I will now turn to the preceramic archaeological record of the late Pleistocene and early Holocene periods in the Indo-Malaysian Archipelago. In this time span there are a number of long-occupied, radiocarbon-dated, and stratified sites (for locations see Chapter 3, Fig. 3.2 and Fig. 6.1), and all associated human remains are of anatomically modern physical type. Prior to the appearance of pottery, most stone industries in the region consisted of flaked rather than polished stone tools, although edge-ground pebble tools do occur in some sites (such as Niah in Sarawak and Kota Tampan in Peninsular Malaysia). Indeed, well verified edge-grinding of late Pleistocene date is also reported from Australia, New Guinea, Vietnam, and Japan (see below). The rather limited economic evidence at present available for the whole of the Indo-Malaysian Archipelago suggests a universal economy of hunting and gathering prior to about 2500 BC. During the Holocene the stone tool industries became more varied, and after 2500 BC new items—pottery and fully ground stone adzes are the most visible—spread through the region.

As I have shown in Chapter 4, the linguistic evidence clearly attests a slow expansion of Austronesian-speaking agricultural groups during the last five millennia, but this expansion was not a geographically unified and totalitarian process of replacement. The hunting and gathering lifestyle has been progressively eroded but it has certainly never disappeared entirely, and flaked stone tools continued to be used by both hunting-gathering and agricultural groups until the recent past in some areas. Agriculturalists have also continued to hunt and gather. Hence in recent millennia different technologies and economies could and did occur in neighboring and contemporary sites, creating a mosaic (Hutterer 1976). The archaeological record has to be consid-
Fig. 6.1 Major archaeological sites in Peninsular Malaysia.

Organized partly in terms of synchronic regional variation and not totally in terms of pan-archipelagic technological and economic phases following one after the other.

Before going further, it is necessary to give a brief recapitulation of the paleoenvironmental evidence from the archipelago, particularly pertaining to the
last 30,000 years, within which the great bulk of the preceramic dated sites lie (see Chapter I, Section IVD). The most dramatic environmental changes would undoubtedly have been caused, particularly in the Sundaland region, by a drop in sea level from about minus 70 to minus 120 meters between 30,000 and 20,000 years ago (see Fig. 1.6), and then a much more rapid rise to the present level between approximately 15,000 and 8,000 years ago. Apart from drowning an unknown number of coastal archaeological sites—to the obvious detriment of modern archaeological studies—the postglacial sea level rise carved the Sundaland continent into the islands that exist today. Economically, the change would have had certain benefits from the increased length and environmental variety of coastline, but there might also have been less favorable changes for human population densities, particularly through the expansion of everwet rain forest, both altitudinally and latitudinally, with the prevailing warmer and wetter climate.

Although the postglacial climatic amelioration perhaps had little effect in the core regions of the equatorial rain forest close to the equator, it would presumably have had more impact on fringing areas of seasonal climate, where monsoon forest or parkland vegetation may have been more extensive during the last glacial period. An increasing density of vegetation in these areas would have affected hunting populations through a diminution in mammal biomass, which decreases dramatically as one moves from optimal savanna conditions, through parkland, toward rain forest. For instance, modern densities of wild banteng cattle range from about ten to fifteen animals per 100 hectares in Javan savanna grasslands down to only one to two animals per 100 hectares in rain forests (Pfeffer 1974). Rain forest faunas present additional problems in that animals rarely herd together; in addition, many species are arboreal, making them more difficult to hunt. This atomistic pattern also characterizes rain forest vegetation, with many species mixed in a mosaic of small numbers of individuals rather than in large stands. Such patterns tend to promote nonspecialized economies and low population densities amongst hunting and gathering populations. Even today, huge regions of interior Borneo rain forest are quite uninhabited by agriculturalists and foragers alike. In view of these points, perhaps it is no coincidence that most of the late Pleistocene flaked stone assemblages in the archipelago come from such seasonally dry regions as central Java, southern Sulawesi, the Lesser Sundas, and parts of the Philippines; human collecting and hunting populations would presumably have been denser here.

Yet there is a puzzle in this. If the archaeological record for the Indo-Malaysian Archipelago is taken at face value it suggests that inland rain forest occupation occurred mainly during the warmer and wetter phases of the late Pleistocene and early Holocene (Endicott and Bellwood 1991; Bellwood 1990a, 1993). So far there is only very limited evidence for occupation a long way inland dur-
ing the drier last glacial maximum, around 20,000 years ago. Such evidence is
represented, for instance, by a few riverine shells at Gua Sireh in Sarawak, a site
which then would have been located about 500 kilometers inland (see p. 175).
There appears to be no evidence for occupation of the Peninsular Malaysia inte-
rior rain forests at this time. This goes against expectations, and the reasons are
not clear. Perhaps the very expansion of the equatorial forest itself caused those
people living toward its boundaries, especially in regions formerly under mon-
soon forest, to try new and ultimately more successful methods of trapping and
subsistence and hence to increase their population densities. Perhaps food sup-
plies are actually greater in some equatorial rain forests than in the monsoon
forests, although if this is true it would go against the body of theory postulat-
ing that equatorial rain forests are not good locations for foraging (this issue
was discussed at some length in Chapter 5, Section I). Perhaps also, in periods of
very low sea level, people occupied mainly the coastal regions, which at that
time would have been far away from the present-day equatorial interiors of Pen-
insular Malaysia and Borneo. At present we simply do not know the answer to
this puzzle, but the last glacial maximum “gap” certainly seems to be real.

