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AN ANALYSIS OF THE LARGE STONE IMPLEMENTS FROM FIVE WORKSHOPS ON THE NORTH COAST OF NEW SOUTH WALES.

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(Figures 1-22, Plates xxxvi-xxxix.)

The 445 implements dealt with in this study are from aboriginal workshops at Point Plomer, Tacking Point beach, Dark Point, Anna Bay and Morna Point, on the lower north coast of New South Wales. Some of the specimens from Dark Point, Anna Bay and Morna Point were collected by the late W. W. Thorpe, and the others by the Rev. A. J. Barrett, Miss Lesley Hall and the author, while those from Point Plomer were collected during a week that I spent in the district in April, 1945. In addition, Mr. H. J. Wright, of Sydney, has kindly made available a considerable number of specimens in his collection from the three first-mentioned localities. The implements analysed comprise trimmed coroids, nuclei, blocks, *worimi* and *karta* slices, uniface pebbles, edge-ground axes, and a few normal flake and blade implements, including *elouera* and *bondi* points. This is the fifth paper of a series of analyses of sites in New South Wales from which reasonably complete collections are available.

All of the above workshops occur on the recent coastal sand-dunes, and they were apparently in use by the aborigines right up to the time of white occupation, when steel and iron replaced the stone and bone implements. This conclusion is indicated by the physiographic changes that have taken place in the area, as revealed by Dr. A. Voisey (1934, p. 342, fig. 1; 1935, pp. 88-103, fig. 1; 1939, map 1); he has shown that an

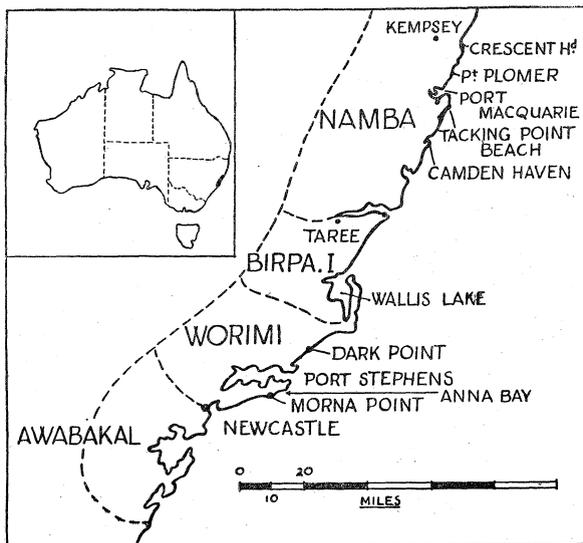


Fig. 1.—Map showing the location of the workshops herein described, and the tribes, of the lower north coast of New South Wales.

ancient shore-line existed along this coast from Tacking Point to Trial Bay and that the area, up to thirteen miles wide, between the old and new shore-lines was infilled by deposition. The old middens and feeding grounds were then abandoned and the later ones, including those described in this paper, built up along the new coast line. A description has already been given of a small number of implements (McCarthy, 1943b) from shell middens along this old shore-line, but it is intended to undertake a detailed study of the deposits at a later date because they may reveal important data about the prehistory of the north coast. These analyses of implements from the later workshops are submitted as a preliminary approach to the general problem of the advent of man and the implements he used in this area. Thorpe (1928, pp. 244-45 and map) drew attention to a similar problem in the Hunter River basin when he stated that "implements found above the thirty-foot contour might be ascribed to comparative antiquity", but here again detailed investigation is necessary.

Classification.—As new evidence is brought forward it is possible to gain a clearer understanding of typological problems. From data now available it is clear that the *worimi* is, technically, a slice of the cleaver type, although I have previously classified it as a block. The *karta*, as I have used the term on the coast of New South Wales, includes both slices and blocks, although they have previously been regarded as coroids.

POINT PLOMER.

Point Plomer is a prominent headland situated at the northern end of a beach eight or nine miles long, which extends southward to Port Macquarie. The Point consists of several high, rounded, grassy headlands, the rocky faces of which are now torn into rugged blocks and clefts by the sea and winds. The workshop is on the dunes right at the end of the beach and adjoins the southern headland of the Point. At the present time the site is limited to a trough, about one furlong long and fifty yards wide, in the dunes furthest from the beach. Previously, however, according to the late Mr. T. Dick's photographs, it covered a much larger area and extended to the back of the beach, but wind-blown sand has built up recent dunes over this eastern portion. Although no shell-midden deposit is now apparent as a layer in the dunes, there are patches of dark ashy soil to be seen. One of Dick's photographs shows a small mound thickly strewn with pippies (*Plebidonax deltoides* Lamarck), but elsewhere these shells are rather thinly scattered at the present time. Pippies are obtainable in quantity on the beach between high and low water. Here and there on the workshop are to be seen fireplaces marked by assemblies of burnt stones, some of which are suitable for grinding into red pigment. Another portion of the workshop at the base of the headland is now overgrown with grass.

The manufacturing techniques and uses of the implements at Point Plomer are discussed at the end of this paper.

Materials.—Dr. Voisey (1934, p. 340) stated that Racecourse, Delicate, Nobby's and the Big Hill headlands are composed of Permian (?) rocks of the Kempsey series, in which occur bands of sandstone, tuffs, mudstones, claystones, and inclusions of grey shale. The sandstones and tuffs vary greatly in colour, texture and composition, and may be termed tuffaceous sandstones. These remarks also apply to Point Plomer, where pieces broken off the two headlands by wave action are washed onto a small beach between them as smoothed pebbles and boulders. The aborigines took the latter to the sand dunes to make their implements. I might mention that the nature, occurrence, and use of the materials are the same at Crescent Head, about 10 miles to the north (McCarthy, 1941c, p. 22).

Occasional implements of a brown chert, brought from elsewhere, also occur. Merewether chert is not represented and was apparently not traded so far northwards.

Artefacts.

Coroid Implements.

Conical Implement (Pl. xxxviii, fig. 2).—The lower cortex surface is flat, but the sides and top form a domed upper surface. The butt is a flat face and the distal end tapers to a rounded point with an oblique flat face on one side. Both lateral margins are trimmed, one side being concave and roughly worked, and the other is a complementary convex edge more carefully trimmed. The whole surface is weathered. It is $32 \times 9 \times 9$ cm. in size and 8 lb. in weight. The function of this implement is unknown, but it may be a large *worimi* in the making. A somewhat similar implement (McCarthy, 1941b, p. 19, Pl. Iv, fig. 2) was collected on an axe quarry at Moor Creek, which is about 40–50 miles west of Point Plomer.

Uniface Pebble Implements.

Semi-Uniface.—The eleven specimens conform in all respects with the usual features of this group. On seven the trimmed edge is on a lateral margin (fig. 2), four of which are straight, two convex, and one a shallow concave 9 cm. long and 1 cm. deep. The trimmed edge forms a convex end on one and extends along the lateral margin and one end on another one. One pebble (fig. 3), 16 cm. long, bears characteristic *Sumatra*-type trimming on half of one surface, on which the parallel flake-scars extend inwards from the lateral and end margins.

There are four *Sumatra* types (fig. 4). Three display bold knapping which has produced large flake-scars at a comparatively steep angle to the flattened upper surface. The fourth specimen is a fine-grained pebble trimmed right round its oval margin, and the flake-scars are small in size; otherwise both surfaces are of cortex.

The working edges of these implements are gapped and notched as a result of use. They range from $9 \times 7 \times 2.5$ to $18 \times 9.5 \times 3$ cm. in size, but are up to 5 cm. thick, and from 10 oz. to 3 lb. in weight.

Nuclei.

(a) *Simple Platform*.—Seventeen possess one or two simple platforms and several are prismatic in shape. Some of the platforms are at opposite ends of the nuclei (fig. 14) and some are at right angles to each other. They are all small nuclei, with a flaking face 4–6 cm. long and are less than $\frac{1}{2}$ lb. in weight. Very neat trimming occurs at the top of the flaking face on seven to prepare the undulating edge of the striking platform for the knapping blow. Only one has a faceted striking platform. A small number of these nuclei bear signs of use on their edges as core implements. Several nuclei collected, and others noted on the site, are pebble-cores on which the striking platform is formed by the removal of a large diagonal flake across one end; the flake-scars extend down the opposite side of the pebble.

On three conical nuclei the base is an oval fracture surface, the upper portion is domed, and the margins are convex and trimmed. The trimmed edges bear signs of use. They are from $9 \times 6.5 \times 6$ to $10 \times 8 \times 7$ cm. in size and 1–1 $\frac{1}{4}$ lb. in weight.

Two very large nuclei were collected and they are abundant on the site, particularly in the grass at the base of the headland (Pl. xxxvi, fig. 1). From this type were struck the large slices forming the *worimi*, *karta*, and block implements. One of these nuclei, of tuffaceous sandstone, is $16 \times 13 \times 9$ cm. in size, and 4 $\frac{3}{4}$ lb. in weight; it is half of a boulder split into two pieces so that one side of the nucleus is a flat fracture face and the other a rounded cortex surface. The latter bears the flake-scars. The striking platform was formed by the fracturing of a block from one end of the nucleus. The second example is of chert $15 \times 13 \times 11$ cm. in size and 7 $\frac{1}{4}$ lb. in weight, and is similar in formation to the other one. It has two striking platforms at right angles to one another. The large flake-scars are from 8×5 to 12×8 cm. in size.

(b) *Alternate Platforms*.—Two are pebbles 10–15 cm. long, with a sinuous edge along one margin formed by the alternate method of knapping. One is a pear-shaped piece which has a flat butt and is knapped along both margins and one end. One (fig. 7) is 12 × 10 × 7 cm. in size, oval in shape, and is knapped all round its periphery from both surfaces; one of the latter is ridged and in the middle of the other surface is a small area of cortex. They are 1¼–2¼ lb. in weight.

Knapped Implements.

Blocks (fig. 6).—A series of thick and irregularly shaped pieces heavily worked on the edges of their steep-faced margins. One is tongue-shaped and trimmed along both lateral margins and distal end. They are from 6 × 6 × 3 cm. to 12 × 8 × 4.5 cm. in size, and from 4 oz. to 1½ lb. in weight.

Slices.

