Archaeological Research in Minahasa and the Talaud Islands, Northeastern Indonesia

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THE archaeological work described in this paper was undertaken by the author with the Indonesian archaeologist I. M. Sutayasa in the Indonesian province of Sulawesi Utara (northern Sulawesi). The two districts within the province which received most attention were Minahasa (the northern tip of Sulawesi) and the Talaud Islands. This report deals mainly with the results from excavations on four major sites, one in Minahasa and three in Talaud. It is from these four sites that a prehistoric sequence going back 8000 years can be reconstructed with some precision.

The province of Sulawesi Utara was chosen for research because of its strategic position: the Sangihe-Talaud Islands and Minahasa are located in a junction-zone between the island chains of the Philippines, northern Indonesia (Borneo, Sulawesi, and Halmahera), and western Micronesia and Melanesia. While the region remained archaeologically blank before our work, with the exception of brief mentions by Beyer (1947: 346–347) and van Heekeren (1972: 170), good sequences extending back into Pleistocene times were available for a number of surrounding areas. These included the Niah Cave in Sarawak (Harrisson 1970), the Tabon Caves on Palawan (Fox 1970), the caves in eastern Timor excavated by Glover (1972), and, with less certainty, the Toalean region of southwestern Sulawesi (van Heekeren 1972; Glover 1975). In Melanesia, a detailed sequence extending back into Pleistocene times was available for the Highlands of Papua New Guinea (Bulmer 1975), and the widespread Lapita ceramics of the period 1500 B.C. to 1 were believed to have ultimate origins somewhere in Island Southeast Asia. While these facts were available, however, they were not allowed to direct the course of fieldwork into a search for

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particular kinds of sites or remains. The northern Sulawesi sequence has been determined from well-stratified and dated sites, and stands as an entity in its own right.

The Physiographic Background

Figure 1 shows the geographical setting of the research area. The Sangihe Islands extend north from Minahasa for about 230 km, and comprise the two major islands of Siau and Sangihe, together with a number of smaller ones. The Talaud Islands lie to the northeast of Sangihe and are separated from it by about 120 km of open sea. The Minahasa district, which forms the northern tip of Sulawesi, is 120 km long with a maximum breadth of 55 km.

The region under consideration forms part of the Northern Moluccan physiographic zone of van Bemmelen (1949: 44–48). There are two island arc systems within this zone, which van Bemmelen terms the Sangihe and Ternate systems. Only the former is of immediate concern. This comprises a volcanic inner arc, which runs from Minahasa through the Sangihe, Kawio, and Sarangani islands to Mindanao, and a nonvolcanic outer arc, which supports the Talaud Islands. The inner arc today reaches a maximum depth of 1700 m below sea level between Siau and Tahulandang islands, and it supports active volcanoes on Minahasa, Siau, and Sangihe. This inner arc is separated by the Sangihe Trough from the outer arc, which has no volcanic activity. However, the Talaud Islands on the outer arc are clearly rising relative to sea level, for raised corals which grade into present living reefs are found up to 50 m above sea level in coastal regions (van Bemmelen 1949: 378; see also EXCAVATED SITES IN THE TALAUD ISLANDS in this report).

Fauna and the Question of Land Bridges

The modern fauna of Sulawesi has long been noted for its high number of endemic forms, a situation that reflects the position of the island to the east of the Wallace Line, in the faunal zone of Wallacea. Elements of both the Asian placental and the Australian marsupial faunas are present, the latter being represented only by members of the genus *Phalanger*. Placentals include species of shrews, bats, rats, monkeys, civets, a tarsier, two species of suids (*Sus celebensis* and *Babyrousa babyrussa*), a deer (*Cervus timorensis*), and a bovid (*Anoa depressicornis*). The only well-described (but poorly dated) Pleistocene fauna from Sulawesi is that from Cabenge on the southwestern arm, which comprises a remarkable suite of extinct forms including elephant, stegodon, giant pig, and giant land tortoise, with *Anoa depressicornis* and *Sus celebensis* being the only modern forms present (Hooijer 1958, 1969).

In a recent analysis of the Sulawesi fauna, Colin Groves (1976) has suggested a Siva-Malayan origin in Sundaland, with land access to Sulawesi perhaps provided through the Pulau Laut Centre of Diastrophism during the Pliocene (Groves 1976; see also Audley-Charles and Hooijer 1973). The modern fauna may in part be derived from this early radiation, although certain species, such as some of the civets and the deer, have probably been introduced in more recent times by man. In this regard, Glover has shown that pig, dog, goat, a bovid, civet, cat, macaque monkey, and *Phalanger* have all made an appearance in the cave record in East Timor since 3000 B.C. (Glover 1972).

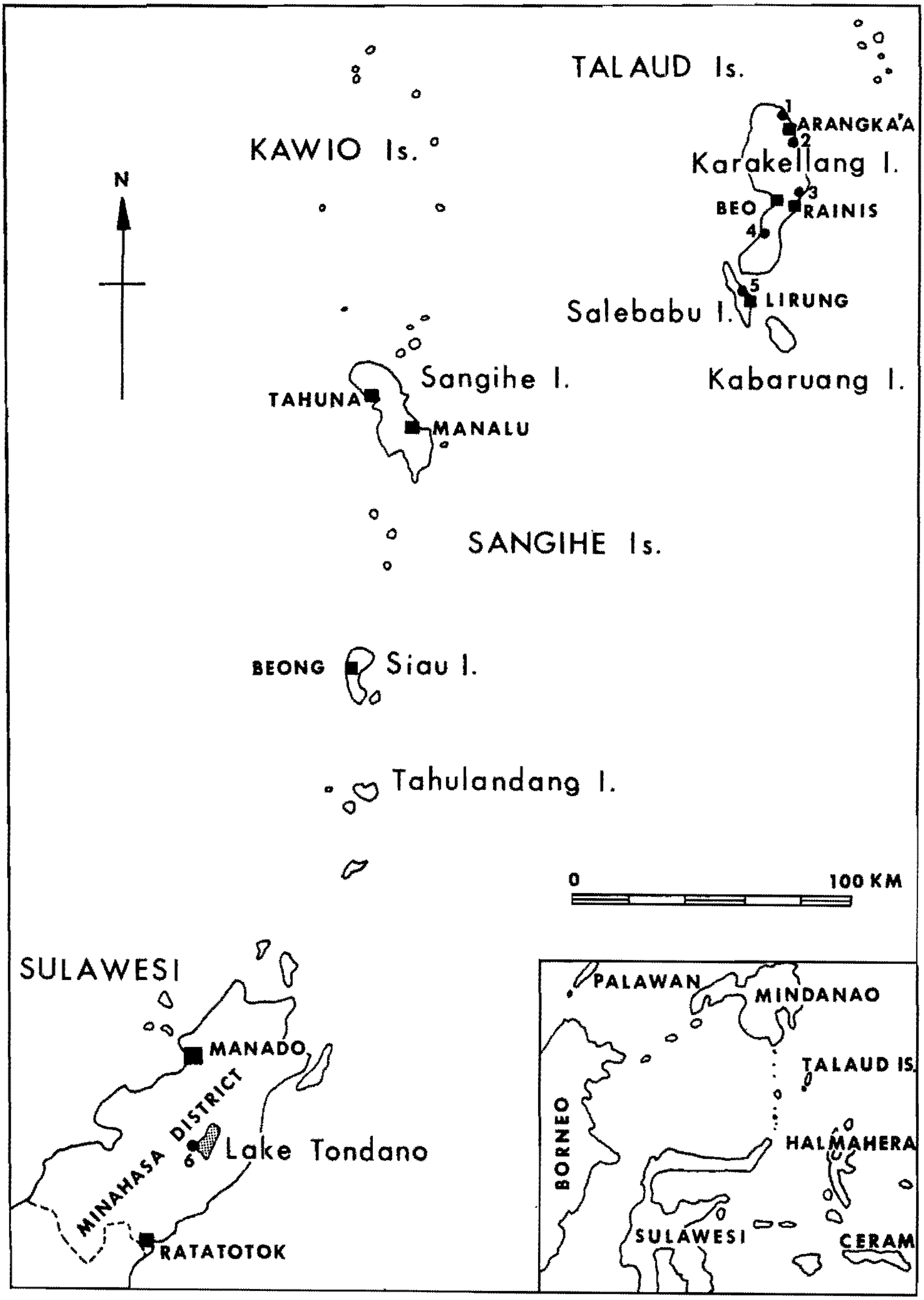

Fig. 1 Map of Minahasa and the Sangihe and Talaud Islands. *1*, Tanjong Rarangunusa; *2*, Leang Tuwo Mane'e; *3*, Leang Balangingi; *4*, Leang Totonbatu; *5*, Leang Buidane; *6*, Paso.

The 1974 excavations did not go back far enough in time to throw any light on the questions of Pleistocene faunas and land bridges, but the still-continuing identifications by A. T. Clason for the Paso site, dating from ca. 6000 B.C. (described fully below), suggest that *Anoa, Sus, Babyrousa,* and *Phalanger,* plus a range of bats, rodents, and reptiles, were present. Dog and deer were not present, and the macaque monkey is uncertain. Elephant, stegodon, and the other Pleistocene species (except for *Anoa* and the suids) were absent as well. The significance of these observations should be more certain when Clason has finished her report.

The faunas of Sangihe and the Talaud Islands are impoverished versions of that on Sulawesi, a circumstance that may reflect the small sizes of the islands (Karakellang, the largest, is only 60 km long), together with isolation. No Pleistocene faunas have ever been reported, and since a Pleistocene land bridge joining Sulawesi with Mindanao via the Sangihe Islands has never been substantiated, then we may have to accept that these islands have been isolated possibly for the whole three million years of this epoch, and perhaps longer. The Sangihe-Talaud faunas comprise rodents and bats, together with the marsupial *Phalanger,* and Sangihe also has a tarsier. But at present there seems little evidence to suggest that these islands were settled by any other animal species during the Pleistocene. A Spanish account of Talaud dating from 1525 (Urdaneta 1911: 52) lists pigs, goats, and chickens as present in the group, but these are surely recent introductions by man, as they are in Timor.

ARCHAEOLOGICAL SURVEY AND EXCAVATION

The first two weeks of fieldwork were spent on site location in Minahasa, on Sangihe Island, and on Karakellang and Salebabu islands in Talaud. Local informants proved indispensable for this work, and we have undoubtedly discovered only a small proportion of the total number of sites which may exist. Since time was restricted, it was felt that excavation should begin in favored sites as soon as possible.

A total of twenty-one sites was located in the field. Of this total, four major and three minor sites were chosen for excavation. All excavated sites were surveyed, and excavated by natural layers where possible, or by 10 cm spits in cases of uncertainty. Excavations were based on 1 m grids covering each site, and trenches were initially 1 m^2, but in many cases were later extended or amalgamated. All deposits were screened, and positions of important objects were recorded three-dimensionally.

The overall date-range for the excavated sites runs from 6000 B.C. to the ethnographic present. Three brief reports on the work have been published previously (Bellwood 1975, 1976*a*, 1976*b*). Even the present report should not be considered complete, since some soil and faunal analyses remain to be done, although most of the artifacts have now been analyzed.

MINAHASA—THE PASO SITE

The major work in Minahasa was undertaken in the vicinity of Lake Tondano (Fig. 2, *top*), particularly at the Paso shell-mound. Lake Tondano covers an area of about 5 by 12 km, and its surface lies about 690 m above sea level. It has been formed by ponded drainage between the Lembean Mountains, which rise to a little

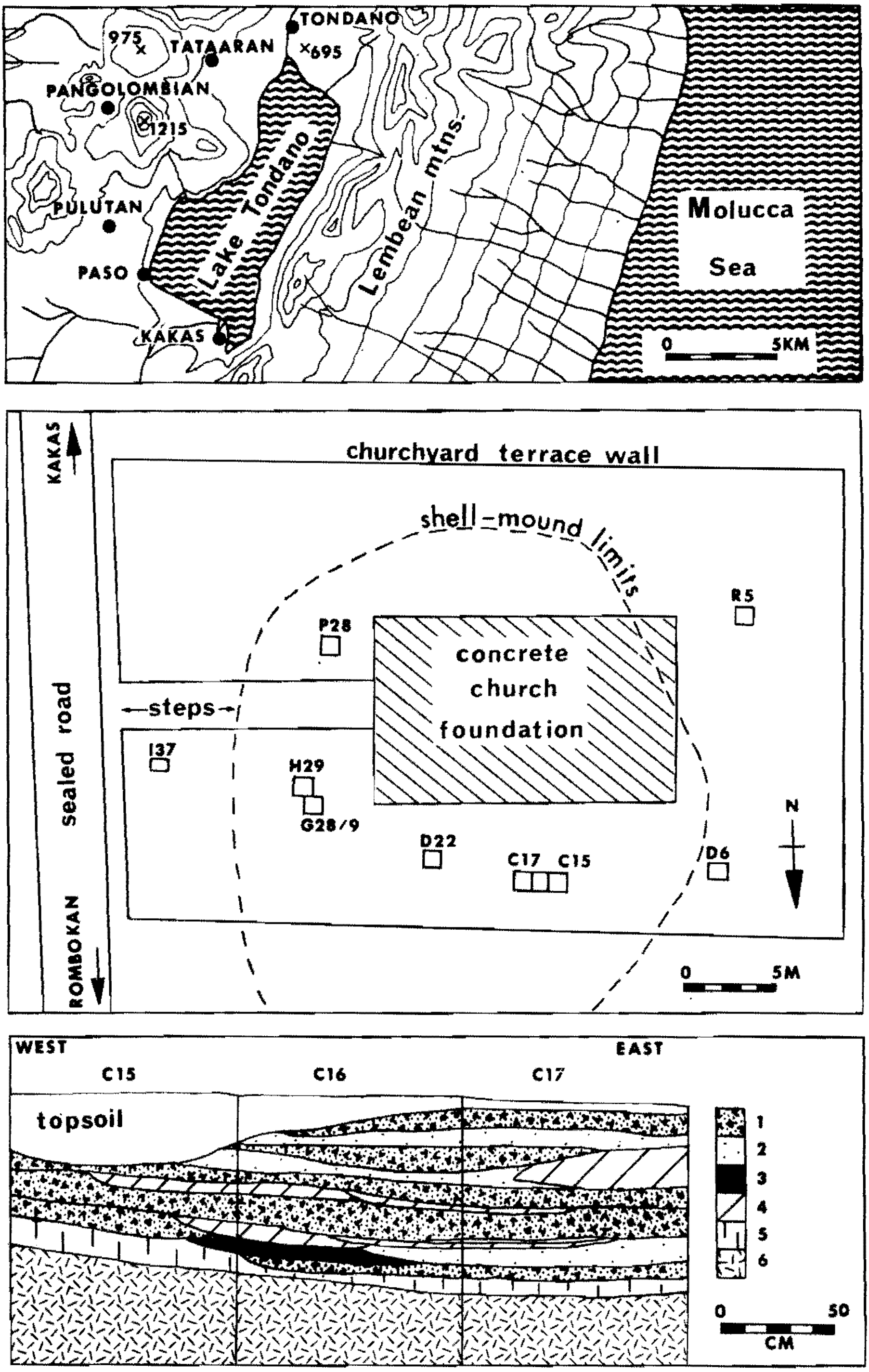

Fig. 2 The Paso site: *top*, Lake Tondano and environs; *center*, plan of the site, showing excavation trenches, church foundation and churchyard; *bottom*, section through trenches C15–17, north wall. Layers are as follows: 1. loose shell; 2. broken shell, black soil, and charcoal; 3. charcoal; 4. ash; 5. gray soil 5Y5/3; 6. light gray lake sand 5Y7/2.

over 1000 m above sea level to the east, and a group of young and active volcanoes rising to 1260 m to the west. The village of Paso, on the southwestern shore of the lake, is built around natural hot springs, and these may have attracted settlers to the site in the first place, some 8000 years ago.

A surface scatter of potsherds and obsidian tools led to discovery of the Paso shell-mound during initial reconnaissance in the area. The true significance of the site was not realized until after excavation began, since it had been buried, fortunately without disturbance, beneath the foundation of the village church and the high terraced churchyard which surrounds it. The site was thus encased in later deposits, which produced the ceramics to be described below, although the shell-mound itself is entirely preceramic.

The shell-mound is estimated to be some 30 m in diameter, from the evidence of excavations and surface indications, and it attains about 1 m in maximum thickness in its central part. The northern perimeter of the mound would appear to have been destroyed by the construction of a 1 m high terrace wall forming the northern boundary of the raised churchyard, and by an unmetalled road adjacent to and below it (see Fig. 2, *center*).

For excavation, the site was laid out under a 1 m grid, and trenches were laid out as shown on the plan (Fig. 2, *center*). A total of 10 m² was excavated, and three trenches (C15, C16, and C17) were excavated as one unit to give the section shown in Figure 2, *bottom*. This section shows the general nature of the site, which comprises small discrete lenses averaging 10 cm in thickness, either of pure shell or of occupation debris in the form of ash, charcoal, black soil, and broken shell. Purer concentrations of ash or charcoal indicate specific hearth positions. The shells from the site are unidentified according to scientific names, but the major species is a large gastropod from the lake, called *renga* in the Minahasan language. Many shell lenses consist entirely of these shells, which seem to be the only edible species produced by the lake. However, some lenses have small numbers of marine bivalves of a single species about 2 cm wide called *wulele*. Certain small lenses consist entirely of these shells, but their overall frequency is low, and they had to be brought about 20 km to the site from the sea. Although tiny, they might have added some variation to an otherwise monotonous diet.