1. PENINSULAR MALAYSIA AND MAINLAND SOUTHEAST ASIA:
THE HOABINHIAN AND ITS PREDECESSORS

Prior to Austronesian settlement, the Malay Peninsula and the adjacent coasts
of northeastern Sumatra belonged culturally to the mainland of Southeast Asia
rather than to the islands. Between about 18,000 and 10,000 years ago, Hoabin-
hian assemblages first appeared throughout this region, and there seems little
reason to doubt that in Peninsular Malaysia they were made by populations
ancestral—either fully or in part—to the present Austroasiatic-speaking orang
asli (Negritos and Senoi; Solheim 1980). These groups had ceased to make
flaked stone tools long before recorded history, but the Negritos have preserved
a hunting and gathering way of life that may be regarded as a modified descen-
dant of the inland Hoabinhian economy.

The term Hoabinhian has been in use since the 1920s to refer to a stone tool
industry characterized by distinctive pebble tools flaked over all of one or both
surfaces (Fig. 6.2). Hoabinhian sites are found all over the mainland of South-
east Asia, westward to Burma, and northward to the southern provinces of China
and perhaps Taiwan. So far, all radiocarbon-dated Hoabinhian assemblages fall
between outer limits of 18,000 and 3,000 years ago; it is possible that some
Hoabinhian tool manufacture continued into even more recent times in some
regions. The greatest “density” of Hoabinhian occupation, particularly in souther-
ly regions such as Thailand and Malaysia, undoubtedly occurred in the early
Holocene.
A. The Antecedents of the Hoabinhian

Late Pleistocene lithic predecessors of the Hoabinhian have been discovered in recent years (Reynolds 1993), particularly in northern Vietnam, southern Thailand, and Peninsular Malaysia. In Vietnam an antecedent pebble tool industry termed the Sonvillian has been dated to between 23,000 and 11,000 radiocarbon years ago (Ha Van Tan 1978, 1980, 1985a, 1991; New Researches into Prehistory of Viet Nam 1988). The Sonvillian differs from the Hoabinhian in having mainly end- and side-flaked pebbles, rather than pebbles flaked all over one surface, and there is clearly overlap between the two both in technology and in time (Hoabinhian industries first appeared in Vietnam around 18,000 years ago). Whether the differences are culturally significant or simply reflect raw material variations remains to be seen, but it is clear that there is no sharp break in lithic evolution in Vietnam during the late Pleistocene and early Holocene.

The situation of apparent continuity also occurs in Peninsular Malaysia at
the site of Kota Tampan in Perak—a site already introduced in Chapter 2, Section D6—because of older (mistaken) views about a potential association with *Homo erectus*. Since 1987 Kota Tampan has been researched by Zuraina Majid, who has shown that it served as a manufacturing locus for pebble and flake tools of quartzite, located close to a former lake about 25 kilometers long possibly dammed up by a landslide in the Perak River valley (Zuraina and Tjia 1988; Zuraina 1990, 1991). The tools are in soil evidently sealed by a layer of volcanic ash from an eruption of the Toba volcano in northern Sumatra, dated by fission tracks in zircons to about 31,000 years ago (Zuraina 1990:89–90). The tools comprise a few pebble tools, one edge-ground tool, and large numbers of flakes; as illustrated they show some resemblance to the Sonvilian of Vietnam and may thus be regarded as a potentially ancestral Hoabinhian industry. However, in Malaysia—unlike Vietnam—there are no occupations dated anywhere between Kota Tampan and the full Hoabinhian, which started there apparently around 13,000 years ago. The last glacial maximum is a void.

The same problem applies to the final site to be described here, a site that adds yet another twist in the form of a technological noncontinuity prior to the Hoabinhian. This site is a rock shelter called Lang Rongrien in Krabi Province, southern Thailand (Anderson 1987, 1990). Lang Rongrien now lies 12 kilometers inland near the head of Phangnga Bay, but during the last glacial maximum it would have been up to 135 kilometers inland. In its upper layers it contains a fairly standard Hoabinhian industry (underlying Neolithic burials) dated to the early Holocene, with a strong bifacial aspect similar to those from the Malaysian sites to be described below. Beneath the Hoabinhian in Lang Rongrien lies an archaeologically sterile layer of rock fall, then beneath this is a basal layer with chert pebble and flake tools dated from four charcoal radiocarbon samples to between 38,000 and 28,000 years ago. Some of the basal tools are of tabular form with bifacial edges, and some of the small debitage looks as if it might derive from bifacial working (see Anderson 1990: Figs. 45–53 for illustrations). This debitage appears from the illustrations to be a little similar to the bifacial flaking debitage from Tingkayu in Sabah (Section IIB), although Anderson does not interpret it in this way. A sequence similar to that from Lang Rongrien is reported from the cave of Moh Khiew in northern Krabi (Pookajorn 1994), but full details of this are not yet published. Moh Khiew also has a basal biface industry dated to 26,000 BP, seemingly followed by a Hoabinhian layer dated only to the end of the Pleistocene.