(a) *Split Pebbles* (fig. 5).—The two examples are both about 14 × 9 × 3 cm. in size. One has the point of percussion on a striking platform at one end, and it is on a lateral margin on the other specimen. One is trimmed along both lateral margins and end, the other along one margin, both on the inner face, which is flattened.

(b) *Worimi Cleavers*.—In 1941 I described (1941c, p. 24, Pl. vi, fig. 11) a single *worimi* found on a pippy midden on Crescent Head Beach. One surface of this specimen is a fracture or inner face, the other is of cortex. I considered this cleaver-like construction of the implement to be unusual, but at Point Plomer and the other sites dealt with in the present study it is the predominant type, there being forty-nine specimens from Point Plomer alone. The angle of the two surfaces ranges from 60° to 70°. They are all large slices struck from pebbles and boulders.

Twenty-nine have the point of percussion at one end (Pl. xxxviii, fig. 3) and sixteen of them possess a striking platform. The point of percussion is not always in the middle of the platform, but is frequently towards one side or the other, and is on the corner of the butt and lateral margin of some specimens; on the other twenty specimens it is on the lateral margin of seventeen and is indiscernible on three. The inner angle ranges from 115° to 140°. The cortex surface is either flat, rounded or slightly concave.

These asymmetrical *worimi* were struck from the nucleus in such a way that the desired form, a thick-backed slice with a cleaver edge, was produced. Some consist of half a split-pebble, and one (Pl. xxxviii, fig. 4) of the largest examples is of this kind. The back was then shaped to a rounded half-oval outline by the removal of a series of flakes or by removal of one or two large flakes. On irregular examples this rough shaping may be continued round one or both ends. The lower edge of the back, that is the one formed with the inner face, is more frequently trimmed (figs. 15, 17, 19–22) than the upper edge; a common variety (figs. 15, 17) has the lower edge and one end as a continuous trimmed margin. The ends may be untrimmed. These edges show undoubted signs of use, and in some instances are worked back under the body of the implement, while one or more concaves are frequently present.

In shape the *worimi* is usually longer than wide, and they vary from the ideal segment to roughly semicircular and trapezoid specimens. The ideal form is thus a large orange segment.

The forty-nine specimens may also be subdivided according to the nature of the thin margin or chord. On fifteen this edge is smoothed and rounded by use-polish, and of them nine are convex and six straight; on these specimens the lower edge of the back and end may be trimmed so that they possess two different kinds of working edges. On nine the thin margin is convex and slightly chipped, there being small flake-scars present on both facets. On another twelve this margin is trimmed from the cortex surface as a working edge, which bears concaves from 2 to 4 cm. wide and 1 cm. deep, while one bears two rounded noses 2 to 2.5 cm. wide. On eleven this margin is a natural unused edge. Three are trimmed from the inner face with the flake-scars on

the cortex surface. One specimen in this group is of dark green chert from Racecourse Head, a few miles to the north of Point Plomer.

On ten additional *worimi* both surfaces are fracture faces. On three the thin margin is unused, and on three it is use-polished. On four it is trimmed, one having a semi-discoidal edge, and they bear concaves from 1.5 to 2.5 cm. wide and 1 cm. deep, and rounded noses 1 to 1.5 cm. wide; three of them are heavily worked on their end-margins in addition. The largest *worimi* (Pl. xxxviii, fig. 5) in the collection is in this group, and it is 20 × 12 × 7 cm. in size and 3 lb. in weight. Two are of grey chert.

The above *worimi* range from 9 × 6 × 4 to 20 × 12 × 7 cm. in size; eight are 3.5–4.5 cm. and the balance 5–8 cm. in thickness. They range from ½ to 5 lb. in weight, the majority being 1–3 lb. All but three mentioned above are made of dark grey tuffaceous sandstone.

(c) *Karta*.—The twenty specimens are all slices and blocks, with a cortex outer surface. Various parts of the margins are trimmed from the inner face with the flake-scars on the cortex surface. There is a striking platform on the end of three, and on the balance the point of percussion is irregularly placed on either a lateral or end margin. The working edges are notched and irregular, and concaves of various widths appear on some of them. On several specimens the working edge is semi-discoidal, and one is a discoid (fig. 13). In shape the *karta* are mainly oval. One is an old knapped blade weathered on the inner face but re-edged at a later date. They range from 6 × 6 × 3.5 to 14 × 10 × 4 cm. in size, with one 16 cm. long, and from ½ to 2 lb. in weight.

Sundry Slices and Normal Flakes and Blades.—There is no normal flake and blade industry on the site. Although there are large numbers of flakes knapped during the shaping of the large implements, an extraordinarily low percentage bear any signs of use or trimming on their edges. Only fourteen specimens were found in several days' collecting. They comprise eight large and thick pieces, 8–11 cm. long, which are actually small slices, and five flakes 5–7 cm. long. Six of the series are trimmed on adjoining lateral and end margins, and several bear small concaves. Many possess notched edges. The point of percussion is at the end on a striking platform on the majority of the flakes on the site. Among them are numerous flakes of a poor quality light-grey chert or shale which are weathered and also blunted on the edges. The normal flake and blade implements knapped from the smaller nuclei on this workshop must have been taken away to other camp sites in the district, but the latter have not been located.

Fabricators.—No pebble hammerstones were found. Five trimmed fabricators were collected, but they are uncommon on the site. One is a tanged slice, 16 × 5 × 5 cm. in size, two are blocks, and two are coroids. Their edges are battered from percussive use. They are from 6.5 × 5.6 × 4 to 10 × 9 × 6 cm. in size and from ½ to 2½ lb. in weight.

Edge-Ground Axes.—Two of the four specimens collected are so weathered that they were left on the site, and both consist of a large elongate blade with a ground edge. The other two were retained. One is a trimmed coroid, 18 × 9 × 3 cm. in size and 1¾ lb. in weight. The other is a *windang* uniface pebble axe ground at one end on both facets and appears to have come from Crescent Head, to judge by the material. All are made of tuffaceous sandstone.

Fish-Hook File.—The only specimen found is of coarse sandstone. It is slightly convex on both surfaces and conical in shape. It is 8 × 2.75 × 1 cm. in size. This is the furthest north at which sandstone fish-hook files have been recorded, Port Stephens having previously marked this point (Thorpe, 1932, pp. 307–9, 311, Pl. xxxii).

TACKING POINT BEACH.

The seventy-eight specimens are from small and scattered patches of shell midden in the dunes fringing a very long beach which extends from Tacking Point, five miles

south of Port Macquarie, to Camden Haven. The principal site is at the northern end of the beach, about half-a-mile south of the Point. The implements were collected by Mr. H. J. Wright, the late Mr. E. O. Milne, and the author over a period of about twenty years.

The materials vary from fine to coarse grained cherts, tuffaceous sandstone, and others. Merewether chert is not represented.

Artefacts.

Coroid Implements.

Nuclei.—There are fourteen specimens, with one, two or three simple platforms, on three of which there are two platforms at right angles to one another. Two slender pebbles have a platform at one end. One is a thin prismatic remnant 4×1.5 cm., with a platform at each end, and three other remnants have a used concave 1 cm. wide on the outer edge of the platform. They are 4–9 cm. long, 1.5–7 cm. wide, and 1.5–4.5 cm. thick.

One nucleus of white quartz is biconical, with alternate knapping right round its circular margin. It is 6 cm. long and 3 cm. thick.

Uniface Pebble Implements.

(a) *Lateral Edge.*—This is the predominant type of large implement on the sites. The series of 26 specimens consists of well-worked and used elongate oval pebbles on which the working edge is convex on ten and straight on twelve; it is a long shallow concave on two, and there are alternate concaves and noses 1–2 cm. wide on two. The trimmed face of the working edge is steep-angled on most of them, and it is flaked back almost to the opposite margin on two. The end has been struck off one to form a striking platform from which flakes have been detached. Two are made of white quartz. They range from $9 \times 6 \times 2$ cm. to $17 \times 11 \times 7.5$ cm. in size and from 6 oz. to $4\frac{1}{4}$ lb. in weight.

Two additional specimens are trimmed on both lateral margins. One, $14 \times 9 \times 6$ cm. in size and 2 lb. in weight, is keeled, pointed at one end and rounded at the other end. The other one, $10 \times 7 \times 4$ cm. in size and 12 oz. in weight, has steep working faces with neatly trimmed edges on both lateral margins, while at one end an unused concave is bounded by two ridged spurs.

(b) *End Edge.*—A series of thirteen specimens somewhat smaller in size than the lateral-edged type.

The working edge is convex on five, on one of which it is like a huge nose, and is straight on three. One of the latter bears a concave 2×1 cm. with a rectangular nose 1×1 cm. The trimmed face is steep-angled on the majority. They range from 8 to 10 cm. long, 8 to 9 cm. wide, and 2 to 3.5 cm. thick, and from $\frac{1}{2}$ to 1 lb. in weight.

Four specimens are more carefully trimmed than the above nine specimens. The flake-scars are long and narrow and at a very low angle, while the natural contour of the convex surface has been preserved. This distinction occurs generally among the uniface pebble implements (McCarthy, 1943a, pp. 131, 136). They range from $8 \times 6 \times 2$ to $15 \times 7 \times 2.5$ cm. in size, and from 6 oz. to 1 lb. in weight.

Knapped Implements.

Blocks.—One has a striking platform with an inner angle of 140° . There is a concave 2×1 cm. on its trimmed semicircular margin. The upper surface is pyramidal with a short central transverse ridge. It is $10 \times 10 \times 6$ cm. in size and 12 oz. in weight. One has a concave 2×0.5 cm. on its trimmed lateral margin, and one of white quartz has notched edges. These two are 4 and 6 cm. long.

Slices.

(a) *Split-Pebbles*.—Of the three oval in shape, one is very neatly trimmed along both lateral margins and distal end, one along one lateral margin and end, and one on one lateral margin. The point of percussion is at the end on all three. The fourth example is roughly triangular in shape, and its long trimmed lateral margin bears signs of considerable use, there being small flake-scars along both facets of its edge; the point of percussion is at the apex. They range from $9 \times 7 \times 2.5$ to $14 \times 9 \times 3$ cm. in size, with one 8 cm. wide and one 4.5 cm. thick, and from 8 oz. to $2\frac{1}{4}$ lb. in weight.