The ecological situation and method of buildup of the site can be reconstructed with some certainty. When it was first occupied, around 6000 B.C., the new settlers would have found a beach of light gray lake sand, perhaps covered with light soil and vegetation, away from the edge of the lake. This beach sand sloped down toward the lake for a vertical distance of about 1.50 m across the 30 m long east-west axis of the site. The first settlers camped in one spot, perhaps quite close to the water, and proceeded to dump food shells in lenses outside and around their living area. In time, they decided to move their dwellings to a new position on top of one or more of these shell lenses, and used their former dwelling area for further shell dumping. This type of rotation, in which one specific area would be used alternatively for living and dumping, clearly went on for some centuries, until the midden reached its present height of 1 m. It was then abandoned for several millennia, during which time the lake has receded considerably. Today the edge of Lake Tondano lies about 390 m from the center of the mound, and its surface is about 6 m below the lowest midden layer. However, the shoreline of the lake is now under rice fields, which actually commence about 230 m from the mound, so while the lake has clearly receded from the site since it was occupied, the exact amount of the recession is hard to estimate owing to the interference caused by the rice field construction. It can only be placed between the two distances given above.

The date for the shell-mound is established from two carbon-14 determinations from charcoal samples. The first, from an upper lens in trench C16, gave a date of 7530 ± 450 B.P. (ANU 1517). The second, from a lens near the base of C15, gave a date of 7360 ± 310 B.P. (ANU 1518). Although these two dates are slightly inverted, they do overlap within one standard deviation from each mean, and they indicate a short period of use of the site, probably less than 3–500 years. This conclusion is supported by the stratigraphic profile, which shows no sign of site abandonment while the midden was forming. If the two dates are fitted to the bristlecone calibration curves presently available, then they fall around 6000 B.C. within quite narrow limits.

The lenses of pure dumped shell naturally contain few artifacts, but there are sometimes a few animal bones present. It is the lenses of occupation which are of the most interest, for these contain quite surprising densities of flaked stone and bone tools, animal bones, and hematite. The obsidian, of a coarse vesicular type which produces a very rough fracture surface, was quite definitely worked on the site. It comes from the local volcanic region west of the lake, and a specific source is known to occur in the vicinity of Tataaran village. Hematite is available near the village of Pangolombian (see map, Fig. 2, *top*). Neither of these sources could be examined carefully in the time available to us.

Over the whole of its area, the shell-mound is covered by 10 to 20 cm of topsoil which contains obsidian and pottery, mixed by recent gardening activity. The pottery, described below, was found on the surface all over the churchyard. Of the three trenches dug outside the limits of the shell-mound, I37 was totally disturbed by churchyard construction, D6 was right on the edge of the mound where the shell lenses terminated, and R5 was beyond the mound on the inland side, away from the lake. R5 merits a brief discussion.

The deposits in R5 consisted entirely of a homogeneous dark soil, of Munsell color 10YR3/2. Obsidian was found from the surface to a depth of 90 cm, while red-slipped pottery, described below, was found to a depth of 70 cm. There are no shell lenses. It appears that the R5 deposits, which have a high density of artifacts, were built up in a slight hollow behind the shell mound. Whether the obsidian is directly associated with the pottery, or whether it has been derived from some adjacent and older deposit, can only be determined by further work. The obsidian is unlikely to be derived from the shell-mound owing to the absence of shell in the R5 deposits, but it is technologically identical to the shell-mound industry.

Artifacts from the Paso Site

The Obsidian Industry (Plate I*a-e*)

The coarse vesicular obsidian used at Paso was worked with volcanic stone hammers and anvils to produce flakes and "chunks." The former show striking platforms and bulbar surfaces, which are always recognizable despite the uneven pockmarked surfaces of the stone. The latter were produced by the smashing of

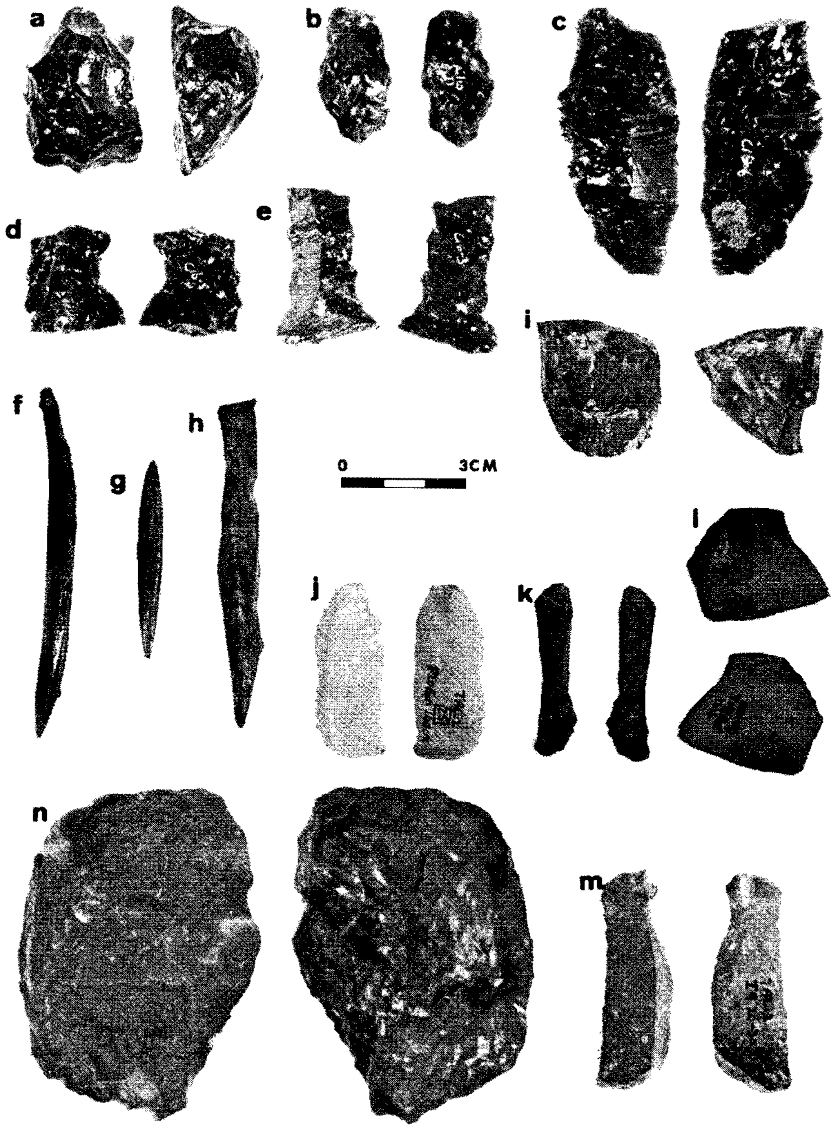

Plate I Stone and bone tools from Sulawesi Utara: *a*, Paso: high-backed obsidian chunk (top and side views); *b*, Paso: thick flake of obsidian heavily retouched on both sides; *c, d, e*, Paso: flakes of obsidian (*d* is notched, *e* has ventral retouch); *f, g, h*, bone tools from Paso; *i*, LTM: bipolar blade core of chert (front and side views); *j, k, m*, LTM: chert blades (*m* has slight edge-gloss); *l*, LTM: chert flake; *n*, unifacially flaked chert pebble tool, from track between Beo and Rainis.

cores and nodules against anvils (cf. Crabtree 1972: 9), and do not show striking platforms or complete bulbar surfaces. Manufacture therefore involved a fairly random process of striking and smashing, with a high rate of wastage. Owing to the free availability of raw material, the rate of wastage was probably considered insignificant by the manufacturers. This type of core-smashing technique is also reported for a possibly contemporary chert industry from the Sohoton Cave on Samar (Tuggle et al. 1972: 76), and it has been used to the present by the isolated Tasadays of southern Mindanao (Fernandez and Lynch 1972).

The following statistics are derived from a total of 807 tools excavated from the shell-mound in trench C15. They were bagged during excavation according to lens, and analysis shows no overall significant change from top to bottom of the trench. The shell-mound industry represents a technological unity.

1. Cores form 0–5 % of total obsidians per lens. This percentage is quite low, and most cores are in fact split or incomplete.
2. Flakes (Plate I*c*-*e*) form 36–45 % of obsidians per lens.
3. Chunks, probably the result of core smashing, form 52–64 % ot obsidians per lens. This a very high percentage, especially when compared to that for the Talaud chert industry described later in this paper.
4. Blades, blade cores, pebble-tools, and core-tools flaked from unbroken primary nodules are absent.
5. Only 18 % of obsidians produced show signs of use-wear, and out of this 18 % a total of 32 % (about 6 % of the total assemblage) were retouched.

Length, breadth, and thickness were measured on all flakes from C15; the results, plotted on triangular coordinate graph paper, showed low correlations between these three measurements. This distinguished the Paso obsidians from the Talaud cherts, which achieved more regular proportions. Lengths of Paso flakes ranged from 10 to 35 mm for unused specimens, with even scatter within the range. Used obsidians ranged from 20 to 45 mm in length, and thus showed a definite tendency to be larger than the unused. Figures for breadths differ little from those for length, and length : breadth and breadth : length ratios seldom exceeded 2 : 1.

Although only the C15 obsidians have been analyzed in detail, all other samples appear to be virtually identical in morphology, and this also applies to the obsidians associated with the upper layers with ceramics, particularly in trench R5. The material itself is so coarse that it would probably be unsuited to blade production anyway, and the manufacturing techniques described above would probably have changed little over time.

One attribute of the Paso industry does stand out, particularly in comparison with the Talaud cherts. This attribute is difficult to quantify objectively, but it concerns the selection of flat-based, high-backed, and steep-sided flakes and chunks (see Plate I*a*) for use as tools. I would estimate that perhaps one-quarter of the Paso tools would fall into such a subjective category, and this tendency is paralleled in the pre-Toalean assemblage excavated by Ian Glover from the base of the Ulu Leang cave in southwestern Sulawesi (Glover 1975). This assemblage is older than 8000 years, and could be roughly contemporary with Paso. Similar high-ridged tools are reported from the Guri Cave assemblage of early Holocene age from Palawan (Fox 1970; personal observations, National Museum, Manila), and they are also present in the Pleistocene assemblages from Tabon Cave, although tools from the latter site are generally much larger than those from Paso; Fox (1970: 37) states that over 80% of the Tabon flakes are more than 50 mm long. High-backed tools have also long been known to characterize early Australian and New Guinea assemblages (Mulvaney 1975: chap. 6; White 1969), although horsehoof cores of the types found in Australia or in the Cagayan Valley on Luzon are not present at Paso. Nevertheless, the Paso obsidian industry fits quite well into the general pattern of early Holocene industries predating the development of a flake-blade technology from about 7000 years ago in the eastern regions of Island Southeast Asia. The obsidian industries reported from Sumatra and Java (Bandi 1951; van Heekeren 1972: 133–137) do not appear to be closely related to Paso, and they could be more recent in time.

Tool Function in the Paso Assemblage

The Paso tools do not fall into "types" in the sense used by European Palaeolithic prehistorians, and in this regard they are typical of many of the stone industries of Southeast Asia and Australasia. This situation has been noted specifically for New Guinea by White (1969; White and Thomas 1972), whose strategy has been to analyze used edges rather than overall form. A code for recording the positions of used edges on tools has been developed by Wilmsen (1970), but I have not so far attempted to apply this to the Paso assemblage, and in this instance the used edges are each considered in spatial isolation.

Two general points should be noted concerning used edges on stone tools: firstly, the manufacturing process can cause heavy flaking damage around the striking platforms on cores, and this is very easy to confuse with the concept of a "retouched high-angled scraper edge." Since high-angled scrapers are common elements of Southeast Asian and Australasian assemblages, I feel there may be dangers here for the unwary. Some Paso tools fall into this category, and I have omitted them from use-wear analyses where ambiguity is present. Secondly, short-term use on soft materials may produce little identifiable damage (Tringham et al. 1974), and this may tend to reduce counts of used tools from prehistoric assemblages. On the other hand, trampling and dropping can produce edge-damage not caused by use (Keeley 1974). I know of no way to control these problems for assemblages such as that from Paso; it is one thing to carry out experiments, but another to apply the results of such experiments to specific archaeological contexts.

In the Paso assemblage, angles of used edges range from 30 to 90 degrees. There are no clusters within the range, such as those claimed by Wilmsen for Palaeo-Indian assemblages (Wilmsen 1970). Edge shapes were classified as convex, straight, or concave; none of these shapes is associated with a particular range of edge-angles, although concave edges tend on the average to have higher angles. Straight and concave edges form about 30–50% each of the edges in each lens, while convex edges are rarer at about 15–25%. There are no clear changes over time through the lenses. Retouch, always unifacial and most often on the dorsal surfaces of flakes, was present on 32% of the used edges. Concave edges were most commonly retouched (50%), as were convex (43%), but straight edges were retouched rarely (15%). Of the total of 169 used obsidians from trench C15, 31 (18%) had two used edges, while only one had three. On the tools with more than one used edge there is no correlation between different edge-shapes.

The Paso tools are technically scrapers: all use-wear is unifacial, and, like the retouch, is generally on the dorsal surface of flakes and flat-based chunks. It consists of small flake scars distinguishable from the larger scars of intentional retouch, and no gloss of the type commonly reported on flake-blade industries in Island Southeast Asia (see below) was observed. In use, the tools appear to have been pulled over the surface to be worked, with their long axes at right angles to this surface. The upper surface (usually the bulbar surface on flakes) was tilted away from the worker at an angle greater than 90 degrees. I have replicated these motor habits on obsidians flaked at the University of Hawaii (materials courtesy of Richard Gould) and believe the reconstruction to be substantially correct. There are no tools with bifacial use-wear in the knife or saw categories, and to-and-fro cutting may have been done with bamboo knives. Knives and scrapers require quite distinct motor habits, and they are likely to have been regarded as separate tool categories by the Paso tool-users (cf. Gould, Koster, and Sontz 1971 for central Australia).

Apart from scrapers, other tool categories in the Paso assemblage include awls, tanged flakes, and rejuvenation slugs struck from blunt retouched scraper edges. These categories are numerically insignificant, however. Four thick flakes with retouched scraper edges on opposed sides (Plate I*b*) could have been used like the flat adzes described by Gould and Quilter (1972) from southwestern Australia, possibly hafted.

The Bone Industry (Plate I*f*-*h*)

A total of 17 long pointed tools of bone was recovered from the midden lenses, together with 5 split and grooved long-bone fragments which were probably associated with their manufacture. The longest specimen is 90 mm, but since many were discarded broken it is not possible to give a range of lengths. The tools were made either on sections split from large mammal long bones, or on smaller bones which were not split. The animal species are not yet identified. The pointed ends are either polished into a rounded taper, or facetted on the larger specimens. There is one definite bi-point 50 mm long (Plate I*g*) and three possible broken bi-points. One specimen (a uni-point) has a thick coating of hematite.

These bone tools, which presumably served as awls or needles were not found in the upper ceramic layers and belong entirely to the shell-mound deposits. They are well paralleled in Toalean assemblages in southwestern Sulawesi (Glover 1975; van Heekeren 1972: Fig. 24), and in the Gua Lawa bone industry on Java (van Heekeren 1972: Pl. 48; the Gua Lawa spatulae are not paralleled at Paso). Similar bone tools are commonly reported from Australian sites.

Hematite

Small pieces of hematite were found throughout the shell-midden, and a number were clearly associated with an obsidian flaking floor in trench C16. A volcanic stone with a coating of hematite on one surface, found in trench C17, may have been used as a surface for preparing the pigment.

The Ceramics

The Paso ceramics can be described only in general terms here, as analyses are still in progress. There are two ceramic styles in the site, both of which are sepaιated spatially and stratigraphically. One comprises a hard gray ware which is often paddle-impressed, and the other comprises a softer buff or gray ware which is often red-slipped. In the discussion below I will refer to the latter as "Paso Ware." Tempers and pastes have not yet been analyzed, so the following descriptions concentrate mainly on form and decoration.

The Paso Ware will be described first. This is concentrated in the deposits in trench R5 and dominates the sherd counts from the layer sealing the shell mound in trenches D6, C15, C16, and C17. It also dominates surface collections made to the south of the church and thus concentrates heavily in the inland half of the churchyard area. The lakeward half, including the upper layers in trenches D22, G28/9, H29, and P28, is heavily dominated by the gray ware.

The Paso Ware excavated from R5 shows considerable homogeneity through the 70 cm depth in which it occurs, and seems to have been deposited within a relatively short time. Its surprising density (2600 sherds in 0.7 cm^3) suggests that the loci of both manufacture and use were close by, and numerous lumps ot lightly fired clay indicate that firing was carried out somewhere in the vicinity. No stone or metal tools (apart from one stone adze) were found in R5 at all, which suggests fairly concentrated and specialized dumping of sherds.

The forms of the Paso Ware are fairly standardized and occur in relatively unvarying frequencies throughout all levels. They are illustrated in Figure 3*a-r*, and may be described as follows:

Type 1. Jars with restricted necks and everted rims (Fig. 3*a-e, h, m*). No examples are fully reconstructible, but diameters at lips range from 10 to 22 cm, and bases are probably rounded rather than flat. Orientation angles of rims (Fig. 3*a*, angle α) range most commonly between 30 and 45 degrees, while inclination angles (angle β) range between 105 and 120 degrees. (I wish to thank Geoffrey Irwin of the Department of Anthropology at Auckland University for suggesting the two terms "orientation angle" and "inclination angle" to me.) There is much variation within the group. Fewer than 30% of these vessels are red-slipped, but percentages are hard to calculate since the slip is not strong and may often have eroded away. Slips are generally on interior surfaces, but exteriors and sometimes both surfaces may be slipped as well. Rim notching (Fig. 3*h, m*) occurs very rarely, as does simple-tool incision in straight-line or zigzag motifs (Fig. 3*m*). Type 1 vessels account for 45% of the Paso Ware rim material.

