouched scraper low in a pre-Bondaian level where backed blades are absent, though the majority are in the Bondaian. At Curraong 1 thumbnail scrapers are contemporary with backed blades and show no evidence for continuing later, though we should observe that scrapers of any kind are uncommon in the upper part of the deposit.

There are no horse hoof cores at Curraong, apart from one doubtful specimen, but there are two pebble core-scrapers (fig. 11:1, 2) of a kind not found at Burrill. These have the steep, overhung working edge characteristic of horse hoof cores and they are similarly massive. They might thus be within this assemblage functionally equivalent to true horse hoof cores in other assemblages, with the difference caused by pebbles being used as raw material.

Shelters 2 and 3 Because only a few scrapers were recovered here, scrapers from shelters 2 and 3 have not been analysed in the same way as those from shelter 1. A subjective appraisal of the six scrapers from shelter 2
suggests they would stand as a sample representative of the shelter 1 scrapers. Apart from one thumbnail scraper finely made of chert, all specimens in the group lack distinctive characteristics and are made of fairly coarse-grained stone. Shelter 3 yielded only three scrapers, one of which is a thumbnail variety.

Backed blades

So that these can be compared with those from other sites, I follow Glover (1967) in my classification and presentation of the data. There are thus two main categories: group A, comprising backed blades with length/breadth ratios less than 2:1, and group B with L/B ratios equal to/greater than 2:1. Broken or doubtful backed blades are assigned to a third group. Dividing the Currarong sample metrically in this way corresponds closely to my more subjective classification by standard typology into geometric microlith (A) (fig. 11:32-4) and the asymmetric bondi point (B) (fig. 11:35-9).

Although this division is often made by Australian archaeologists (e.g. McCarthy 1967) the status of geometric microliths and bondi points as independent formal types is doubtful. On one hand the subjective division of backed blades is substantiated broadly by L/B ratios, both for Currarong and for the Western Australian Millstream collection (Glover 1967:419). At Burrill and Currarong this difference seems supported further by the distribution of the two forms, Burrill having bondi points only whereas at Currarong the bondi point / geometric microlith ratio is 1.3:1.

However, within the Currarong site there is no time-depth differentiation between the two forms and all backed blades from Currarong are made of the same types of stone, quartzite and rhyolite, both fine grained and pale grey. Histograms for length and breadth of the Currarong backed blades (fig. 13) generally support the idea of the backed blade as a unitary type with continuous, unimodal distribution of its characteristics, though for length there is a hint of a bimodal distribution which might be worth further investigation when a larger sample of this kind becomes available for analysis. For Curcurrang, a coastal site some 75 miles (120 km) northward, Glover (1969), using factor analysis, interprets bondi points and geometric microliths as the different ends of a continuous range, rather than independent types.

The combined sample of backed blades from shelters 2 and 3 is a small one, but a high order of similarity to that of shelter 1 is nevertheless apparent in table 18, suggesting that backed blades from the three sites are samples of the same population. Using the above data, group B (bondi points) implements withstand close comparison with those from sites elsewhere in Australia, thus further supporting Glover's claim for widespread homogeneity in the Australian backed blade tradition (Glover 1967:424-5). Backing around the butt occurs on 38% of Currarong group B implements (bondi points) making them slightly more similar to groups from other sites in NSW (34-30% with butts backed) than to the Western Australian Millstream collection where the percentage of butts backed is 63% (Glover 1967:424-5).
Fabricators or Scalar Cores

On the basis of an ethnographic study at Lake Kopiago in the New Guinea Highlands, J.P. White (1968) interprets the 'fabricators' found archaeologically in NSW as scalar cores. White suggests that, like the New Guinea specimens, the NSW fabricators are not implements themselves but the by-products of an industry directed towards manufacturing small flakes by the bipolar technique. He argues a reasonably close similarity between the New Guinea ethnographic and the Australian archaeological specimens on the basis of size, shape and flaking technique.

In the light of White's scalar core hypothesis I shall now examine evidence from the Curraong stone assemblage within the context of similar industries from other sites in eastern NSW. Because fabricators from Curraong shelter 1 are more numerous and from a better stratigraphic context than those from either Burrill or the other sites at Curraong, I have investigated in some detail the shelter 1 specimens and their associations within the site.

Shelter 1 Altogether there are 126 artifacts from shelter 1 having some of the attributes by which fabricators are recognised. The whole group, which I term collectively bipolar artifacts, is subdivided as follows:

A. (fig. 11:22-5) Thirty-seven are characteristic fabricators with the full range of attributes listed by White for scalar cores (1968:658,665). Essentially they are 'bipolar cores with opposing ends battered, splintered and bruised' (1968:665). This is broadly consistent with descriptions by other Australian archaeologists, including McCarthy et al. (1946:34) and Wright (1970:88), for fabricators.

B. (fig. 11:26-7) Twenty-nine have one edge bruised while the opposite edge shows evidence for the artifact having transversely snapped during flaking (cf. White 1968:661), though in some cases the opposite edge takes the form of a core platform, usually with an angle of around 90°.

C. (fig. 11:28-9) Forty-four are slivers, narrower than, though similar in length to, the patent fabricators (A) and showing only vague bipolar bruising or splintering.

D. (fig. 11:30-1) Sixteen are small cores with striking platforms at opposing ends. Scalar bruising or splintering, usually invading only one face, occurs near the edges of some platforms. These cores are less flat in transverse cross-section than fabricators (A), though not significantly different in length. Generally they lack clear evidence to show whether they are true fabricators or conventional small cores on which bipolar flaking is incidental.

The above categories comprise the population of bipolar artifacts from shelter 1, ranging from definite fabricators (A) to possibly conventional small cores (D). The identical flaking technique and general similarity in size suggest they are part of a continuous range, the divisions I have made being artificial ones for the purposes of description. In size, shape and flaking technique the Curraong fabricators (table 19) appear indistinguishable from either the archaeological examples from other sites in eastern NSW or the ethnographic specimens from New Guinea (cf. White 1968: table 1).

<table>
<thead>
<tr>
<th>Group</th>
<th>Site</th>
<th>No.</th>
<th>Length in mm</th>
<th>Breadth in mm</th>
<th>B/L ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>Range</td>
<td>X</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>12</td>
<td>14.6 ± 4.7</td>
<td>9-28</td>
<td>10.3 ± 2.2</td>
</tr>
<tr>
<td></td>
<td>2+3</td>
<td>3</td>
<td>12.5</td>
<td>9.5-15</td>
<td>9.8</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>14</td>
<td>22.5 ± 4.3</td>
<td>14-29</td>
<td>8.6 ± 1.6</td>
</tr>
<tr>
<td></td>
<td>2+3</td>
<td>7</td>
<td>22.3 ± 2.9</td>
<td>20-28</td>
<td>8.6 ± 0.7</td>
</tr>
</tbody>
</table>

Table 18 Curraong: dimensions of backed blades
Bipolar artifact categories

<table>
<thead>
<tr>
<th>Category</th>
<th>A</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>37</td>
<td>44</td>
<td>16</td>
</tr>
<tr>
<td>Length (cm)</td>
<td>2.11 ± 0.8</td>
<td>1.99 ± 0.56</td>
<td>2.27 ± 0.57</td>
</tr>
<tr>
<td>Breadth (cm)</td>
<td>1.87 ± 0.72</td>
<td>1.2 ± 0.42</td>
<td>1.59 ± 0.77</td>
</tr>
<tr>
<td>Thickness (cm)</td>
<td>0.77 ± 0.34</td>
<td>0.66 ± 0.34</td>
<td>1.09 ± 0.42</td>
</tr>
<tr>
<td>B/L ratio</td>
<td>0.89 ± 0.22</td>
<td>0.64 ± 0.25</td>
<td>0.66 ± 0.28</td>
</tr>
</tbody>
</table>

Table 19 Curramong shelter 1: mean and standard deviation values for bipolar artifacts

Category B (broken) not shown

In analysing the Lake Kopiago material, White selected only those specimens 'having two or more "working edges" bifacially bruised and splintered' (1968:662) for comparison with NSW fabricators, that is 33% of the cores produced by bipolar flaking collected in the field. At Curramong those in category A, forming 30% of the range, conform to the criteria used by White to select his sample. The closeness of the two percentages seems further to support the claim for similarity of the New Guinea and NSW bipolar artifact groups. Furthermore, in personal correspondence, Dr White recognises the four classes of bipolar artifacts I have set up for NSW as being present in the New Guinea material.

From his Lake Kopiago observations, White suggests the NSW fabricators are cores which 'probably result from the production of small flakes which were mostly used as tools without further modification' (1968:664). In the middle level at Curramong 1, in which fabricators are most numerous (table 20), there is a noticeably large number of small unmodified flakes, most of which are less than 0.5 in. (1.3 cm) square (table 21), small enough to be the flake component of an assemblage whose cores average about 2 cm in length. It at least seems certain from the percentage relationship between implements and flakes (0.9% implements) that stone was knapped in level II times (cf. White, J.P. 1967:162), whereas this is less certain for level I (2.2%) and probably not the case for level III (5.4%). The view that the bipolar artifacts and flakes in question are part of the same industrial process receives better support from the fact that a high percentage of each is of quartz. Breuil and Lantier (1965:63) point out that the bipolar method of flaking is the only means of 'reducing an entire block of quartz to small pieces'. Of the 126 bipolar artifacts, 37.3% are quartz, 14.3% chert, 48.4% other stone. The distribution of flakes by stone types is shown in table 20.

The above evidence suggests that the Curramong shelter 1 fabricators result from the production of small flakes. At Burrill also there is a high incidence of quartz and small flakes in the level (II) in which fabricators are most common. For Sassafras 1, a rock shelter 36 miles (58 km) inland from Curramong (Hume 1965), there is in upper levels a similarly low proportion of implements to waste, also a large amount of quartz, although the size distribution of the unmodified flakes is not on record.

Shelters 2 and 3

Like other flaked stone, bipolar artifacts are much rarer in shelters 2 and 3 than in shelter 1, and thus cannot be analysed with the same rigour. Of 14 bipolar artifacts from shelter 2, six are fabricators (A) having a mean length of 2.13 ± .56 cm which may be compared with 2.3 ± .34 cm for the mean length of seven fabricators from a bipolar artifact sample numbering 14 from shelter 3. These values are close enough to the mean length (2.11 ± .8 cm) of the larger sample from shelter 1 to suggest that the three samples could be from the same population. Of the 28 bipolar artifacts from shelters 2 and 3, 15 are of quartz, one is of chert, 11 are of other stone, while one is of bottle glass, presumably European in origin.

Despite the obvious similarities of the bipolar artifacts from these two shelters to those from shelter 1, there seems to be a disparity in the
Table 20: Currawong shelter 1: distribution of unmodified flakes based on squares 1D and 2D in levels II and III and all squares in level I.

<table>
<thead>
<tr>
<th>Level</th>
<th>Size distribution %</th>
<th>Stone type %</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;0.5 in sq (1.3 cm sq)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top</td>
<td>17.2</td>
<td>26.9</td>
<td>227</td>
</tr>
<tr>
<td>Middle</td>
<td>69.4</td>
<td>53.7</td>
<td>1495</td>
</tr>
<tr>
<td>Bottom</td>
<td>39.2</td>
<td>13.5</td>
<td>1057</td>
</tr>
<tr>
<td></td>
<td>0.5-1 in sq (1.3-2.6 cm sq)</td>
<td>9.2</td>
<td>2022</td>
</tr>
<tr>
<td></td>
<td>16.7</td>
<td>14.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.6</td>
<td>80.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;1.5 in sq (2.6-3.8 cm sq)</td>
<td>63.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.4</td>
<td>31.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>80.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;1.5 in sq (3.8 cm sq)</td>
<td>26.9</td>
<td>227</td>
</tr>
<tr>
<td></td>
<td>4.4</td>
<td>2022</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1495</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1057</td>
<td></td>
</tr>
</tbody>
</table>

Table 21: Currawong shelter 1: distribution of bipolar artifacts and non-scalar cores.

<table>
<thead>
<tr>
<th>Levels</th>
<th>Bipolar artifact distribution</th>
<th>Other cores</th>
<th>As a percentage of flakes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Top</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Middle</td>
<td>31</td>
<td>22</td>
<td>38</td>
</tr>
<tr>
<td>Bottom</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 22: Currawong shelters 2 and 3: distribution of unmodified flakes.

<table>
<thead>
<tr>
<th>Shelter, level</th>
<th>Size distribution %</th>
<th>Stone type %</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;0.5 in sq (1.3 cm sq)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, Upper</td>
<td>33.9</td>
<td>26.7</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>57.2</td>
<td>21.7</td>
<td>675</td>
</tr>
<tr>
<td></td>
<td>6.7</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.2</td>
<td>59.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.5</td>
<td>88.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>429</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>486</td>
<td></td>
</tr>
<tr>
<td>3, Upper</td>
<td>33.5</td>
<td>25.1</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td>61.1</td>
<td>25.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.8</td>
<td>49.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.6</td>
<td>48.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.5</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>486</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>429</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>135</td>
<td></td>
</tr>
</tbody>
</table>
relationship of fabricators to unmodified flakes compared with the middle level at shelter 1. In table 22, flake distributions of shelters 2 and 3 are roughly divided, at about half deposit depth, into 'upper' and 'lower' to expose possible time differences in the distributions. Bipolar artifacts come from both levels at the two sites but are not numerous enough to be divided according to depth. It can be seen that there are much lower values for small unmodified flakes and for the use of quartz as raw material. This situation also holds for the top level of shelter 1 (table 20).

For none of these three samples does the implement to flake percentage suggest that stone was definitely worked on the spot: 2.2% for the top level of shelter 1; 5.7% for shelter 2; 2.0% for shelter 3. We may note further that the percentage relationships between fabricators and flakes in the three assemblages are very close: 2.2% for the top level of shelter 1; 2.2% for shelter 2 and 2.3% for shelter 3. However, in contrasting these results with those for the middle level at shelter 1, the smallness of the three assemblages under discussion should be borne in mind.