(b) *Worimi Cleavers*.—Two are of the ideal segment form, and about $12 \times 7 \times 5$ cm. in size and 14 oz. in weight. They are neatly trimmed along one edge of the thick back, one on the upper or cortex edge, the other (fig. 15) on the lower or inner face edge. The thin margin is use-polished on one and is trimmed from end to end from the cortex surface on the other. The point of percussion is on the end of both specimens.

The third specimen is a poorly shaped trimmed coroid of coarse pink porphyry with two cortex surfaces and a straight fracture face forming one end. The working edge is steep-faced. It is $12 \times 9 \times 4.5$ cm. in size and 2 lb. in weight.

Normal Flakes and Blades.

Scraper-Knives: Elouera.—Five are trimmed on one edge only of the thick margin or back. One is a type i with the trimming on the back and plain ends; three are of type ii with the trimming extending round the distal end; two are of type iii with the trimming extending round both ends. On one of the latter the thin margin is rounded and use-polished, on three others it is scraper-trimmed, and on two it is plain and unused. They range from $3.5 \times 1.5 \times 1.25$ cm. to $6 \times 5.5 \times 2.5$ cm. in size.

Scrapers.—Eight irregular blades are trimmed on one straight lateral margin and two blades are trimmed on both convex margins. One of the latter has a heavily faceted striking platform. They are 4–5.5 cm. long. On a small flake 3 cm. long is a concave 1×0.5 cm. There are, in addition, two segments 3 cm. long, trimmed along the thick margin, but they are not geometrical microliths.

Knives.—Two of these three narrow blades have slightly scaled convex edges and one of them has a straight use-polished edge in addition. They are from 4 to 6 cm. long.

Bondi points. Six specimens from 2 to 4 cm. long.

Trimming Flakes.—One of the punch type used at both ends, and one used on one lateral margin. 4–5 cm. long.

Fabricators.—One white quartz coroid fabricator, oval in shape, 4 cm. long, on which the prominent edges of the flake-scars are battered.

Edge-Ground Axe.—The only specimen is a splendid example of the *Windang* uniface pebble axe. The blade has a broad ground facet on the trimmed surface, the other facet being cortex. A few flakes have been detached along the margins of the cortex surface by percussion use along the edges. It is $19 \times 12 \times 5$ cm. in size, $3\frac{1}{4}$ lb. in weight, and made of tuffaceous sandstone.

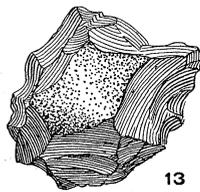
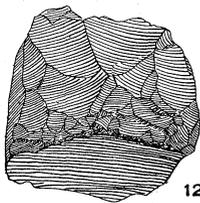
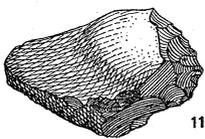
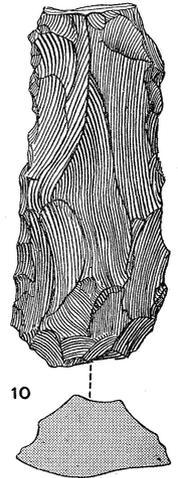
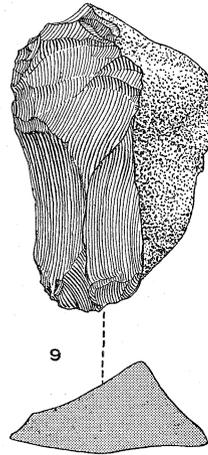
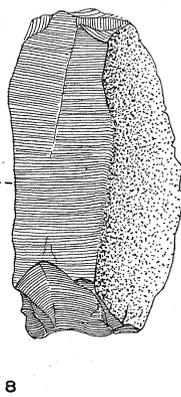
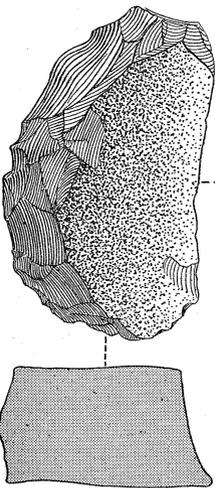
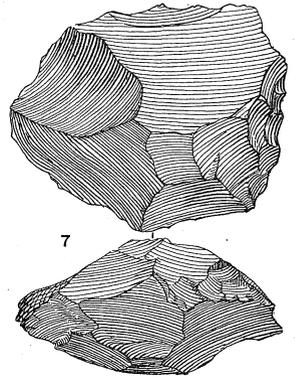
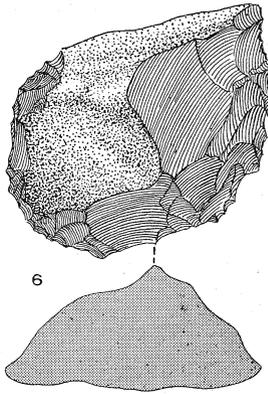
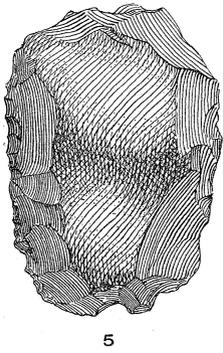
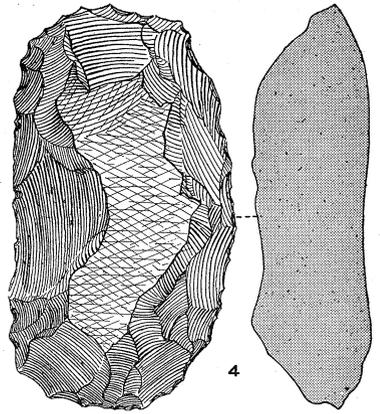
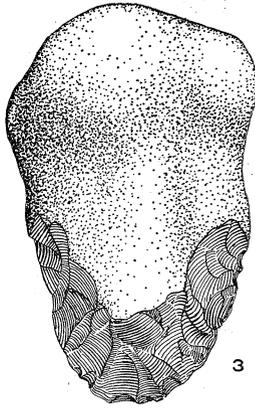
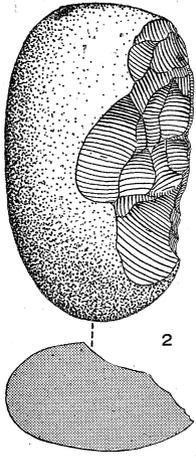
DARK POINT.

This headland of reddish-grey porphyry is situated a few miles north of Port Stephens and about eighty miles south of Port Macquarie. The workshop extends across the dunes behind the headland, and it is not as extensive as the one at Point Plomer. The site is very inaccessible and although a larger series of specimens is desirable, the 114 dealt with in this analysis are of particular interest because of the wide range of materials and types represented. Merewether chert was freely used on the workshop. In each group of implements the materials are widely varied.

Artefacts.

Coroid Implements.

Nuclei.—There are ten specimens with simple platforms, on five of which there is one platform, on two a platform at each end, and on three two platforms at right



angles. One of the latter has one faceted platform. One is a brown chert pebble with a platform formed by a diagonal flake-scar at one end. The angle is between 75° and 80°. There is a trimmed working edge on a lateral angle on four of these nuclei. They range from 5 cm. in diameter to 11 cm. long and from 4 to 6 cm. thick.

Ten other conical nuclei with simple platform (fig. 12) form a distinctive series on which their oval and circular margin is trimmed all round. The lower surface is a flat cleavage face on nine and is of cortex on the other one. The inner angle of the striking platform by which one was detached is 135°. They are all high-crowned, and several bear a patch of cortex on their domed upper surface. Seven display heavily worked margins which are worn inwards under the body of the block, which thus overhangs the working edge. These implements conform in all respects with the *horsehoof* core implement of the interior of Australia, but the Dark Point series is much smaller in size, ranging from 5.5 × 4.5 × 4 cm. to 11.5 × 10 × 6 cm. and from 4 oz. to 2½ lb. in weight. A wide range of materials is represented.

Among the four specimens with alternate platforms there is a patch of cortex in the middle of each surface on two, and on the third one seven flake-scars radiate from the off-centre conical point; on the fourth one the cortex is completely worked away on both surfaces. They are 6–11 cm. long and about 4 cm. thick.

One made of Merewether chert, 8 × 5 × 5 cm. in size, has a poorly formed compound platform.

Uniface Pebble Implements.

(a) *Lateral Edge.*—Three specimens with convex edges. On one a trimmed corner forms a large nose 4.5 cm. wide and 2 cm. deep. Two are of coarse porphyry. They are from 13 × 7 × 5 to 15 × 7 × 6 cm. in size, with one 9 cm. wide, and from 1¼ to 2¼ lb. in weight.

(b) *Lateral and End Edge.*—A splendid example made of a fine-grained tuffaceous shale (?). The margin is trimmed on one side and both ends to form a semicircular working edge with a steep-angled face. It is 13 × 11.5 × 6 cm. in size and 2¾ lb. in weight.

(c) *Sumatra-Type.*—The three specimens are made of porphyry and tuffaceous sandstone. One is an almost ideal example of the complete uniface type and is the largest of the series. They range from 12 × 8 × 4 to 17 × 11.5 × 5 cm. in size and from 1 to 2½ lb. in weight.

Knapped Implements.

Blocks.—All but two of the eleven specimens are elongate and flat-crowned with edges trimmed from the inner face along one or both lateral margins and sometimes also on the distal end. One, with a narrow butt and a broad trimmed distal end, is a type figured by Thorpe (1928, Pl. xix, fig. 1, and Pl. xxiii, fig. 1), from Lake Macquarie and Anna Bay. The working edges on the majority are convex, but one has a long shallow concave, and another one a series of concaves 1 cm. wide separated by pointed noses round its distal end.

One of the three keeled specimens is trimmed on both lateral margins and end. Another one, of *arapia*-type, is trimmed all round its oval margin with step-trimming on one side and a long shallow concave working edge on the other side. It is 10 × 7.5 × 5 cm. in size and 1¼ lb. in weight.