Type 2. Unrestricted bowls. This category consists of three main forms referred to as variants 2A, 2B, and 2C. Type 2A bowls have direct flattened rims (Fig. 3*i, j*) and are highly standardized in shape. Almost all are red-

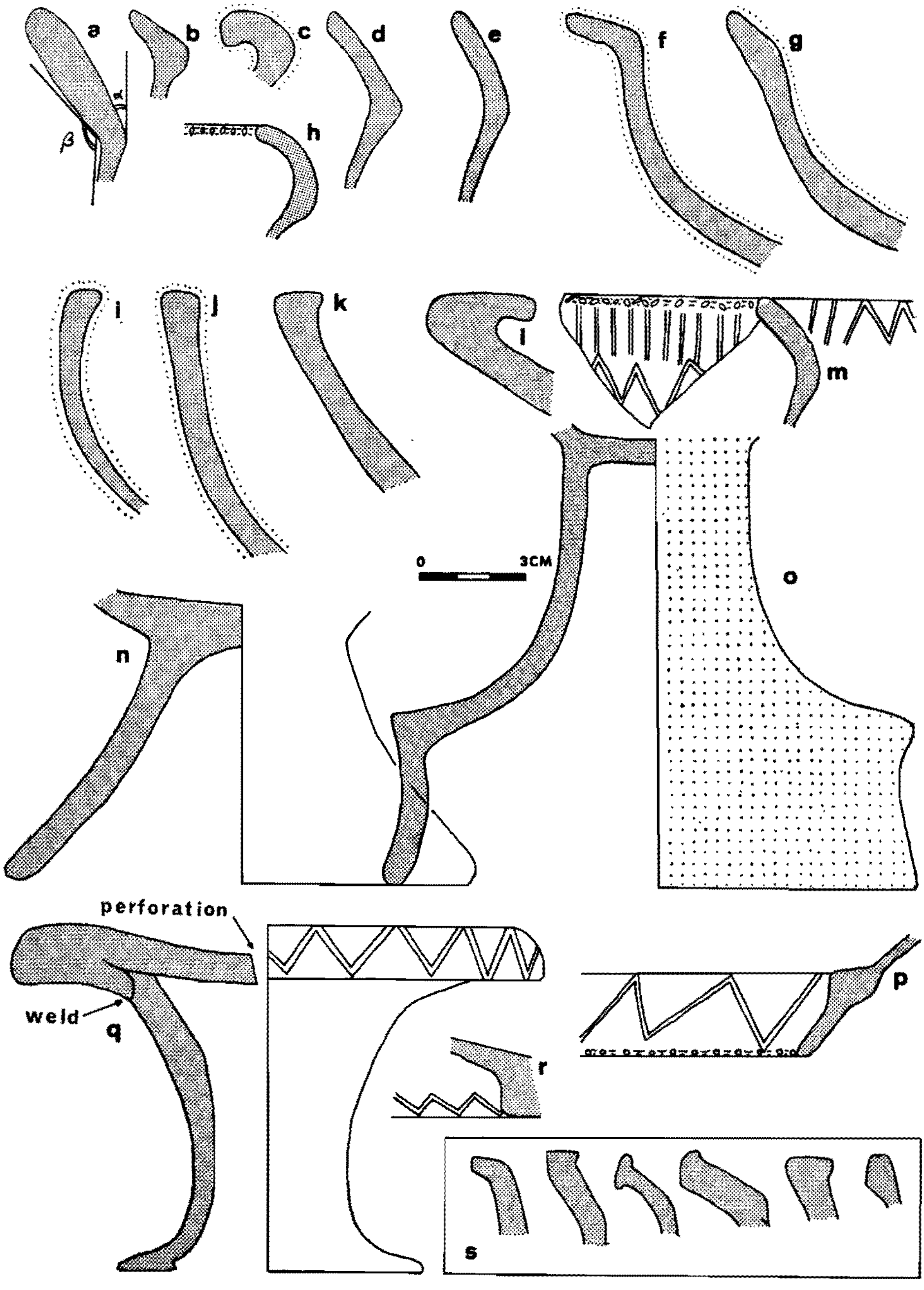

Fig. 3 Pottery from Paso: *a-r*, Paso Ware; *s*, gray ware. Stippled halo denotes red slip.

slipped, often on both surfaces. Vessels of type 2A account for 31% of the Paso Ware rim material. Variants 2B and 2C have interior flanges and are never slipped. Flanges of 2B bowls (Fig. 3*k*) are from 10 to 18 mm wide; those of 2C bowls (Fig. 3*l*) are from 25 to 45 mm wide. There is no overlap between the two variants in flange width, and the flanges often have transverse grooves across their upper surfaces. Type 2B and 2C vessels are of coarse thick fabric and may have served as mortars. Together they account for 6% of total Paso Ware rims. The rims shown in Figure 3*f* and *g* are intermediate between types 1 and 2A in having unrestricted orifices with indirect rims. These forms are very rare and have not been considered statistically.

Type 3. Pedestals. Pedestals most probably belonged to type 2A bowls, although no complete examples can be reconstructed. They are of two kinds—simple and carinated (Fig. 3*n, o, p*). They are rarely slipped, but usually on exteriors if so treated. A few simple pedestals have single circular perforations and some carinated examples (Fig. 3*p*) have simple incision and lip-notching. Pedestals form 16% of the Paso Ware rim material.

Type 4. Pedestalled platters. This form is described separately, and is the only one which shows any temporal distribution, being restricted to the lower layers of R5. A fully reconstructed example is shown in Figure 3*q*; this has a central perforation and lip incision. Type 4 vessels account for only 2% of the Paso Ware rim material.

Virtually all of the Paso Ware rim material fits the foregoing categories, and the degree of standardization is quite remarkable. Three spouts, one perforated lug, and two bottle necks were also found in R5, but these frequencies are insignificant. There is also one thickened vessel foot (Fig. 3*r*). There appear to be no lids or tripods present. Decoration, extremely rare, is only of the simple-tool incision type shown in Figure 3, and about 2% of body sherds have simple parallel impressions made with a carved paddle.

The gray ware found over the eastern side of the shell midden is very fragmentary, and no forms have been reconstructed. A few rim sherds are illustrated in Figure 3*s*; their profiles are entirely different from those of the Paso Ware. The gray ware is not slipped, but about 20% of sherds have parallel or crossed-line paddle impression. A complete gray ware globular vessel with an everted rim and paddle-impressed sides was placed in a pit dug into the top of the shell-mound in trench D22, but this had unfortunately collapsed before the cavity was filled with soil. A few fragmentary bones were found in the pot, so it may have been a jar-burial. In trench G28/9 the lower legs and feet of an inhumation burial were found associated with gray ware sherds, but no definite statements can be made about burial posture. The rest of the burial remains unexcavated.

In trenches H29, D22, and P28, sherds of gray ware were sometimes found stratigraphically below the Paso Ware, but most of these contexts have been disturbed by recent cultivation and churchyard construction. No datable material was recovered with any of the ceramics, and I am awaiting the results of thermoluminescence analyses from A. J. Mortlock at the Australian National University. A number of problems do arise concerning dates, for the gray ware is similar to modern impressed pottery made around Tondano, and it is associated with a few Chinese sherds. The Paso Ware is unlike anything made in the area at present, and it was found with only a stone adze (possibly nephrite) of quadrangular cross-section. I am inclined to accept it as older than the gray ware, but can draw no firm conclusions at present. The associations of the gray ware would suggest that it is not over 500 years old.

At the present time I have located no definite archaeological parallels for the gray ware, but the situation is much more interesting with respect to the Paso Ware. This has two very different sets of parallels, one being Neolithic, the other Late Period, postdating A.D. 1300. The two alternatives are discussed in turn.

1. *Neolithic Period*

The site of Dimolit, on Palanan Bay in northeastern Luzon, has produced ceramics very similar to those from Paso, in association with the post settings of small square houses dating between 1300 and 3500 B.C. (Peterson 1974*a*, 1974*b*). The Dimolit material comes from globular vessels with everted rims, open bowls on pedestals, and some carinated forms. About 30% of the material is red-slipped, mainly the open bowls, and there is no other type of decoration. Some of the pedestals have circular perforations cut through, smaller but more numerous than those on the Paso pedestals. Basically, the Dimolit pot forms are very similar to those from Paso, despite specific rim differences, which may be expected considering that the distance between the two sites is about 1600 km. I have been able to examine the Dimolit material stored in the Department of Anthropology at the University of Hawaii, and I feel the parallels reflect more than mere coincidence. The Paso and Dimolit assemblages are much more similar to each other than either is to the broad range of other reported ceramics of Neolithic and Early Metal date from Island Southeast Asia. As we will see, plain red-slipped pottery is also characteristic of the earliest Neolithic ceramics in the Talaud Islands, but the forms here are rather different in that they lack pedestals and carinations.

2. *Late Period*

At the more recent end of the time-scale, the Paso Ware does have more tenuous parallels with certain ceramics from Zamboanga and Jolo published by Spoehr (1973). These ceramics postdate Spanish contact in the southern Philippines. The Paso pottery may be compared with some of the red-slipped rim profiles from Fort Pilar and with some of the notched rims from the Tausug walled enclosures on Jolo (Spoehr 1973: Fig. 114). However, these Philippine wares have a very large number of features of form and decoration not paralleled at all at Paso, and they are associated with imported ceramics. No imported ceramics were found with the Paso Ware, although this does not automatically imply a date before the Late Period. The Paso material also has parallels with the plain pottery recovered by Hutterer (1973*b*) in association with porcelains in burials beneath Cebu City. The Cebu material has Paso type 1 and 2, and possibly type 3 vessels, but slipping is much rarer. The site also has rim notching like the Paso Ware and does seem to have more parallels with it than do the Zamboanga and Jolo materials.

At present I am unable to assess these two sets of parallels with finality, and the Paso pottery badly needs independent absolute dates. Early Metal Period ceramics of the Bagupantao and Novaliches types reported by Solheim (1964) also have ring-feet and pedestals with cutout designs, but I feel these to be unrelated to Paso. The choices seem to be late Neolithic or Late Period. I am inclined to choose the former, since the Paso pottery has a stone adze in direct association, no porcelain or clearly recognizable Early Metal Period pottery, and the similarities with Dimolit are the closest.

Peterson is unable to find close parallels for his Dimolit material and feels it is not closely related to any of the well-reported material from Taiwan. I have seen similar red-slipped pottery from the Lal-Lo shell-mound in the Cagayan Valley of northern Luzon, stored in the National Museum in Manila. This pottery is apparently associated with radiocarbon dates of 3690 ± 100 and 3580 ± 100 B.P. (Ellen and Glover 1975: 376), but the exact nature of the site is unknown to me. Nevertheless, I feel that ceramic parallels of a specific nature may be beginning to appear between the Philippines and northeastern Indonesia for the late Neolithic Period, prior to the spread of jar-burial, which took place after about 1000 B.C.

Additional Investigations in Minahasa

Although the Paso site accounted for most of the Minahasa research, a few other sites were investigated as well, with minimal results. Several rock-shelters were investigated about 4 km inland from Ratatotok on the southeastern coast of Minahasa, but no important cultural deposits were located. We also spent some time examining the well-known square stone burial jars *(waruga)* which are to be found in many localities around Lake Tondano. These are often carved with figures in Dutch costumes, and contain beads and Chinese ceramics of very modern appearance, together with a well made local earthenware decorated by incision and dentate-stamping. These *waruga* clearly need more detailed study. I would be inclined to regard the observed examples as postdating A.D. 1500. However, stone burial jars are found widely in adjacent regions, such as inland Borneo (Harrisson 1962*a*), central Sulawesi (Kaudern 1938), and southern Mindanao (Maceda 1964, 1967; Kurjack and Sheldon 1970, 1971), and since some of the Mindanao urns from the Seminoho rock-shelter in the southern Cotobato Highlands may date back to about A.D. 600 (Kurjack and Sheldon 1970), the Minahasa *waruga* jars may then have a long and interesting prehistory as well.

Excavated Sites in the Talaud Islands

The Talaud Islands are three, comprising Karakellang (60 km long) in the north and the two smaller islands of Salebabu and Kabaruang in the south. We did not visit Kabaruang. Karakellang is still mainly forested and has low mountains in its northern and southern sectors rising to maximum heights of about 750 m. Across the center of the island is a lower sector, followed by the only major track on the island, which runs from Beo to Rainis. There are no roads, motor vehicles, or pack animals anywhere in the group, and all movement is on foot or by boat. The general topography of Salebabu is similar to that of Karakellang.

Neither the Talaud nor the Sangihe islands have barrier reefs and lagoons, but coral does grow right against the shoreline in many areas. The lack of lagoons reflects the tectonic instability of all the islands in this area. Today, the population of the Talaud Islands is very small, and is confined to small coastal villages. No modern population figures are available to me, but population density for Karakellang prior to World War II was only 13 persons per km^2, compared to 141 on Sangihe and 197 on Siau. The latter two islands have fertile volcanic deposits which are lacking in Talaud.

Van Bemmelen (1949: 378–379) gives a brief description of the geology of the Talaud group. The islands consist of varied rocks ranging from Cretaceous to Pliocene in age, and the earlier Cretaceous series is of considerable importance since it contains the cherts which were used on the islands for stone tools. Quite large nodules of chert are very common on many beaches and along inland tracks where soil is exposed, and the material would have been in plentiful supply throughout prehistoric times. Many of the coastal regions of Karakellang and Salebabu are occupied up to 50 m above sea level by raised reefs of coral limestone, which van Bemmelen suggests are Pleistocene or Holocene in date. They grade into the living reefs without interruption, a circumstance which suggests that the islands may have been rising recently, and may still be doing so. This matter is discussed again below in connection with the Leang Tuwo Mane'e site.

LEANG TUWO MANE'E (LEANG-U-TUWOMANEE), KARAKELLANG ISLAND

The Leang Tuwo Mane'e site (henceforth LTM) is a wave-cut rock-shelter in an uplifted coastal block of coral limestone. It lies about 150 m north of the northern end of Arangka'a village and is 20 m inland from the head of the beach. The track between the villages of Arangka'a and Geme passes just in front. The shelter is very angular in shape (Fig. 4) and has a total length of about 25 m in three linked sectors. Maximum breadth is about 6 m, and height at the time of first use would have been everywhere adequate for standing. The southwestern sector of the site was partially excavated by a cluster of trenches labelled P and Q, while the northeastern sector was partially excavated by trenches labelled H, I, J, and K. These sectors are referred to as the P/Q and H/K sectors below. Between them lies the middle part of the shelter, now occupied by a walled tomb with a wooden lid, built in 1905. This tomb is surrounded by a walled and gated enclosure, and it sits on a modern sand terrace built up within the enclosure wall. There is every reason to assume that prehistoric deposits still survive intact beneath the sand, but no excavation was undertaken. The bones in the tomb, of 68 individuals, were collected from within the shelter according to informants, but they are without goods except for two *Conus* bracelets and are doubtless very recent. Christianity did not spread in these islands until the end of the nineteenth century, and cave burial may have lasted until this time.

Cultural deposits in both the P/Q and the H/K sectors extended down to a depth of 1 to 1.5 m. These deposits were excavated in 10 cm levels in each 1 m^2 trench, since it was virtually impossible to see the very slight changes in coloration in the dry deposits during excavation. At the end of excavations, layers could be discerned with some difficulty in the cleaned sections, and these were fully recorded for all

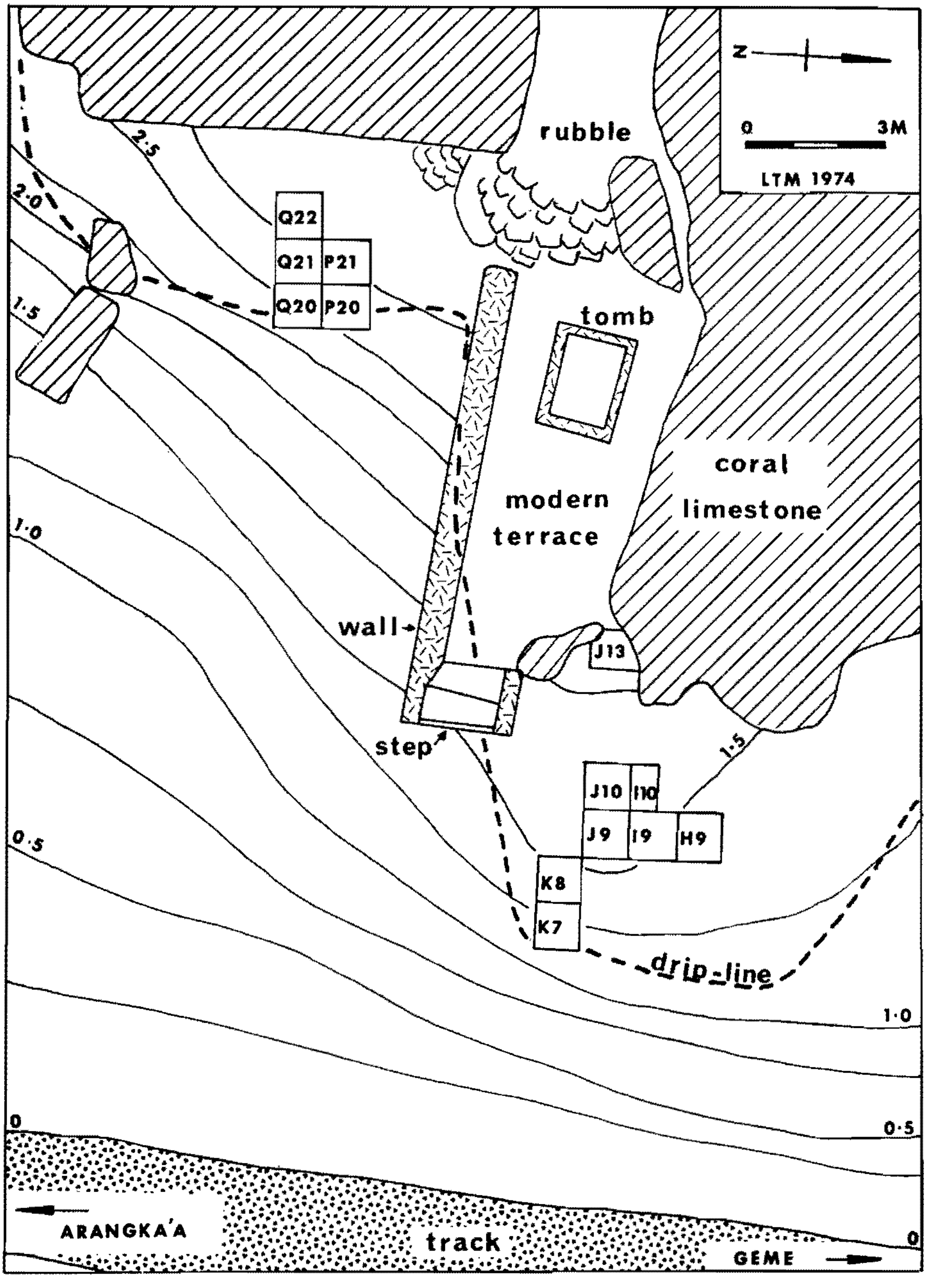

Fig. 4 Plan of Leang Tuwo Mane'e (contour interval 0.25 m).

trenches. Back in the laboratory at Australian National University, the ceramics were analyzed both by 10 cm depth units and by natural layers, but no major differences were observed between the results from the two methods. Ceramics and stone tools are analyzed by 10 cm depth units in this report, since this simplifies presentation without distorting the information content. I do not believe that all the layers have cultural significance, since some are clearly products of differential leaching and humus accumulation which would proceed regardless of human activity.