A site with an adequate stone sample, difficult to explain in the terms of White's scalar core hypothesis, is Gymea Bay (Megaw and Wright 1966), on the coast some 75 miles (120 km) northward from Curraong. Although the industry there seems to have been 'directed towards the production of small, squat flakes' (1966:29), fabricators average 14% of flakes, which would appear to be too high a percentage for fabricators to be regarded as the core component of this industry (cf. White, J.P. 1967:126).

Function of bipolar artifacts The above inconsistencies can be resolved by thinking of fabricators as core-implements rather than simply as cores. As implements they could have been carried from site to site and thus appear in contexts that lack other evidence for bipolar flaking. This would explain why fabricators are acceptable as the core component of the stone industries at Curraong 1 middle level and Sassafras 1 but not at Gymea Bay. Evidence to support their use as implements comes from both Burrill and Curraong, where altogether six fabricators were found with use-polish along an unbruised margin (pl. 2:4; figs. 5:41; 11:22,23). The fact that some fabricators were utilised suggests that others could have been.

Whatever their subsequent role, it is apparent, however, that fabricators were initially the cores formed during bipolar flaking and that small flakes were the likely end-product of this industry. From the lack of trimmed implements of comparable size in stratigraphic association at the sites mentioned for NSW, these flakes were evidently used without further modification. This raises the question as to the function of the flakes. Since they might have served many uses, it is impossible to specify the functions of particular unmodified flakes. However, with a large sample the most frequent use for the flakes might be deduced from such modes as consistent preference in flake size and stone type, a repeated pattern of stratigraphic relationship to other artifacts or industrial traditions and, as bipolar flaking was popular recently, the most likely ethnographic parallel.

By such reasoning the flakes could have been frequently made for the death spear (Davidson 1934), a wooden spear to which stone flakes were gum-hafted in one or two rows, several inches in length, near the tip of the spear. The evidence for this is as follows:

1. Death spear barbs were always unmodified flakes (Davidson 1934:149; Mulvaney 1969:93).
2. The flakes used were small. Eyllmann (1908:327) records a maximum length of 1 cm for flakes hafted in death spears by a coastal tribe in South Australia; a specimen from Queensland (Australian Museum E60830) has four flakes of lengths in the range 0.5 - 0.9 cm.
3. Flakes of quartz are common in death spears. Referring to spears in European collections, Mulvaney (1969:93) says flakes are 'usually quartz', while McCarthy et al. (1946:44) talks of 'many kinds of stone including quartz'. All four flakes in the spear from Queensland noted above are of quartz.

Quartz is also common in archaeological levels containing fabricators. In Curraong 1 middle level, where fabricators and small flakes are most numerous, quartz is the commonest stone. For Sassafras 1 Hume (1965:40) notes an increase in the proportion of quartz used in upper levels where
fabricators are also most numerous. As mentioned earlier, the bipolar method is most suitable for quartz flaking.

Following European contact glass fragments were sometimes used in death spears (Roth 1903:58; Etheridge and Whitelegge 1907:247; Davidson 1934:147-8; Mulvaney 1969:93). From 12 cm below the surface of shelter 2 at Currawong came a glass artifact biconically flaked on two adjacent margins while both opposing margins are broken. Though not a true fabricator (A), it nevertheless falls within the range of bipolar artifacts described above (i.e. group B).

4. A fairly large number of flakes was hafted in each spear. Estimates made from the row lengths on record, allowing 1 in. (2.6 cm) for each flake, range from eight (cf. Eydmann 1908:32) to 36 (cf. Etheridge and Whitelegge 1907:244) flakes per spear. A spear from the Sydney district illustrated by Collins (1798:439) has ten flakes. Mulvaney (1969:93) records a maximum of 22 flakes for spears in European collections. The Queensland spear in the Australian Museum, however, has only four flakes.

The abundance of small flakes in shelter 1 middle level suggests a function which required these flakes in considerable numbers. The combination of the bipolar flaking technique and the use of quartz was perhaps an efficient method to produce small flakes in quantity.

5. The death spear seems logically acceptable as a replacement for a putative earlier spear type in which backed blades were gum-hafted as barbs and/or points (McCarthy 1943:149, 1967:fig. 26; Mulvaney 1960:79-80). Use-wear along the chords of some bondi points, however, suggests that backed blades were not used exclusively for spears (Moore 1970:59). Certainly some backed blades were gum-hafted in northeastern NSW (McBryde 1968:89) but the function of these is unknown. With reference to death spear barbs Mulvaney (1969:94) notes that 'it has been suggested that these formless fragments were degenerate substitutes for carefully trimmed backed blades ... however this plausible interpretation remains unconfirmed'.

Provided we accept that the NSW fabricators result from deliberate small flake production, this functional argument gains some support from the replacement over time of backed blades by fabricators at both Currawong 1 and Sassafras 1. At Sassafras 1 the backed blade / fabricator ratio gradually changes through successive levels in favour of fabricators (Hume 1965:24-5). By this argument gum-hafting of small stone artifacts as spear barbs remains constant, although the form of the hafted artifacts changes from backed blades to unmodified flakes.

6. The eastern NSW sites at which fabricators are numerous fall within the area of Australia for which death spears are on record (Davidson 1934:123-4). This distribution does not, however, entirely coincide with that of backed blades (Mulvaney 1969:fig. 28).

To sum up this section, White's thesis of scalar core/small flake production as the function of NSW fabricators is broadly supported by the evidence from Currawong and Burrill, though at both sites fabricators were found that had served as implements in their own right. A better fit for the NSW evidence would be a concept of fabricators as cores initially, which in some instances later became implements. The fact that White's argument has to be thus modified in detail is hardly surprising because of the distant and culturally different area from which his ethnographic parallel has been drawn. Acceptance of the view that small flake production was a major industry at a number of late sites in NSW prompts the question as to the use of the flakes. The armament of death spears is one function suggested by a number of evidences.

Use-polished Artifacts

Use-polish occurs along the margins of 20 artifacts, 16 of which are simple flakes (fig. 11:19-21), one is an elouera (fig. 11:18), and four are fabricators with polish along an unbruised margin (pl. 2:4; figs. 5:41; 11:22,23). Similarities between these and the use-polished implements from Burrill (pl. 2:2,3) suggested at the outset that the two groups could be viewed collectively. The total sample is thus 22 flakes, six fabricators and three eloueras.
All share a number of characteristics. Chattering and blunting occur along the polished working edge, which is always a longitudinal margin, usually the more acutely angled, though both margins are equally acute on six flakes, five of which have polish along one margin, while one specimen has both margins polished. Use-polish diminishes inward from the margin fairly equally across both faces. There appears to be little variation in the extent of polish between implements, the maximum invasion of polish on each being detectable around 10-12 mm from the margin, though because of the gradual diminution the actual endpoint is hard to recognise.

Under microscopic examination striations in the polish are visible on 11 of the flakes, two of the fabricators and two of the eloueras. The angle of these striations to the margin is in all cases between 80° and 85°, except for one outlying value of 75°. They are parallel to each other and do not therefore intersect. On the clearest example (fig. 5:42 and pl. 2:3) they appear equally distributed over both faces. Of several types of use-wear described by Semenov, the polish on this flake most closely resembles that on 'whittling knives', used for cutting wood or bone, in that polishing is along the margin of the tool and gradually weakens away from the margin, while the striations lie nearly at right-angles to the margin (Semenov 1964:109). The large area of polish, the depth and frequency of the striations, and the blunting of the margin, together suggest that considerable physical force must have been applied. A flake of this small size must have been hafted, for little force could be applied if it were merely held in the fingers (Semenov 1964:114-5).

The most likely hafting method is indicated by Lawrence (1968:153). From the study of early accounts of Aboriginal life in coastal southeastern Australia, he concludes that 'the stone or shell mounted on the spear-thrower was the most frequently recorded cutting implement, being used as a knife or chisel in woodworking and as a knife in cutting flesh'. As the use-wear is unlike that described by Semenov (1964:104-5) for meat knives, the most fitting interpretation of the use-polished stone implements from Burrill is that they were end-hafted in spear throwers to form composite tools primarily used for woodworking. The tendency for use-wear to be evenly distributed over both faces of the stone suggests there was no preference for holding the tool with a particular face towards the material being cut (Semenov 1964:109). This in turn suggests the implements from Burrill and Currawong were end rather than side-hafted.

Other Utilised Flakes

Other than use-polish there are 105 flakes from Currawong showing some degree of utilisation, usually chattering along a sharp margin.

Eloueras (fig. 11:16-18)

None of the 11 eloueras conforms to McCarthy's 'ideal type', which resembles an orange segment in form and has the whole of the arc trimmed, frequently from both margins. Of the Currawong specimens all except one, of doubtful status as an elouera, fall within the wider range described by McCarthy et al. (1946:28). Only a part of the arc is trimmed, from both margins on nine of the specimens, one of which is trimmed only at the distal end of the arc.

Use-wear in the form of chattering occurs along the chord in all cases. On five it is accompanied by slight polishing restricted to the very margin. This perhaps is a less developed version of the invasive polish described in the previous section for one elouera from Currawong and two from Burrill.

The affinity between these and the use-polished flakes has been noted. Some of the characteristics common to both are shared also by other Currawong eloueras, even those from which use-polish is entirely absent. Use-wear in the form of chattering along the more acute of the longitudinal margins is common to all the implements in question, both eloueras and use-polished flakes. The suggestion made here is that, though typologically they might be separated, functionally they are equivalent.

This proposition is investigated further by comparing formal characteristics. In table 23 dimensions of both eloueras (group 1) and use-polished flakes (group 2) are compared with flakes having use-wear other
than polish. From the latter has been selected a group of flakes (group 3) showing some of the characteristics held by the first two categories: they are either longish flakes or blades, each with chattering along one acute-angled longitudinal margin. The remaining utilised flakes comprise group 4.

<table>
<thead>
<tr>
<th>Category</th>
<th>Length (mm)</th>
<th>Breadth (mm)</th>
<th>B/L</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Eloueras</td>
<td>35.0 ± 7.2</td>
<td>23.0 ± 5.3</td>
<td>67.5 ± 15.1</td>
<td>11</td>
</tr>
<tr>
<td>2 Use-polished</td>
<td>33.9 ± 8.8</td>
<td>20.2 ± 3.8</td>
<td>61.9 ± 14.8</td>
<td>16</td>
</tr>
<tr>
<td>3 Selected utilised</td>
<td>27.7 ± 5.3</td>
<td>14.7 ± 3.7</td>
<td>52.9 ± 7.7</td>
<td>22</td>
</tr>
<tr>
<td>4 Utilised</td>
<td>26.5 ± 9.3</td>
<td>17.0 ± 6.8</td>
<td>65.3 ± 6.8</td>
<td>105</td>
</tr>
</tbody>
</table>

Table 23 Currarong: mean and standard deviation values for specific artifacts

In the three characteristics tabulated, use-polished flakes are not significantly different from eloueras. However, eloueras and use-polished flakes are each significantly different in both length and breadth from utilised flakes without polish, even from the group selected because of greatest apparent similarity. This relationship suggests that the function of the eloueras without use-polish was the same as that argued from use-wear evidence for the use-polished eloueras and flakes from both sites. They could have all thus been end-hafted as chisels for use mainly in woodworking.

Evidence for the hafting of eloueras comes from Oenpelli in the Northern Territory where a complete side-hafted specimen was found (Setzler and McCarthy 1950). The authors (1950:2,4) note that use-polish is concentrated on one surface of both the hafted elouera and an unhafted specimen from the same locality. C. White (1967a:235-6) observes that most of the 91 unhafted eloueras excavated by Setzler and McCarthy 'have a distinctive form of use polishe along one edge, the gloss being dull on one surface and bright on the other'.

More intense use-polish on one surface of a cutting implement indicates that it was used with a particular surface towards the material being worked (Semenov 1964:109). This suggests that all the Oenpelli eloueras were side-hafted. Not only do the eloueras from Burrill and Currarong give evidence of a different form of hafting; the suggested affinity between northern and eastern forms of elouera has already been questioned on typological grounds (White, C. 1967a:234-6).

Other Stone Artifacts

Flakes with hafting gum (pl. 3:1) There are two of these, both from the top level of shelter 1, in which other organic materials were well preserved. Each flake has black gum thickly spread around the blunter of its longitudinal margins, suggesting it was hafted in a manner that allowed utilisation of the thin margin. However, microscopic examination did not reveal signs of use-wear to provide further clues about function and hafting.

Fish hook files (fig. 11:41-4, table 24) There are four of these, all from the top level at shelter 1, a level from which a fish hook and five fish hook blanks were also recovered. The files are unexceptional examples of a range found on the NSW south coast, in which McCarthy (1967:58-9) sees two main forms: one triangular or leaf-shaped in plan, usually with flat surfaces, the other cylindrical with a cross section fairly uniform in diameter throughout its length. Both forms are represented at Currarong but whether they should be considered two distinct types with different functional or other implications seems questionable. The use-wear on each is concentrated near the pointed tip.

Earlier than the above files, there is from the bottom level one small piece of ground quartzite roughly cylindrical in form (fig. 11:46). It could be the tip of a broken fish hook file but this is not certain.
**Hammers and anvils** The 13 complete hammer stones have a mean weight of 218 ± 106 gm with a range of 90 - 430 gm. All are natural pebbles that in shape tend to be elongated (B/L: $\overline{x} = 56.6 \pm 14.7$) with a fairly round cross section (T/B: $\overline{x} = 72.8 \pm 9.2$). This form appears to represent a selection rather than a sample of local pebbles. Percussion pitting is mainly at the ends rather than the sides, while some are also pitted on the faces suggesting they were combined hammer-anvil stones. McCarthy (1967:80) also records an elongate variety of Australian hammer stone with percussion marks at each end.

Additionally there are six broken hammer stones, also three deeply pitted anvil stones with weights of 190 gm, 430 gm and 450 gm and with fairly flat cross sections (T/B values: 38, 44, 46). On each anvil stone both of the flat surfaces are pitted, with a tendency towards localised depressions having a maximum depth of 5 mm (cf. McCarthy 1967:80).