In his conclusions, Anderson points out that the Lang Rongrien basal industry with its nonpebble focus is clearly not ancestral to the pebble-tool Hoabinhian, an opinion with which I concur. But how one explains this apparent disjunction is another matter. If the basal industry of Lang Rongrien really is related to the biface industry from Tingkayu, it could represent a specific radia-
tion of a population that has not been picked up elsewhere (except possibly at Moh Khiew). Whatever the answer, in the Malay Peninsula it appears that the Hoabinhian represents a later radiation—following a hiatus in last glacial maximum occupation—into the expanding postglacial equatorial rain forests of the early Holocene. It should be remembered, of course, that there is no evidence for such a hiatus in more northerly regions such as China, central/northern Thailand, or Vietnam; the sequence of occupation there seems to be continuous from at least 23,000 years ago right through to the commencement of the Neolithic.

B. Some Hoabinhian Basics

In Peninsular Malaysia and Sumatra the true pebble-tool Hoabinhian, as defined by all-over flaking of one or both surfaces of river pebbles, does not appear to extend back in time for more than 13,000 years. Hoabinhian sites are found mostly in rock shelters, but there are a few coastal shell middens in Sumatra and Peninsular Malaysia that seem to belong to the present period of sea level after 8,000 BP. These middens have never been satisfactorily investigated; most have now been destroyed for lime (McKinnon 1991). In addition, some inland open sites with Hoabinhian stone tools have been reported. However, the excavation record is highly skewed toward the inland rock shelters in the many limestone massifs that dot the jungles of the Malay Peninsula.

The characteristic tool types of the Hoabinhian are unifacially or bifacially flaked flat river pebbles of an approximate fist size, often with cutting edges all around their peripheries (Fig. 6.2). They come in a variety of shapes, from oval through rectangular to triangular, and some occasionally have waisted forms. Bifacially worked tools appear to predominate in most sites in Peninsular Thailand (e.g., Lang Rongrien) and Malaysia, but unifacial forms predominate elsewhere in Thailand, Burma, Laos, Cambodia, and Vietnam. The industry (or technocomplex, after Gorman 1971) has been excavated most prolifically in the limestone massifs of northern Vietnam, where it is associated with flake tools, stone mortars and pounders of various sizes, bone points and spatulae, and flexed burials often dusted with red ochre (hematite).

In Vietnam there is considerable industrial variation within the Hoabinhian time span, and many sites also have edge-ground tools, apparently dating back to 18,000 BP in Xom Trai Cave (Ha Van Tan 1991; Pham Ly Huong 1994). Indeed, overlapping with the late Hoabinhian in time and place is a variant industry that has long been known as the Bacsonian—in reality just an aspect of the Hoabinhian characterized by a high proportion of edge-ground tools. The Bacsonian, which is recognized separately from the Hoabinhian by Vietnamese archaeologists, is stated to date mainly from about 11,000 BP onward;
this date clearly marks a time when edge-ground stone tools started to become common. Pottery (mostly plain or vine/mat impressed rather than cord-marked) was also widespread in Vietnam by at least 6,500 BP and seems to overlap genuinely with Hoabinhian/Bacsonian tools in the shell mound of Da But in Thanh Hoa Province (Bui Vinh 1991). In this case we may be witnessing a local adoption of pottery making and perhaps also agriculture by indigenous late Hoabinhian populations; more on this in Chapter 7.

One major question, of course, concerns the role of the Hoabinhian itself in any local development of agriculture in Southeast Asia. It should be noted that the Hoabinhian technocomplex covered a vast area, extending virtually from the equator in Sumatra to beyond the Tropic of Cancer in southern China. In the far southern regions, I remain fairly convinced that it had no true agricultural status, but there can be less certainty for northern Vietnam and northern Thailand. On this question there are still only the results of Gorman’s excavations in Spirit Cave in northwestern Thailand (Gorman 1970, 1971; Glover 1977b:11–17), where remains of a number of edible fruits and legumes appeared in terminal Pleistocene Hoabinhian levels. None of these remains is from a definitely domesticated species (Yen 1977), and current opinions on the status of the Spirit Cave Hoabinhian economy regard it as part of a foraging lifestyle that might have continued in remote valleys in northern Thailand until 1,000 years ago (Higham 1989:59–61; Bellwood 1992:88). On the other hand, Kuchikura’s (1993) studies of wild yam densities in Peninsular Malaysian rain forests lead him to suggest that inland hunter-gatherers there could not have existed in completely undisturbed environments without access to agricultural foods. This need not imply that Hoabinhians were necessarily agriculturalists; perhaps they used their pebble tools to clear and ring-bark vegetation in order to encourage forest floor vines, such as yams, to thrive (a scenario also suggested for the late Pleistocene New Guinea Highlands by Groube 1989). Whatever the real nature of the Hoabinhian economy—and I am certainly unable to accept that it was one of systematic field agriculture—it is now apparent that true agricultural economies based on the cultivation of rice were present in many coastal and lowland valley regions of the Southeast Asian mainland well before 4,000 years ago. There is no clear evidence to suggest that these economies were developed entirely by resident Hoabinhians.