The natural stratigraphy in the H/K sector is shown schematically in Figure 5*A*; colors are described from the Munsell soil chart. Layer 1, 20–30 cm thick, is a dark gray soil containing many coral lumps from the roof and walls of the shelter. Such lumps are found in all layers in the site. Beneath layer 1 is layer 2, a gray soil having the same texture as layer 1. At present, I would regard layers 1 and 2 as closely related in origin, with layer 2 being leached and layer 1 having more humus and dampness. The division between layers 1 and 2 has no cultural significance in the artifact analyses. Layer 3 is more clearly distinct from layers 1 and 2, and is basically a pure beach sand of pale yellow color. In its top 20 cm or so it grades into a grayish brown sand due to soil infiltration from layer 2. The H/K layers therefore consist of a basal beach sand overlain by a two-part terrestrial deposit.

The natural layers in the P/Q sector are a little more complex (Figure 5*B*), but begin again with a dark gray topsoil 20–30 cm thick, best developed near the drip-line in the front of the shelter. Beneath this is layer 2, up to 60 cm thick in some trenches toward the back of the shelter. This layer owes its origin to two or possibly three coral gravel floors with intervening occupation deposits. It rises almost to the surface at the back of the shelter, where conditions were too dry for layer 1 to develop fully. These floors have been disturbed beyond recognition in the P20/21 section illustrated, but they are visible elsewhere in the P/Q excavations, as well as in a large hole dug by culprits unknown in the back of the cave behind Q22. They are about 10 cm in individual thickness and are separated by layers of dark gray earth with occupation material. Layer 2 grades at the drip-line into layer 3, which seems simply to have been the muddy edge to the layer 2 floors. Traces of stone paving were also found in layer 3. Layer 4, a gray soil similar to layer 2 in sector H/K, gets darker toward its rocky base around and outside the drip-line, perhaps due to humus accumulation. Layer 4 is about 50–60 cm thick, and it seems to form the natural subsoil for layer 1, from which it is separated by the intrusive contents of layers 2 and 3. It sits on the basal deposit of the shelter—layer 5—which consists of a light yellowish-brown clayey sand with many large coral blocks, grading down into a light yellow sand similar to that at the base of the H/K sector.

The cultural stratigraphy of the site is fairly clear, even though there are rare cases where sherds of one pot may be separated by up to 40 vertical cm. Disturbance is fairly characteristic of the upper natural layers, and the amount of scuffing and poking into the dry shelter floor must have been high at all times. The cultural levels (not to be confused with the natural layers) are delineated in Figure 7 from the data given in Figure 6, in which a number of cultural parameters are plotted by depth. These cultural levels (see Bellwood 1976*a*) can be described as follows:

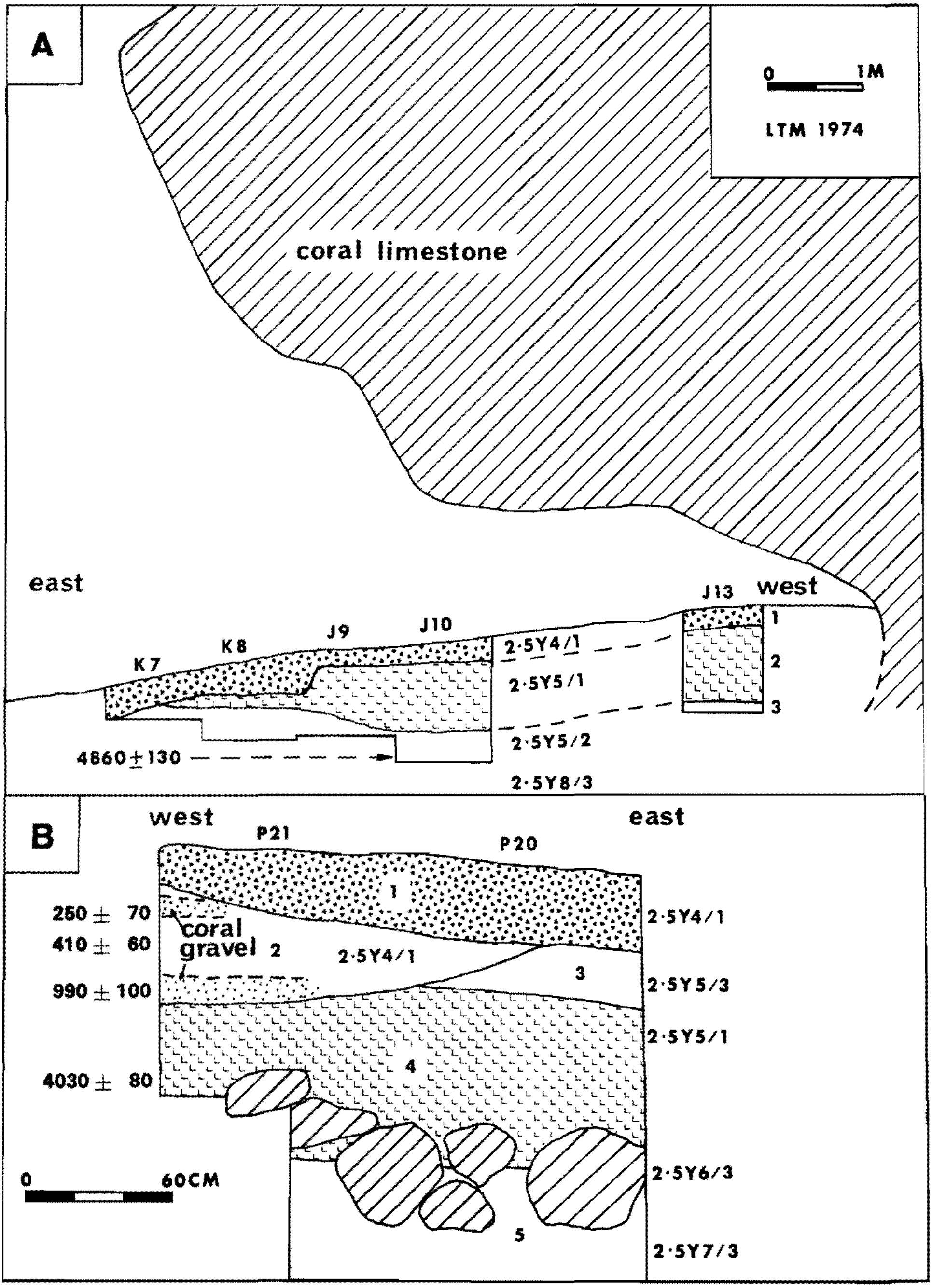

Fig. 5 Leang Tuwo Mane'e sections: *A*, through H/K sector (full section); *B*, through P/Q sector (trenches P20 and P21). Carbon dates shown at left, Munsell soil colors at right.

1. Preceramic. H/K sector only, below 80 cm (layer 3, upper). Absent in P/Q sector. Well-developed blade industry, using roughly equal proportions of local gray and brown cherts.
2. Neolithic. The lower part of layer 2 in H/K (60–80 cm) may be earliest Neolithic, with a continuing blade industry and rare potsherds. The remainder of the Neolithic in H/K is then represented by sparse deposits between 40 and 60 cm in the middle part of layer 2. The P/Q layer 4 (70–120 cm) seems also to be Neolithic, with prolific pottery and flake tools of brown chert. Blades and the use of gray chert are phased out in this layer. The fairly high proportion of gray chert in the upper layers of H/K is probably due to disturbance of the lower layers.
3. Early Metal. P/Q layers 2 (lower part) and 3, 40–70 cm; H/K layer 2 (upper part), 20–40 cm (very approximately). Characterized by Metal Age pottery,

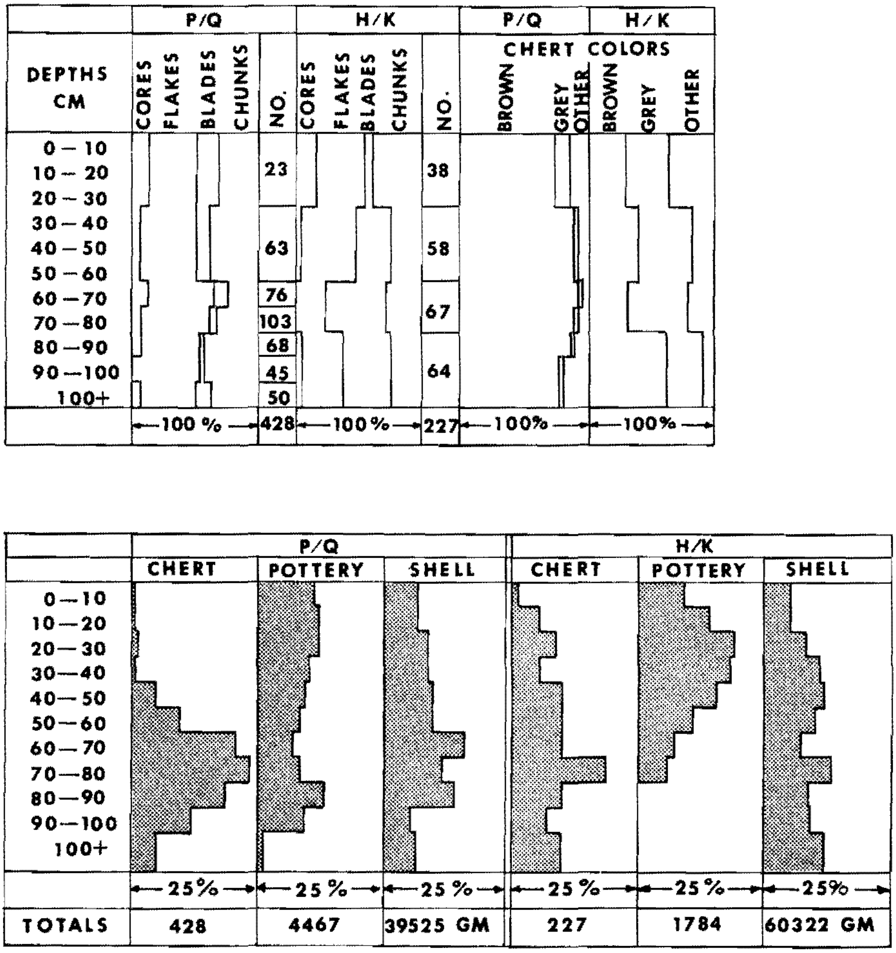

Fig. 6 *Top,* stone tool categories and chert colors at Leang Tuwo Mane'e, by 10 cm level; *bottom,* distribution of chert, pottery, and shell at Leang Tuwo Mane'e, by depth.

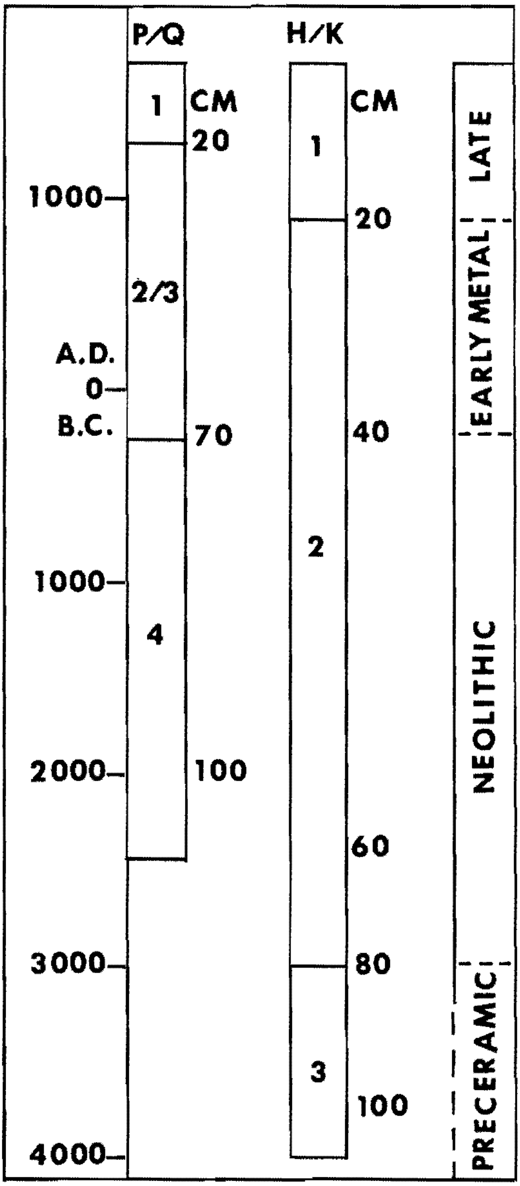

Fig. 7 Proposed correlation between absolute dates, natural layers, depths, and cultural levels at Leang Tuwo Mane'e.

copper or bronze, imported beads, and a very sharp decline in percentages of stone tools, especially in P/Q.

4. Late. Layer 1 in both sectors and the upper part of layer 2 in P/Q. Imported ceramics and Rarangunusa earthenwares (see below), possibly dating from Sung or Yüan times to the present.

Dates for the LTM deposits are derived from archaeological considerations and from five radiocarbon samples, four of charcoal and one of shell. These dates are shown in stratigraphic location in Figure 5. A dating scheme for the site, summarized in Figure 7, provides the essential framework for the following discussions.

The earliest date of 4860 ± 130 B.P. (ANU 1717) comes from *Turbo* shell near the top of layer 3 in trench H9, and it dates the Preceramic blade industry, a little prior to the first appearance of pottery. The next date, 4030 ± 80 B.P. (ANU 1515), comes from charcoal near the base of layer 4 in the P/Q sector, and dates the first appearance of pottery in the site. Allowing for carbon-14 calibration, these dates suggest that the site was first occupied, in the H/K sector, at possibly 4000 B.C. Pottery then appears about 2500 B.C. or perhaps a little before. The date of ca. 4000 B.C. for initial use of the shelter is of interest, since the surface of the basal beach sand deposit in LTM is now between 6.5 and 7 m above high sea level. I would suggest that the shelter was actually at sea level prior to first occupation. Had it been high and dry it would surely have been used, and uplift of the surrounding coastline by about 7 m in the past 6000 years seems to me to be the only reasonable explanation.

The three other dates from the site (all charcoal) are quite consistent, and come from the Early Metal and Late Period layers in the P/Q sector. The date of 990 ± 100 B.P. (ANU 1715) comes from the lower part of layer 2 at 50–60 cm, and falls within the Early Metal cultural level. The higher dates of 410 ± 60 (ANU 1514) and 250 ± 70 (ANU 1513) are Late Period, and come from the upper part of layer 2. There is also a sixth date of 530 ± 70 B.P. (ANU 1716) from the 60–70 cm level in trench H9, but this trench was clearly disturbed by a deep pit and the date is therefore not shown on Figure 5.

Economically, there is little to report for LTM until many more analyses have been completed. The shell percentages shown in Figure 6 might be noted here, for these do not fall off in later levels in the way that Peacock (1971) has shown for Malayan Hoabinhian sites. Clearly, shellfishing was always a favored activity for LTM inhabitants, and remains are prolific throughout. The shells present are so far unidentified. Other economic material, mainly from the recent pit dated to 530 ± 70 B.P. in trench H9, includes fishbone, plates from tidal invertebrates, and *Canarium* nuts. No cultivated plant remains were found, despite use of saltwater flotation, and no mammal bones were found.

The LTM Chert Industry (Plate I*i-m*)

All stone tools from the LTM deposits are of chert, with the exception of one obsidian nodule from the base of the Neolithic cultural level in the P/Q sector. The source of this obsidian is unidentified, but it could come from Minahasa or the Sangihe Islands. The cherts are of two main types: a reddish-brown, averaging around Munsell color 2.5YR4/4, and a pinkish-gray, averaging around Munsell color 7.5 YR7/2. Other colors, mostly intermediate between these two, are numerically insignificant.

The chart showing the distribution of stone tool characteristics by depth (Fig. 6) reveals a number of very sharp differences between the P/Q and H/K sectors. The P/Q industry, which is throughout associated with Neolithic ceramics, lacks blades and is almost entirely made of brown chert. This brown chert, in nodules too small for blade production, is scattered today all over the beaches and tracks around Arangka'a. The P/Q inhabitants clearly used these nodules.

On the other hand, the H/K industry, from the H/K levels below 30 cm, is characterized by up to 50% of blades and by a markedly higher percentage of gray chert, although the brown chert was also in use throughout, particularly in the lowest levels. The gray chert, according to my observations, does not lie around on the ground in large quantities, and the H/K inhabitants may have gone to special lengths to acquire it in nodules large enough for blade production. Flakes do increase in percentages in the later Neolithic levels of H/K, and these flakes are on brown chert as they are in P/Q.

My interpretation of the foregoing situation is that the Preceramic inhabitants of the H/K sector used blade tools made of gray chert and also flake tools of the more common local brown chert. Following this, the Neolithic inhabitants of both sectors gradually stopped using the gray chert and simply made small flakes from the brown chert. Although blades of gray chert are found as high as the Early Metal levels of the H/K sector, I strongly suspect that this may indicate reuse of tools already in the site, together with scuffing. Since there was no Preceramic occupation in the P/Q sector, the factor of reuse would not apply here. My interpretation is thus basically chronological, and I regard this as more likely than the possibility of two contemporary but separate groups in the shelter, each using different raw materials to make different types of tools.