McCarthy et al. (1946:58-9) suggest a number of uses for percussion stones but warn us that there is very little precise information based on first-hand observation of their use by Aborigines. At Curraong an obvious use for hammer stones would have been detaching shell fish such as rock oysters, while hammers and anvils could have been used together for breaking open shell fish and for bipolar flaking of stone. However, as both hammers and anvils are not strongly concentrated in the shelter 1 levels where bipolar flaking is most evident, we cannot say that they were used more for bipolar flaking than for the other purposes suggested.

**Axes** The two edge-ground axe blades found at Curraong were petrologically examined by Dr D.F. Braganan. A complete specimen (fig. 11:40) found 95 cm below the surface of square D, shelter 2, is of a coarse-grained gabbro obtained possibly from near Moruya on the coast some 75 miles (120 km) to the south (cf. Braganan and Megaw 1969:14). The other axe, a broken fragment unearthed at about mid-depth in level II, shelter 1, is of a fine-grained basalt whose possible origin is near the mouth of the Clyde River about 60 miles (97 km) south of Curraong.

**Other ground stone** Two rather irregular pieces of quartzite show marks of grinding or rubbing, each on its flatter surface. A third piece, from the top level of shelter 1, might be a broken fish hook file but if so it would be a unique form. Its base has been rounded while towards the other end its width has been reduced, both modifications being effected by grinding (fig. 11:45).

**ARTIFACTS OF BONE AND SHELL**

**Bone Points** (fig. 14)

The 46 bone points from the three Curraong shelters have a range of forms very similar to those from Durras North and I therefore describe them using the same terminology and classificatory system (Lampert 1966). For reasons previously stated (Lampert 1966:101), length is the only major dimension thought reliable enough to support typological distinctions, which are based more on other observations. I list the Curraong bone points in the following classes.

---

**Table 24 Curraong shelter 1: characteristics of fish hook files**

<table>
<thead>
<tr>
<th>Reference:</th>
<th>Dimensions (cm)</th>
<th>Shape</th>
<th>Stone</th>
</tr>
</thead>
<tbody>
<tr>
<td>fig 11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>5.5</td>
<td>3.3</td>
<td>0.3</td>
</tr>
<tr>
<td>42</td>
<td>7.0</td>
<td>2.5</td>
<td>1.2</td>
</tr>
<tr>
<td>43</td>
<td>6.2</td>
<td>3.0</td>
<td>1.1</td>
</tr>
<tr>
<td>44</td>
<td>4.6</td>
<td>1.3</td>
<td>1.1</td>
</tr>
</tbody>
</table>
A. (fig. 14 e) Five bipoints of split bone, four of which have the visible remains of a medial band of hafting gum. The tips are finely ground and polished. Length: $\bar{x} = 37.8 \pm 9.8$; range = 32-54 mm.

B. (fig. 14 f) Twenty-eight unipoints of split bone, two of which have remains of gum near the base. They are similar to the bipoints (A) in the treatment of their tips. Length: $\bar{x} = 24.4 \pm 9.0$ mm; range = 13-62 mm.

C. (fig. 14 a, b) Six hollow points of unsplit bird bone, five of which are unipoints each with the butt formed by part or all of the shaft head, while one is a bipoint (fig. 14 a). On four specimens a sharp tip has been formed merely by snapping the shaft diagonally. There is use-polish on these, concentrated at the extreme tip and diminishing rapidly away from it, but no evidence for shaping by grinding. On the other two points, one of which is the bipoint, the tips have been ground but it is not known whether this was preceded by snapping, since evidence for this would have been obliterated by grinding. One of the four snapped specimens has, over much of the length of its shaft, a high glossy polish, slightly different from the duller, more localised use-polish at the tip. Length: $\bar{x} = 62.3 \pm 13.3$ mm; range = 42-79 mm.

D. (fig. 14 d) Four unipoints of unsplit macropod fibula each with a finely ground and polished tip formed in the naturally flat part of the fibula. Two have a high glossy polish extending over most of their lengths as seen on one of the unsplit bird bone unipoints (C). On all four use-polish is apparent at the tip. Length: $\bar{x} = 97.0 \pm 22.4$ mm; range = 61-126 mm.

E. (fig. 14 c) Three broad, blunt unipoints with rounded or 'spatulate' tips, each of which has at its extremity use-polish that diminishes rapidly away from the tip; grinding is evident on one tip only. Two points are of split bird bone while the third is of unsplit wallaby fibula. Length values are 77 mm, 78 mm and 84 mm.

Fig. 14 Curraong: bone points arranged in groups described in text.
Plate 2

(1) Upper left: edge of saw from Burrill Lake, level IV (x 4.2)
(2) Upper right: use-polished flake from Curraong shelter 2, depth unit 1 (x 3.1)
(3) Lower left: use-polished elouera from Burrill Lake, level II (x 2.4)
(4) Lower right: use-polished fabricator from Curraong shelter 3 (x 2.9)
Plate 3

(1) Lower left: flake with hafting gum from Curraong shelter 1
(2) Upper right: utilised wallaby bone from Curraong shelter 1
(3) Upper middle: cut macropod bone from Curraong shelter 2
(4) Upper left: lizard jaw with gum from Curraong shelter 1
(5) Lower right: wad of plant fibre from Curraong shelter 1
(6) Lower middle: knotted piece of string from Curraong shelter 1
The overall length values for the 46 points are: \( \bar{x} = 40.8 \pm 27.2 \text{ mm} \); range = 13-126 mm.

All the typological divisions emerging from the Durras bone points are applicable to the Currarong material. There are no notable absences and the only addition to the range is the class of points made from macropod fibulae (D). In both assemblages the numerically dominant form is the short unipoint (B), of length usually in the range 15-35 mm, fairly slender and finely tipped. Other forms common to both sites are a slender bipoint often having a medial band of hafting gum (A); a unipoint of unsplit bird bone (C); a broad unipoint (E) whose greater breadth and rounded tip place it in a category distinct from the other unipoints. Furthermore the frequency distributions for length do not differ significantly (at the 5% level using \( \chi^2 \)) between the two collections.

It is not always possible to establish whether bird or mammal bone has been used, particularly when the point is small and its surface has been removed by grinding, in which case bone thickness is the only evidence. However, the points whose bone material is positively identifiable as land mammal are alone sufficient to show that a higher percentage of mammal bone was used at Currarong than at Durras. The estimated mammal to bird bone ratios are: Durras, 1:49, Currarong, 1:4. These differences are consonant with other evidences for a more varied economy at Currarong, with greater emphasis on the hunting of land mammals than at Durras.

The Currarong bone points, generally better preserved than those from Durras, allow more accurate observation of fine detail, particularly use-polish. This characteristic supports a major functional division in the implement range only weakly apparent when observing the Durras sample alone. I see the following two groups:

1. A group of large points comprising classes C, D and E, most of which are of unsplit bone and have use-polish concentrated at the tip while on the shaft there is sometimes a more dispersed, glossier polish and none of which shows gum or other evidence for hafting. These I suggest are hand-held implements used for piercing, the glossy polish on the shaft being caused either by frequent handling (cf. Semenov 1964:109) or by deep, repeated penetration of some material, as in sewing. I have listed a range of bone point uses, ethnographically recorded for the NSW coast, which include sewing of canoes and possum skin cloaks (Lampert 1966:107), while McCarthy (1967:82-3) describes more widely distributed but similar bones as awls often used in sewing.

2. The bone points in the other group (classes A and B) differ from those above in that most are much shorter (\( L: \bar{x} = 26.5 \pm 10.0 \text{ mm} \) compared with 77.0 ± 23.2 mm for group 1); all are of split bone; the surface finish appears to be the result of deliberate polishing rather than use, in that it is spread evenly over the ground tip rather than diminishing rapidly away from a concentration at its extremity and is neither highly glossy nor widespread over the shaft; hafting gum adheres to several specimens. These small unipoints and bipoints, numerically dominant within the range, were probably hafted as bars and tips of multipronged fishing spears, as I have argued for Durras North (Lampert 1966:106-11) and Megaw for sites near Sydney (1968b: 18, 1969:214-5).

Other Bone Artifacts

On a wallaby ischium, found in level 1, shelter 1, the edge of the blade has been sharpened by grinding, then chipped through use (pl. 3:2). Although the use of this bone is not ethnographically recorded, a bone similar in shape, the kangaroo scapula, with an edge of its blade sharpened, was used in Arnhem Land for slicing vegetable foods (McCarthy 1967:84, fig. 66).

Two short pieces of macropod fibula have tool marks. One, from depth unit 2, shelter 2, has a cluster of fine transverse cuts at a point where the fibula has been snapped (pl. 3:3). The cuts might thus have been deliberately made to weaken the bone at this point. The other piece of fibula is from depth unit 1, shelter 3. Grinding at one end suggests it is the broken-off tip of a spatulate point.
A lizard (*Tiliqua* sp.) mandible, found on the surface of shelter 1, has its distal end covered by a blob of gum (pl. 3:4). Since its proximal end is very thin and fragile, it is less likely to be a tool than an ornament. On the coast not far to the south, shipwrecked members of the *Sydney Cove* saw Aborigines in 1797 with 'fish bones or kangaroo-teeth, fastened with gum or glue to the hair of the temples and on the forehead' (H.R. NSW 1895:55), while similar observations were made on the coast near Kiama, 37 miles (60 km) northward of Currawong, (Backhouse 1843:428) and in the Sydney area (Phillip 1789:137; White 1790:137; Leigh 1821:962-3). Besides fish bones and kangaroo teeth, feathers, birds, slips of wood, dog teeth and lobster claws are listed as body ornaments, most being fastened to the hair with gum. The wide variety of faunal remains used as body ornaments suggests the lizard mandible could also have been thus used.

Fish Hooks

Including broken specimens there are four fish hooks and eight fish hook blanks (fig. 15), all made of the large turban shell, * Ninella torquata*. In type they are identical to specimens found elsewhere on the NSW coast, both nearby and in the Sydney region, and the same manufacturing method is indicated (Lampert 1966:113; Megaw and Wright 1966:39-40; Megaw 1968b:17; Lampert and Turnbull 1970). In size the hooks show a considerable variation, paralleling the wide size range of excavated fish bones, particularly those of snapper (*Chrysophrys auratus*), almost certainly caught by hook and line and the most common species represented in the Currawong shelters.

![Fish Hooks](image)

Fig.15 Currawong: shell fish hooks (a-d) and fish hook blanks (e,f)

Artifacts of Vegetable Material

All preserved vegetable remains found at Currawong were in trenches 6 and 7 of shelter 1. Near the back wall of the shelter, they were in a position well protected by the low roof from weathering.
Several tips of the flower stalk of the grass tree *Xanthorrhoea* sp. were found, but no part of the main stalk itself. The flower stalk of this tree was used for spear shafts, including the shaft of the multipronged fishing spear (Lampert 1966:110), which, from the evidence of small bone points found in the same level as the grass tree remains, was a spear used by the most recent Aboriginal occupants of the shelter. The presence of the tips could thus result from the manufacture of fishing spears.

There are two artifacts of plant fibre. One is a simple wad of rolled-up, untwisted fibre (pl. 3:5), while the other is a knotted piece of string (pl. 3:6). The string was obviously made by twisting together two strands of plant fibre, a method which is on record for the Sydney area, where two strands of bark were used to make fishing lines (Bradley 1786-92:133; White 1790:200; Leigh 1821:1012).

Other plant remains found in this part of the shelter include small pieces of bark from the paper bark tea-tree *Melaleuca* sp., leaves of eucalypt and wattle, grass and small twigs, all of which could have been carried in by wind. However soft bark, such as that of *Melaleuca* sp., and grass were both used by Aboriginals on the NSW coast. At Port Jackson (Sydney) in 1791 a newly born infant was seen 'wrapped up in the soft bark of a tree' (Macarthur H.R. NSW 1893:504), while grass was used as bedding (Thompson H.R. NSW 1893:797).

**HUMAN BURIALS IN SHELTER 1**

Human remains were found in level I and the pit, both of recent date. Of the three skeletons in articulated position, burial 1, in the upper fill of the pit (fig. 9:4), is stratigraphically the earliest; burial 3, in compact material above the pit (fig. 9:3), is second in the sequence, while burial 2, in loose shell (fig. 9:1), is the latest. The human remains from Currarong are fully reported on in Appendix 3.

**CURRARONG FAUNA**

*(table 25)*

Faunal remains were found throughout the entire deposit in shelters 2 and 3, but only in the top level of shelter 1, the site richest in artifacts. The absence of faunal remains or other organic materials except charcoal in the lower four-fifths of this deposit is almost certainly the result of decomposition; it is not because the shelter's occupants failed to exploit the local fauna. This repeats the situation at Burrill Lake, Sassafras and Curruarang, all of which like Currarong are fairly open sandstone rock shelters having in most cases lower deposits of confirmed antiquity.

Shelter 2, which has the deepest and oldest preserved fauna at Currarong, has more bone towards the back of the shelter than outside, but more shell at depth in square D outside the shelter than in squares C and K beneath the overhang. Decrease in shell frequency there might result from the more rapid accumulation of wood ash from fires lit at the shelter's mouth, since the matrix in squares C and K is a white to pale-grey powder flecked with microscopic charcoal fragments, unlike the darker matrix in D. Fire would also accelerate the decomposition of shell. Bone tends to be more common in the upper part of the deposit. In square D, the deepest part excavated, half the bone is in the top quarter of deposit. The increase in bone towards the back of the shelter is not really as sharp as it appears in table 26, since the deposit volume used in the calculation includes both the deep part of square D where bone is rare and the shallow area X which consists only of upper, bone-rich deposit. Even so there is a horizontal change in the distribution of bone which conflicts with the distribution of shells. Increase in bone both towards the back of the shelter and in the upper part of the deposit is a distribution seen also in shelter 1, where, however, both shell and bone together follow this pattern. It is the expected distribution with more sheltered and more recent material better preserved.