Figs. 2-14.—2-4. Uniface pebble implements with lateral and lateral-end working edges, and a *sumatra*-type. 5. Split-pebble slice trimmed on inner face. 6. Block of crown type trimmed on end and lateral margins. 7. Nucleus with alternate platforms. 8. Coroid *worimi* with use-polished edge. 9. *Worimi* with cortex back and use-polished chord. 10. *Worimi* with both lateral margins trimmed. 11. A small *worimi* with use-polished chord and trimmed end. 12. Conical nucleus with simple platform. 13. Discoid *karta*. 14. Nucleus with a striking platform at each end. Nos. 2-7, 13-14 are from Point Plomer, and Nos. 8-12 from Dark Point.

The point of percussion is at the end on three and on the lateral margin on two, the others being indeterminate. The only inner angles measurable are 130° , although one has a right-angled cortex striking platform. They range in size from a small pyramidal block $5.5 \times 5.5 \times 3$ to a thick elongate specimen $16 \times 9 \times 6$ cm., with one 10.6 cm. wide, and from 4 oz. to 2 lb. in weight.

Slices.

(a) There is one oval slice of fine-grained brown chert, with a trimmed convex edge, $13 \times 9 \times 3$ cm. in size.

(b) *Split-Pebbles.*—The working edges of the six specimens are trimmed from the cortex surface on one or both margins. They range from $8 \times 7 \times 3$ to $16 \times 9 \times 6$ cm. in size and from 8 oz. to 2 lb. in weight.

(c) *Worimi Cleavers.*—An excellent series of thirty-eight specimens is represented. In shape they vary from thin blade-like examples to thick segments, a number being irregular and poorly fashioned. Fourteen are formed by a cortex surface opposed to a fracture surface or inner face, the thick back being shaped by knapping. Twenty-four possess two fracture surfaces, and on three of them the outer face consists of several large flake-scars. Four have a rounded back with cortex surface (fig. 9) and the balance are knapped to shape. On a minority the back is crescentic and carefully trimmed, but on the majority it is roughly knapped. On sixteen the inner edge of the back is trimmed and bears signs of use; on twelve this trimming extends round one end and on four round both ends. Two are trimmed on both edges of the back; one (fig. 10) of them, of Merewether chert, has step-trimmed edges, and one of fine-grained porphyry has battered edges due to percussive use, probably as a fabricator. Both are trimmed on the thin margin in addition.

The thin margin is smoothed and rounded by use-polish on ten, one of which was figured by Thorpe (1932, p. 302, Pl. xxviii, fig. 2, E.32372); on three of them the use-polish has smoothed a previously trimmed edge, but as a rule there is no trimming on a use-polished edge. On one (fig. 9) half of this margin is use-polished and the other half is trimmed, and on another one (fig. 11) both edges of the thick end are neatly trimmed to form a semicircular end joining a use-polished thin margin. On seventeen this margin is trimmed from the inner face and one from both surfaces. Nine are unused on the thin margin. One outstanding specimen was figured by Thorpe (1932, pp. 302, 310, Pl. xxviii, fig. 1, E.32371). It is made of fine-grained grey quartz-porphyry and has a cortex surface opposed to a fracture or inner face. It is well trimmed along its steep-faced thin margin and butt end, and the striking platform has been eliminated. Its working edges bear a number of small concaves and noses. It is $18 \times 15 \times 5.5$ cm. in size and $4\frac{1}{4}$ lb. in weight. Another fine specimen (fig. 18), made of a fine-grained brown quartzite, is a perfect segment, with two fracture faces, and is trimmed on all three edges; it is $15 \times 6 \times 6.5$ cm. in size and $1\frac{1}{2}$ lb. in weight. It is as well to mention that the use-polished thin margin is often combined with one or two trimmed edges on the back of *worimi*.

On thirteen the point of percussion is on a striking platform at one end, it being of cortex on several specimens. The inner angle ranges from 123° to 140° . The point of percussion is on the lateral margin of four and is indeterminate on twenty-one, most of which are of coarse porphyry.

They are from $7 \times 6.5 \times 5.5$ to $18 \times 15 \times 5.5$ cm. in size and from 8 oz. to $4\frac{1}{4}$ lb. in weight.

Three coroid *worimi* will be described in this section. They are elongate, thick lumps of porphyry and tuffaceous sandstone, with flat cortex upper and lower surfaces. One has almost vertical and roughly knapped sides. The second one has one edge of one side trimmed, and above it a cortex face sloping sharply to the upper surface.

The third one (fig. 8) has one crescentic side, roughly flaked on an almost vertical face, while the lower edge of the other steep side has the most pronounced use-polished edge that I have seen on any implement; the polishing extends 1.5 cm. up the side and 0.5 cm. back from the rounded edge on the lower surface. Although trimmed coroids, these implements possess all the other characters of the *worimi* cleavers. They range from $10 \times 6 \times 5$ to $13 \times 8 \times 4.5$ cm. in size and from 1 to 2 lb. in weight.

Karta.—The eight specimens are oval slices 8–10 cm. long. One is trimmed from the inner face all round, and two on both lateral margins. They range from 8 to 10 cm. long and from $\frac{1}{2}$ to $1\frac{1}{2}$ lb. in weight.

Normal Flakes and Blades.—A small series of six knives, six side-scrapers, one with a semicircular working edge, and one *elouera* of type ii. They range from 4 to 9 cm. long.

Percussion Stones.—No pebble hammerstones are represented, but there are nine trimmed coroid fabricators, most of which are discarded nuclei with battered ridges and projections. Four are elongate and keeled, and three of them of grey chert have a poorly formed compound striking platform. Two are spheroidal and two are irregular. One trimming stone is a rectangular piece of grey chert, flat on both surfaces, with vertical sides which appear to have been rubbed on a number of facets; both edges at one end and one edge of one margin are battered. They range from 6 to 10 cm. long.

Edge-Ground Axe.—The only example is a *Windang* uniface pebble axe, oval in shape, $10 \times 8 \times 3$ cm. in size and 14 oz. in weight. It is made of tuffaceous sandstone. Percussive use has resulted in the detachment of flakes from both surfaces along the lateral margins. The blade is ground on the facet of the inner face only, the other facet being cortex.

ANNA BAY AND MORNA POINT.

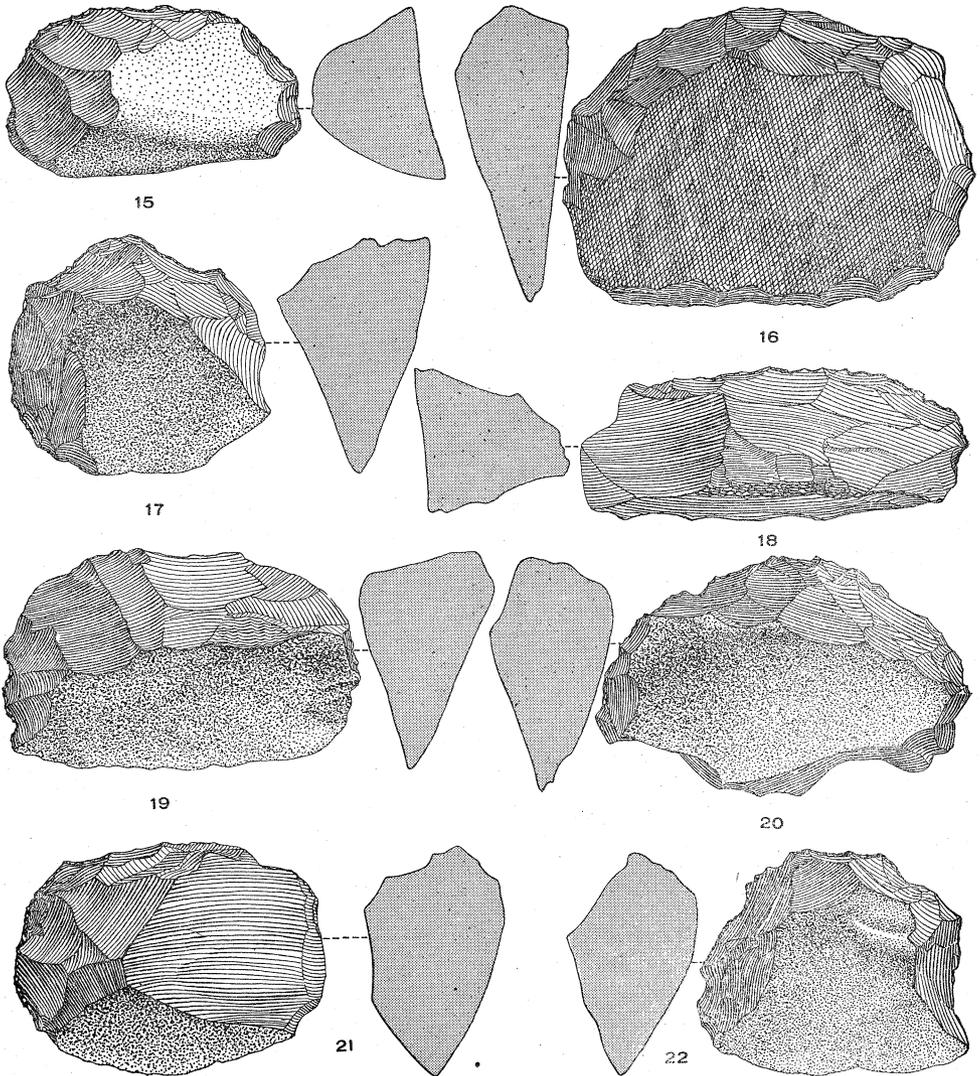
Miss Hall (1928) gave a detailed description, with a geological map, of the Morna Point site and implements, and Thorpe (1928, pp. 245–6, Pls. xx–xxii, 1932, Pl. xxviii, fig. 3) has described a number of the large implements, including *worimi* cleavers from Anna Bay. Both sites are workshops in the dunes along small beaches, each about a quarter of a mile long, flanked by headlands and outcrops of reddish-grey quartz and feldspar porphyry, while andesite occurs at Point Stephens to the north and also outcrops to the south of Morna Point. The two beaches are strewn with agglomerations of porphyritic boulders, used as a source of material by the aborigines. As Miss Hall pointed out, “the swampy character of this area is due to the fact that during Tertiary times it was under water and formed part of the estuary of the Hunter River. Since that time much of the land has been reclaimed by silting associated with a recent minor uplift of fifteen feet.” The high, rocky headlands which were formerly islands are now surrounded by low-lying flats, and the workshops of Morna Point and Anna Bay, as at Point Plomer, are thus on the most recent dunes.