**C. Peninsular Malaysia**

Having given this contextual introduction to the Hoabinhian, I will now turn to its most southerly expressions in Peninsular Malaysia (see Fig. 6.1) and Sumatra (Fig. 3.2). In Peninsular Malaysia a number of inland Hoabinhian caves and shelters have been excavated in the many limestone massifs scattered
through the northern states of Perlis, Kedah, Perak, Pahang, Terengganu, and Kelantan. In addition, coastal shell middens once existed in the northwestern states of Pinang and Perak. The majority of sites were excavated during the 1920s and 1930s and the reports can only be described as brief. However, the important site of Gua Cha in Kelantan—excavated in 1954 and more recently by a Malaysian National Museum team in 1979—has produced a firm record. During the last fifteen years Malaysian archaeologists have excavated several more sites, including Gua Bukit Ta’at in Terengganu (Nik Hassan Shuhaimi et al. 1990; the basal date here is 9,000 BP), Gua Gunung Runtuhr in Perak (Zuraina 1994), Gua Kelawar in Perak (Adi and Zulkifli 1990), and Gua Peraling and Gua Chawas in Kelantan (see below). First, we examine Gua Cha.

This massive limestone rock shelter lies in a remote inland region of equatorial rain forest on the bank of the Nenggiri River, a tributary of the Kelantan River, which flows into the sea at Kota Bharu. In 1954 three large trenches were excavated in the shelter by Sieveking, who published a detailed report on the contents of the Neolithic layers (Sieveking 1954) but gave only stratigraphical observations on the underlying Hoabinhian. In order to throw light on a number of questions concerning the Hoabinhian, the shelter was excavated on a small scale again in 1979 by Adi Taha of the Malaysian National Museum (Adi 1985). I will combine the results of both excavations here.

The Hoabinhian layers at Gua Cha are up to 170 centimeters thick and rest on sterile alluvial deposits. According to sediment analyses the Hoabinhian deposit itself is also of alluvial origin and was clearly formed by occasional flooding of the shelter by the neighboring river (Hughes, in Adi 1985). The industry is a surprisingly homogeneous collection of bifacially flaked flat river pebbles (see Fig. 6.2), with a minority component of cruder pebble tools together with flake debitage and a number of river pebbles that may have served for crushing and pounding—some have red ochre stains. Bone tools were absent, despite their occurrence at other Peninsular Malaysian sites such as Gua Bintong in Perlis (Fig. 6.3). The homogeneity and emphasis on bifacial working of the Gua Cha industry are both quite striking, and radiocarbon dates indicate a commencement soon after 10,000 years ago with a fairly decisive termination a little before 1000 BC. A number of primary flexed or secondary burials had been placed in the Hoabinhian deposits; none contained certain grave goods, but one young flexed male excavated in 1979 (Plate 17) had a stone-slab pillow and a body cover of tufa chunks dusted with red ochre. Another unexcavated burial lay beneath two limestone slabs.

The diet and economy of the Gua Cha Hoabinhians were investigated from three angles. First, an examination by Bulbeck (1982) of the occurrence of caries in the teeth of the burials excavated in 1979 suggested considerable consumption of sweet foods such as fruits and honey. Second, flotation of the deposits
produced a large quantity of charcoal but unfortunately no recognizable plant-food remains; in this regard it is important to note that a large quantity of carbonized rice was found in an upper layer of the site dated to about 900 years ago, so this cereal would have been detected had it been present earlier in carbonized form (silica phytoliths, since discovered in sediments in nearby Gua Chawas [see below], were not searched for when the site was excavated). Therefore there is no evidence to suggest cereal cultivation at Gua Cha—either Hoabinhian or Neolithic. Finally, large numbers of animal bones were found throughout the Hoabinhian layers; pigs (*Sus scrofa* and the bearded pig *Sus barbatus*) were the most commonly killed animals, and it is possible that large numbers of bearded pigs were killed during mass river crossings, as described by Hislop (1954) for Peninsular Malaysia and by St. John (1974, I:138) for northern Borneo. Sieveking (1954) found about twenty-five small heaps of jaws and skull fragments of juvenile pigs in one sector of the Hoabinhian deposits, and young animals seem to have been favored as prey in other species, too. The latter included deer of several species, bear, monkeys, gibbons, rats, squirrels, flying foxes, and (more rarely) rhinoceros and cattle. This species list is very similar to that found in Hoabinhian sites as a whole (Gorman 1971:Table 2). It is also worth noting that small quantities of freshwater shellfish were found in the site, but marine shells were absent as in most inland Hoabinhian sites (Bellwood 1993).
Within the Southeast Asian Hoabinhian in general, the question of overlap with Neolithic assemblages characterized by pottery and fully ground stone adzes has always been a particularly vexed one, partly because the necessary stratigraphic details were simply not recorded in the earlier excavations. In northern Vietnam, as noted above, Hoabinhian tools do sometimes overlap with Neolithic assemblages of potsherds and stone adzes, as in the shell mound of Da But. So in some northern regions it is quite possible that the Hoabinhian did grade slowly into a fairly coherent and presumably agricultural array of Neolithic cultures. In Peninsular Malaysia, however, the situation appears to be different. According to Sieveking (1954, 1987), the Hoabinhian at Gua Cha was separated by a gap from the overlying Neolithic occupation, which commenced with a working floor for quadrangular cross-sectioned stone adzes and later continued with a series of burials that I will describe in Chapter 8 (the Neolithic occupation at Gua Cha was mainly associated with burial activity rather than true living-site occupation as in the Hoabinhian).