By this argument the anomalous situation is the presence of shell at the base of the fairly deep deposit outside shelter 2. Possibly this was caused by a rapid accumulation of material, the successive surfaces being covered by more material before such forces as sun, wind and rain had sufficient time to cause decomposition; certainly shells at the bottom of square D look better
### Mammals:

<table>
<thead>
<tr>
<th>Name</th>
<th>Common Name</th>
<th>Shelter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antechinus stuartii</td>
<td>brown phascogale</td>
<td>1 4 5</td>
<td>5</td>
</tr>
<tr>
<td>Perameles nasuta</td>
<td>long-nosed bandicoot</td>
<td>2 1 3</td>
<td>3</td>
</tr>
<tr>
<td>Isoodon obesulus</td>
<td>brown bandicoot</td>
<td>18 9 1</td>
<td>28</td>
</tr>
<tr>
<td>Pseudocheirus</td>
<td>ring-tailed possum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(or Schoinobates)</td>
<td>(or great glider)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichosurus vulpecula</td>
<td>brush-tailed possum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Potorous tridactylus</td>
<td>potoroo</td>
<td>8 6 1 15</td>
<td>15</td>
</tr>
<tr>
<td>Wallabia rufogrisea</td>
<td>red-necked wallaby</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Wallabia bicolor</td>
<td>swamp wallaby</td>
<td>4 6 10</td>
<td>10</td>
</tr>
<tr>
<td>Wallabia sp. ibicolor</td>
<td>wallaby</td>
<td>5 5</td>
<td>10</td>
</tr>
<tr>
<td>Macropus giganteus</td>
<td>grey kangaroo</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Pteropus poliocephalus</td>
<td>grey-headed fruit bat</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Rattus lutreolus</td>
<td>eastern swamp rat</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Rattus sp.</td>
<td>rat</td>
<td>1 5 1 7</td>
<td>9</td>
</tr>
<tr>
<td>Oryctolagus cuniculus</td>
<td>rabbit</td>
<td>3 1 4</td>
<td>8</td>
</tr>
<tr>
<td>Canis familiaris</td>
<td>dog, presumably dingo</td>
<td>6 1 1 8</td>
<td>8</td>
</tr>
<tr>
<td>Otariidae</td>
<td>seals</td>
<td>5 2 7</td>
<td>12</td>
</tr>
<tr>
<td>Cetacea</td>
<td>whale</td>
<td>1 1</td>
<td>2</td>
</tr>
</tbody>
</table>

### Birds:

<table>
<thead>
<tr>
<th>Name</th>
<th>Common Name</th>
<th>Shelter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puffinus tenuirostris</td>
<td>short-tailed shearwater</td>
<td>15 5 1 21</td>
<td>21</td>
</tr>
<tr>
<td>Puffinus gavia</td>
<td>fluttering shearwater</td>
<td>1 1 2</td>
<td>4</td>
</tr>
<tr>
<td>Eudyptula minor</td>
<td>little penguin</td>
<td>2 1 3</td>
<td>6</td>
</tr>
<tr>
<td>Morus baseanus serrator</td>
<td>Australian gannet</td>
<td>3 2 5</td>
<td>10</td>
</tr>
<tr>
<td>Pachyptila turtur</td>
<td>fairy prion</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Thalassarcho cauta cauta</td>
<td>white-capped mollymawk</td>
<td>3 2 1 6</td>
<td>10</td>
</tr>
<tr>
<td>Thalassarcho sp.</td>
<td>mollymawk</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>?</td>
<td>petrel</td>
<td>2 1 4</td>
<td>7</td>
</tr>
<tr>
<td>Phalacrocoracidae</td>
<td>cormorants</td>
<td>2 2</td>
<td>4</td>
</tr>
<tr>
<td>Circus approximans gouldi</td>
<td>Australasian harrier</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Diomedea sp.</td>
<td>albatross</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>?</td>
<td>duck</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Corvus sp.</td>
<td>crow</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Falco sp.</td>
<td>falcon</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Gymnorhina sp.</td>
<td>magpie</td>
<td>1 1</td>
<td>2</td>
</tr>
</tbody>
</table>

### Reptiles:

<table>
<thead>
<tr>
<th>Name</th>
<th>Common Name</th>
<th>Shelter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiliqua sp.</td>
<td>blue-tongued lizard</td>
<td>1 1</td>
<td>2</td>
</tr>
</tbody>
</table>

### Fish:

<table>
<thead>
<tr>
<th>Name</th>
<th>Common Name</th>
<th>Shelter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysophrys auratus</td>
<td>snapper</td>
<td>78 15 93</td>
<td>93</td>
</tr>
<tr>
<td>Mylio sp. australis or butcheri</td>
<td>bream</td>
<td>38 9 1 48</td>
<td>48</td>
</tr>
<tr>
<td>Labridae</td>
<td>wrasses</td>
<td>19 4 1 24</td>
<td>24</td>
</tr>
<tr>
<td>Achoerodus gouldii</td>
<td>groper</td>
<td>7 3 10</td>
<td>20</td>
</tr>
<tr>
<td>Rubroalga jacksoniensis</td>
<td>red-spotted rock cod</td>
<td>2 1 3</td>
<td>6</td>
</tr>
<tr>
<td>Nemadactylus douglasii</td>
<td>morwong</td>
<td>10 2 12</td>
<td>24</td>
</tr>
<tr>
<td>Aluteridae</td>
<td>leatherjackets</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Acanthistius serratus</td>
<td>wirrah</td>
<td>3 1</td>
<td>4</td>
</tr>
</tbody>
</table>

### Crabs:

<table>
<thead>
<tr>
<th>Name</th>
<th>Shelter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leptograpsus variegatus</td>
<td>3 1 4</td>
<td>8</td>
</tr>
<tr>
<td>Plagiastra shabra</td>
<td>1 1 2</td>
<td>4</td>
</tr>
<tr>
<td>Plagiastra glabra</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Ctenopode cardimana</td>
<td>1 1</td>
<td>2</td>
</tr>
<tr>
<td>Geitis truncatus</td>
<td>1 1 2</td>
<td>4</td>
</tr>
</tbody>
</table>

**Table 25 Curraong: minimum numbers of fauna per site**
Table 26 Currarong: bone weights in gm

<table>
<thead>
<tr>
<th>Shelter 1</th>
<th>Mammal</th>
<th>Bird</th>
<th>Fish</th>
<th>Reptile</th>
<th>Crustacea</th>
<th>Total</th>
<th>Gm/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth units 1 &amp; 2</td>
<td>2316.6</td>
<td>298.3</td>
<td>3348.9</td>
<td>12.6</td>
<td>8.9</td>
<td>5985.3</td>
<td>2153.0</td>
</tr>
<tr>
<td>(0-48 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth units 3-10</td>
<td>350.3</td>
<td>15.0</td>
<td>95.4</td>
<td>0.4</td>
<td></td>
<td>461.1</td>
<td>69.3</td>
</tr>
<tr>
<td>(48-148 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pit</td>
<td>322.7</td>
<td>57.3</td>
<td>142.4</td>
<td>0.2</td>
<td>8.9</td>
<td>522.6</td>
<td>435.5</td>
</tr>
<tr>
<td>Total</td>
<td>2989.6</td>
<td>370.6</td>
<td>3586.7</td>
<td>13.2</td>
<td>8.9</td>
<td>6969.0</td>
<td>677.9</td>
</tr>
<tr>
<td>Shelter 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area X</td>
<td>426.7</td>
<td>60.4</td>
<td>428.6</td>
<td>2.8</td>
<td>1.6</td>
<td>920.1</td>
<td>3067.0</td>
</tr>
<tr>
<td>Squares K &amp; L</td>
<td>437.9</td>
<td>54.4</td>
<td>367.9</td>
<td>0.6</td>
<td>1.3</td>
<td>862.1</td>
<td>783.7</td>
</tr>
<tr>
<td>Squares C &amp; D</td>
<td>58.7</td>
<td>5.5</td>
<td>38.2</td>
<td></td>
<td>2.9</td>
<td>102.4</td>
<td>41.8</td>
</tr>
<tr>
<td>Total</td>
<td>923.3</td>
<td>120.3</td>
<td>834.7</td>
<td>3.4</td>
<td>2.9</td>
<td>1884.6</td>
<td>489.5</td>
</tr>
<tr>
<td>Shelter 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>271.9</td>
<td>13.2</td>
<td>68.3</td>
<td></td>
<td></td>
<td>353.4</td>
<td>146.6</td>
</tr>
</tbody>
</table>

preserved than those at the top. Scarcity of bone towards the bottom of D could result from different rates of decomposition for bone and shell under local conditions; alternatively there could be a cultural reason, with the site being initially used for specialised shell fish gathering rather than as a base for wider exploitation of the environment.

**Mammals**

The extensive list of mammals both reflects the varied environment of the Beecroft Peninsula and indicates its wide-ranging exploitiation by the Aborigines; it is a catalogue seen by Mr J.H. Calaby as a good representative sample of mammals found in the locality.

Hunting in areas of heath and low scrub such as exist on the rocky plateau is indicated by the strong presence of *Isoodon obesulus* (brown bandicoot) and *Potorous tridactylus* (potoro), while the damp sheltered gullies are a habitat favoured by *Wallabia bicolor* (swamp wallaby) and *Rattus lutreolus* (eastern swamp rat). The meat of whales, probably of seals too, was obtained from animals stranded on the shore (cf. Lampert 1966:100).

**Birds**

The majority of birds represented are species whose habitat is the ocean and its shore. They are today found washed up on local beaches, usually dead, though both *Puffinus tenuirostris* (short-tailed shearwater) and *Eudyptula minor* (little penguin) are sometimes found in a weakened condition but alive. All the marine birds represented in the Curraong shelters could have been collected by the Aborigines from the nearby beach. The numerically predominant *Puffinus tenuirostris* was almost certainly collected for food during its spring - early summer annual migration southward (cf. Lampert 1966). Although other marine birds could also have been eaten, it is likely that the bones of many, particularly of the larger birds, were collected to manufacture the bone implements found in the sites.

**Fish**

Best represented numerically are those fish species inhabiting reefs, predominant among which is *Chrysophrys auratus* (snapper), a bottom-dwelling fish easily caught by hook and line (Roughley 1953:77). This species and many of the others represented were probably caught from the reef-fringed headland with hooks like those found in the same archaeological levels as the fish bones.

*Nemipteroidea* sp. (bream), which forms a quarter of the total fish count, is the only species estuarine in habitat. It was probably caught in the lower reaches of the creek running past the rock shelters. Because it is a fish fairly difficult to hook (Roughley 1953:82), the Aborigines might have caught bream mainly with fishing spears such as are represented in the sites by small bone points.
Crabs

Dr D. Griffin, Curator of Crustacea, Australian Museum, recognises the crabs represented as species frequenting a rocky intertidal zone where they often shelter under stones or in crevices.

Shell fish

The marine molluscs represented at Currarong have been divided into three groups, whose different distributions through the deposits in the shelters seem to have some significance.

1. Pyrazus ebeninus (Hercules club whelk)
2. Crassostrea commercialis (rock oyster)
3. All other fairly well represented species:
   (a) Mamelertia atramentosa (black nerite)
   Austrocochlea obtusa (lined periwinkle)
   Subminnella undulata (small turban)
   Ninella torquata (large turban)
   Haliotis ruber (mutton fish)
   Dicathais orbita (cartrut)
   Trichomya hirsuta (hairy mussel)
   Mytilus planulatus (common mussel)
   chitons, limpets and tritons of various species;
   (b) Plebodonax deltoides (pipi)

At Currarong the first two categories, Pyrazus ebeninus and Crassostrea commercialis, both inhabit the estuarine lower reaches of the creek flowing past the rock shelter. Species in the third group are all from the shore, those in 3a occupying a rocky habitat, such as the intertidal rock platform and offshore reef abutting the nearby headland, while Plebodonax deltoides (3b) is the only species from a sandy shore intertidal zone, such as the beach extending northwestward from the headland.

Shell fish remains in each of the three shelters were sampled by a 25 cm square column taken from a wall of the open excavation trench through the depth of deposit where shell was present. The column was removed in spits 5 cm in depth, each spit being a sample bagged separately for analysis. From some of the 1 m excavation squares check samples were taken at greater depth intervals from another face in the same square to test whether the main column was accurately sampling the deposit within its general area. The check samples show almost identical species proportions with the relevant column sample for the same depth, which is taken to indicate the validity of the sampling method.

Within each sample the shells were identified, the weight of each species determined and by weight expressed as a percentage of all shell in the sample. The species were grouped as described above and the combined percentages graphed as a function of depth, as shown in figure 16.

Shelter 2, with shell present throughout its depth, has the longest sequence. The results shown are from a sample column taken from the northern end of square D, where preserved shell is at its deepest. The column shows a change through time with Crassostrea commercialis (group 2) predominant in the earliest occupation, being largely replaced later by another estuarine shell Pyrazus ebeninus (group 1), while throughout there is a gradual increase in group 3 shells whose source is the sea-shore. During most recent occupation the three groups have fairly equal representation.

Shelter 1, where shell is preserved only in the top 20-25 cm, and shelter 3, where shell is preserved throughout but is comparatively scarce, both appear to exhibit the latest part of the sequence seen in shelter 2: the percentage of C. commercialis is constant but low, while P. ebeninus is decreasing in favour of group 3 shell fish. The change common to all three shelters is the increase in shore molluscs at the expense of estuarine species.

General Comments

Because the three shelters are alike in fauna they are considered collectively. In more recent times their Aboriginal occupants practised a varied and wide-ranging economy, exploiting almost every faunal food resource known in the area. From intertidal rocks fringing the headland,
crabs and a variety of shell fish were gathered, while in the adjacent waters reef fish were caught, mainly with hook and line. The sandy shore provided only a very few shell fish and apparently no scale fish, but it is the likely place for people to have foraged for stranded whales, seals and sea birds. In the tidal lower reaches of the creek whose outlet is at the beach, oysters were removed from rocks and mangrove trunks, whelks gathered from the sandy creek bed, bream caught in the shallow water, probably with the fish spear, and possibly such aquatic birds as ducks and cormorants were taken. In the wooded valley through which this creek flows, and on the surrounding scrub-covered plateau, land mammals of several species were hunted.
Sea-shore, estuary and land were all strongly exploited without predominant emphasis upon any one element of the local environment. This contrasts with the most recent occupation at Burrill, a site in a fairly similar environmental setting, where food gathering was restricted to a rather limited range of the resources found in the site's immediate locality.