A very interesting industry of Merewether chert normal flake and blade implements occurs at Anna Bay and Morna Point. That from the latter site was described by Miss Hall. This industry will not be dealt with in the present study, but will be analysed in a subsequent report upon the “Merewether” chert industry generally, as it extends from Tuggerah Lakes to Port Stephens and further north to Dark Point so far as is known to me, and is the predominant one in the Newcastle district on the Hunter River. This chert was traded from Newcastle a considerable distance to the north and south along the coast.

The following analysis of *worimi* slices from Morna Point and Anna Bay is given for comparison of their characteristics with those of the series from Dark Point, Tacking Point Beach, and Point Plomer.

There are twenty-four specimens from Morna Point. Nineteen are made of grey or red porphyry, which varies from fine to coarse in texture, five of light-grey Merewether chert, and one of fine-grained yellow quartzite.

Only four (fig. 16) consist of a cortex surface opposed to a fracture face on the sides. One of the chert specimens of this kind is half of a thick pebble split diagonally and laterally. The balance possess an inner face, and an outer face bearing flake-scars made prior to the detachment of the piece from the nucleus. The thick crescentic back is roughly flaked to a steep face. Some are irregular in shape, but all conform to the general orange-segment formation characteristic of the *worimi*. On a few examples the upper edge of the thick back is close to or in the middle of the outer surface on which it forms a median keel. One Merewether chert specimen is semicircular in



Figs. 15-22.—A series of *worimi* cleavers illustrating the shape, transverse section, and trimmed working edges. No. 18 possesses two fracture faces, the balance consist of one fracture face opposed to a cortex surface. No. 15 is from Tacking Point, No. 16 from Anna Bay, Nos. 17, 19-22 from Point Plomer, and No. 18 from Dark Point.

shape. Edge trimming on the thick back is present on very few of the porphyry *worimi*, probably because of its coarse and unsuitable trimming qualities, but it is well shown on three of the Merewether chert specimens, one of which has a trimmed semicircular thick margin.

The point of percussion is variously situated. It is on the end of nineteen, a minority of which possess a striking platform, is on the lower edge of the thick back of two, and is indiscernible on three. The inner angle ranges from 120° to 135°, with one at 110°.

The thin margin is use-polished on five, including one of chert figured by Thorpe (1928, Pl. xx, fig. 3), but he did not refer to this working edge. It is trimmed from the outer or cortex surface on fifteen, five of which are convex, five straight, four slightly concave, and one has a concave 4.5 cm. long and 1 cm. deep; four of this group are of Merewether chert; the remaining four are unused on this margin. Miss Hall has described and figured a number of these specimens (1928, pp. 277-78, Pl. xxxvii, figs. W1, W2, W3, Pl. xxxviii, Xi-2) and McCarthy one (1941a, p. 257, fig. 6). They range from 9 × 7 × 4 cm. to 10 × 10 × 7 cm. in size, and from ½ to 1 lb. in weight. There is no line of demarcation between the small light and the large heavy specimens.

ANNA BAY.

There are forty *worimi* slices from this site. All but one of andesite are of red or grey porphyry, frequently coarse in texture.

Three consist of two cortex sides, nine of a cortex opposed to a fracture or inner face, and twenty-eight of a knapped outer face and an inner cleavage face. The thick back is formed in the same manner as on those from Morna Point. The distal end of one is trimmed into a semicircular edge like a large nose. One resembles very closely a lateral-edged uniface pebble implement.

The point of percussion is on a striking platform at the end of twenty specimens, on a lateral margin of five, and is indiscernible on fifteen. The inner angle ranges from 133° to 135°, with one at 140°. The thin margin is use-polished on five. It is trimmed on thirty-three specimens, twelve of which are convex, twelve straight and nine concave; six of them have one concave 7-10 cm. wide, and three have one or two concaves 1-3 cm. wide. This margin is unused on two specimens. They range from 8.5 × 5.5 × 4.5 to 16 × 12.5 × 5 cm. in size, but up to 9 cm. in thickness, and from ½ to 4 lb. in weight. Several of these *worimi* were figured by Thorpe (1928, p. 245, Pl. xxi, figs. 1-2, Pl. xxii, figs. 1-2) and McCarthy; 1941a, p. 257, fig. 7).

The data given above regarding the *worimi* may be tabulated as follows:

| | Plomer Point. | Tacking Point. | Dark Point. | Anna Bay. | Morna Point. | Totals. |
|-----------------------------|---------------|----------------|-------------|-----------|--------------|---------|
| <i>Sides.</i> | | | | | | |
| Cortex and fracture | 49 | 2 | 14 | 9 | 4 | 79 |
| Two fracture | 10 | — | 24 | 28 | 19 | 81 |
| Two cortex | — | 1 | 3 | 3 | — | 7 |
| <i>Back trimmed on</i> | | | | | | |
| Lower edge | 27 | 3 | 16 | 6 | 8 | 60 |
| Upper edge | 1 | — | — | — | — | 1 |
| Both edges | — | — | 2 | — | — | 2 |
| Untrimmed edges | 31 | — | 23 | 34 | 16 | 104 |
| <i>Chord.</i> | | | | | | |
| Use-polished | 18 | 1 | 12 | 5 | 5 | 41 |
| Trimmed | 25 | 1 | 20 | 33 | 15 | 94 |
| Plain | 16 | 1 | 9 | 2 | 4 | 32 |
| <i>Point of Percussion.</i> | | | | | | |
| End | 34 | — | 13 | 20 | 19 | 88 |
| Lateral | 21 | — | 4 | 5 | 2 | 33 |
| Indiscernible | 3 | 1 | 21 | 15 | 3 | 43 |

* There are three coroid examples.

Dimensions.—The dimensions of 124 *worimi* cleavers from Point Plomer, Anna Bay and Morna Point are as follow:

| | Length. (mm.) | Width. (mm.) | Thickness. (mm.) | | Weight. (oz.) |
|----------|------------------|-----------------|---------------------|------------|------------------|
| 30-9 .. | — | — | 7 | 0-9 | 3 |
| 40-9 .. | — | — | 39 | 10-9 | 34 |
| 50-9 .. | — | 3 | 40 | 20-9 | 56 |
| 60-9 .. | — | 15 | 25 | 30-9 | 20 |
| 70-9 .. | — | 16 | 11 | 40-9 | 8 |
| 80-9 .. | 5 | 32 | 2 | 50-9 | 1 |
| 90-9 .. | 12 | 34 | — | 60-9 | — |
| 100-9 .. | 18 | 15 | — | 70-9 | 1 |
| 110-9 .. | 19 | 7 | — | 80-9 | — |
| 120-9 .. | 27 | 1 | — | 90-9 | 1 |
| 130-9 .. | 22 | 1 | — | | |
| 140-9 .. | 10 | — | — | | |
| 150-9 .. | 8 | — | — | | |
| 160-9 .. | — | — | — | | |
| 170-9 .. | — | — | — | | |
| 180-9 .. | 2 | — | — | | |
| 190-9 .. | — | — | — | | |
| 200-9 .. | 1 | — | — | | |

This table reveals a wider dispersion in length and width than in thickness and weight, and particularly a narrow range in the two latter characters. Exceptionally large specimens are uncommon.

TABLE OF ARTEFACTS.

| | Point Plomer. | Tacking Point. | Dark Point. | Sub- totals. | Totals. |
|----------------------------------|------------------|-------------------|----------------|-----------------|---------|
| <i>Coroids.</i> | | | | | |
| Sundry | 1 | — | — | 1 | 1 |
| <i>Nuclei.</i> | | | | | |
| Simple platform | 19 | 14 | 10 | 43 | 68 |
| Conical platform | 2 | — | 10 | 12 | |
| Alternate platform | 4 | 1 | 4 | 9 | |
| Compound platform | — | — | 4 | 4 | |
| <i>Uniface pebble.</i> | | | | | |
| Lateral | 7 | 28 | 3 | 38 | 62 |
| End | 2 | 13 | — | 15 | |
| End and lateral | 1 | — | 1 | 2 | |
| Sumatra type | 4 | — | 3 | 7 | |
| <i>Blocks</i> | 7 | 3 | 11 | 21 | 21 |
| <i>Slices.</i> | | | | | |
| Sundry | 8 | — | 1 | 9 | 153 |
| Karta (and blocks) | 20 | — | 8 | 28 | |
| Split-pebble | 2 | 4 | 6 | 12 | |
| Worimi | 60 | 3 | 41 | 103 | |
| <i>Normal Flakes and Blades.</i> | | | | | |
| Elouera | — | 6 | 1 | 7 | 49 |
| Scrapers | 5 | 10 | 6 | 19 | |
| Knives | — | 3 | 6 | 9 | |
| Trimmers | — | 2 | — | 2 | |
| <i>Bondi points</i> | — | 6 | — | — | 6 |
| <i>Edge-ground Ares.</i> | | | | | |
| Windang type | 3 | 1 | 1 | 5 | 6 |
| Biface coroid | 1 | — | — | 1 | |
| <i>Percussion.</i> | | | | | |
| Trimmed fabricators | 5 | — | 9 | 14 | 14 |
| <i>Abrading.</i> | | | | | |
| Fish-hook files | 1 | — | — | 1 | 1 |
| | | | | | 381 |

In addition there are 64 *worimi* from Morna Point and Anna Bay.

TECHNIQUE.

It will be noted in the table that nuclei with simple platforms form a distinct majority, while those with alternate and compound platforms are comparatively scarce. The knapped implements do not always possess a striking platform; in fact, it is present on a small proportion only. On the *worimi* the inner angle, where measurable,

ranges from 115° to 140°, with one at 110°, which is approximately that of the so-called Clactonian technique.

Trimmed coroid fabricators were employed as detaching hammers, and none of the pebble kind are represented. The great majority of *worimi*, *karta*, split-pebble and uniface pebble implements on the sites, as opposed to thick block types, identifies the industry as cleaver-edged, that is, one in which the predominant implements possess an acute-angled working edge formed by an outer cortex and an inner fracture face, but the cortex face is often replaced by an outer face bearing flake-scars or by a second fracture face.