The 1979 work at Gua Cha tended to support Sieveking, although there can be no doubt that a few Hoabinhian tools do occur in the pottery-bearing upper layer from which the Neolithic burials were cut, despite their absence in the adze working floor. My own inclination here is to regard these tools as having been brought to the Neolithic surface during the course of intensive grave digging and then either reused or simply thrown away. They certainly do not occur amongst the Neolithic burial goods themselves, which do include several fully ground stone adzes. It seems, however, that Sieveking may originally have over-emphasized his concept of a gap between the Hoabinhian and the Neolithic; a more likely explanation is that rapid cultural change took place in the region of the site and that this change, according to the skeletal evidence reviewed in Chapter 3, Section III B, involved no very major replacement of population. I strongly suspect that the whole of the Gua Cha sequence belongs to ancestral orang asli populations who, as I will document later, were brought fairly rapidly into the Neolithic world of the Malay Peninsula through some degree of Senoi immigration from the north commencing around 2000 BC.

Some of the complexity of the overall Peninsular Malaysian situation for the Hoabinhian can be estimated from a brief review of other sites. Another case of nonoverlap between Hoabinhian and Neolithic, similar to that for Gua Cha, is illustrated by Peacock (1971) for the unpublished excavations at Kota Tongkat in Pahang (here shown as Fig. 6.4). However, at the cave of Gua Kechil ("Small Cave"—modern spelling Gua Kecil), also in Pahang, Dunn (1964) found eight Hoabinhian tools together with cord-marked and plain pottery in a lower occupation layer about 40 centimeters thick. This was overlain by a layer with polished adzes and pottery similar to that of the main Neolithic layer at Gua Cha. Hoabinhian tools were absent in this upper layer, but the situation beneath
Fig. 6.4 Distributions of Hoabinhian tools, pottery, animal bone, and stone flakes by depth at Kota Tongkat, Pahang. From Peacock 1971. Courtesy: University of Sydney, B. A. V. Peacock.
could suggest an overlap situation of Hoabinhian tools and pottery (Fig. 6.5) that can certainly not be recognized in the sequence from Gua Cha. Nevertheless, Gua Kechil is a small site and the sample of artifacts is small; I have expressed some reservations about its real significance elsewhere (Bellwood 1993).

It may also be recalled that edge-ground tools are quite characteristic of later stages of the Hoabinhian (i.e., the Bacsonian) in Vietnam. In Malaysia they have been reported from old excavations at Gua Madu in Kelantan (Tweedie 1940) and from Gua Baik (Gol Ba’it, Stein Callenfels and Noone 1940) and Gua Kerbau (Stein Callenfels and Evans 1928) in Perak. At the last two sites they
were reported as occurring down to the undated bases of the deposits. They are now recorded from the upper Hoabinhian layers in Gua Peraling in Kelantan (see below).

The most recent excavations in Peninsular Malaysia, undertaken since the first edition of this book was published, should add large quantities of data to the above reconstructions. Zuraina's excavations in Gua Gunung Runtuh in Perak (Zuraina 1994) have yielded a crouched burial of a Hoabinhian male laid on his back within a midden deposit dated between 11,000 and 7,500 BP on freshwater shell. The burial was of a person of Australomelanesian affinity with a deformed left arm and hand, aged forty to forty-five years. Zuraina points out that unifacial tools predominate in this site and that some links with the much older Kota Tampan assemblage are evident. Unfortunately, however, Gua Gunung Runtuh has almost no Neolithic deposits, so it does not inform about the post-Hoabinhian transition. Other recent excavations by Zuraina have been undertaken in the caves of Gua Sagu and Gua Tenggek in Pahang, the former with occupation from about 14,000 BP, and in Gua Teluk Kelawar (dated from 8,500 BP) and Gua Harimau, both near Lenggong in Perak (Zuraina 1991).