The lower levels of shelter 2, however, suggest an earlier pattern of economic activity different from the one I have described for more recent times. The only faunal remains in significant quantity in the basal deposit are those of the rock oyster, whose habitat is the tidal part of the creek beginning less than 100 yd (90 m) from shelters 1 and 2. Shells from shelter 2 thus show that the earliest shell fish gathering by occupants of the site was restricted to one species found nearby. Perhaps for the Aborigines the rock oyster was a preferred species - as it is for Europeans - which through over-exploitation dwindled in numbers to be gradually replaced by the Hercules club whelk, another shell fish from the same and immediately local habitat. This change, plus the gradual ascendancy in proportions of shell fish from the sea shore, shows that an increasingly wide species range was gathered from more varied and more widely dispersed tidal environments.

While the scarcity of bone in the lower levels of shelter 2 is possibly a result of poor survival, it is tempting to consider the alternative hypothesis, namely that vertebrate fauna were only rarely exploited by the early occupants of the shelter. In this light the change from specialised to wide-ranging use of local shell fish would appear as a more general move from specialised shell fish gathering to widespread exploitation of almost every local faunal resource.
ENVIRONMENT AND ECONOMY

Environmentally the Burrell Lake and Currarong sites are similarly situated, both being in sheltered wooded valleys through which flow streams of fresh water. In each case estuarine conditions are about 100 yd (90 m) from the site and only a few hundred yards further away is the sea-shore with an intertidal zone comprising both reef and sandy beach. One difference is the nature of the hinterland, which at Currarong is low rocky plateau, rather sparsely covered with shrubs and small trees, whereas the Burrell site is backed by low, gently sloping hills which are thickly wooded. At Burrell the estuarine zone is a lake, larger but less regularly tidal than the lower reaches of the creek at Currarong.

Most of these similarities and differences are reflected in the fauna excavated from the two localities. Although food remains at each provide evidence for a wide-ranging use of a varied environment, the Burrell economy was much more restricted to immediately local resources, particularly shell fish gathered from the nearby lake shore. Estuarine shell fish were also important at Currarong, particularly in the early levels of shelter 2, but other major food resources indicated by the upper deposits were reef shell fish, estuarine and reef scale fish, land mammals, and beach-stranded sea birds and sea mammals.

In some instances the implements recovered by excavation indicate the resources exploited. At Currarong a large number of fish bones was in stratigraphic association with small bone points, fish hooks, fish hook flies and fish hook blanks, whereas at Burrell there was only sparse representation of these implements with very few fish bones. Because the use of this fishing equipment is well known from ethnographic sources and has been fully discussed elsewhere, no further comment is necessary here (Lampert 1966, 1971; Megaw and Wright 1966; Megaw 1967, 1969; Lawrence 1968).

There is a scarcity of sources describing land hunting on the NSW coast and little is known about the equipment used. Lawrence (1968:148, table 8) records only two early accounts which refer to such equipment. Both say spears were used, one of which is described as having a shaft of Xanthorrhoea sp. flower stalk, tipped with a hardwood head and barbed with either bone or shell. A bone-barbed spear used for land hunting is also mentioned by Threlkeld, the barb possibly being a heavy bone bi-point (Lampert 1966:115), used on spears elsewhere in Australia (McCarthy 1940) and found archaeologically at Curracurra and North Cronulla (Lampert 1966:112,115), sites just south of Sydney, but not recovered from either Burrell or Currarong. The shell-barbed spear was possibly a form of death spear, because Collins (1798:585) describes a spear 'armed with pieces of broken oyster-shell for four or five inches from the point, and secured by gum', Mrs Macarthur (H.R. NSW 1893:505) in 1791 saw spears 'with many barbs in them and sharpen'd shells' and Clark (1813) describes spears 'armed, 7 or 8 inches from the point with several bits of stone, shell or bone'. Although there is plenty of broken shell in the Burrell and Currarong sites, none shows evidence for having been so used, such as deliberate shaping or traces of hafting gum.

Although the name 'death spear' has overtones of warfare rather than hunting, Eylmann (1908:327) says it was a spear used by a South Australian tribe 'mainly for killing the larger wild animals'. I have suggested that fabricators and other products of bipolar flaking could indicate the manufacture of stone-barbed death spears. Thus the bipolar artifacts found at the Burrell and Currarong sites could relate, through a long chain of assumptions rather than direct evidence, to land mammal hunting.

Described for the NSW coast are two types of unadorned wooden spear even less likely to be represented in the archaeological record: a simple pointed spear seen at Sydney (White 1790:200; Collins 1798:585; Tench 1798:86) and one with barbs carved from the solid wood, seen both at Sydney (Collins 1798:585) and Jervis Bay, on the coast between Burrell and Currarong (D'Urville 1833: pl. 36,3).

Many forms of food gathering using non-specialised equipment or simply the human hand would leave no distinctive artifact in the deposit. In eastern NSW possums, gliders and other small animals were removed from hollow trees by cutting holes (Lawrence 1968:table 8) or by smoking out (Clark 1813).
Though crabs and stranded sea birds were simply collected, large sea mammals must have been butchered where stranded.

Many shell species can be gathered by hand, some such as pfp (Plebidonax deltoideus) and cockle (Anadara trapesia) dug from the mud or sand, the more tenacious limpets could have been knocked off rocks by a sharp blow with any heavy object available (Dakin 1953:234), while the rock oyster might have been either opened while still attached or removed, using for both either leverage or percussion. Although no specimen of the oyster pick (McCarthy 1967:55) was recovered, equipment represented in the deposits which might have been used for collecting rock oysters are the hammer stone and the spear thrower. The proximal end of the latter was used 'for opening shell fish, getting them off the rocks, and various other purposes' (Bradley 1786-92:69), though admittedly Bradley is referring to a spear thrower into which a shell was hafted, not the stone-hafted type suggested for Burrill and Currarong. The form of hammer stone common at Currarong - elongate and pitted at both ends - has been interpreted as a 'limpet - hammer', for detaching shell fish, in the European Upper Palaeolithic (Lacaille 1954:216-7, 233-4). As both hammer stones and the above-mentioned varieties of spear thrower are multi-functional implements, the ones represented in the deposits cannot be associated with either shell fish collecting or any other specific activity. Moreover, towards the bottom of squares C and D, Currarong shelter 2, where rock oysters are most common, the above implements are absent; in fact artifacts of any kind are extremely rare.

Ethnographic records frequently mention vegetable foods, particularly 'yam' (species unknown), 'fern root' (probably Pteridium esculentum) and Macrozamia kernels (Collins 1789:556-7; Clark 1813; Lawrence 1968:149-50). However their archaeological presence was undetected at either site. The piece of equipment described as for gathering vegetable food is a heavy spear thrower with plain rounded end used for digging fern root and yam (Collins 1789:585), unlikely to leave archaeological evidence for its presence.

Economic Specialisation

Taken at face value, the upper deposits at both Burrill and Currarong represent the activities of a group or groups of people who practised a mixed economy, exploiting the resources of land, estuary and sea-shore. This, as I have suggested elsewhere (Lampert 1971) seems the obvious explanation. However, because of the many early records which stress predominance of fishing by NSW coastal Aborigines, plus a few accounts which describe an actual dichotomy between inland hunting and coastal fishing groups, consideration has to be given to an alternative hypothesis, namely that at the excavated sites a firm economic division did exist and the seemingly mixed economy actually results from closely spaced alternating visits by different groups having interests specific to either land or sea.

There are several reasons making a mixed economy the more attractive hypothesis:

1. The ethnographic literature, though voluminous and internally consistent, is a collection of casual observations made by First Fleet diarists, early explorers and missionaries; there is no systematic study based on protracted first-hand observations. Under such circumstances there would almost certainly be a bias towards the recording of activities enacted in easily observed situations, such as on the prominent foreshore, rather than just inland where vision was limited by vegetation. This would be particularly so if within a mixed economy there was a major orientation towards the more dependable resources of the sea-shore with land hunting parties being fewer and more highly mobile. We must remember also that in the main European travel was along the coast.

2. Although within the early literature land hunting itself is rarely described, there are frequent references to and descriptions of various types of single-pointed spear. Among the many accounts of spear fishing only one writer says that a single-pointed spear was used for fish (Bradley 1786-92:126), but several authors specifically relate single-pointed spears to either land hunting (Collins 1798:585; Threlkeld 1855:229-30) or fighting (White 1790:200; Hunter 1793:462; Southwell H.R. NSW 1893:664,669).
3. Australian Aborigines usually exploit all foodstuffs within their zone of activity (Meggitt 1962:4; Cleland 1966:116; Hiatt 1968:216; Peterson 1971). There may be dietary preferences (Lawrence 1968:223) but commitment to only a sector of the accessible resources would be a special case.

In conclusion, the economic picture that can be confidently accepted is the obvious one, namely that the deposits reflect visits by groups with wide-ranging economic interests but with a strong orientation towards the rich dependable resources of the sea-shore. While this is particularly so for the Curraong sites, the occupants of the Burrill Lake shelter were more restricted in their activities. In this economy foreshore sites of the kind excavated at Durras North (Lampert 1966) and just south of Sydney (Megaw 1968b; Lampert 1971) are seen as specialised adjuncts of main sites like Curraong which display most if not all main aspects of the economy. Faunal remains and implement types show a cultural link between Curraong and many of the foreshore sites, particularly Durras.

The restricted economic exploitation evidenced by Durras and similar foreshore sites suggests that visits to them were of short duration. In this regard we might also note that, unlike Curraong, the site at Durras is some distance from permanent fresh water and has a stone assemblage consisting mainly of fairly large, unretouched but utilised flakes indicating that stone flaking did not occur at the site (Lampert 1966:112; White, J.P. 1968:664). In particular, Durras may be contrasted with Curraong shelter 1 which is situated in an optimum ecological position, from its faunal remains evidence: wide use of local resources, and, at least in its middle level, has a stone industry which indicates that flaking took place at the site. Its situation and the varied activities indicated by its excavated contents suggest shelter 1 was occupied for fairly lengthy periods.

However, shelter 2 suggests a more specialised earlier economy at Curraong. This can be explained purely in local terms. The Curraong sites, being on a remote peninsula, were occupied only fairly recently and the lower deposits at shelter 2 might result from casual visitors who were content during their short periods of occupation to exploit only the most readily available food resources. This explanation receives support from the dearth of flaked stone in early levels.

In the economic scheme described above, Burrill appears at a half way stage, not as specialised to immediately local resources as Durras, yet not as diverse as Curraong 1. From the sparseness of flaked stone throughout the site, Burrill may have been at times a minor stopover on the itinerary of hunter-gatherer groups. Despite many other attractive features, its dampness may have been a factor against lengthy occupation. Its sheltered position and the use by its occupants of lake shore and other immediately local resources suggest that it was possibly used more as a refuge during unfavourable weather than as a regular habitation.

THE BURRILL - CURRAONG SEQUENCE

The Burrill Lake and Curraong sites together show a three-phase industrial sequence which parallels to a certain extent McCarthy's Eastern Regional Sequence - Capertian, Bondaian, Eloueran (McCarthy 1967:91). Both sites share the middle phase but only Burrill has the first and only Curraong clearly shows the last. In the following review I shall compare the Burrill - Curraong evidence with that from other sites in southeastern Australia and discuss the wider and more general implications of the body of evidence now available from that region.

The first phase, beginning some 20,000 years ago at Burrill Lake, is characterised by scrapers, most of which are crude and amorphous, though the few finely made scrapers and the carefully dentated saws show that delicate retouch was not confined to the overlying Bondaian horizon. Because scrapers are almost the only secondarily worked implements in the phase I levels (III-V), they must have been used for most purposes requiring a robust working edge, such as cutting or scraping, while the heavier examples, some of which are made on cores or pebbles, could have usefully served as chopping or smashing tools.
Around 5000-5500 years ago at Burrill the scrapers were joined by a range of stone implement types appearing to have more specific functions. The incoming stone tools include backed blades (i.e. bondi points and geometric microliths), thumbnail scrapers, eloueras and fabricators (scalar cores). In the main these are implements characteristic of the Bondaian phase of eastern NSW prehistory as defined by McCarthy (1948) and they herald phase II at the Burrill site. Though fairly late in the depositional history of the Burrill shelter, the phase II industry is basal at Currarong, where it is not directly dated. However, its appearance there may be nearly contemporary with its debut at Burrill. At Currarong its advent was certainly before 2000 BP, while at a number of sites in Australia industries containing bondi points and other forms of backed blade appear to have a maximum antiquity of around 5500 years (Mulvaney 1969:180).

The backed blade was almost certainly gumhafted (McBryde 1968:89), perhaps as the barb or tip of a spear (McCarthy 1967:fig. 26). From the character of the use-wear along its chord edge, the elouera was endhafted, as were some unretouched flakes which are elouera-like in type of use-wear and some metrical characteristics. These appear to have been the blades of woodworking chisels, the handles of which were perhaps the butt ends of spear throwers.

Fabricators were rare among the earliest Bondaian material but later became increasingly popular. The many small quartz and other stone flakes with which they are associated could have been produced from them for use in the death spear.

Although thumbnail scrapers are common in Bondaian levels, the typological credentials distinguishing them from other scrapers are not above suspicion. While at Currarong their separate identity seems secure, at Burrill there is no clear distinction between thumbnail and other small, finely retouched scrapers, a few of which come from phase I levels (cf. Glover and Lampert 1969:225). Though dentated saws were not found in Bondaian levels at either Burrill or Currarong, their complete disappearance from the tool kit cannot be statistically supported because of their paucity in earlier levels; also saws of this type persist in Bondaian levels at Capertee (McCarthy 1964:238).

Compared with other Australian sites, Burrill has most obvious affinities with its geographically nearest neighbours, Capertee and Curracurang, where both phases are also represented. The evidence for this relationship during phase I is largely the presence of dentated saws at all three sites, the more numerous scrapers having not yet been compared metrically. As saws of this type have not been recorded for comparable levels at other sites in Australia, their presence at three sites in close proximity suggests a regional variant.