The analysis throws further light upon the origin of the *worimi* cleaver. I have asserted (1941c, p. 25, 1943a, p. 139) that this thick slice implement supplanted the semi-uniface pebble implements, particularly the lateral-edged kind, and this conclusion is borne out by the material dealt with in this study. It is notable that the majority of *worimi* at Point Plomer, where they were detached from water-worn pebbles and boulders, possess an outer cortex face, but the majority at Dark Point, Anna Bay and Morna Point have an outer fracture face or one bearing flake-scars; the two latter methods of making the *worimi* are probably due to the occurrence of the material at these sites in easily procured lumps that have not been smoothed on the beach, and also to the fact that the surface of the porphyry weathers to a thick crumbly layer. It might also be mentioned that the *worimi* trimmed from the outer face on the thin margin thus possess the same type of working edge as the lateral semi-uniface pebble implements. The natives therefore were able to develop a knapping technique which enabled them to produce cleavers either from the abundant large water-worn stones or from lumps of rock obtained from outcrops. This process merely required an adaption of the simple split-pebble technique they already employed, as on the comparatively small pebbles of Tacking Point beach, where semi-uniface pebble implements predominate and *worimi* are scarce.

So far as I know, the *worimi* cleaver does not occur on Kangaroo Island, but in size and form it is similar to the large lateral-edged uniface pebble implements so abundant on this island.

Thorpe (1928, p. 243) considered the *worimi* to be a percussive tool used for breaking open molluscs to expose the shellfish, but my analysis of the working edges reveals that the *worimi* was rarely used for percussive or battering purposes.

Discussion.—The Point Plomer and Dark Point workshops are of particular interest in being confined chiefly to the production of large implements of the cleaver and chopper kinds. The *elouera* industry (McCarthy, 1943a, McCarthy and Davidson, 1944) prevails along the coast from Port Stephens southward to the Victorian border and probably beyond. It might be mentioned here that the Australian Museum possesses an oblique trimmed blade, 2.25 cm. long and 1.75 cm. wide, with a faceted butt, from Fingal on the Tweed River; it is actually a variety of *Bondi* point, and indicates that the *elouera* industry might be found on scattered sites on the north coast. Tacking Point also has yielded one *elouera* and some *Bondi* points, but is unimportant for purposes of comparison. It is also important to note that the specialized uniface pebble implements, the *worimi* cleaver and implements of the Kartan culture form part of the *elouera* industry on southern workshops, and the further claim (McCarthy, 1941) that the *elouera* normal flake and blade industry is a later development than the Kartan uniface pebble industry appears to be supported by the segregation of the latter on North Coast workshops. One reason for the latter situation is that the high mountains of the Great Dividing Range probably formed a barrier which preserved the North Coast as a backward cultural pocket. The Dark Point and Plomer Point sites belong to the Yamba and Crescent Head (McCarthy, 1941c) group, and it is probable that similar workshops exist near many other headlands on the north coast. Furthermore, the North Coast sites at which the *worimi* cleaver predominates should be regarded as

local variants of the Kartan uniface pebble culture, with the addition of the edge-ground technique and fish-hook files. The *horsehoof* core implement occurs with this culture on Kangaroo Island and the sites herein described.

One other point of importance is that most of the axes found on the workshops at Crescent Head, Point Plomer, Tacking Point beach and Dark Point are of the *Windang* uniface pebble type (McCarthy, 1944), an occurrence which supports the conclusion that this axe is a transition type from the trimmed to the ground edge. Curiously enough, pecked and grooved and biface coroid edge-ground axes are ploughed up on farms along the alluvial banks of North Coast rivers. Two pecked axes from the Port Macquarie district were presented to the Museum by Mr. Pountney in 1945.

The use-polished edge, to judge by its common occurrence on the *worimi* cleaver, is the result of a special use of these implements. The first explanation of the manner in which this edge is produced is the cleaning and scraping of skins for cloaks, and another one is the scraping of the rough outer shreds from the sheets of bark used for making canoes, shields, and containers. The scraping of wooden weapons and implements could also produce such an edge. Only experiment will demonstrate which of these suggestions is correct. It must not be forgotten that the use-polished edge occurs not only on large implements like the *worimi*, but also on normal flakes and blades such as *elouera* and unspecialized kinds.

Point Plomer Implements.

The Australian Museum possesses a collection of photographs of the Port Macquarie natives, made by the late T. Dick, whose observations extended from 1890 to 1927 in his daily occupation as an oyster-grower and fisherman on this estuary. He took a kindly interest in the local aborigines, especially in their problems arising from contact with the whites, but he also made a deep study of their customs. So sincerely did they respect him that he was able to get them to make replicas of their weapons, domestic articles like bags, baskets and bark containers, and canoes, ornaments and skin cloaks, public aprons and ritual objects, and with these and the old specimens that he had collected they re-enacted various aspects of their daily and ceremonial life. In addition, he wrote a manuscript embodying the information he collected, but unfortunately this work and his collection of specimens, including those shown in the photographs, cannot now be traced by the surviving members of his family.

Among the photographs are about fifty in which stone implements are shown. The majority of these were taken at Point Plomer, others in the mangrove swamps along the western and southern shores of Port Macquarie, and a few elsewhere in the district. In assessing the value of these photographs insofar as their accuracy is concerned it must be remembered that they are not of natives living in their original primitive state, but of more or less civilized individuals re-enacting the past. T. Dick had the benefit of information from his father, J. S. Dick, who had lived in the district for sixty years and had seen the natives using stone tools. Settlement was established at Port Macquarie in 1821, and it can be accepted without doubt that from this date onwards metal axes and other tools, and bottle-glass, were given by the settlers to the natives to gain their goodwill and to pay them for services rendered. Henderson (1851, ii, p. 148) said that all of the natives in contact with whites on the Macleay River had steel axes, and T. Dick himself stated in 1915 (p. 283) that the Stone Age was almost immediately replaced by the Metal Age. Dick's photographs were taken between 1914 and 1927. It is probable that none of the old men whom he knew had any first-hand knowledge of the manufacturing techniques, nor of the precise functions of the implements, and further, that none of the natives shown in the photographs had any practical knowledge of the Stone Period. This is an important point to establish and it appears to be clear that the subjects illustrated are an expression of the combined knowledge of these customs possessed by Mr. T. Dick

and his native friends. Their names and ages, so far as they are known by his son, Raymond Dick, who knew them personally, are as follows: Charlie Murray, between 65 and 70 years of age; Peter Budge, between 70 and 75; Neil Morcom, 40; and Ted Dungay, 40; Mrs. Murray, Mrs. Dungay.

Raymond Dick told me that Murray and Budge knew a great deal about the traditional life of their people, and probably about stone implement manufacture, but both were born after 1850. Mr. T. Dick is to be commended very highly for his admirable effort to preserve a knowledge of the past with these photographs, but for the sake of accuracy it is necessary to evaluate them in the light of present-day knowledge, because they illustrate both doubtful and authentic methods of manufacture and uses of stone implements in this area. The following remarks are not, therefore, a criticism, but merely an impartial review of the evidence presented by Mr. Dick.

No less than five photographs show the placing of pebbles on the fire for fracturing purposes (Pl. xxxvi, fig. 2), but none of the implements collected show any signs of having been in the fire, moreover, the presence of a striking platform, point and bulb of percussion on the majority of specimens, each struck by one blow, appears to rule out the employment of the heat-fracturing method in the old days. Thorpe (1932, p. 302) conjectured the use of this method in the Newcastle district. Actually, the effect of fire on tuffaceous sandstone and chert is to soften the stone.

Two methods of knapping are shown and these are probably correct. They are both variants of direct rest percussion (Holmes, p. 300, fig. 163). Pl. xxxvi, fig. 1, demonstrates the removal of large flakes from a massive nucleus set upright on the ground by striking it with a large two-handed knapping stone. Pl. xxxvi, fig. 3, shows a widespread method of knapping, that in which the nucleus is placed and held firmly in one hand on an anvil stone, while the hammerstone is held in the other hand. Pl. xxxvi, fig. 4, illustrates the latter technique applied to a working edge, but the implement should be lying flat on the anvil stone to make it possible to trim the edge. These are obviously implements picked up on the workshop and not made by the natives shown in the photographs.

None of the photographs shows direct free-hand fracture (Holmes, 1919, p. 284, fig. 144) recorded by Roth in Western Queensland (1904, p. 16, fig. 23) but it was probably employed in trimming and shaping implements.

The only other technique illustrated is that of grinding the blades of axes, which incidentally, appear to be *windang* uniface pebble types picked up on the workshop. Pl. xxxvii, fig. 3, shows the grinding being done on an outcrop of sandstone (?) at Green Hills, twelve miles south of Port Macquarie. Raymond Dick has informed me that there are no axe-grooves at this site. Another photograph shows the use of the sand-covered surface of a pebble for the purpose; I did not collect any pebbles bearing axe-grinding grooves, but Raymond Dick has informed me that his father collected several examples. It might be mentioned that in other parts of New South Wales this process produces definite grooves up to 30 cm. long, 5-8 cm. wide, and 4 cm. deep. Portable whetstones from 7 cm. to 30 cm. long, bearing a groove, are widely distributed in Australia.

In regard to the uses of the implements the same feeling of uncertainty exists as to whether or not these natives really knew the exact or correct type of stone implement to use for the various operations illustrated. The photographs are, however, valuable in demonstrating a wide range of the known uses of stone implements, and furthermore, they are, so far as I know, the only series in existence dealing with the coastal natives of New South Wales. Both Kerry's and Lindt's photographs are of physical types and ceremonies, and they do not illustrate stone implement techniques and uses. Pl. xxxvii, fig. 2, shows the use of a hand-scraper or graver on a boomerang, and in several other photographs a carved club is substituted.

To my knowledge there is no record of the use on the north coast of New South Wales of a stone adze-flake or a shell-chisel mounted on either the end of a spear-thrower or a wooden handle. Enright (1900) does not mention it in his review of the material culture of Port Stephens. Further south, the hafted shell-chisel was recorded by the First Fleet historians in the coastal area between Botany and Broken Bays, a hafted stone adze-flake was used by the *Buruberongal* horde in the area where the Hawkesbury River joins the Nepean (Hunter, 1793, p. 452), and Bradley (1788, October, pp. 129-130) recorded the use of a stone adze secured in a similar manner to the axe-blade in describing the stone implements of the Sydney district.