Two large rock shelters excavated in 1994 by Adi Taha—Gua Peraling on the Perias River and Gua Chawas in the hinterland of the Nenggiri—should also add much to questions about Hoabinhian technology and transitions to the Neolithic. The base of Chawas has currently not been reached with certainty, but Hoabinhian occupation here dates from at least 12,000 (freshwater shell) years ago. Above the Hoabinhian comes a rather sparse Neolithic deposit, present by ca. 3,000 years ago, with indications of virtually no overlap between the two. Gua Peraling (Plate 18) has about 3 meters of dense Hoabinhian occupation with masses of biface flaking debitage, large numbers of river pebble Hoabinhian bifaces, a few fragmentary burials, and large quantities of food remains (bone, shell)—all stratified beneath some rather disturbed Neolithic burials. Some of the Hoabinhian tools are edge-ground in the upper deposits. Analysis of the materials from these two sites is continuing, but Gua Peraling in particular promises an extremely detailed record of Hoabinhian activity during the early and middle Holocene. The deposits in Gua Chawas are especially rich in phytoliths, amongst which two species of banana, four of rattan, and three of bamboo have already been tentatively identified in layers dating between 12,000 and 5,000 BP (Doreen Bowdery; research in progress).

The Peninsular Malaysian shell middens now tell rather a sorry tale of destruction, although Adi (1983:53) has reported a recent discovery at Seberang Perak, near Teluk Anson in Perak, for which a date of about 6,000 BP is available from the middle of the deposit (Adi Taha, pers. comm.). It has also been known since 1860 that large middens of marine/estuarine bivalves once occurred on old beach ridges in the mainland portion of the state of Pulau Pinang (formerly
Province Wellesley). These have now been destroyed apart from small remnants, but the remains of three were excavated long ago by Stein Callenfels at a location about three miles inland called Guar Kepah (Stein Callenfels 1936a; the sites were then called Guak Kepah).

According to Stein Callenfels, these middens—originally up to 5 meters thick—contained hearths, secondary burials dusted with red ochre (one jaw was classified as “Palae-Melanesian” by Mijsberg 1940; see Chapter 3, Section IIIB), pig and estuarine fish bones, Hoabinhian tools, necked and apparently hammer-dressed axes, and small quantities of cord-marked and incised pottery (Plate 19). No stratigraphic order for these items was clearly established, but Tweedie (1953:69) thought that the pottery may have postdated the Hoabinhian tools. It appears that the Hoabinhian tools and the necked axes (often described as “ground,” but I suspect from illustrations that they were simply hammer-dressed) did belong together with the midden deposits, which presumably date from the present phase of sea level and thus somewhere within the Holocene. These sites clearly pose a number of unresolved problems; they appear to represent a coastal Hoabinhian adaptation and thus an aspect of Hoabinhian life that cannot be found in the inland shelters, but that may now be virtually lost as a result of the terminal Pleistocene rise in sea level and the activities of lime burners.

D. Sumatra

The only Hoabinhian sites found within the modern political boundaries of Indonesia lie inland from the northeastern coast of Sumatra for a distance of about 130 kilometers between Lhokseumawe and Medan (Witkamp 1920; Kupper 1930; Heekeren 1972:85–92; Brandt 1976; Glover 1978b; McKinnon 1991) (also see Fig. 3.2). Many of the sites are large shell middens up to 100 meters in diameter and 10 meters deep (Plate 20), with interstratified lenses of shells, soil, and ash. Most appear to be located at approximately present sea level on an early Holocene strandline that now lies between 10 and 15 kilometers inland, although some have their bases well below present sea level (e.g., see Sukajadi Pasar IX; McKinnon 1991:135). Most have been buried under sediments deposited along this rapidly aggrading coast during the past few millennia. None have been systematically excavated or dated, although a radiocarbon date of ca.7,500 BP has been reported from a point two-thirds of the way down the profile in the midden of Sukajadi Pasar III (McKinnon 1991:138). Unfortunately, most of the Sumatran middens have now been quarried for their shells—used in making cement—leaving behind huge holes in the ground that fill with water. Like the Pulau Pinang middens of Peninsular Malaysia, the Sumatran middens must be of Holocene date and may have been occupied at any time between
10,000 and perhaps as recently as 3,000 years ago. The region has no caves or shelters, but other nonmidden Hoabinhian sites have been reported from inland terraces and flat limestone rises to about 150 meters above sea level.

Many archaeological collections have been made from the Sumatran middens over the years; these are described by Heekeren (1972). The majority of the tools appear to be unifacially flaked oval or elongated pebbles, often flaked all over one surface. Bifacial tools and edge-ground tools appear to be rather rare, as are retouched flakes. This industry thus gives the impression of being technologically simpler than that of the Peninsular Malaysian sites. Grindstones, mortars, red ochre, and human burials also occur in the middens, and faunal remains include elephant, rhinoceros, bear, deer, and presumably many smaller species. The shellfish illustrated by Heekeren (1972:Plate 36) appear to belong to the same estuarine species that once formed the Pulau Pinang middens. Pottery appears to be universally absent, at least in confirmed association with the Hoabinhian deposits.