The Phase I/II Transition

The phase I/II transition at Burrill and the other NSW sites discussed exemplifies a pattern of development very widespread in Australia, as many writers have recently pointed out. There is a unifying theme of a basal industry consisting of predominately unspecialised implements such as scrapers, core-scrappers and pebble tools, joined within the past 5500 years by a regionally varying suite of more specialised implements that might include points, backed blades, eloueras or adzes. The transition has been found at Kenniff Cave and the Tombs (Mulvaney and Joyce 1965) in south-central Queensland, at Puntutjarpa (Gould 1968) in the Warburton Range of Western Australia, at Ingaladdi (Mulvaney and Joyce 1965:207; Mulvaney 1969:111) in the Northern Territory and at three sites near Oenpelli (White, C. 1967a, 1967b) in Arnhem Land. Tasmania is interesting and important because it does not participate in this development (Jones 1968:200).

In a review of this question (Mulvaney and Joyce 1965) Mulvaney interpreted the evidence in terms of the appearance of hafting techniques. Subsequently C. White (1967b) found edge-ground axes of obviously hafted type in early levels at Oenpelli and in his latest statement on the subject, Mulvaney (1969) talks of a 'Core and Flake-tool' phase (1969:164) followed by a 'Point and blade' (1969:151) or 'Inventive' (1969:107) phase. Jones and Allen (Bowler et al. 1970:52) suggest the 'Australian core tool and scraper tradition' for the first phase, while for the second Gould (1969:235) proposes the 'Australian small-tool tradition'. In the eastern NSW context this succession is essentially my 'pre-Bondaian/Bondaian' (Lampert 1971). While descriptive labels have their
merit, for the sake of brevity within this discussion, I will continue with 'phase I/phase II' as terms for the Australia-wide evidence.

It is instructive to see what really happened with the appearance of the small specialised Bondaian tools at Burrill and other sites. The scraper component underwent no marked change with the advent of the Bondaian, despite the additions to the tool kit. Although scrapers became somewhat smaller and the number of concave working edges decreased, these changes appear to have continued trends already under way in phase I times. They are not, therefore, changes which may be seen as part of the incoming technology but rather as the extension of already changing scraper fashion, thus raising the possibility that the Bondaian added a number of specialised tools to, rather than replaced, a basic industry.

The trend in Burrill scrapers over the phase I/II transition is seen elsewhere. Thus at Capertee both shelters 1 and 3 have a significantly higher proportion of scrapers with concave working edges in the Capertian (phase I) levels than in the Bondaian (phase II) (based on McCarthy 1964: table 3). We may note that at Green Gully, southern Victoria, a scraper industry older than 8000 BP has a high percentage (43%) of working edges that are concave (Mulvaney 1970:73). On the other hand, a site at Lake Mungo, western NSW, has a scraper industry 25-30,000 years old with only few concave working edges (Bowler et al. 1970:52, table 4). Compared with the other sites being discussed, Lake Mungo is far inland, raising the possibility that either regional or environmental differences may be reflected in scraper forms.

Burrill and Kenniff, the only sites providing a long sequence over the phase I/II transition for which scrapers have been statistically examined, show a number of similarities: a mutual decrease through time in the proportion of scrapers having concave working edges; a mutual increase through time of scraper edge angle. On the other hand, Kenniff scrapers became heavier through time while Burrill scrapers became lighter; at Kenniff the average breadth of scrapers is noticeably nearer the average length than at Burrill, though the average breadth/average length ratios change synchronously between sites. But perhaps close likeness in all characteristics between tools over such a distance is not to be expected. We should also perhaps remember Mulvaney's (1970:73-6) warning, regarding the similarity between scrapers from levels older than 8000 BP at Green Gully and scrapers of similar antiquity from the lower deposits at Kenniff Cave, that many metrical and other observations might merely assess characteristics common to scrapers, irrespective of cultural context. Be that as it may, there is a persistence in scraper typology at Kenniff which bridges the phase I/II transition (Mulvaney and Joyce 1965:178). As at Burrill, slight changes in scraper form which follow the appearance of phase II tools merely continue trends already under way in phase I.

The possessive significance of these trends I will now examine. The new types of implement appearing in Bondaian levels in eastern NSW are spear armatures, small scrapers and woodworking chisels. Similar implements were introduced in phase II times elsewhere in Australia. None would functionally replace the stone technology of phase I but add to it. Because specialised implements were received while the basic, general purpose scraper industry continued unaffected, I suggest the transition marks the reception of ideas rather than the replacement of populations. In this sense Mulvaney's (1969:107) characterisation of phase II as the 'Inventive Phase' is valid only if the implements in question originated in Australia. This is too large a question to detail here, but parallels for phase II implements are well known from Indonesia and beyond (Mulvaney 1969:127,164-5; Birmingham 1969:153). The widespread and rapid appearance in Australia of phase II with similar forms throughout and the absence of transitional prototypes suggest that it was a technology received from outside rather than invented within the continent. With backed blade forms Glover (1967) shows regularities over wide areas.

The widespread acceptance of phase II technology may be explained by the specialised nature of the incoming stone implements, some of which, as I have argued for backed blades, use-polished flakes and eloueras, were hafted into composite tools. On the other hand, the core-tools and scrapers which are the main components of phase I are not obviously of hafted type. Composite tools with specialised forms of stone armature, I suggest, were found to have great efficiency and their use rapidly became popular. It is significant that both phase II stone implements and composite hafted tools are absent from Tasmania.
which was isolated by sea level rises before the arrival of phase II on
the mainland (Jones 1968:200). These conclusions conform with the original
hypothesis advanced by Mulvaney in 1965 (Mulvaney and Joyce 1965:206-10).

The Phase II/III Transition

The middle and top levels (phase III) at Currawong shelter 1, contrasted
with the basal Bondaian level (phase II), show waning and eventual eclipse
of backed blades and a complementary increase in fabricators (scalar cores)
and other evidence for bipolar flaking. Eloueras and use-polished flakes
are slightly more numerous in phase III than phase II at this site. Numerical
ascendancy of bipolar material over backed blades occurs at a point where
there is a sharp stratigraphic break separating levels II and III and dated
by the deepest available carbon sample in level II to 1970 ± 80 BP. However,
the transition was gradual, beginning before and continuing well after this
date.

Burrill level I is not so clearly phase III on the evidence of the
relative distributions of backed blades, fabricators and eloueras, since the
implements here are so few. However, the carbon date of 1660 ± 70 BP for
the base of Burrill level I makes it not unreasonable to think that the change
noted on the coast at Currawong, which is also represented 35 miles (56 km)
inland at Sassafras, occurred too the same distance along the coast at Burrill.

At Currawong shelter 2 the stratigraphic relationship between squares K
and L and square D is not clear. As the few backed blades and fabricators
are nearly all from K and L, while the carbon date (3740 ± 100 BP) is from D,
the dating of any of the implements is uncertain.

Almost certainly, it now seems, the main purpose of bipolar flaking was
to produce numbers of small flakes for use without further modification.
Many of these, I have suggested, were used to barb the death spear which,
within fairly recent times in eastern NSW, replaced a spear type armed with
backed blades.

The Currawong shelters also show that implements of organic materials,
mainly bone points and shell fish hooks, were commonly used in later phase III.
Whether these were restricted thereto is quite unknown, since no organic
remains of any kind have survived from earlier levels. The stone fish hook
file which might be accepted as evidence for fish hook manufacturing is, apart
from one doubtful specimen, also confined to later phase III. However, the
small number of files overall prohibits a conclusive deduction. Although at
shelter 2 shell and perhaps to a lesser extent bone have survived for much
longer, the few organic implements, like those of stone, are nearly all from
squares K and L and not firmly related to the single carbon date (3740 ± 100 BP).
There is, however, one short bone unipoint from square D (fig. 14:33), 80-85 cm
below the surface and therefore not far above the carbon sample, which was
obtained from the deposit 95-115 cm below surface. This type of bone point
is thought to be part of a fishing spear.

The phase II/III sequence seen at Currawong shelter 1 is present at
several other sites in eastern NSW. Of these the nearest and perhaps most
closecomparable site is a rock shelter near Sassafras Mountain (Hume 1965)
some 35 miles (56 km) inland. At an altitude of about 2000 ft (650 m) the
site is on the scarp of the Dividing Range. As at Currawong shelter 1, the
stone industry shows a change through time from backed blades to fabricators,
thumbnail scrapers are associated with backed blades, there is an increased
use of quartz as fabricators became popular, and eloueras, though present in
the upper levels, are rare. However, the change from backed blades to
fabricators is more gradual than at Currawong, perhaps because the stratigraphic
division between levels II and III at Currawong shelter 1 represents a hiatus
in occupation which makes the change appear more abrupt than it really was.

Low on the eastern slope of the Dividing Range some 100 miles (160 km)
northward is the Lapstone Creek rock shelter (McCarthy 1948). Here the phase
II level (Bondaian) has at its midpoint a date of 3650 ± 100 BP, while the
phase III level (Eloueran) has just before its midpoint a date of 2300 ± 100 BP
(Polach et al. 1967:20). Comparing the two levels, eloueras increase from six
in the Bondaian to 73 in the Eloueran, fabricators increase from 11 to 105,
while bondi points are present only in the Bondaian.

At Curcurrrango ICUS/+, on the coast not far south of Lapstone Creek,
both eloueras and fabricators are strongly present in phase III (Megaw 1966).
Only six miles (10 km) north of Curcurrrango, however, the coastal site of Gymea
Bay (Megaw and Wright 1966) yielded 55 fabricators but only one elouera from a deposit dated towards its base at 1220 ± 55 BP. This recent date and the absence of backed blades indicate that the Gymea Bay site is phase III. Some 120 miles (190 km) south of Currawurang, the foreshore Durras North site (Lampert 1966) with a basal date of 480 ± 80 BP produced two eloueras but no fabricators.

Although there are some differences in respective proportions of fabricators and eloueras in these sites and between them and Currawong/Burrill, there is no doubt that we are dealing with an essentially similar development. Only recently I saw this as 'post-Bondaiian' (Lampert 1971). However, re-examination of the data from the above sites shows that the indicators of this phase (eloueras and fabricators) are themselves components of the Bondaiian, often being contemporaneous - albeit in small numbers - with the earliest backed blades. Thus it might be more realistic to look upon this latest phase in southeastern NSW as a regional development within the Bondaiian tradition.

We cannot be sure that the organic component has bridged the phase II/III transition without change because of bad preservation of phase II (Bondaiian) material everywhere in southeastern NSW. On the coast there are only two published claims for Bondaiian shell middens (Wright 1963:8; Wooley 1966:318). Currawong 1 has a dubious fish hook file in the Bondaiian level, older than 1970 ± 80 BP. Currawong 2 has preserved shell of an antiquity (3740 ± 100 BP) that suggests phase II status, while only 20-25 cm above the dated level there was a bone point of a type common in phase III. At Curcurarrang 2C5/(J.V.S. Megaw pers. comm.) two fish hook files were found in a level dated to 1930 ± 80 BP and below the earliest preserved shell in the deposit. The 16 eloueras, 37 fabricators and 27 backed blades with which the files are associated would place the level at approximately the midpoint of the phase II/III transition. The above evidence, though slight, suggests that the organic implements found so frequently in phase III levels at southeastern NSW coastal sites were present also in phase II.

The replacement of backed blades from about 2000 years ago in southeastern NSW industries is paralleled elsewhere in southeastern Australia. Only in the New England district of northeastern NSW, where backed blades continue strongly into the past few centuries (McBryde 1966), does the transition seem absent, though further research may substantiate the apparent absence of the transition in the Hunter River valley of central-eastern NSW (Moore 1970). For the southern coast of Victoria, the Wilsons Promontory excavations (Coultt 1967a, 1967b) show that the eclipse of backed blades occurred between 3060 ± 100 BP and 1260 ± 90 BP. The latter date was associated with a flaked stone industry almost devoid of secondary working. At Cape Otway, some 160 miles (260 km) westward across Port Philip Bay, is a coastal rock shelter (Mulvaney 1962) with a near-basal date of 370 ± 45 BP. The flaked stone here shows a similar paucity of secondary working, but the site is rich in well made bone points. Many bone points were found also on a surface site dated to 538 ± 200 BP and situated near Korotit some 70 miles (110 km) further westward along the coast (Gill 1955).

Still further to the west there is a regional variant of phase II different from the Bondaiian. The industry is named Pirrian because the pirri point is numerically predominant, although the bondi point and other forms of backed blade are present also. Excavations at Devon Downs (Hale and Tindale 1930) and Fromms Landing shelter 2 (Mulvaney 1960, 1969:181) show that in the lower Murray River valley this industry enjoyed its greatest popularity 4-5000 years ago. Later in the history of these sites (around 3750 ± 85 BP at Fromms Landing) tulas and bone points were important. In more recent levels, bone implements and secondarily worked stone tools of any kind are rare.

Having such evidence in review, Mulvaney (1969:91) sees a 'trend away from stone supplies towards the substitution of local organic raw materials [which] may represent an optimum adjustment to local conditions ... It seems reasonable to term this latest prehistoric phenomenon the Adaptive Phase'. Because of the wealth of ecological data in their recent deposits, NSW coastal sites, including Durras North, Burrill Lake and Currawong, seem to Mulvaney (1969:91) relevant sites to test this hypothesis.

Mulvaney's argument rests on two propositions:

1. Stone craftsmanship degenerated. This is seen as being supported by the rarity of well made specialised implements in recent deposits in eastern NSW, coastal Victoria and the lower Murray.
2. There was a complementary increase in the use of organic raw materials, mainly bone, shell and wood. To support this claim, Mulvaney notes the extensive use of organic materials witnessed by early European settlers in the lower Murray (1960:74-5), the large numbers of bone tools in the Durras and Cape Otway shelters where secondarily worked stone is rare (Mulvaney 1969:89) and the predominance in some eastern NSW recent deposits of fabricators thought to have been 'used primarily to split bone' (Mulvaney 1969:90), presumably on the analogy of Semenov's (1964:149) interpretation of πιδος δοκιμάς. In addition he notes that the decreasing frequency of finely made stone tools at the lower Murray sites was accompanied by an increase in the number of 'adze-stones' (tulas), seen as woodworking tools (Mulvaney 1960:74-5).