In a series of twelve photographs (some of which have been published—Dick, 1915, and Goddard, 1934) is shown the cutting of a sheet of bark and wood to a depth of three inches from the trunk of a mangrove tree. Dick's remarks (pp. 283-88) on the uses of the stone tools are as follow:

"On investigating the result of the work of the stone axe on the Grey Mangrove a vast field was opened up, as not only was the work done by the stone axe revealed, but there was also brought to light the method and locality where these axes were made . . . In the Stone Period the shields were cut with stone implements only, and this period must have extended over a very long time, as shown by the variety of shapes of the axes and cutting stones found at the bases of trees, from very crude unground stones with cutting edges made by splitting only, to the ground-edged implements. The former are actually the shivers off water-worn boulders weighing over one hundred pounds, and in many cases so many shivers have been taken from the original stones that the unused part now only weighs a few pounds . . . The late John Stuart Dick of Port Macquarie had often seen the natives removing the shields in the early days of the settlement by stone tools only . . . and by steel tools as well. It was the information given by this Mr. Dick that led to the search amongst the trees, as he often drew my attention to those which were marked . . . Mr. E. H. Dick saw a native using a steel tomahawk and wooden wedges . . . The wedge was of special stone found in the district, and shaped similarly to the gads used for bursting stone, only the point was not made fine, but on the contrary, it was blunt and would not enter timber. The rabbit was cut to take the point of this wedge, and to allow this wedge to be driven into it, and so derive great lifting power . . . eight or nine wedges were driven into the rabbit and when the tree was hard, there would be a number of wedges destroyed and dropped, and these can be found at the present time by digging round old trees. To get the lifting power the wedges were made practically double the width of the rabbit into which they were to be driven. The shield, having been removed, would be carried to the camp, where with smaller wedges and cutting stones its manufacture would soon be finished . . . In cutting the rabbit, two kinds of stones were evidently used, one of them was a shaped and ground axe made from stone and another was formed to fit the hand, and was not ground, the edge being kept keen by chipping the blade. In several instances ground axes from which part of the face had jumped out were found at the foot of the tree . . . Two natives (pl. xlix) are shown engaged driving the peculiar bluff wedges into the special rabbit, the man on the left is handing up the wedge to the native on the right, who is driving them in with a stone hammer or maul."

Bradley (1788, Oct., pp. 129-30) said that the natives of the Sydney district used a hatchet and an adze both secured to a stick with gum and lashing, and a wedge, all of the same kind of stone. A junk of wood was used as a mallet or maul. These tools, he continues, all appear to be used in providing the canoes and shields from the trees, by cutting the bark to the length required to enter the wedges and leaving it in that state some time before the sheet was removed. The natives were seen engaged in this work. Unfortunately, Bradley did not illustrate these implements.

As Dick's specimens are not available, it is not possible to identify definitely his so-called "bluff-wedges" in the collection from Point Plomer dealt with in the present study. The *worimi* cleaver with a trimmed end would serve the purpose of blunt-ended wedges. None of the *worimi* from the workshop sites herein described display any signs of battering on either end or on the thick back such as would be present had they served as wedges driven into a rabbit. Furthermore, their principal working edges are on the thin margin or chord and on the lower edge of the thick back. Figures 17, 19 and 21 could be used as wedges. It must not be forgotten that the *worimi* were undoubtedly used on the workshops, where they were collected, for other

purposes. Thus Goddard's claim (1934, pp. 192-93) that the wedge-shaped choppers, now termed *worimi* cleavers, were used as wedges in the cutting of shields is feasible but still open to doubt. He found five massive flaked implements of this kind and some chippings at the base of old mangrove stumps along Tilligery Creek, Port Stephens, and two others of diabase in the vicinity of Yellow Jacket or flooded gums at Kelvin, where an old resident, Mr. G. Urquhart, told him that the natives preferred this tree for shields.

Other implements that would form wedges are the lateral- and end-edged uniface pebble implements, which are rare at Point Plomer and common on Tacking Point Beach, and also the rather scarce end-trimmed blocks. I spent a day digging round the bases of the mangrove trees bearing shield-scars in the area where Dick's photographs were taken, but I failed to locate any wedges, and digging on a deeper and wider scale would have to be carried out. The collecting of a series of wedges, many of which would be broken and all of which should show percussion marks where they were struck with the mallet, is the only conclusive way to identify the type. Perhaps the most suitable implement among those in the industry to serve as a wedge is the edge-ground axe.

The uses of the hafted axe shown in Plates xxxvii and xxxix are probably correct, although some of this work is carried out with hafted adze-flakes or hand choppers in other localities. They comprise cutting the grooves on a tree round a sheet of bark for a canoe (Pl. xxxvii, fig. 1), cleaning the loose and stringy outer bark off the sheet (Pl. xxxvii, fig. 4), cutting a gnarl from a tree-trunk for a container (Pl. xxxix, fig. 1), and cutting a design in a dendroglyph (Pl. xxxix, fig. 2). Hafted axes were also employed as hammers and mallets on their butt, but not on their sharpened edge, to drive in wedges as shown in Pl. xxxviii, fig. 1. Just how many edge-ground axes were picked up by Mr. T. Dick at Point Plomer will never be known nor will their types, but Raymond Dick has told me that they were not uncommon on the workshop when he visited it with his father, and also that a genuine hafted axe from Rolland's Plains, near Port Macquarie, was used in the various operations photographed.

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EXPLANATIONS OF PLATES.

Plate xxxvi (Point Plomer).

- Fig. 1.—Knapping flakes from a large nucleus.
- Fig. 2.—Placing a pebble on a fire to split it into pieces.
- Fig. 3.—Natives on the workshop, knapping flakes and shaping weapons.
- Fig. 4.—Trimming a lateral-edged uniface pebble implement.

Photographs by the late T. Dick.

Plate xxxvii.

- Fig. 1.—Cutting a groove round the trunk with a hafted stone axe in the process of removing a sheet of bark for a canoe. Port Macquarie.
- Fig. 2.—Shaping a boomerang with a knapped scraper. Point Plomer.
- Fig. 3.—Grinding axe-blades at Green Hills.
- Fig. 4.—Removing the stringy outer bark with a hafted stone axe on a sheet intended for a canoe. Port Macquarie.

Photographs by the late T. Dick.

Plate xxxviii.

- Fig. 1.—Cutting out a shield with stone implements. This tree is still standing in the mangrove swamp on the south-western shore of Port Macquarie. (Photograph by the late T. Dick.)

- Fig. 2.—Large conical implement, Point Plomer.
- Fig. 3.—Inner face of a large *worimi* cleaver, Point Plomer.

Fig. 4.—Outer face, showing the trimmed lower edge of the thick back of a large *worimi* cleaver. Point Plomer.

Fig. 5.—The largest *worimi* cleaver from the Point Plomer workshop. It has a fracture face opposed to a trimmed face. (Photograph by G. C. Clutton.)

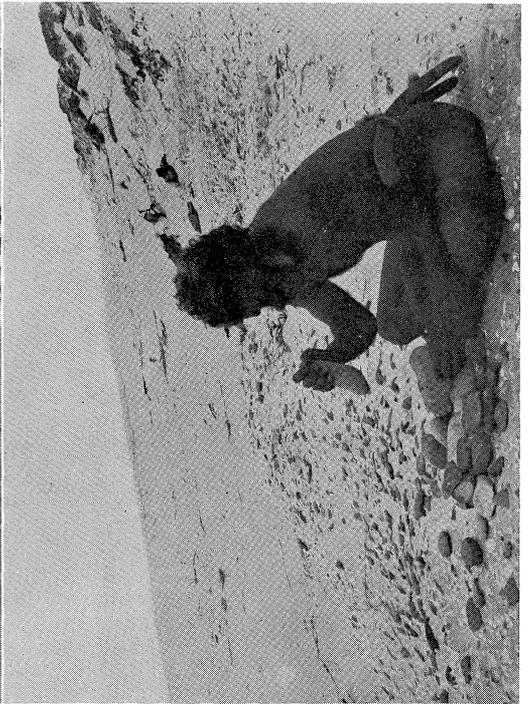
Plate xxxix (Port Macquarie).

- Fig. 1.—Cutting a gnarl from a gum tree with a hafted stone axe.
- Fig. 2.—Cutting a design on a tree with a stone axe-head.
- Fig. 3.—Cutting up a dolphin with a stone knife.

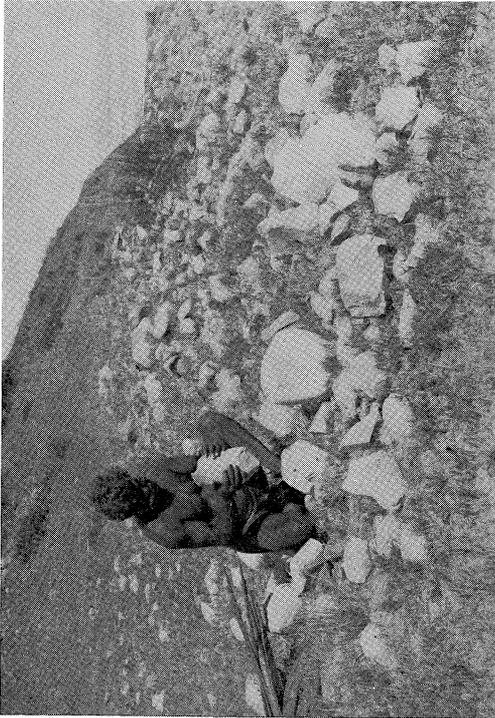
Photographs by the late T. Dick.