E. Further Comments on the Hoabinhian

As reported from Peninsular Malaysia and Sumatra, the Hoabinhian seems to have had a coastal and inland hunting and gathering mode of economic orientation. I feel it is pushing the evidence too far to suggest a local development of agriculture in these regions. As I have stated, the Hoabinhian of the intermediate tropical zone in northern Vietnam and southern China may hold more significant evidence in this regard, although a lot more material needs to be excavated if this possibility is to be substantiated. The edge-grinding of stone tools is clearly an innovation from within the Hoabinhian cultural matrix, but the situation is not so clear for pottery, partly because shelter deposits are so prone to those types of hidden stratigraphic disturbance that will perhaps always cloud the issue.

Hoabinhian sites sensu stricto do not occur in the Indo-Malaysian islands outside northeastern Sumatra. I suspect they are present in Taiwan, perhaps in the so-called Ch'angpinian of the eastern coast (Sung 1979) and also perhaps in some aceramic assemblages of "chipped hoes" reported by Koyama (1977) from the western coast. In the Philippines, assemblages termed Hoabinhian have been reported by Kress (1977a, b) for Palawan and by Peterson (1974) for the Pintu shelter in northern Luzon, but the illustrations provided by Peterson (1974:Plate 1) do not convince me that the tools from this site are really any different from the contemporary pebble and flake industries characteristic of many of the other Indo-Malaysian islands. Naturally, signs of a gradation from the classic mainland Hoabinhian into the quite different stone tool expressions found in the islands might be expected, and it is possible that the Philippines
and Sumatra are in such gradation areas. But my own experience from handling Peninsular Malaysian and Sumatran Hoabinhian stone tools is that they represent a dominance of pebble tools as opposed to flake tools, which sets them well apart from contemporary industries in all the island regions, including the Philippines.

II. ISLAND SOUTHEAST ASIA: THE LATER PEBBLE AND FLAKE INDUSTRIES, WITH VARIATIONS

In the Philippines, East Malaysia, and Indonesia the record of flaked stone tool production goes back to between 30,000 and 40,000 radiocarbon years ago, as it does in the Melanesian and Australian regions beyond. As noted in Chapter 3, the record appears to document a radiation of anatomically modern humans from Sundaland across the seas of eastern Indonesia into Australasia and western Oceania. The problem, however, is that radiocarbon dates of this antiquity could in fact be much older because small amounts of young radiocarbon can contaminate them in the direction of younger ages. This problem is currently a “hot topic” of debate in Australia, where archaeologists would like to know if the first colonists arrived 30,000 or more than 50,000 years ago (e.g., Roberts et al. 1994; Allen and Holdaway 1995). Currently, luminescence dating of sediments is being used to support the older ages back to 50,000 years or more in Australia, but this technique has never been applied in Southeast Asia. Common sense dictates that people were obviously somewhere (but not necessarily everywhere) in eastern Indonesia before Australia was first colonized, but “when” is a big question under current scientific analysis. In this chapter I can only give the radiocarbon dates as published. These go back for 40,000 years, but there is no guarantee that this is the true chronological basement.

The stone industries of Island Southeast Asia, beyond the Hoabinhian orbit, belong to a widespread pebble and flake technocomplex that was also—on present evidence—carried by at least one of the first populations to settle in Australia and New Guinea. The technocomplex includes the majority of the Indo-Malaysian flaked stone assemblages of the late Pleistocene and Holocene. In its most basic form it is characterized by varying proportions of simple pebble tools, cores, and flakes with nonstandardized shapes. As I have noted, the Hoabinhian tendency toward a dominance of pebble tools with regular bifacial or all-over unifacial working is not present. While this circumstance may reflect important cultural differences between mainland and islands, I suspect there may also be some geological reasons behind it. For instance, the blocky cherts and obsidians used more commonly in the island regions may have been more amenable to a flake tool technology than the rounded pebbles that occur in Mainland Southeast Asian rivers, although this is only a subjective opinion
drawn from my own rather limited geological observations. In Indonesian islands where cherts and obsidians are not present but where beach or river pebbles are (such as the northern Moluccas—see below), the results, perhaps predictably, are often somewhat Hoabinhian-like.

The best way to visualize the prehistoric record of flaked stone tools within the last 40,000 years in the Indo-Malaysian islands is in terms of periodic and normally highly localized accretions to the basic pebble and flake technocomplex, which in its basic form underwent little change over this period. Thus, sporadic and short-lived occurrences of prepared-core, bifacial lanceolate, edge-grinding and blade technologies occur, each in a restricted region and over a different period of time. The final stage is of course the widespread appearance of fully ground adzes and axes together with pottery after 3000 BC. I will return to this in Chapter 7. However, it should be noted that the older flaked stone technologies often continued with no obvious changes until they finally faded in the face of metal tools from the late first millennium BC onward. The flaked stone traditions do not in themselves record the spread of an agricultural lifestyle in the region or even necessarily the arrival of new populations.