Though the first proposition appears to be strongly supported by the low implement to flake ratio in the recent deposits at Cape Otway and the paucity of specialised tools in upper levels at the lower Murray sites, it does not accord with the southeastern NSW evidence. Here fabricators are numerous in recent levels and I have argued they are evidence for the deliberate production of small flakes for death spears, by which spears armed with backed blades were progressively replaced. This is a degeneration of stone-working techniques only from an aesthetic point of view.

For other recent deposits in eastern NSW (Lapstone Creek and Curricurang) Mulvaney omits mention in this context of the strong presence of the elouera, a secondarily worked, typologically viable implement (Glover 1969). As Durras North is demonstrably a specialised component of a wider ranging economy, its stone assemblage may not be representative of the industrial products of its occupants. On the whole the evidence from southeastern NSW is less convincing than that from Victoria for a decrease in the importance of stone working.

Concerning the second proposition, the extensive use by Aborigines of organic raw material at the time of European contact is too well documented to warrant further discussion. However, the implication that this was a recent innovation requires examination.

While the coastal shelters at Durras North, Curraong, Curricurang and Aire River show the considerable use of bone and some use of shell, these recent deposits merely give a few centuries of depth in time to the ethnographically known technology. In the sandstone rock shelters of NSW bone has survived for usually less than 2000 years and only at Curraong shelter 2 has shell been found with an antiquity greater than this. The poor survival rate in eastern NSW of organic materials precludes a positive statement about a possibly changing intensity of their use. However, at Rocky Cape in northwestern Tasmania bone implements are common early in a sequence having a near-basal date of 8120 ± 160 BP and within a cultural assemblage thought to have its origin in mainland southeastern Australia before Bass Strait was inundated some 10,000 years ago (Jones 1966:3; Mulvaney 1969:139). The Durras North site, for which the worked bone was examined in three levels deposited since 480 ± 80 BP, shows no consistent increase in the use of bone tools during this time (but see Bowdler 1970:70), although there is possibly an improvement in bone craftsmanship (Lampert 1966:103).

Devon Downs and Fromms Landing 2, on the other hand, both show a marked decrease in the amount of bone used in recent times (after 3240 ± 80 BP at Fromms Landing), although Mulvaney (1969:91) reasons from the ethnographic evidence for the common local use of bone implements that this is unlikely to be true for the lower riverine area generally. Carbon dates suggest that the peak in both bone point and tula (adze-stone) use occurred at Fromms Landing shortly before 3240 ± 80 BP and only a little later than the greatest popularity of pirris and backed blades, judging from the basal date of 4850 ± 100 BP at this site and the Pirrian climax of 4250 ± 180 BP at Devon Downs. Tulas, like bone points, are rare in upper levels at the lower Murray sites (Mulvaney 1960).

In sum, the lines of evidence used by Mulvaney to support his 'Adaptive Phase' are not entirely consistent. The increasing rarity of well made specialised stone implements seen for coastal Victoria and the lower Murray cannot readily be claimed for eastern NSW; 'degeneration of craftsmanship', an aesthetic judgement, is inapplicable to the evaluation of an implement's efficiency. Bone tools are most frequent in northwestern Tasmania and along the lower Murray in levels antedating the Adaptive Phase, while poor preservation of organic material elsewhere in southeastern Australia before
the last 1000 years or so makes it impossible to form a definitive
judgement for that region. Certainly fabricators are not good evidence
for bone working in eastern NSW. Ethnographic and use-wear evidence,
respectively indicate that both the lower Murray tula (Cooper 1954)
and some eastern NSW elouera were end-hafted and used for woodworking.
Improved techniques for woodworking may thus be evidenced. Howev-
the implements are typologically dissimilar and were most popular at
different times. Although the elouera is best represented in recent
levels, the tula was most common before the Adaptive Phase.

The model proposed by Mulvaney in his concept of Adaptive Phase is a
stadial one (cf. Groube 1967), in which a long period with little change
was followed within recent centuries by a shorter period of comparatively
rapid adaptive response. This not only does not fit the facts but is hardly
appropriate to the evolutionary changes he wishes to explain. On the other
hand, an alternative hypothesis of a continuous, uniformly changing
evolutionary model for eastern NSW is equally unacceptable. The phase I/II
transition gives evidence for a technological retooling that may have
appreciably affected rates of adaptation. The uniformity of the new tools
over wide areas and their fairly contemporaneous appearance suggest adoption
from outside Australia and rapid diffusion within, while the persistence of
phase I traits beyond the transition indicates that the incoming tools were
an addition to the existing technology.

On the other hand the phase II/III transition was generally a slow
development but with regionally different rates and directions of change.
Thus in the lower Murray there was an early change to bone tools and tulas
which later, however, became less popular; in coastal Victoria the move was
to bone points and a stone industry of simple flakes; in southeastern NSW
tools present in small numbers at the beginning of phase II achieved
ascendancy gradually, over several thousands of years; in northeastern NSW,
if a transition did occur, it was very late.

The archaeological record for the past 5000 years or so in southeastern
Australia is a dynamic one. It shows the formation of 'culture areas'
(Wissler 1923) within which similar change seems to have occurred. Better
definition of these by future research might provide insights into cultural
relations and intercommunications between the regions involved.
Excavation teams were recruited mainly from members of the Canberra Archaeological Society and students from the University of Sydney, the Wollongong University College and the Australian National University.


Specialists in several fields who visited the sites to give expert advice were: W.R. Ambrose and C.A. Key (both Department of Prehistory, ANU), J.N. Jennings (Department of Biogeography and Geomorphology, ANU) and H.J. Hewson (Department of Botany, ANU).

In sorting and classifying the excavated materials at ANU I was assisted by A. Bickford and L. Fuller. The majority of faunal identifications were made by P.W. Thompson, who also analysed in detail the human remains (Appendix 3). Determinations of specific fauna and relevant ecological information were provided by the following specialists:


**Crabs**  D. Griffin, Curator of Crustacea, Australian Museum, Sydney;

**Fish**  J.R. Paxton, Curator of Fishes, Australian Museum, Sydney;

**Shell fish**  W. Ponder, Curator of Molluscs, Australian Museum, Sydney;

**Mammals**  J.H. Calaby, CSIRO Division of Wildlife, Canberra.

I discussed several problems of faunal identification and ecology with J.H. Hope, Department of Prehistory, ANU.

For the identification of plant remains I consulted R.K. Bamber (Division of Wood Technology, Forestry Commission of NSW), A.B. Costin (CSIRO Division of Plant Industry), H.D. Ingle (CSIRO Division of Forest Products), L.D. Pryor (Professor of Botany, ANU), J.H. Webb (Department of Botany, ANU) and D. Walker (Professor of Biogeography and Geomorphology, ANU). Axes and other stone artefacts were petrologically examined by D.F. Branagan (Department of Geology and Geophysics, University of Sydney). The selection of samples for carbon dating was discussed with H.A. Polach (ANU Dating Laboratory).

Various sections of this report were written in the light of suggestions made by my colleagues: J. Flood, I.C. Glover, R.M. Jones and D.J. Mulvaney (all Department of Prehistory, ANU), J.K. Clegg and R.V.S. Wright (both Department of Anthropology, University of Sydney), J.V.S. Megaw (Department of Archaeology, University of Sydney), F.D. McCarthy (Principal, Australian Institute of Aboriginal Studies, Canberra) and J.P. White (Assistant Curator of Anthropology, Australian Museum, Sydney). A complete draft was read and criticised by J. Golson and R.M. Jones. Other members of the Prehistory Department who assisted were W.I. Mumford (editorial), S. Wilkie and D. Markovic (photography), L. White (editorial) and B. Fox (typing). A German text was translated by my wife, K.W. Lampert.

I thank all the above persons, and any others who assisted but whose names I have inadvertently omitted. My deepest gratitude is to J. Golson who, as head of the Prehistory Department, has stimulated my research since I began this project.
Fig. 17 Burrill Lake: stratigraphy of embayment
APPENDIX 1

SEDIMENTS IN THE LAKE EMBAYMENT AT THE BURRILL LAKE SITE

The sandy clay wedge (level IV) in the sands beneath the midden prompted the hypothesis to R.J. Lamper, C.A. Key and myself that this was the expression of an estuarine shore at a Holocene high sea level of about +2 m. I had previously postulated such a high sea level to explain the Double nature of the tidal delta at the entrance to Burrill Lake. The distal part of the exposed delta merges in level with the submarine part which is actively extending with a steep foreset slope into the deep water of the lake, whereas the seaward part on which houses have been built appears to be too high to have been constructed by tidal currents at present sea level. The situation matches that at Wagonga Inlet described by E.C.F. Bird (1967) who also refers to the Burrill Lake situation amongst others of a related nature along the south coast of NSW. Because of the degree of podsollisation of the soil on some of these cases, Bird, however, inclines to a late Pleistocene age for their formation and associated high sea level.

The hypothesis was worth testing and in August 1968 I made a line of boreholes along the middle line of the depositional flat in the embayment in front of the shelter. A Hiller peat auger with an alternative twist drill head was used to reach bedrock or as far down as was possible manually. For the most part boundaries between the horizons were gradational and this must be borne in mind when referring to figure 17 which sets out the results of the boring.

Description

From the rockfall beneath the lintel of the shelter the ground surface declines about 3 m almost uniformly to an abnormally high lake level.

(a) In the inner half of the embayment, a few cm of yellow sand have an abrupt contact with underlying sediments.

(b) Beneath this there is a black, very humic and in parts peaty loam with a slight sand content; it extends to the lake margin.

(c) In boreholes 3-25 and 3-5, this changes downwards into a coarse detritus organic mud.

(d) Inwards of these holes a black humic clay occupies an equivalent horizon.

(e) In some of the bores sandy clay of varying shades of grey underlies (c) or (d).

(f) Sloppy, loose light grey sand underlies (d) or (e).

(g) Beneath this a grey sandy clay in 3-25, a blue-grey clay with less sand in 3-5 and a greenish-grey clay-nekron mud in borehole 4 appear to be lateral variations of one horizon.

(h) Except for bore 1, ending in sandstone which may have been a fallen block, the basal layer consists variably of sandy clay and clayey sand, including coarser sand than in higher horizons. Yellow and reddish hues intermingle with grey and blue-grey. Sandiness increases downwards and there are occasional sandstone fragments, especially near contact with the sandstone bedrock.

In boreholes 2 and 3 black organic flecks and small pieces of charcoal occur, especially near the top of this layer (h). In 3-5 a thin horizon resembling (h) occurs above the washed grey sand.

Discussion

The variegated colouring of the basal layer (h), its poor sorting and occasional fragments of bedrock suggest a colluvial or residual origin with some oxidation in aerobic conditions. It may be partly fluvial but lacustrine deposition seems unlikely. The overlying layer (g), with its nekron mud content and colouring, is the one most indicative of lacustrine conditions and anaerobic accumulation. The sands (f) may have been brought in fluviually from the catchment behind the embayment but their increasing thickness and height towards the mouth of the bay is suggestive of wave action...
building a baymouth barrier. The stagnant area behind this barrier, with its increasing organic content upwards, (d) + (c) + (b), received a declining supply of fluvial and littoral material to end in the *Casuarina* and sedge fen of today. The surface sand (a) has been emplaced quickly and recently; it may be the product of the archaeological excavations themselves.

This sequence of infilling is consistent with a rising lake level or a constant lake level after an initial drowning of the terrestrial basal layer (h). No suggestion of a fall in lake level is apparent.

Because of the rockfall zone it was not possible to relate the sandy clay wedge of the archaeological excavation (IV) by lateral continuity with any of the horizons of the embayment fill. In its characters it most resembles the basal layer in boreholes 2 and 3 and this is also the simplest correlation that can be made in the section. Consequently there is no basis for regarding the clay wedge as the shore facies of a higher lake level than at present or indeed of any phase of the lake history.

This is in accord with a report provided *in litt.* by Mr A.C. Collins on the microfossils of a sample from the clay wedge of the shelter:

The material after washing through a 180 mesh sieve consisted almost entirely of sharply angular quartz grains, with some cemented aggregations, some gravel-size particles of milky quartz and carbonised woody material. There were also six specimens of foraminifera, an ostracod and three juvenile molluscs. The foraminifera were as follows:

- *Elphidium advenum* Cushman
- *E. sp. aff. advenum*
- *Triloculina* sp. (juv., indet.)
- *Globigerina* sp. (2, juv., indet.)
- *Globocassidulina subglobosa* (Brady)

Of these, *Globigerina* is a pelagic genus and unlikely to be found in estuarine conditions. All of them, however, could be found in ocean beach sand. In my experience estuarine assemblages are marked by the dominance of numbers of *Ammonia*, with other shallow-water species occurring sparingly. This genus was not found, which inclines me to the view that this very small assemblage is adventitious, rather than representing an estuarine fauna. Their presence in a freshwater deposit could arise from wind-transport from nearby beaches or calcareous dunes, or from beach mud transported by the feet of wading birds.

The radiocarbon age determination for the clay wedge obtained subsequently to an initial draft of this report also supports this conclusion since the date of c. 20,000 years BP lies within the final pleniglacial of the last Glaciation of the Pleistocene when sea level was low (-50 m, Milliman and Emery 1968; -110 m, Curry 1965).

In this context an explanation of this deposit must be sought in fluvial action. Today a small creek drains a modest catchment behind the embayment. It periodically flows along a little channel above the shelter and cascades over the lip with some water deflected back beneath the overhang. The following sequence can therefore be postulated. Weathering of the shelter roof produced the sand of level V within the shelter. Collapse of the forward edge of the roof resulted in a barricade of blocks along the front of the shelter, which deflected more of the intermittent creek discharge backwards into it. There it was dammed up as a small pond in which the sediment load was deposited (level IV). Subsequently movement of the blocks or washing-out of fines from the rockfall allowed floodwaters to go forward to the lake more persistently than previously. Cave roof weathering products and occupation debris (levels I-III) sealed in the pond deposit.