For the purposes of analyzing the LTM assemblage, a blade is defined as an elongated flake with length equal to or greater than twice the width, with parallel sides, and with parallel ridges and scars down the dorsal surface (cf. Crabtree 1972: 43). Blades tend to be produced from prepared cores which are struck in one direction around the circumference of a flat striking platform. The resulting cores often tend to have a cylindrical or conical shape. Such cores are present but rare at LTM. In addition, the LTM blades (Plate I*j*, *k*, *m*) are thin, have low edge-angles, and occasionally present thin undamaged striking platforms which may suggest the use of soft hammers, although stone hammers were certainly used as well. Some of the cores show evidence of bipolar working on anvils (Plate I*i*).

The LTM tools are similar in size to those from Paso, although percentages of chunks are lower, and there are no flat-based and high-ridged tools. Blades fall between 15 and 50 mm in length, with modes between 20 and 30 mm. The flakes have a similar size range, with dimensions under 10 and over 40 mm being rare. Triangular coordinate plotting of length : breadth : thickness ratios adds an interesting observation—in all levels throughout P/Q and H/K the ratio of thickness to combined length + breadth + thickness is always between 10 and 20%. When compared to the Paso obsidians, the LTM cherts show much greater control of relative thickness.

Tool Function in the LTM Assemblage

The LTM and Paso assemblages clearly differ from each other in several crucial ways, apart from the obvious difference in raw material. The Paso tools tend to have high-angled edges, often retouched, that are always used with a scraping motion. The LTM tools tend to have lower edge-angles, negligible retouch, and seem to have functioned as knives for cutting and perhaps whittling.

Use-wear on the LTM assemblage was much more difficult to define than for Paso. Retouch was only present on six of the total of 655 tools, and two of these examples appear to be tanged flakes, while the other four are of indeterminate form. What may appear to be retouch on some cores has been interpreted as striking-platform damage caused during manufacture. Otherwise, LTM use-wear consists only of very slight edge-chipping. Although some of this could have taken place by various means after the tools were discarded, most of the edge-chips did show what are believed to be nonrandom concentrations caused by use.

Between 5 and 52% of LTM tools in each 10 cm level show use-wear, and there is no pattern behind the frequency variation. The average per level is between 10 and 20%. Lengths of edges showing use-wear are distributed fairly evenly between 5 and 40 mm at all levels, and angles range from 20 to 90 degrees, with a high concentration between 30 and 60 degrees. Edge-angles and edge-lengths do not correlate in any clear fashion.

The use-wear was observed to be either unifacial or bifacial. Bifacial wear is more common (40% of total use-wear) in the H/K blade assemblage than it is on the P/Q flakes (30% of total use-wear). In addition, bifacial edges tend to be slightly longer than unifacial edges, and I would interpret them as knives used with a to-and-fro motion. Bifacial edge-angles never exceed 60 degrees. Unifacial edges tend to be shorter than bifacial edges, they very often have edge-angles up to 90 degrees, and they are more common in the P/Q flake assemblage. They are interpreted as whittling rather than scraping tools of the Paso type.

So far, I have not prepared detailed statistical tests to support the foregoing observations, since the data base does not have sufficient rigidity. I know of no way to resolve this problem at present. Peterson (1974*a*) has recently discussed some of the many variables which must be assessed in analyzing use-wear on stone tools from northern Luzon. The flake-blade industry of jasper described by Peterson for the Dimolit site on Palanan Bay (discussed above in connection with the Paso ceramics) has been divided into saw, scraper, burin, wedge, spokeshave, awl, and whittler categories, but I would hesitate to identify such a range of functions for LTM. Peterson has provided a useful discussion of edge-gloss and notes that bamboo-gloss is more widespread over the surface of the tool than the gloss caused by cutting other grasses. Blades and flakes with edge-gloss do occur right to the base of the LTM deposits in small numbers, and they seem to be of the nonbamboo type. Similar flake-blade industries with some edge-gloss, roughly contemporary with LTM, are also reported from islands in the southern Samar Sea (Scheans et al. 1973), from the Panhologan II Cave on Samar (Hutterer 1973*a*), and from eastern Timor (Glover 1972) and southwestern Sulawesi (Glover 1975).

The LTM assemblage, together with the Luzon, Samar Sea, and Timor assemblages mentioned above, is one of a number of similar flake-blade industries widespread through the Philippines, eastern Indonesia, and into Australia from about 5000 B.C. onward. The Duyong Cave flake-blade industry from Palawan (Fox 1970), dating to between about 5000 and 2000 B.C., is of similar type, as of course is the Toalean of southwestern Sulawesi. In the cases of LTM and the Toalean sites, the blade element seems to predate the flake element, with the latter being specialized into the "microliths," backed-flakes, and Maros points of the Middle and Late Toalean (van Heekeren 1972: Fig. 24; Glover 1975). Whether this trend will be visible in other areas remains to be seen, but there may be a tendency for blade industries to be Late Preceramic, while less elongated flake-tools become more common during the Neolithic. The overall picture may indeed be complex, for Hutterer (1973*a*) has reported a flake industry without blades from the Sohoton Cave on Samar, which seems to be contemporary with the Late Preceramic flake and blade industries elsewhere, and which also has parallels in manufacture with the Paso assemblage. Hutterer suggests that the Sohoton Industry was made by Negrito hunters and gatherers, and that the flake and blade industries are associated with early horticulturalists. The latter is quite possible (except for Australia), especially if the development of horticulture can be traced to Late Preceramic times.

The LTM Ceramics

Since LTM was purely a habitation shelter, the pottery does not reveal the intricate decoration characteristic of Early Metal Period jar-burial sites, such as Leang Buidane to be described below. Most of the pottery is plain and of simple forms, mainly bowls with restricted orifices and everted rims with rounded lips. Although sherds were uniformly small and no complete vessels could be reconstructed, there is no evidence for any bases other than round, nor are there complex elements such as ring feet, tripods, lids, handles, or spouts. These are, on the contrary, much more common in Early Metal burial assemblages.

Since the LTM ceramic deposits span about 4500 years, it comes as no surprise that there are many significant changes in attributes over time. These are discussed according to the three cultural levels in LTM, which are attributed to the Neolithic, Early Metal, and Late periods respectively. The rims illustrated in Figure 8 are all from the P/Q sector.

The LTM sherds have been analyzed for all attributes apart from paste and temper. The latter can be described only generally: the pottery is soft, bonfired, and tempered with either river or beach sand. Women potters at Geme village near Arangka'a use river sand today; they build pots either by modelling from lumps or by coiling, and they finish with a paddle and anvil. Although local potting is virtually extinct, we were able to see one demonstration during the LTM excavations, and I have in my possession notes on all stages of manufacture prior to firing. The prehistoric LTM pottery was almost certainly made with paddle and anvil, and probably by coiling too; the latter method was certainly in use with the Leang Buidane Metal Age pottery.

The pottery from the Neolithic cultural level at LTM is thin: body sherd thicknesses range between 2 and 7 mm, with a mode of 4 mm. No sherds are thicker than 7 mm, as may be seen from the graph for layer 4 in the P/Q sector, in Figure 8, *top*. Rim profiles have rounded lips, low inclination angles generally approaching 90 degrees, and short stubby eversions. All vessels seem to be globular pots with everted rims, apart from a very few bowls with direct rims and probably vertical sides. About 10% of the sherds are red-slipped on their exteriors, although some vessels had red slip restricted to a band around the inside of the rim. No other form

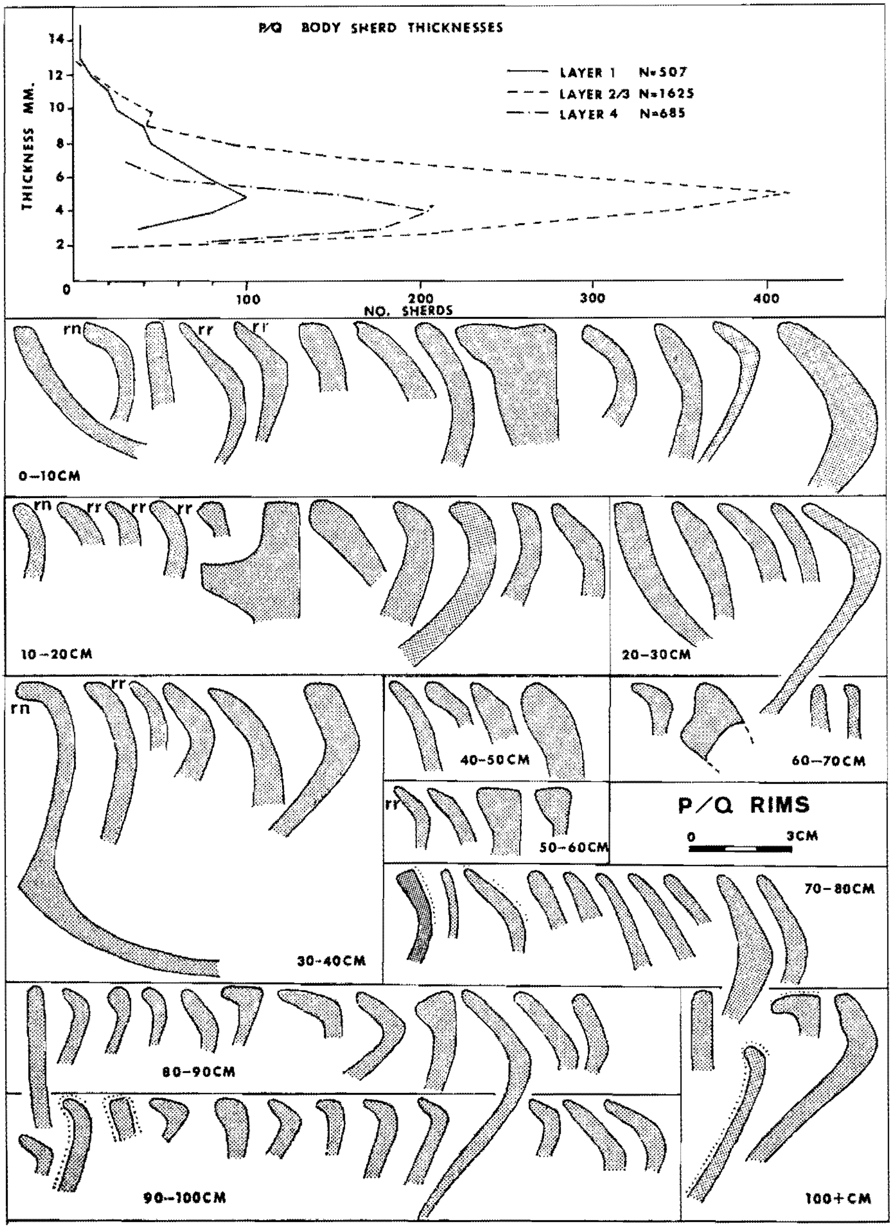

Fig. 8 Pottery from Leang Tuwo Mane'e: *top*, body sherd thickness distributions by natural layers; *bottom*, rim profiles by 10 cm level. Stippled halos denote red slip; *rn* = rim notched; *rr* = Rarangunusa decoration.

of decoration is present. Pot diameters range between 12 and 22 cm, and there is little change in this range throughout the LTM layers.

The pottery from the higher cultural level of Early Metal affinity trends away from the Neolithic forms, but with no sharp breaks. Body thicknesses now range from 2 to 13 mm, with a mode of 5 mm (Fig. 8, *top:* layer 2/3), and thick sherds between 8 and 13 mm appear for the first time. Lips remain rounded, but inclination angles increase and become much less angular. The profiles shown for P/Q 30–40 cm show this clearly, and this trend can be traced back to 70–80 cm, thus emphasizing the gradualness of the change, and the continuity. Red slip becomes very rare in this cultural level, but it does continue with quite high percentages in H/K, although this is because the H/K pieces are mostly from one large vessel broken on the spot. The red-slipped sherds in the Neolithic cultural levels come from at least four vessels. Other important ceramic appearances in the Early Metal levels are carinations, thickened lips (e.g., the two right-hand profiles in the 50–60 cm level in Fig. 8), and incision and cord-marking of Leang Buidane type (to be described).

The Late Period body thicknesses at LTM (Fig. 8, *top*: layer 1) range from 3 to 15 mm, and very thin sherds of 2 mm thickness now drop out of the distribution. The skew caused by very thick sherds increases in length, and there is a definite tendency at LTM for body sherds to get thicker through time. Late Period rims are basically similar to those in the Early Metal levels, but very important new occurrences comprise Rarangunusa incised decoration (to be described below) and Chinese pottery. The latter ranges in date from T'ang onward, although I would hesitate to claim that Chinese pottery was actually arriving in Talaud prior to Sung times.

The LTM ceramic sequence thus presents a gentle gradation with no sign of any sharp interruption. Sherd thicknesses increase gradually, as do inclination angles and lengths of rims. Necks tend to become more rounded and less angular over time. Carinations, incised decoration, fine cord-marking, and distinctive thickened rims appear in tiny percentages in the Early Metal Period, but otherwise the pottery remains plain and of simple household type. Most of the ceramic innovations which characterize the Early Metal Period in Island Southeast Asia are confined to burial assemblages. The LTM household pottery provides rather important evidence for basic continuity in the region from Neolithic times onward.

The Early Metal and Late Period ceramic parallels for LTM will be considered later, as more material remains to be presented from other sites. However, LTM was the only site excavated in Talaud with Neolithic ceramics, and some comment is necessary here. Pottery predating 1000 B.C. has rarely been reported from the islands of Southeast Asia, apart from Taiwan, but recent work is altering the situation very rapidly. From shelters in eastern Timor, Ian Glover (1972) has excavated sherds of plain globular pots and open bowls, apparently not slipped, dating to about 2500 B.C. After examining the LTM material in Canberra, Glover informs me that it resembles quite closely this early Timor pottery, particularly in form. Glover has also reported plain unslipped sherds from round-based pots with everted and thickened rims from the Toalean site of Ulu Leang in the Maros region (Glover 1975), and these may also date back to about 2500 B.C. Furthermore, Peterson (1974*a*: 108) has reported sherds with some red-slipping, of unknown form, from the Pintu rock-shelter in the Upper Cagayan basin of northern Luzon. These may date back to 2000 B.C. Spoehr (1973) also reports red-slipped ware of presumed Neolithic context from the Sangasanga rock-shelter in the Sulu Archipelago. So we now have reported occurrences of plain pottery, usually globular in form with everted rims, and sometimes red-slipped, extending through the greater part of eastern Island Southeast Asia from 3000 B.C. to perhaps 1000 B.C. This, in

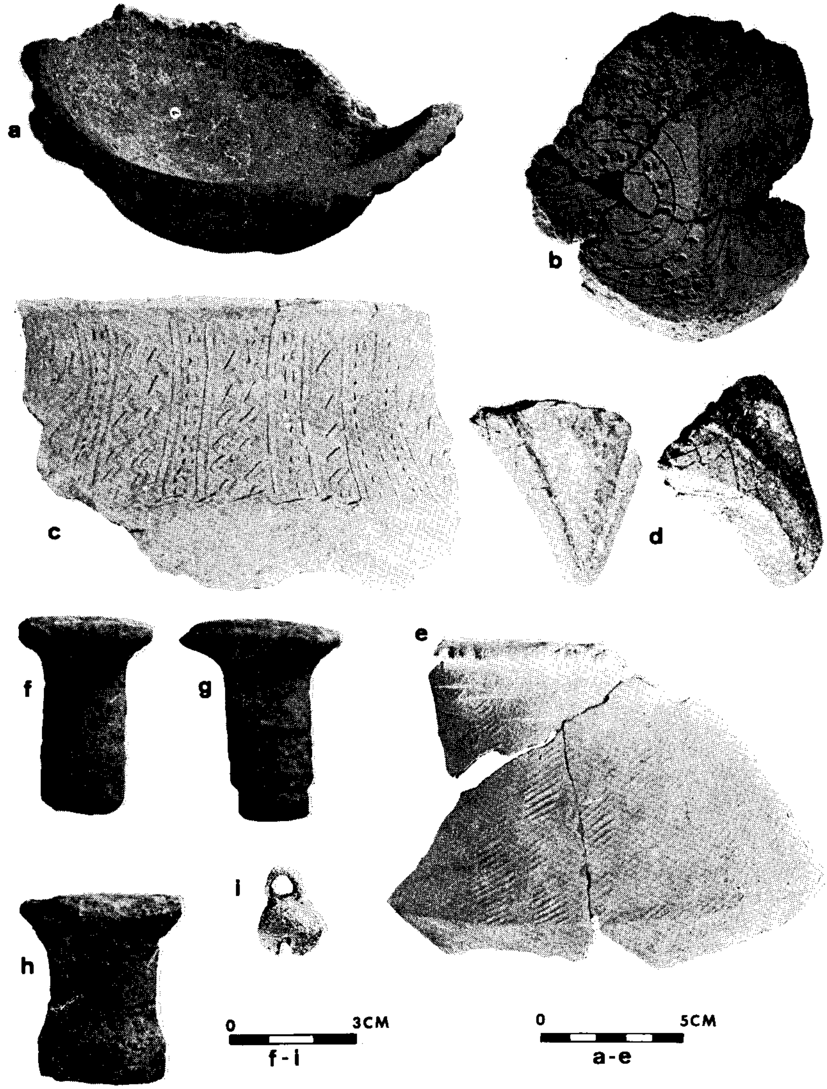

Plate II Items from the Talaud excavations: *a,* red-slipped dish with notched lip and flat base from Leang Balangingi; *b,* section of hexagonal vessel foot from Leang Balangingi; *c,* typical Rarangunusa decoration, from Tanjong Rarangunusa; *d,* incised tripod or tetrapod from Leang Balangingi; *e,* carinated and lip-notched sherd from Leang Buidane, with herringbone paddle-impression; *f-h,* cylindrical plugs of coral limestone, *f* and *g* from Leang Buidane, *h* from Leang Balangingi; *i,* copper or bronze bell from Leang Tuwo Mane'e.

fact, is our first archaeological definition of the Neolithic in this area, and it is beginning to provide a stimulating alternative to the adze migrations of former scholars.