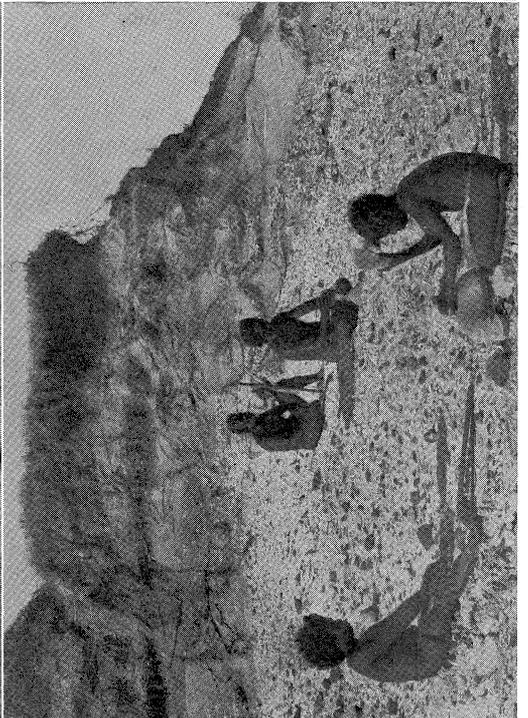
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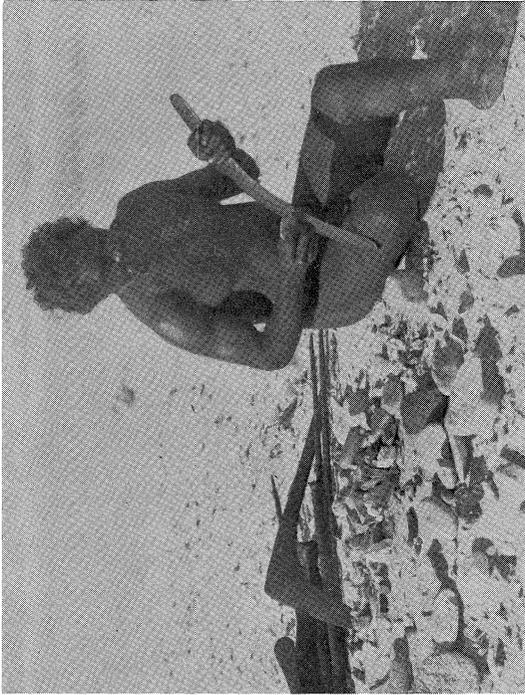
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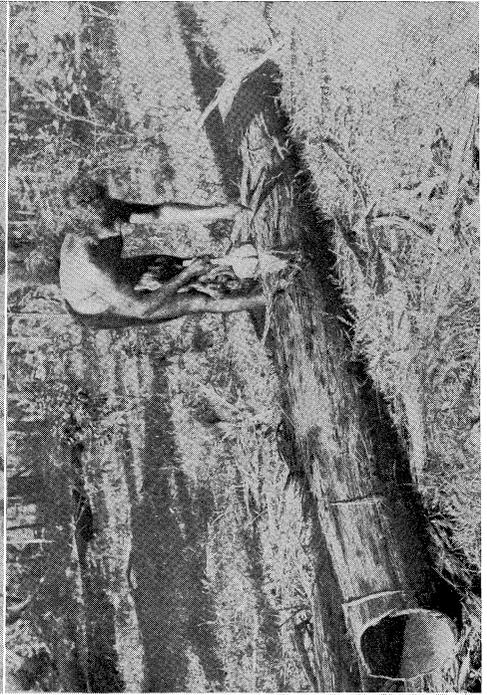
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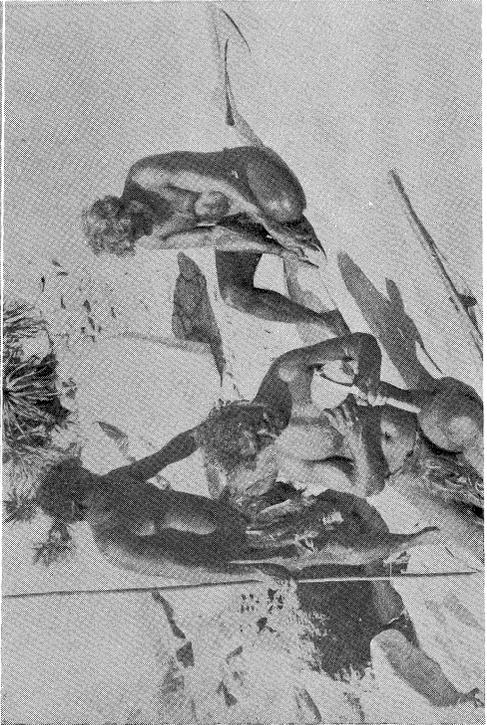
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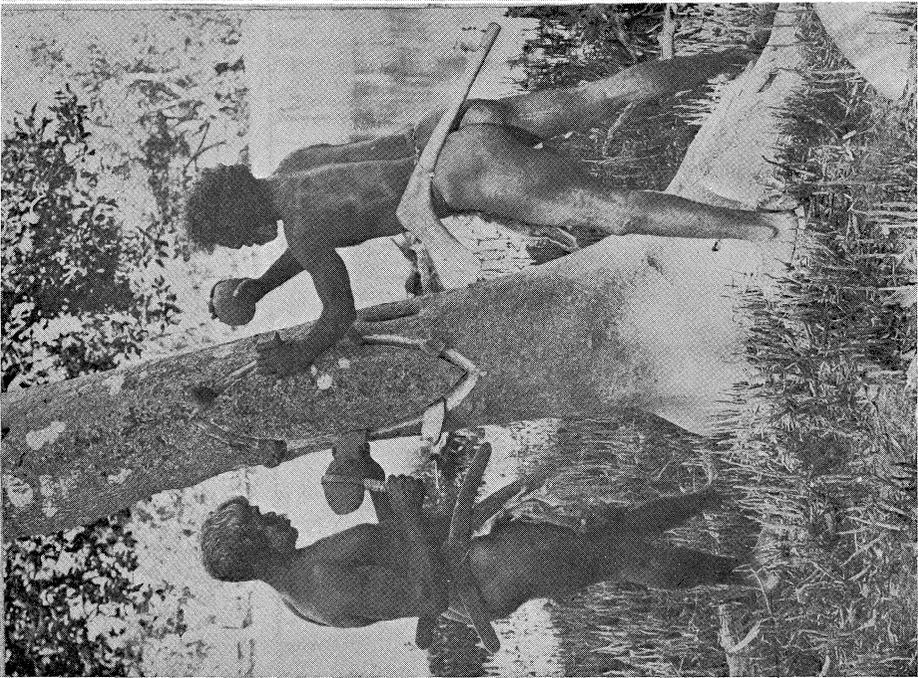
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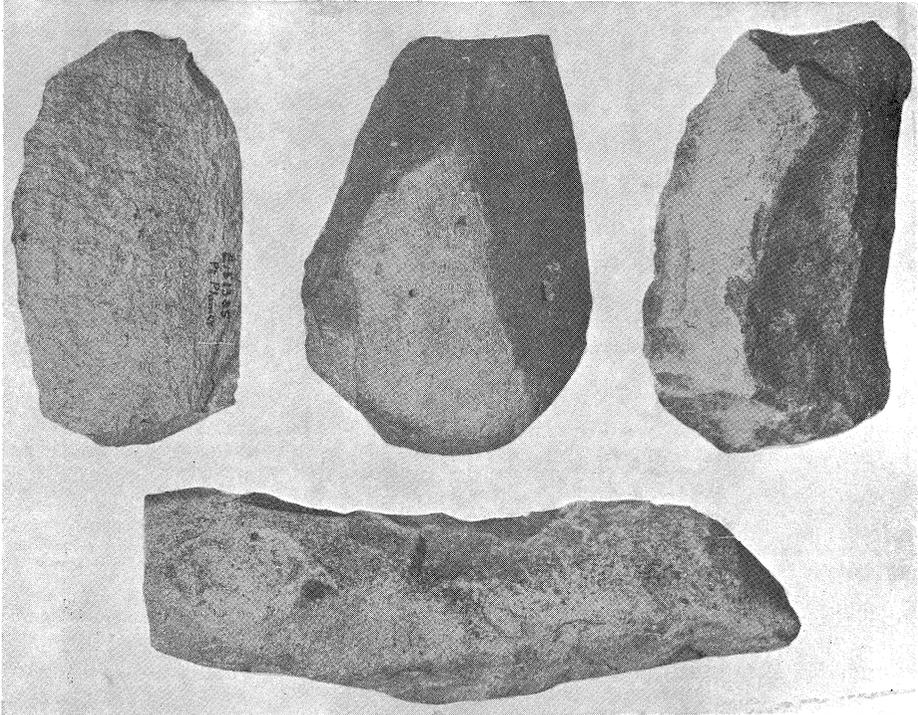
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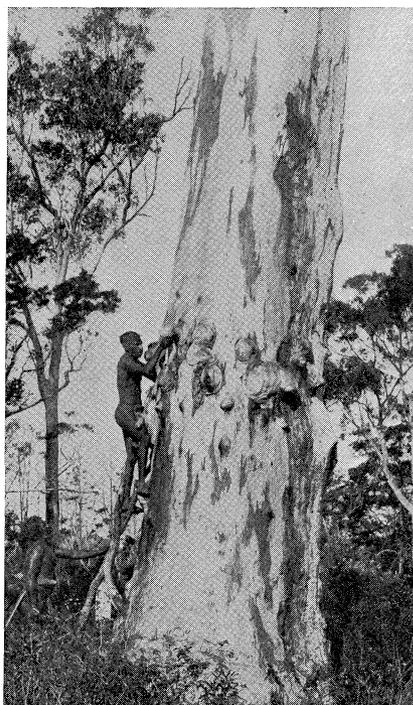
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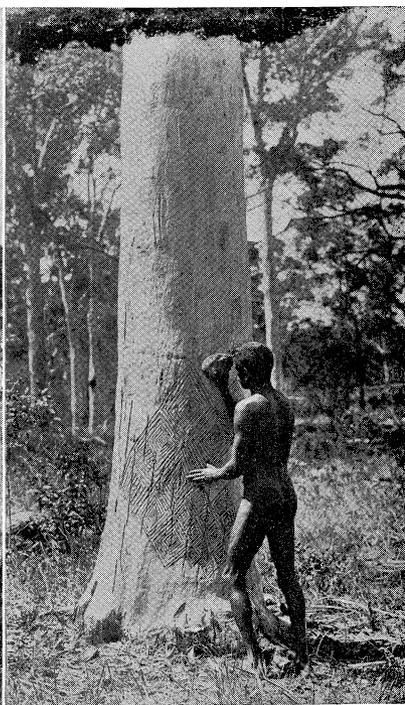
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