The weaknesses of this explanation are that:

1. Rockfall is unlikely to give a very watertight barrier.
2. A less clayey pond deposit might be expected from the sandstone catchment behind the shelter, unless there were a phase of soil stripping.

74
Since the radiocarbon dates for the sandy clay wedge take its genesis to a time of probable colder climate (Costin 1971), climatic change must be considered as a part cause of the sediment sequence. The temperature fall would, however, still leave the coastal area in good forest cover in all likelihood, so that significant change in runoff behaviour and slope processes as a result of vegetation change is not a necessary corollary. Accompanying higher precipitation has often been presumed for Pleistocene cold periods in Australia but Galloway (1965) has argued strongly that the reverse is more likely in southeastern Australia. However the evaporation/precipitation balance must still have favoured runoff more than today's balance; there is, for instance, evidence that about 15,000 years ago there was more runoff into Lake George (Galloway 1967). It is possible therefore that increased runoff on this count was responsible for the ponding in the shelter which produced the clay wedge.

Against this the closeness of the two radiocarbon dates, one below the clay wedge, (20,760 ± 800) and one near its top, (20,830 ± 810) indicates that the time taken for its accumulation was quite short. A very short time of formation is more consonant with a genesis in terms of local factors solely than with one involving climatic change which must be regarded as of longer term.

Conclusion

This stratigraphic and microfossil reconnaissance, together with the radiocarbon dates, eliminates an explanation of the clay wedge (level IV) as the shore deposits of a lagoonal transgression accompanying a higher sea level, be it Holocene or Pleistocene. The extremely short time of its deposition does not fit well with genesis through increased runoff as a result of climatic change. On the present evidence therefore an explanation is preferred in terms of purely local factors - partial deflection of creek floods into the shelter by rockfall, accompanied by pond sedimentation.

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Revised 1st October, 1969
Appendix 2

Botanical Report

Burrill Lake Site

The local vegetation is predominantly wet sclerophyll grading into gully flora in the valley in which the rock shelter is situated. This valley terminates in a swamp near the lake shore. The area shows evidence of disturbance by European man, i.e. agricultural and village exploits. Introduced vegetation includes Rubus vulgaris (blackberry) and Physolocha octandra (ink weed).

Eucalyptus maculata (spotted gum) and Eucalyptus robusta (swamp mahogany) are the dominant trees in the wet sclerophyll. Here the shrub layer includes such species as Acacia parramattensis, A. longifolia and A. botrycephala and Indigofera australis. These shrubs are small and abundant, traits probably caused by recent fires which burned larger adults as well as induced considerable seed germination. Ground cover includes such species as Lomandra longifolia, Pimelea linifolia, Goodenia heterophylla and Macaranga communis (burrawang). Climbers include Hardenbergia violacea and Smilax glycoptyla.

Continual dampness of the cave floor is indicated by the presence of fern prothalli and the liverwort Riccia canaliculata. In the gully outside the cave Eucalyptus robusta is the dominant tree. Smaller trees such as Callicoma serratifolia and Erythrina sp. (coral tree) are present in a dense ground cover, which includes also Gahnia clarkii, Pteridium esculentum (bracken fern), Kennedia rubicunda and Glycine clandestina.

The swamp has such trees as Casuarina glauca (swamp oak) and Melaleuca linearifolia, and the shrubs include Leptospermum flavescens and Operoeulia aspera. Ground cover includes Phylidium lanuginosum, Ranunculus inundatus, Samolus valerandii and numerous Cyperaceous and Juncaceous sedges, an example being Leptronia articulata.

Currarong Site

On the plateau top the vegetation is heathlike dry sclerophyll. In the valley containing the rock shelters this grades into gully flora which towards the sea is replaced by mangrove swamp. The creek flowing through this valley enters the sea through an area which is grossly disturbed by a European village. However, some remnants of the sand-dune and hind-dune flora still persist.

The dry sclerophyll is dominated by the eucalypts - E. racemosa (snappy gum), E. gummifera (red bloodwood), E. saligna (blue gum) and E. botryoides (bangalay). Many of these have the mallee growth form in the rocky exposed tops. The shrub layer includes such shrubs as Banksia asplenifolia, B. arietifolia, Acacia longifolia, Epacris microphylla, Baesekea brevifolia, Lambertia formosa (mountain devil), Viminaria juncea and Xanthorrhoea resinaea ssp. resinaea (yellow grass tree). The ground cover includes Lomandra longifolia, Actinotus helianthi (flannel flower), A. minor, Symphionema paludosum and Themeda australis. Swampy poorly drained patches have numerous sedges including Gahnia clarkii, Juncus sp., Restio sp., Cyperus sp. and Cladium sp.

The top grades into the gully with Banksia serrata, Podocarpus spinulosus, Xanthosia pilosa and Pteridium esculentum. The gully flora includes such small trees as Melaleuca squamea and Casuarina glauca. The shrubs include Leptospermum squarrosum (tea tree), and ferns include Pteridium esculentum, Culcita dubia and Todea barbara. Among other ground cover is Phragmites communis (common reed), Gahnia clarkii, Caujatis pentandra and Selaginella uliginosa.

The mangrove swamp has two species of mangrove, Aegiceras corniculatum and Avicennia marina (grey mangrove). Ground cover includes Samolus valerandii, Cyndon dactylon and Selligera radicans. The dunes are dominated by Banksia integrifolia and Casuarina distyla, while Spinifex hirtus and Hydrocotyle bonariensis are common sand binders with such species as Lomandra longifolia and Tetragonia tetragonoides appearing in the more stable part of the dune.

Field report by H.J. Hewson. Eucalypts identified by J.H. Webb, both Department of Botany, SGS, ANU.
HUMAN REMAINS FROM CURRARONG

Skeleton BS1
Shelter 1; square 1B (fig. 18:1)

Condition The bone is generally well preserved but some weathering of the vertebrae has taken place. The skull has been slightly distorted by soil movement. Bones not recovered include the right stapes, vertebrae C1, C4 to Th1, the body of Th8 and the coccyx, ribs R2, R3, L1, L2 and L3, the right clavicle and the sternum. Of the arms the proximal and medial epicondyle epiphyses of the right humerus, the distal epiphyses of right radius and ulna, two right carpals, three left carpals, one right metacarpal and four distal phalanges are missing. The proximal epiphyses of both fibulae, the distal epiphysis of the right fibula, one proximal, four middle and all but two distal phalanges are missing from the skeleton of the lower limbs.

Part of C2, C3, the arch of Th2, Th3, both coracoids, the left clavicle and parts of two ribs were found among material recovered from above the skeleton. Near these were found several rabbit jaws, so it seems reasonable to attribute the displacement of these bones, as well as some of the missing bones, to disturbance by rabbits. No trace of a burrow was visible at excavation.

Burial position The skeleton was lying on the dorsal part of its right side, roughly horizontal, with the head slightly raised and facing out of the rock shelter. The arms were folded across the abdominal region. The legs were tightly flexed so that the knees were near the folded arms and the feet were just below the pelvis.

Age 14.5 ± 1 years
Sex Female

Morphology Immature skeletal remains from Australia have not been extensively studied. The skull of this individual appears to be consistent with the pattern of morphology of adult Aborigines from the NSW coast (Larnach and Macintosh 1966). Notable is the combination of a flat glabella, equal to Martin's grade 1, and marked forehead recession (index = 21.9). The epiphreric bones are very large; right = 38 x 10 mm and left = 24 x 10 mm. The skull has a value of one for all characters used by Larnach and Freedman (1964) in their sex determination study.

Pathology Tooth wear is very slight. There are no dental caries. 'Accessory dental masses' are present around the alveoli of the upper second premolars. These are assumed to be remnants of the deciduous molar roots (Campbell 1925:61-2). The twelfth ribs are very short, the right being 41 mm and the left 32 mm long, and the free ends of these ribs are atrophied.

Skeleton BS2
Shelter 1; squares 1B and 2B (fig. 18:2)

Condition The bones of this skeleton are in very good condition. All elements of the upper limbs are missing. The clavicles are present and the scapulae are complete except for both coracoids. These facts suggest that the upper limbs were detached from the body before the soft tissues were completely decayed (cf. Macintosh 1970:99). The only tooth missing is the upper L1. Vertebrae S5 and Col are missing. The greater trochanter of the left femur, the left and right proximal and right distal fibulae epiphyses are missing. All but two middle pedal phalanges are missing and the only distal phalanges to survive are those of both first toes. The ear ossicles were not recovered.
Fig. 18 Currarong shelter 1: human burials
Burial position  The body was in a semi-upright position facing out of the rock shelter. The legs were lying roughly horizontal and were lightly flexed to the right of the body so that the feet were near the pelvis.

Age  7.5 ± 0.5 years  
Sex  Probably male

Morphology  This juvenile cranium has a glabella with prominence equal to Martin's grade 3 and it has moderately prominent temporal crests and occipital muscle markings. The forehead recession is slight (index = 26.6). There is a fronto-temporal suture at the pterion, the malars have a flattened orbital border and there is a mild degree of cribrum orbitalia. The general features of the cranium are consistent with Aboriginal morphology and suggest that it is more likely to be male than female.

Pathology  There is no sign of dental caries. Wear is extreme on the anterior deciduous teeth. There is a very small depression just to the rear of the eminence of the left parietal bone. It appears to be mild osteitis rather than a healed injury. There is a large oval hole (33 x 16 mm) in the frontal bone. The long axis of this hole runs from 14 mm anterior and 3 mm to the right of the bregma, towards the right orbit. The edge of the hole is unhealed and irregular and there is no surrounding depression. The bone around the hole is darkly stained, probably due to the soil or possibly blood. This hole was made by a large sharp object. There is no conclusive evidence to show whether it is a post-mortem injury or the cause of death.

Skeleton BS3  
Shelter 1; squares 1B and 2B; spits 1 and 2 (fig. 18:3)

Condition  This infant skeleton is almost complete. Missing parts of the skull include most of the right mandible and the right exoccipital. The vertebrae are fragmentary. Both ilia and one fibula were not recovered. Most of the teeth are missing.

Burial position  The skeleton was extended, lying on its back. The head was turned to the right, facing the back of the rock shelter.

Comments  The two halves of the interparietal are incompletely fused to the supraoccipital portion of the occipital bone. The tympanic ring is not attached to the petrosal, nor the petrosal to the squamosal. The detachment of the petrosal from the squamosal appears to have occurred in the soil and it is probable that the tympanic was also detached in the grave. Only one incisor and one molar crown are present and these are incompletely formed. Lengths of the long bones are:

- humerus = 66 mm  
- radius = 56 mm  
- ulna = 62 mm  
- femur = 75 mm  
- tibia = 68 mm  
- fibula = 63 mm

These measurements slightly exceed the largest full term foetus measured by Macintosh (1958) so that it would seem that this skeleton is that of a new-born baby, certainly not more than 1 month old. There is no evidence for the cause of death.

Skeleton BS4  
Shelter 1; squares 6C, 6D, 7C and 7D; spits 1 to 3

Condition  This infant skeleton was not recognised at excavation, but because most of it was recovered from four adjacent squares, it is thought to represent a burial. Only four teeth were recovered and the left parietal, the basi-occipital and part of the right parietal are missing. The left clavicle, left scapula, left ulna and the pelvis, as well as several vertebral and hand and foot bones, are missing. The bone is in good condition.

79
The incisor crowns are incompletely formed. Fusion of the parts of the occipital bone is at a similar stage to skeleton BS3. One temporal bone preserves the fusion of squamosal, petrosal and tympanic ring.

Long bone lengths are:

- humerus = 63 mm
- radius = 53 mm
- ulna = 59 mm
- femur = 70 mm
- tibia = 64 mm
- fibula = 59 mm

As with CR-BS3 these measurements are mostly slightly larger than those given by Macintosh (1958) for a full term foetus. This skeleton is slightly smaller than BS3, so it too is the remains of an infant less than 1 month old.

There is no evidence for the cause of death and it has not been possible to work out the burial position from the occurrence of the bones in the several squares and spits.

Human Remains from Shelter 2

**Individual 1** A left petromastoid bone and a right clavicle from square K, spit 2, and a left femur from square L, spit 1, are all referable to a very young or premature infant. These bones are approximately equal in size to those of individual A of Macintosh (1958), which he gives an age of about the 36th intra-uterine week: clavicle length = 34 mm; femur = 61 mm. Despite possible racial and/or nutritional differences in development rates, it is clear that these remains are those of a premature but potentially viable infant. It may have been born dead.

**Individual 2** A complete left temporal bone from square L, spit 2, a right scapula and right clavicle from K2, a left humerus from K6B, a right ilium and a right femur from L1A and a metacarpal from L1 all belong to an individual about the size of CR-BS4, that is, an infant less than 1 month old. Humerus length = 61 mm; femur = 70 mm.

**Individuals 1 and 2** A piece of parietal bone from K4, three neural arch halves of cervical vertebrae from K2 and a radius fragment and a neural arch half from L1A could belong to either individual 1 or 2. These individuals were found in the same squares and spits but their precise association is not certain.

**Individual 3** From square D, spit 1, come two teeth, an upper R.a and an R.d, a right scapula and right clavicle, and fragments of a maxilla and a greater wing of sphenoid. The incisor crown is fully developed (7.5 x 5.2 mm) and the clavicle is 46 mm long. This individual is probably about 2 months old.

**Tooth** Lower left deciduous canine from K2. Size = 6.4 x 5.2 mm. This tooth has mild wear and was lost by an individual about 3-4 years old.

**Tooth** Upper left deciduous second molar from L2. Size = 10.2 x 11.3. The roots are broken off. This tooth is from an individual about 8-10 years old.

This collection of human remains from Currarong is notable for the low age of the individuals represented. No burials of adults were uncovered by the excavation.

I am grateful for the advice of Professor N.W.G. Macintosh and Mr S.L. Larnach, Department of Anatomy, University of Sydney.

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