Nevertheless, the definition of this island Neolithic is still hazy, and ceramics alone can tell us little. More details on the use of the red slip would be very helpful, for this is clearly not confined to the earlier Neolithic and is in fact very common in possibly late Neolithic assemblages such as those from Dimolit and Paso, and the important late Neolithic assemblages from the Batungan caves 1 and 2 on Masbate (Solheim 1968). The Batungan material has some incised decoration and a relatively late carbon date of 750 ± 100 B.C. (Fox 1970: 98), but its rim forms are similar to those in the LTM Neolithic (Solheim 1968: Fig. 4). Red-slipping is also very common in the Early Metal Period, and it is only at this time that cord-marking makes its first appearance in the Philippines and eastern Indonesia. This is a point of interest, given the overwhelming importance of cord-marking in Mainland Southeast Asian Neolithic assemblages.

Other Artifacts from the LTM Excavations

Apart from pottery and stone tools, little was recovered from LTM, and the total absence of stone adzes is disappointing. A copper or bronze heel-like plate of unknown use was recovered from the Early Metal levels, as was a small copper or bronze bell (Plate II*i*) of shape similar to an example from Sa-Huỳnh in South Vietnam (Parmentier 1924: Fig. 17), but lacking the spiral surface decoration present on the latter. Since the Sa-Huỳnh Culture dates most probably to the later first millennium B.C., this bell could then indicate the use of metal in the Talaud Islands by as much as 2000 years ago. The only other metal object from LTM is a copper or bronze finger ring, recovered from near the surface, that still awaits cleaning.

Items of shell from LTM come from the Early Metal and Late levels, and comprise 2 small perforated discs, a perforated whole bivalve and a perforated cowrie shell, and a section of a thick triangular cross-sectioned *Tridacna* bracelet. Bracelets like the latter are known from other Early Metal contexts in the Philippines (Solheim 1964: 186–191), but are difficult to date. Because of the nature of the LTM deposits, I am unwilling to suggest specific dates for any of the above objects.

Other Sites in the Vicinity of Leang Tuwo Mane'e

Thirty meters north-northeast of the main LTM shelter lies another small shelter with a floor area of about 7 by 5 m. Excavations here revealed about 30 cm of cultural deposits belonging entirely within the Late Period, with Rarangunusa incised decoration. About 50 m southeast of the main shelter is a second small shelter, with a floor area of 11 by 3 m. This had a liberal scattering of Rarangunusa sherds on its surface, but was not excavated. Neither of these two small shelters is thought to warrant further excavation.

LEANG BUIDANE, SALEBABU ISLAND

The Leang Buidane cave (henceforth LB) lies 2 km northwest of the town of Lirung on the coast of Salebabu Island. The site is of great importance, although entirely different in character from LTM. It contained an Early Metal Period jar-burial assemblage dating from the later first millennium A.D., with ceramics, imported beads, copper, bronze, and iron. The site was never used for habitation and contains no economic refuse.

The plan and cross-section of Leang Buidane are shown in Figure 9. The cave is 18 m long, a maximum of 9 m wide, and roof height averages 2.5 m. Like LTM it is formed in raised coral limestone; the site is now 24 m behind the beach and the surface of its beach sand fill is about 5 m above high sea level. Like LTM, the cave may have risen to its present position in Holocene times, although in this case there is no Preceramic or Neolithic settlement within. Eight chert flakes and one tiny blade-core found among the jar-burial deposits might attest to short visits by earlier peoples, but this evidence is very slim indeed.

The LB cave has a floor area of about 100 m². The rear 35 m², behind the excavation trenches, contained no jar-burials, and only scattered Rarangunusa sherds were

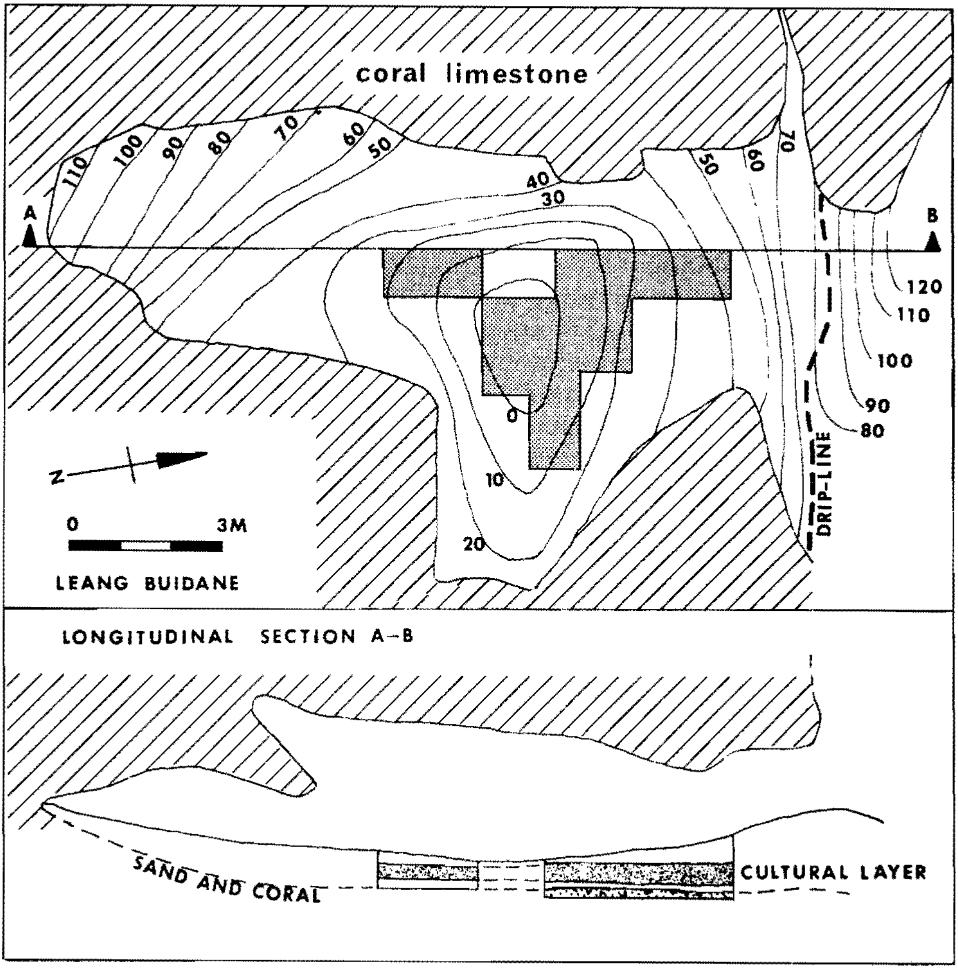

Fig. 9 Leang Buidane: plan and section of site, with contour intervals of 10 cm.

found here, the results of recent visits. The jar-burial deposit itself occupied the front 65 m^2 of the cave, and 12.5 m^2 (about 20%) of this area was excavated. There arises the problem of why the cave was not used before the Early Metal Period, for, although the mouth is now very low due to the buildup of deposits around the drip-line, the section shown in Figure 9 shows that these deposits postdate the jar-burial interments, and they are formed of materials recently fallen from the cliff face above the cave. Hence, prior to the jar-burials, the cave should have had a good clear entrance eminently suitable for habitation. There is no obvious answer to this problem. Today, the partial blockage of the entrance has made the cave quite dark and airless inside, and all excavation had to be carried out with pressure lamps.

When the cave was first entered, we found an earthenware casting-mould for a copper axe, a carnelian bead, and a glass bead on the surface, together with a number of sherds. These had clearly been disturbed out of the buried cultural layer. During excavation of the area shown in Figure 9, which was laid out and recorded in 1 m squares, the cultural layer was found to lie between 10 and 20 cm beneath the surface, covered by a layer of dry dusty soil. This ruled out any recent funerary use of the cave. No Chinese imported sherds were found in the deposits, apart from 6 pieces in this top layer.

Beneath the top sealing layer, the main cultural deposit occupied a thickness of 30 to 40 cm in the center of the cave, less near the sides. This deposit was absolutely packed with fragmentary human bones, sherds, and other artifacts in remarkable density. Some 15,200 sherds were recovered from the excavations, and the cave could contain an estimated 50,000. The rather strange problem here is that no complete pots were recovered at all, although there were a number of near-completes. Furthermore, sherds of quite a number of individual vessels were found scattered throughout the whole depth of the deposit over several square meters. Quite clearly, none of this material was *in situ* when excavated, and ancient disturbance had taken place long enough ago to allow for formation of the top sealing layer. Whether this disturbance is to be related to the burial practices themselves (i.e., ritual smashing of offerings) I cannot say, but there is also a possibility of treasure hunting from the Spanish-Portuguese period, which in this area could have begun in the sixteenth century. Recent visits for bat-hunting and other purposes could also have caused damage, since the cave deposits are very soft and dry, although trampling alone cannot account for the degree of disturbance. Saurin (1973) has suggested that burial jars in the Hang-Gon site in South Vietnam were smashed purposefully after placement, a kind of activity that is also evident in the Leang Balangingi site on Karakellang, to be described below. In addition, Fox (1970: 53) records that mediums in Palawan have been said to break pots in burial caves during times of epidemics. Possible explanations for the LB situation are clearly numerous.

Because the ceramic material from the cave is so uniform in style, this disturbance may pose few stratigraphic problems, since I suspect that the burials were placed by a related group over a short period of time, perhaps a few centuries. However, the scattering does make the archaeologist's job a little harder. The cave probably contains sherds from a finite number of complete vessels, and so far some progress has been made in piecing them together. However, many pieces of the jigsaw puzzle are still in the cave, and laboratory sorting of the analyzed material is still far from finished, due to the time-consuming nature of the job. Some of the reconstructed vessels are shown in Figure 11, but otherwise, apart from recording attributes of individual sherds, there is still a long way to go with reconstruction.

The majority of the human bones from the cave would appear to have been placed in jars, as discussed below. However, at the north end of the excavated area five separate skulls were found, in two cases with a few associated postcranial bones, right at the base of the deposit beneath the jar-burial layer. The two skulls with postcranial bones appear to have been placed between and under large lumps of coral, and may thus have been placed in scoops in the cave floor and covered over. These burials did not have any goods, and although some sherds were found among them, I feel these could be derived from the jar-burials immediately above. There is thus some evidence that the cave was used for burial prior to the period of the jar-burials, but the details are very imprecise. Although skull fragments were plentiful among the jar-burial remains, only the five skulls mentioned seem to have been *in situ* when excavated.

The Leang Buidane Ceramics

The 15,200 sherds from the cave break down into 93% plain, 4.4% red-slipped, 1.7% incised, 0.15% carved-paddle-impressed, 0.18% corded, and 0.15% Rarangunusa (top layer only). These percentages do not correspond to percentages of whole vessels, since most decorated vessels have more than 50% of their surfaces plain, and the large burial jars, which produce the majority of sherds, are generally entirely plain. In terms of whole vessels, these percentages would have to be increased for all but plainware by an unknown amount.

The LB ceramics clearly relate most closely in form and decoration to the Kalanay ceramics of the central Philippines (Solheim 1964), rather than to the Tabon ceramics of Palawan (Fox 1970), where paddle impression is found on over 40% of the sherds from some sites. Unfortunately, no records survive of actual methods of burial placement in Kalanay sites, but for the Tabon sites there is good evidence that the large jars containing bones were placed upright on the floor of the cave, while the smaller offering pots were placed around and perhaps sometimes inside the larger jars. It is possible that the LB vessels were once placed similarly. The many human bones found in the LB deposits were in unknown relationships to the original positions of pots. None of this bone has yet been analyzed. However, it seems very likely that all the jar-burials were secondary as in the Tabon caves, and were not of complete skeletons.

The large burial jars at Leang Buidane were either round or of rectilinear shape, and generally undecorated. Round vessels appear to have had cylindrical or globular bodies with everted or thickened rims (Fig. 10*a-e, g*), and some may have had ring-feet with small perforations (Fig. 10*l*). Square or rectangular vessels have more complex rim shapes, often with ledges or flanges, perhaps to support lids (Fig. *10h-k*). No complete profiles of any burial jars can yet be reconstructed, and no temper analyses have yet been undertaken on any LB material. Plain jars and rectilinear forms such as these are unfortunately rather undiagnostic, particularly when fragmentary; there are clearly many generalized parallels right through the Tabon, Kalanay, and Sa-Huỳnh jar-burial cultures, although rectilinear vessels appear to be unknown from the latter.

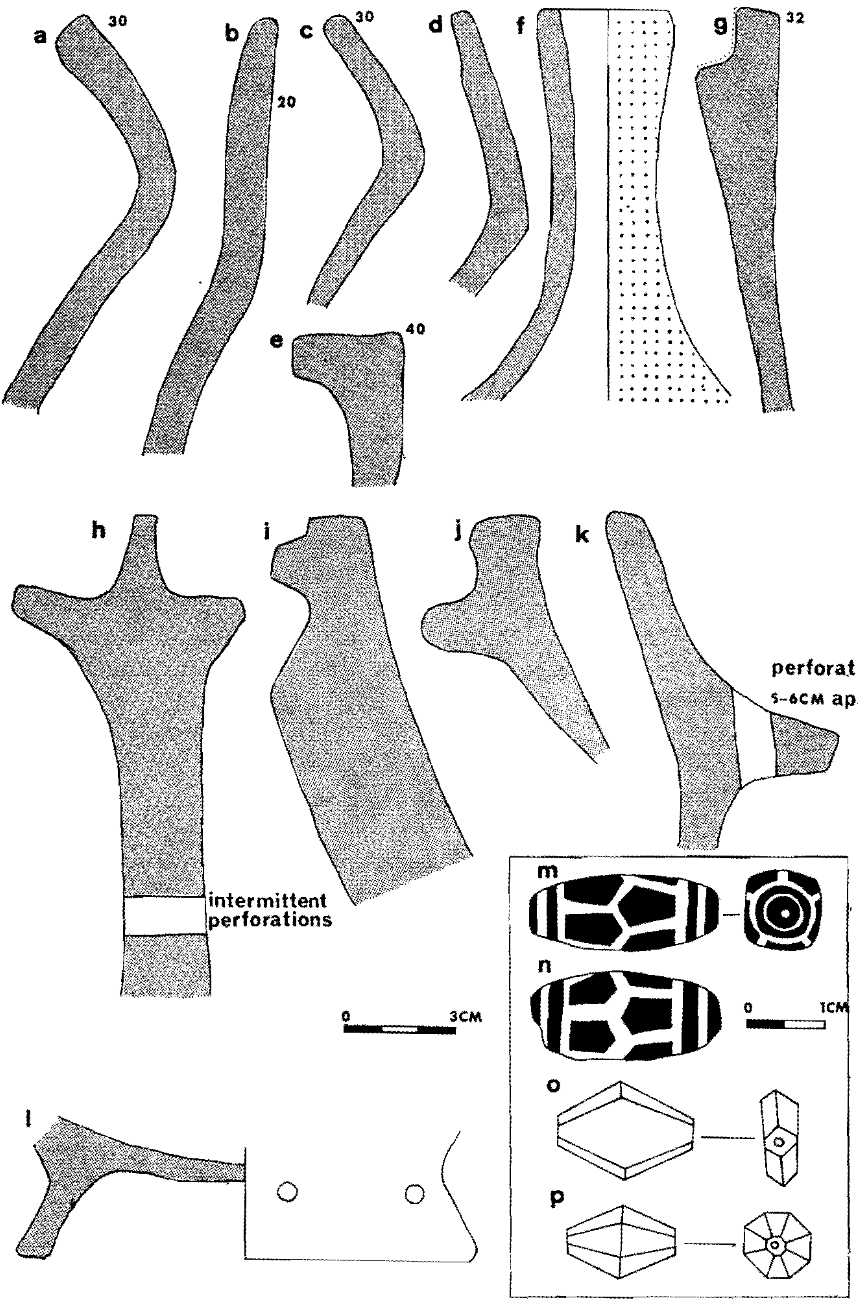

Fig. 10 Pottery and beads from Leang Buidane (stippling denotes red slip, numbers denote diameters in cm.): *a-g*, round vessels; *h-k*, rectilinear vessels; *l*, perforated ring foot; *m*, etched barrel bead of black agate; *n*, identical specimen from Sirkap Mound, Taxila, dating from first century A.D. (after Beck 1941: Pl. II, 17); *o*, flattened lozenge of carnelian; *p*, octagonal bicone of carnelian.

The smaller offering vessels from Leang Buidane are often much more complete, and comprise round-bottomed carinated vessels, either plain or with decoration in horizontal bands above the carination (see Fig. 11). Notching on lips and carinations is common, especially on plain vessels. Rims are normally everted slightly, and some show slight thickening and lip-squaring. The vessel shown in Figure 11*a* is the only one known so far with a vertical direct rim. Also present are red-slipped bottle necks (Figure 10*f*) and tripods or tetrapods (similar to Plate II*d*), although the latter cannot yet be fitted to any actual pots. Lids are present too, perhaps for the large burial jars.

The decoration on these small vessels is red-slipped, impressed, or incised. Red-slipping and incision often occur together, with the former being on the inside of the pot (Fig. 11*b*, *f*, *g*, *i*). The incision is nearly all done with a single point, and comprises the normal spiral, rectangular meander, crossed diagonal, and triangular motifs so well known from Southeast Asian sites. The pot shown in Figure 11*b* has shallow cutout triangles beneath its lip, and that in Figure 11*f* has two-pronged incision, but both these vessels are unusual. The "sloping-S" designs on Figure 11*f* are very similar to those on pottery from the Sasak shelter in the Kalatagbak area of central Palawan—a site which Fox (1970: 169–171) dates to between A.D. 400 and 600. These dates seem very reasonable. Some of the LB vessels also have an upper zone of paddle-impression, as shown in Plate II*e*.

Parallels for these offering vessels from Leang Buidane are fortunately very easy to find, particularly from the Kalanay and Tabon sites. With the Kalanay sites of the Visayas (central Philippines), the LB assemblage shares the general forms of the burial jars, the carinated pots, bottles, and tripods or tetrapods, although it lacks the complex cutout ring-feet of the Bagupantao vessels from Kalanay Cave. Similarities to ceramics from the Tabon sites are about even, except that Tabon lacks any tripod forms, as well as the cutouts in ring-feet.

In terms of decoration, LB shares with Kalanay the running scrolls and meanders, but it lacks the paired diagonal and border motif which, Solheim (1964) states, characterize Kalanay pottery, and it also lacks the long rolled facets on lips and carinations which are distinctive of both Kalanay vessels and also the recently discovered vessels from the Panhologan burial cave I on Samar (Hutterer 1973*a*). LB also lacks the punctate fields between paired incised lines (e.g., Solheim 1964: Pl. 17*h*), although this format is known from the Leang Balangingi site, to be described below. Both Kalanay and LB are characterized by very low frequencies of paddle-impression, both carved and cord-bound.

From Solheim's 1964 monograph on the Kalanay sites, some very close specific similarities between Kalanay and LB material can be listed, and these more than overcome the negatives listed above. Solheim's Plate 15*f* shows a ring-foot with scroll-shaped cutouts from Siquijor, and LB has virtually an identical piece. I would be almost inclined to suggest a single source of manufacture for them both. Solheim's Plate 19 (Unknown Site, probably Visayas) shows incised scroll designs absolutely identical to examples from LB, and the same applies to the sherds with notched lips and rectangular meander designs in Solheim's Plate 21 (again from the Unknown Site). Several more examples such as these could be listed, and the evidence clearly suggests that LB is part of the same ceramic tradition as Kalanay, but with a few obvious and expectable differences.

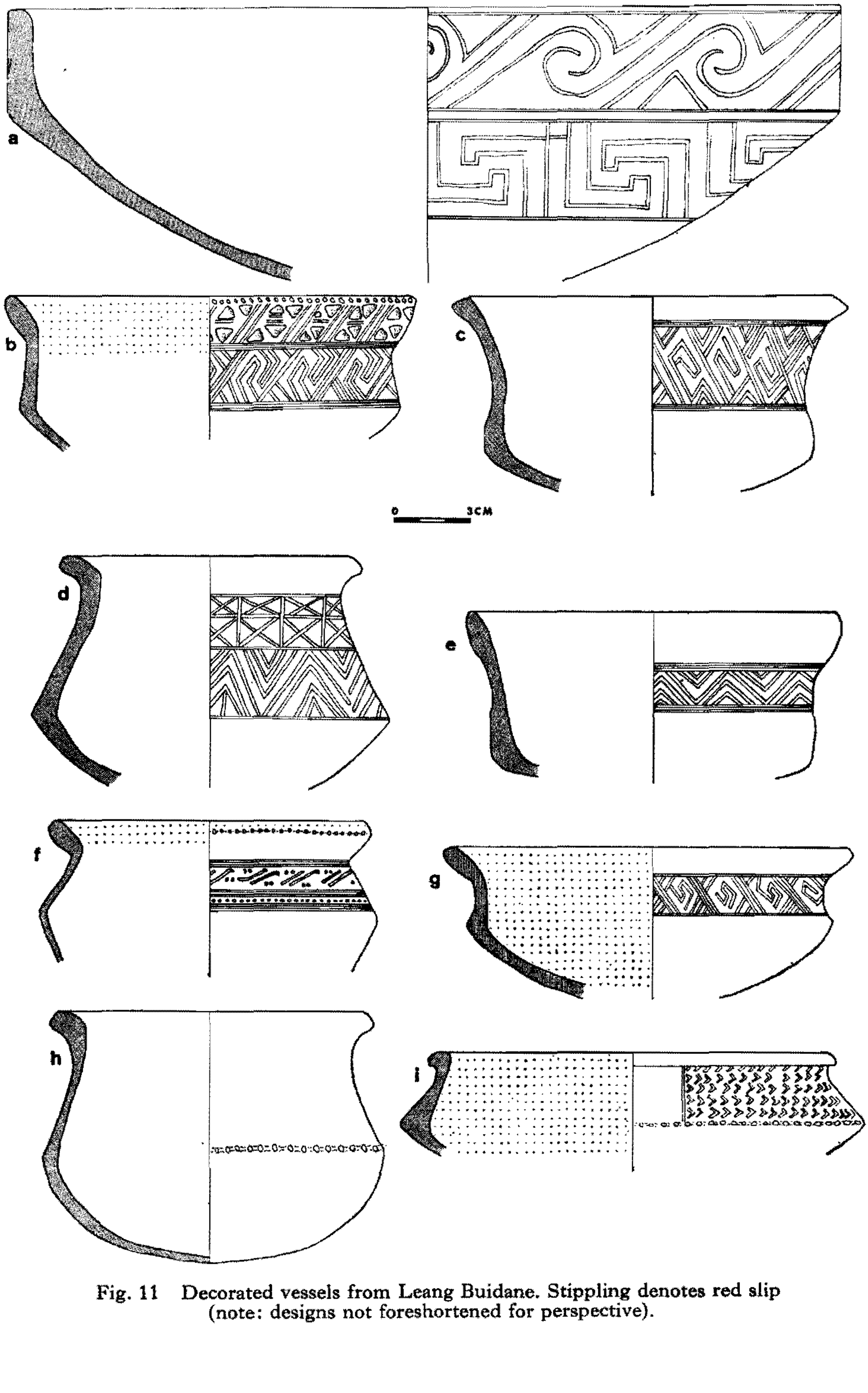

Fig. 11 Decorated vessels from Leang Buidane. Stippling denotes red slip (note: designs not foreshortened for perspective).

Turning to Tabon, the picture is similar, but different in specifics from that presented by the parallels with Kalanay. The Tabon vessels do not have such closely related forms of scrolls and meanders as do LB and Kalanay, but a carinated vessel with incised triangular motifs from Diwata Cave (Fox 1970: Fig. 27*c*) is very close to the LB vessel shown in Figure 11*d*. However, Tabon does differ from LB in the high frequency of paddle-impression, and my impression is that the latter relates more closely to Kalanay.

The similarities to the other well-known jar-burial cultures of Niah and Sa-Huỳnh are more remote, despite the sharing of an obvious substratum in ceramic form and decoration, and in the practice of jar-burial itself. The jar-burials at Niah and the Sa-Huỳnh sites predate A.D. 1 on present evidence, and by the time LB was in use, Sarawak was already dominated by the Bau-Malay pottery tradition (Solheim 1965), while South Vietnam was the geographical focus of the Indianized Chamic civilization. To the south, the only pottery jar-burials reported elsewhere in Sulawesi are those from Sa'abang in the central part of the island (Willems 1940), but there is no ceramic material here like that from LB. Neither does burial pottery recently recovered from caves in the Maros region (Mulvaney and Soejono 1970; Glover 1975) have any close parallels. The undated Kalumpang material (van Heekeren 1972) relates more closely to the Maros material than to anything from northern Sulawesi, and I suspect that relationships for the latter area in the Early Metal Period were very strongly oriented toward the Philippines rather than toward the south.

All the sites mentioned, with the possible exception of Galumpang, belong in the Early Metal Period (Bellwood 1976*a*) and thus date somewhere between 500 B.C. and possibly A.D. 1200. The period of Chinese imports in the southern Philippine region appears to have begun with the Sung dynasty (see below), and the ornately decorated Early Metal Period pottery gradually ceases to be produced after A.D. 1000. The LB assemblage, from evidence to be presented below, dates to the second half of the first millennium A.D., and much of the Kalanay and Tabon material is clearly of similar date, although Fox inclines to date the latter to before A.D. 500. Since Solheim (1975) has recently reported Kalanay-like pottery from Asin Cave on the coast of southeastern Mindanao, it is easy to visualize the great extent of contact throughout the Philippines and northeastern Indonesia during the Early Metal Period. This extensive contact certainly formed a suitable milieu for the later rapid development of the trade in Chinese ceramics in the region.

Other Artifacts from Leang Buidane

Seventy-five nonpottery artifacts were recovered from the Leang Buidane deposits, as follows:

- 7 shell bracelet segments
- 3 beads of shell and bone
- 1 perforated mammal tooth
- 1 glass bracelet segment
- 4 glass beads
- 8 chert flakes and 1 core, possibly predating the burials

3 stone beads (jade, agate, and quartz)
23 carnelian beads
3 etched agate beads
2 coral bottle-stoppers or earplugs
11 artifacts and fragments of copper or bronze
4 earthenware casting valves, or fragments thereof
3 pieces of iron
1 baked clay penannular earring

Artifacts of Shell and Bone

The seven shell bracelet fragments are fairly crude, and of rectangular or irregular cross-section. The shell beads are perforated subspherical discs, perhaps from the bases of *Conus* shells. There is also a perforated fish vertebra, which may have served as a bead. The perforated mammal tooth is 55 mm long, but is so far unidentified. None of these items has diagnostic characters which might assist dating, and none are figured.

Artifacts of Glass

The glass bracelet segment is of a semitransparent green glass, of triangular cross-section, and about 50 mm in diameter. Solheim (1964) believes that glass bracelets come quite late in the Kalanay sequence in the Visayas, but he has no precisely dated examples. Harrisson (1962*b*) dates blue and green monochrome glass bracelets from the Sarawak River Delta between A.D. 700 and 1300 on the basis of Chinese ceramic associations, and in the Calatagan burials on Luzon they may have been in use as late as the sixteenth century (Fox 1959: 41). On the other hand, Fox (1970: 15) also mentions green glass bracelets with triangular cross-sections from Manunggul Chamber B on Palawan, associated with a carbon-14 date of 190 ± 100 B.C., so these artifacts may have had long popularity in Southeast Asia, and I am unable to give a close date to the LB specimen.

The 4 glass beads from LB are rather restricted in variety. They are of an opaque frit, roughly cylindrical in shape, and do not exceed 4 mm in any dimension. Three are blue and one is dark red, the latter resembling the *mutisalah* beads of Indian origin illustrated by Lamb (1965*a*: Fig. 5). The LB beads are therefore restricted in range of color, and no polychromes are present.

The literature on Southeast Asian glass beads is in a highly confused state, and it is virtually impossible to give dated parallels for the LB beads. The sources of manufacture remain virtually unknown, although Lamb (1965*a*, 1965*b*) has suggested that manufacturing centers using scrap Western glass were in operation on the Malay peninsula during the first millennium A.D.

Artifacts of Stone

The chert flakes and cores are in the LTM tradition and require no comment. The two items of coral limestone (Plate II*f*, *g*) are either bottle stoppers or earplugs; I suspect the latter.

The stone beads from LB are of particular importance, especially the carnelians. There are twenty-three carnelians, three etched agates, one banded agate, one quartz, and one possible jade or nephrite. Of the latter three, the banded agate is of black and gray stone, and is drilled evenly with a metal bit, like the carnelians. It was almost certainly manufactured in India, where such drilling techniques were perfected. On the other hand, the quartz bead was made locally and split longitudinally before being finished. It has a crude conical hole drilled partly into one end, and clearly does not belong with the Indian group. The jade or nephrite bead is a fragment of a broadly drilled and fluted cylinder, like the example from Palawan illustrated by Fox (1970: color plate 1*A* : *g*). It may be of Philippine origin; the example shown by Fox is from either Duyong or Uyaw Cave, and is of Early Metal Period date.

The carnelian beads are of two kinds: faceted and spherical. The faceted ones range in length from 9 to 22 mm and are of a semitransparent red or orange. They are drilled with admirable precision from both ends, a well-known characteristic of the class (Lamb 1965*a*). There are two groups in terms of shape (Fig. 10*o*, *p*): the flattened lozenges with two broad flat sides and the octagonal or hexagonal faceted bicones. There are seven beads in the former group, four in the latter (two octagonal and two hexagonal). The spherical carnelians range from 4 to 16 mm in diameter, but only three exceed 8 mm, and seven of the total of twelve spherical carnelians have diameters of only 4–5 mm.

The majority, perhaps all, of these beads were probably made in India. However, fragments of carnelian beads which may come from a workshop have been found at Kuala Selinsing in Perak, West Malaysia (collections in University Museum, Cambridge), and it may be that imported Indian carnelian was worked locally in Malaya. Unless more definite proof is found to support this possibility I will accept a more conventional Indian origin for the Leang Buidane beads.

The main characteristics of the Indian carnelian bead industry have recently been summarized by Bridget Allchin (1977). Carnelian, which like agate is a variety of chalcedony, has been used for beads since Harappan times, and in historical times one of the main centers for manufacture has been Cambay in Gujerat, using carnelian mined near Ratnapura (see also Arkell 1936; van der Hoop 1932: 137). Carnelian and agate also occur in southern and eastern India, and were manufactured into beads at the Roman trading station of Arikamedu (Lamb 1965*a*). Unfortunately the sources of the Southeast Asian trade beads prior to the sixteenth century remain unknown, and the Cambay industry is of rather uncertain antiquity. However, the techniques of manufacture have changed little since Harappan times, and involve roasting to deepen color, flaking and grinding, and drilling with a metal or perhaps even a diamond drill. The Leang Buidane beads have certainly been drilled with one of the latter. The faceted beads were ground individually on grindstones, while the spherical ones may have been rotated in large quantities for long periods in containers with sand and water.

The date of the export trade to Southeast Asia is hard to establish. Historically the most extensive trade took place between A.D. 1300 and 1500 with the spread of Islam (Arkell 1936). As Vlekke (1943: 52) has noted, the first Moslem traders to penetrate Maluku during the thirteenth century were in fact Gujeratis from Cambay, not Arabs, so reasons for a trade in carnelians after A.D. 1300 are not hard to find. The carnelians were still available at this time; large numbers dating between A.D. 850 and 1100 have been found at the north Indian site of Ahichchhatrā (Dikshit

1952). They were being traded to East Africa by at least A.D. 800 (van der Sleen 1958).

However, carnelians were being traded into Southeast Asia long before the dates given above, according to archaeological indications. They date back to the beginnings of the Early Metal Period and are found in faceted forms identical to those of LB at Sa-Huỳnh (Parmentier 1924: Fig. 15), Hang-Gon (Saurin 1973), and Phu-Hoa (Fontaine 1972) in Vietnam, in jar-burial contexts which probably date between 700 B.C. and 1. They are probably shown carved on the Tanjungsirih image in South Sumatra (van der Hoop 1932: Pl. 10) in a context perhaps contemporary with the Dong-Son Culture of North Vietnam. They are also reported by Fox (1970: 118) from Manunggul Chamber B on Palawan, in an assemblage dated to 190 ± 100 B.C.

Several other Southeast Asian sites with faceted carnelians prior to A.D. 500 are known (e.g., Oc-Eo; Malleret 1962: 205), and the list would be extended greatly if one were to include the nonfaceted types, which are common as far east as the Palau Islands, despite their absence at LB. Of more direct relevance to the latter, carnelians of identical faceted form have been recovered from a pre-Sung burial in Cebu City (Hutterer 1973*b*: Fig. 3*g*) and from several Early Metal sites on Palawan (Fox 1970: color plate 1*A* : *O*) and Java (I. M. Sutayasa, personal communication). Harrisson reports them from the site of Jaong in Sarawak, dating between A.D. 900 and 1100 (Harrisson and O'Connor 1970: 143), and they were also being buried with imported pottery of Sung and post-Sung date in Sulu (Spoehr 1973: 76, 243) and Samar (Hutterer 1973*a*).

At the present time, these parallels can do no more than point out the importance of carnelian beads in Southeast Asia. As far as the LB beads are concerned, date of manufacture could perhaps be anywhere between 500 B.C. and A.D. 1500. As Dikshit (1952; 41) states of the faceted carnelians in India, they "are shapes of such common occurrence and are distributed over such a wide span of time that by themselves they have little dating value." Since there is no historical evidence for Indian contact with Indonesia prior to the first century A.D. (Wolters 1967), I would incline to date the majority found in Island Southeast Asia to between 1 and A.D. 1500.

The three beads of etched black agate from LB (Fig. 10*m*) are also of Indian origin. According to Mackay (1933) these beads were produced in Cambay and Delhi, and the white designs were formed by painting on a mixture of soda and vegetable paste, after which the bead was baked. The three LB beads are of sharply contrasted black agate and white designs, and are paralleled with absolute precision in a bead from Taxila dating from the first century A.D. (Fig. 10*n*). This form may date back to about 400 B.C. in northern India (Dikshit 1952: 35). The LB examples may thus be of first millennium B.C. manufacture, and may well have been in circulation for several centuries before burial. I know of no exact parallels for the LB beads from Southeast Asia, but spherical forms with similar etched patterns are known from Early Metal sites in the Philippines (Fox 1970: color plate 1*A* : *j*; Solheim 1964: Pl. 30: *l*).

Metal Artifacts and Baked Clay Moulds

Bronze or copper objects found at Leang Buidane include many curved fragments which appear to be from bracelets, a hollow cone-shaped item of bronze, and a copper socketed axe 65 mm long. Since these objects have been considered in detail and illustrated in a more recent paper (Bellwood 1976*b*), only a few comments are necessary here. The axe has a splayed and curved cutting edge, similar in general shape to the examples from the Tabon Caves (Fox 1970: Fig. 39). Three casting valves of baked clay were also found, each presumably being one-half of a two-piece mould. One of the valves, unfortunately fragmentary, appears to be for a socketed axe similar but not identical to the one recovered. The other two valves are also fragmentary; one appears to be for a parallel-sided axe, the other for a tubular object.

Iron objects include what appears to be a tang for a knife or spearhead, and two other small rodlike fragments. Places of manufacture of these objects are unclear for the iron and bronze, although the copper items (including the axe) were clearly cast locally. Copper is found commonly in Sulawesi and the Philippines. Tin, apparently, is not, and it may be that scrap metal was imported and recast.

The Date of Leang Buidane

The jar-burial assemblage contains no imported Chinese or Siamese pottery, and the artifacts in general (particularly beads and ceramics) suggest a date in the first millennium A.D., perhaps the latter half. One radiocarbon date of A.D. 1440 ± 80 (ANU 1516), obtained from charcoal collected from scatterings in the top sealing layer in the cave, clearly postdates the assemblage. There is also a thermoluminescence date for one of the baked clay casting moulds of 960 years B.P. (courtesy of Allan Mortlock, Australian National University). This date places the assemblage at around A.D. 1000, and I accept it as valid. The date of 950 ± 130 B.P. for an intermediate level of the assemblage of Buidane type from Leang Balangingi is also directly relevant. Overall considerations would suggest that Leang Buidane, and the Buidane Culture as a whole, dates to between A.D. 700 and 1200.

Leang Balangingi, Karakellang Island

The rock-shelter of Leang Balangingi is situated about 1.5 km northwest of the village of Rainis, on the central eastern coast of Karakellang. The shelter is about ½ km inland from the sea, and, like Leang Buidane, was used entirely for burials and offerings, mainly in the Early Metal Period. It contains no economic or habitation remains (apart from some shellfish), despite its apparent suitability for settlement, and this may be a reflection of its inland situation. Once sites such as Leang Buidane and Leang Balangingi had been used for burial, future generations would be unlikely to contemplate habitation in such caves, although this explanation cannot account for the absence of Preceramic and Neolithic remains. This remains something of a mystery.

The Leang Balangingi shelter has a habitable area 10 m long and up to 5 m wide, and is thus quite large. It is formed from coral limestone, and has a vertical back wall and a roof height of over 4 m. Excavation trenches were laid out in the center of the floor and were excavated to sterile deposits, which here consisted of stratified clays (denoted layer 3). The shelter may have an ultimate base of coral sand, but this was not reached.

Above layer 3 are layers 1 and 2, which contain the cultural materials. Layer 1 is a humic soil (Munsell 10YR 4/1) about 20 cm thick, which has formed only in the central and lowest portion of the shelter, and which owes its existence to the wash of humic materials down the slopes on either side. Beneath layer 1 is layer 2, more heavily leached and with a Munsell color of 10YR 5/3. Outside the boundaries of layer 1, layer 2 rises to the surface of the shelter, and is up to 40 cm thick in places. Neither of these layers has any cultural significance, and the main Early Metal assemblage runs through both. The maximum depth of cultural deposits is 70 cm.

The contents of layers 1 and 2 were kept separate during excavation, but the material is more meaningfully presented in terms of 10 cm levels. As with LB, fragments of individual vessels were found scattered from near the surface to a depth of 30 cm in layers 1 and 2. Oddly enough, no bones (human or animal) were found at all, but five separate human teeth were found among the sherds. Although the shelter is rather damp, it is unlikely that bones have dissolved, since there are shellfish in the deposits. Either the burials were ransacked in antiquity, or teeth alone were buried in some unknown commemorative rituals; the latter would appear to be the more likely situation.

We excavated 8.60 m^2 at Leang Balangingi, this being about 25% of the total habitable area. A total of 2604 sherds was recovered; distributions by depth are shown in Table 1. The columns for incised, impressed, and carinated sherds, square vessels, and tripods refer to sherds which in many cases are almost identical to the material from Leang Buidane. That the Balangingi assemblage is in the same tradition as Buidane is made even more evident by the rim forms, which have been analyzed but which are not illustrated here. All the major Buidane types are present. The Balangingi sherds have been graphed for thickness, and at all levels there are two quite sharply separated groups—the small vessels between 4 and 7 mm in thickness and the large burial jars between 10 and 13 mm. The 8 and 9 mm points are very low on all curves. Clearly the Balangingi material comes from separate groups of burial jars and offering pots, precisely as does that from Buidane.

TABLE 1. LEANG BALANGINGI: DISTRIBUTION OF POTTERY BY DEPTH (in numbers of sherds)

DEPTH	TOTAL POTTERY	PLAIN	INCISED	IM-PRESSED	CARI-NATED	RED-SLIPPED	SQUARE VESSELS	TRIPODS	BARAN-GUNUSA	CHINESE
0–10	532	466	13	—	9	15	5	5	17	2
10–20	1006	943	20	4	10	5	16	3	5	—
20–30	795	738	12	3	7	12	11	7	5	—
30–40	152	130	1	2	3	5	6	5	—	—
40–50	64	63	—	—	—	—	1	—	—	—
50–60	52	51	—	—	—	—	—	1	—	—
60–70	3	3	—	—	—	—	—	—	—	—
Totals	2604	2394	46	9	29	37	39	21	27	2
% sherds	100	92	1.8	0.3	1.1	1.4	1.5	0.8	1.0	—

One particularly interesting discovery at Balangingi comprised the deliberately smashed remains of a large plain jar, placed under a small flat slab of stone near the base of the cultural level. This pot was clearly broken prior to burial and the sherds placed in a small hole scooped in the shelter floor and then sealed with the slab. No bones were present, and the only possible association is a segment of a copper or bronze bracelet. This interesting circumstance suggests that deliberate smashing at placement could account for some of the disturbance in the Leang Buidane assemblage.

Two other vessels from Balangingi are of interest. One is the flat-based dish shown in Plate II*a*, which is red-slipped inside and out, and has shallow rim notches. It was again buried purposefully under a small stone slab near the base of the cultural level, like the burial jar above, and the two vessels are presumably contemporary. However, the flat-based dish is not evident as a Buidane form, and it does resemble a common vessel form found in Lapita assemblages in Melanesia (e.g., Green 1973: Fig. 4). I am not sure how this can be explained, since the Balangingi vessel is apparently of Early Metal date, and, like the burial jar, was broken before placement.

The other unusual piece is the large fragment of a vessel foot of apparent hexagonal plan shown in Plate II*b*. This is decorated with running scrolls enclosing rows of punctate decoration, a type of decoration not found at Leang Buidane. However, Solheim pictures a similar design on a lid of Kalanay affinity from Leyte (1964: Pl. 17*h*), and the Kalanay cave itself on Masbate has related material as well (1964: Pl. 7). This type of design is also paralleled on Late Neolithic material from Palawan (Fox 1970: 113).

Chinese sherds (unidentified) are found only in the top 10 cm at Leang Balangingi, although Rarangunusa sherds are found down to 30 cm, a situation which may reflect disturbance, since they are never found earlier than Chinese material elsewhere. It is unlikely that the Rarangunusa ceramic style overlaps in time with any Early Metal assemblages.

Other artifacts found with the jar burial material comprise one faceted carnelian bead, three red glass and two green glass beads, a coral "earplug" (Plate II*h*) similar to the examples from LB, two pottery penannular earrings likewise similar to the one example from LB, and three fragments of copper or bronze, including the bracelet segment referred to above.

The Leang Balangingi assemblage is dated from charcoal to 950 $\pm$ 130 B.P. (ANU 1714) at the 20–30 cm level, and is thus satisfactorily contemporary with Leang Buidane. Shellfish, so far unanalyzed, were found in all layers. These could indicate that the shelter was used for occasional habitation. However, the artifacts from the site are considered to be the results of burials and offerings rather than habitation. Offerings to spirits are still made in secluded places on Sangihe, and in 1974 we visited an offering place inland from Lapango village near the southern tip of the island. Here a number of artifacts, including modern crockery and coins, had been placed between the buttresses of a large tree. Informants described it as a place of offerings to spirits. It is not hard to imagine that Leang Balangingi may have served similar purposes—even the shellfish could be offerings—and such a circumstance might account for the absence of skeletal material apart from a few isolated teeth.

I thus interpret Leang Balangingi as a place of burials and offerings, in use mainly in the latter half of the first millennium A.D. The site is an unquestionable component of the Buidane Culture, a term which I would like to introduce for the Early Metal Period in the Talaud Islands.

TANJONG RARANGUNUSA AND ITS CERAMICS

Tanjong Rarangunusa (Tanjong = peninsula) protrudes from the northeastern shore of Karakellang and terminates in a raised coral knoll surrounded by a low cliff. A very small burial cave is formed in this cliff; it has an entrance 3–4 m wide by about 1.5 m high, but the inside of the cave rapidly dwindles to a chimney which leads to the top of the knoll. Only a few hours were spent on the site and no plan was made, so this description is unfortunately rather generalized.

The cave contained skulls and long-bones stacked in a niche at the back, and one skull was observed to be sitting on a plate believed to be of Ch'ing date. Above the cave, on the very rough coral surface of the knoll, we found very large numbers of Chinese and local potsherds. These sherds clearly resulted from offerings, perhaps connected with the burial cave, and were not associated with any habitation refuse. The exact extent of sherdage was not recorded.

The imported pottery collected from the site was all Ch'ing or European; and I would be inclined to date it to the eighteenth and nineteenth centuries. The local earthenware, in the Rarangunusa style mentioned several times earlier, was found in large sherds with clear details of decoration. For this reason, I have chosen Tanjong Rarangunusa as the type site for this style.

The decorative characteristics of Rarangunusa pottery are shown in Plate II*c*. Vessels, as far as can be determined, are round-based, globular, and have gently everted rims with high inclination angles, a high degree of taper, and rounded lips (see examples indicated *rr* in Fig. 8). Rarangunusa rims are in fact quite standardized and can generally be recognized. The percentage of vessels decorated is also very high (no exact figure can be given), and this clearly assists identification.

Rarangunusa decoration is on upper bodies and necks only, usually from a carination or point of vertical tangency to the lip. All decoration is done with a two-pronged tool and is generally vertically zoned. It is entirely unrelated to anything in the Buidane range. Motifs include vertical paired lines and zigzags, and the very distinctive trademark of paired notches, usually found in vertical rows. Lips are frequently notched, and thickened or flattened lips of the Buidane type are absent.

A point of great interest about the Rarangunusa style is its wide distribution. It was found in the top layer or on the surface of virtually every Talaud site visited, generally associated with Ch'ing ceramics. On Sangihe Island, sherds of precise Rarangunusa affinity were found in sites around Tahuna and Manalu (see below), and they have also been found at Beong on Siau Island. For Mindanao, Solheim (1975: 177–178) described what appears to be almost identical decoration on late pottery from Davao and Cotobato, in the latter case in association with stone burial jars in caves (Kurjack et al. 1971). Some of the incision from the Panhologan II cave on Samar could be related as well (Hutterer 1973*a*: 74). However, no pottery related to Rarangunusa is known from Minahasa, or anywhere on Sulawesi to my knowledge.

The Rarangunusa ceramic style may be interpreted as an expression of the high degree of contact among Mindanao, Talaud, and Sangihe in early historic times. Much of this contact took place under European and Islamic influence, in cultural circumstances to be discussed in the concluding section. The style may have survived until as recently as fifty years ago, although it is not produced today. Concerning the origins of the Rarangunusa style, I regard it as a household ware lacking the ceremonial vessel forms present in the Buidane assemblage. Such ceremonial vessels were quite clearly replaced by Chinese ceramics. The Rarangunusa decoration is unlike that of Buidane and might have developed in Mindanao rather than Sangihe-Talaud. Wherever it first developed, the spread of the style is more likely to be a result of widespread ties of intermarriage rather than of total population movement. The style is pleasing when done well and may simply have "taken on" as an element of fashion.

Other Sites on Karakellang and Sangihe

On Karakellang and Salebabu, a number of other caves and rock-shelters which may have cultural deposits were visited. None were excavated, but all produced a few surface sherds. Leang Totonbatu was the most interesting (Fig. 1, no. 4), being a burial cave near the top of an outcrop of raised coral limestone. The outcrop is on the end of the small peninsula called Tanjong Totonbatu. The cave, open at either end (and thus strictly a tunnel), is about 8 m long, 4 m wide, and 1 m high. It contains one stack of skulls and another separate stack of long-bones, from approximately thirty-five individuals. Separate from the bones is another stack of Ch'ing dishes, many polychrome. Local earthenware sherds were found only on the cave floor, and some of the material is of Buidane affinity, so the cave might contain earlier remains below the obvious surface material, which is not more than 300 years old. The cave also contains one Ch'ing brown glazed storage vessel, which has a large piece broken out of its side. Informants stated that this vessel once contained a skull. My impression was that the long-bones and skulls had been stacked recently, although I cannot be certain. A number of sides of wooden coffins or bone boxes were lying on the cave floor as well. Apart from a few small sherds, none of the material in this cave was disturbed or removed.

On Sangihe Island, very little archaeological material was recovered. Two shelters called Leang Mangki and Leang Kaluhaghi, near Tahuna, were excavated but found sterile, apart from Rarangunusa sherds on their surfaces. Near Manalu, two shelters called Leang Bowonleba and Leang Timpalo were visited, and the latter produced surface sherds of possible T'ang and Yüan pottery, as well as Rarangunusa sherds. Sangihe was neglected because so much material was found in Minahasa and Talaud, and because time was short.

A Possible Pebble and Flake Industry in Talaud

While walking along the track which leads across Karakellang from Beo to Rainis, we collected a number of chert tools. Most finds were made on the western half of this track, for about 3 km inland from Beo. Several of the specimens are flakes, and there is a single blade, which would not be out of place in the levels at Leang Tuwo Mane'e. However, there are also a number of chert pebble tools, as shown in Plate I*n*. These have varying amounts of cortex, and are both unifacially and bifacially worked. Nothing like them is known from the excavated LTM and Paso stone-tool assemblages, and they could be older than 8000 years on these grounds.

The question arises whether these tools are of Pleistocene date. Certainly, they are smaller than the Pacitanian tools of Java I have seen in Jakarta, but they appear to be in a similar tradition. Pebble tools are present in Upper Pleistocene assemblages from Niah and Tabon caves, in the Cagayan Valley of northern Luzon (von Koenigswald 1958), and also in the industries of presumed Pleistocene date from Flores and Timor (Maringer and Verhoeven 1970*a*, 1970*b*, 1972). I hesitate to suggest Pleistocene settlement in the Talaud Islands without better evidence, but the material is at least suggestive.

THE MINAHASA AND TALAUD RESULTS IN WIDER PERSPECTIVE

Apart from the possible Pleistocene tools from Karakellang, the earliest site excavated by the 1974 expedition was the shell-mound at Paso on Lake Tondano, which dates from about 6000 B.C. The obsidian tools from this site are related to other, nonblade industries from the Philippines, eastern Indonesia, and Australia, and they are part of a hunting and gathering way of life that was widespread through these islands in the earlier Holocene. No definite evidence for horticulture was recovered from Paso, and the site is basically a shell-mound of a type known from Hoabinhian contexts on the mainland of Southeast Asia and on Sumatra. The later red-slipped ceramics from Paso are of unknown date, but have both Neolithic and Late Period affinities in the Philippines.

The Leang Tuwo Mane'e site on Karakellang belongs to the period after 5000 B.C. when blade industries had spread through the eastern islands of Southeast Asia, and its levels also record the arrival of plain Neolithic ceramics at about 2500–3000 B.C. By this date, linguistic evidence for the reconstruction of early Austronesian languages would suggest that horticulture was present, as well as a canoe technology and voyaging ability. Neolithic cultures of the LTM type developed soon after 3000 B.C. from the Philippines down to Timor.

Following the Neolithic, which at present is best known from ceramics, we have a much richer record for the Early Metal Period, from 500 B.C. to about A.D. 1000–1200. The internal developments of Early Metal cultures are still poorly known, but Fox (1970) has presented a good sequence for Palawan. He divides the period into two: an Early Metal Age beginning about 5–700 B.C. with bronze and glass beads, and a Developed Metal Age from about 200 B.C. with iron, glass bracelets, and an increasing use of carnelian beads. The Buidane Culture of the Talaud Islands has very strong Philippine affinities, but is more closely related to the Kalanay Culture of the central Philippines than to Palawan, and dates to the latter half of the first millennium A.D. Earlier material may be present at Leang Balangingi, but I am not certain of this.

Broader relationships in the Preceramic, Neolithic, and Early Metal periods in the Philippines and eastern Indonesia have been discussed in more detail in two other works (Bellwood 1976*a*, 1977: chaps. 3 and 8), and I cannot repeat all of the details here. The Late Period, as I have defined it elsewhere (Bellwood 1976*a*), is characterized by the widespread use of imported Chinese and Siamese pottery, and it witnesses the demise of the more flamboyant local ceramics of the Early Metal Period. In the western Philippines and Sarawak, this import trade goes back as far as the T'ang dynasty (Fox 1967; Zainie and Harrisson 1967), but the greater part of the trade in the Philippines took place from Sung times (A.D. 960–1279) onward (Beyer 1948; Cole and Laufer 1912; Reynolds 1967). Historical Chinese records of this trade go back to A.D. 982 (Scott 1968: 67), and it seems likely from the findings of the 1974 expedition that Sangihe and Talaud were being reached by at least this date. For Minahasa I have no definite data.

Identification of social and political changes in Minahasa and Sangihe-Talaud in the Late Period is much more difficult, and impossible from present archaeological data alone. There is no good evidence for any direct extension of fourteenth-century Majapahit control into these regions (Vlekke 1943; Rausa-Gomez 1967), and they do not appear to have been Islamicized during the fifteenth century. All the evidence suggests that they remained as small-scale pagan tribal societies until well into the nineteenth century. This is how Wallace (1962: 186) described the people of Minahasa for the period prior to 1822, when the Dutch introduced coffee cultivation. Although the four local chiefs of Sangihe were called "Raia" (Rajah) in 1521 (Pigafetta 1969: 64), it is not clear that this term indicates any high degree of political integration, since its use was so widespread. Archaeologically, there is no evidence to contradict a view of small-scale tribal societies prior to the nineteenth century, and the widespread Rarangunusa style may well postdate 1800 and thus be contemporary with the period of active Dutch government.

In conclusion, the importance of the sites described in this report is that they give a continuous chronological sequence from 6000 B.C. to the present, with only a short break between Paso and the basal layers of Leang Tuwo Mane'e. The four periods represented are Preceramic (8000–3000 B.C.), Neolithic (3000–500 B.C.), Early Metal (500 B.C. to A.D. 1000), and Late (A.D. 1000 to the ethnographic present). These periods are taken from my two previous discussions of prehistory in the eastern islands of Southeast Asia (Bellwood 1976*a*, 1977: chap. 8), and I have tried to be systematic without rejecting too much of the terminology previously in use. Southeast Asia is now far from being archaeologically unknown, and some sort of order needs to be brought into the data. A long and detailed sequence, such as that presented here, provides a good excuse for synthesis.

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