In organizing this chapter I have decided to proceed along geographical lines, discussing the best-known sequences from Borneo through eastern Indonesia. The industries with a blade or "microlithic" component, all dating within the last 7,000 years, are described separately in the final section.

A. The West Mouth, Niah, Sarawak

The huge West Mouth of the Niah Caves in Sarawak (Plate 21) contains the longest stratified record of human occupation in Island Southeast Asia. The caves themselves form a network of high and awe-inspiring passages, with an area of about 10.5 hectares, inside the Gunung Subis limestone massif near Niah in northern Sarawak. The system has many outlets, of which the West Mouth is the largest, being about 250 meters across and 60 meters high. Most of the system is floored with continuously deposited wet guano, but an area high and dry at the northern end of the West Mouth was used for habitation and burial from about 40,000 until perhaps 2,000 years ago or later. This area was excavated on a fairly massive scale by the late Tom Harrisson between 1954 and 1967.

Harrisson produced many impressionistic articles and a few detailed typological studies based on his research at Niah, but no proper plans or stratigraphic drawings were ever made. Zuraina (1982) later attempted to piece together some of the information that could be gleaned from the earlier records. In addition, other publications since 1967 by Barbara Harrisson, Lord Medway (Earl of Cranbrook), and by biological anthropologists have filled in many lacunae in the records of animal faunas and human burials.
Harrisson's reconstructions of the cultural sequence at Niah were based partly on the idea that depths and ages could be correlated regularly across the site. However, the site has an uneven surface, and arbitrary levels of excavation up to 24 inches thick—plus a set of partially contradictory radiocarbon dates recorded only by depths below surface—clearly do not encourage much confidence in the finer details of the "Niah area phaseology" that he published and revised from time to time. His last version appeared in a 1970 paper, in which he favored a basal flake industry with pebble tools appearing intermittently and becoming edge-ground after about 10,000 years ago. I will consider the Neolithic tools and the pottery (the latter comes in at about 2000 BC) in Chapter 7, Section IIID, but wish now to examine the preceramic West Mouth sequence in terms of artifacts, faunas, and human burials.

1. Artifacts at Niah

The Niah industry is mainly of fairly coarse-grained rocks and comprises an unretouched array of chunks and chips, without coherent core forms and with few conchoidal flakes. There is little systematic retouch. Pebble tools also occur, but apparently not in the oldest levels. Bone spatulæ and points do apparently occur to the base of the site, some made on pig tusks or mammal long bones (Harrisson and Medway 1962; Zurain 1982:Appendix 3). Stone mortars and edge-ground pebble axes appear later in the sequence; dates unfortunately are not clear, but Zurain suggests that both could have appeared somewhere between 20,000 and 10,000 years ago, although Harrisson preferred the latter date for the edge-ground axes.

The edge-grinding of pebble axes is of course a significant technological development (Hayden 1977). It occurs from about 30,000 years ago in Japan (Oda and Keally 1992), within the Hoabinhian in Vietnam and Malaysia, and from dates in excess of 20,000 years ago in northern Australia (Schrire 1982) and 14,000 in the New Guinea Highlands (Mountain 1983:94–95). Hence, if Niah is included, there are at least four apparently separate late Pleistocene occurrences, to which may be added possibly early Holocene appearances on Palawan in the Philippines (Kress 1977a; see also Peterson et al. 1979 for Luzon) and on Manus Island in northern Melanesia (Fredericksen et al. 1993). On Manus, and in Golo Cave on Gebe Island in the northern Moluccas, edge-grinding was also used on shell adzes after about 12,000 years ago (see Section F). The technique clearly precedes the development of blade technologies, even in Japan where blades appeared by perhaps 26,000 years ago, and it occurs in similar pebble- and flake-based industrial backgrounds in each region. At Niah it was probably adopted because of the difficulty of finding good stone for flaking, and it is totally absent in many contemporary or later Indo-Malaysian industries where good cherts were available (for instance, in neighboring Sabah).

Hence there are two rather contradictory aspects of the distribution of edge-
grinding: on the one hand a widespread distribution around the eastern fringes of the Old World, but on the other hand a spotty occurrence within this territory (within Australia, for instance, it remained strangely restricted to the region of Arnhem Land until about 5,000 years ago). It thus seems that equal cases can be made for multiple independent development of the technique or for its diffusion from one source. The real answer may combine both processes.

2. The Niah Economy

The animal bones from the West Mouth indicate fairly eclectic hunting patterns. Medway (1977a) lists fifty-eight species of mammals found in the cave. Apart from the bats, which may have fallen naturally into the deposits, there are numerous species of rodents and insectivores, seven species of primates, eleven carnivores (excluding the Neolithic dog and a possibly imported tiger tooth from the top of the site), and ten other large native mammals (see also Harrison 1996). Wild pigs (*Sus barbatus*; Medway 1978) were the most popular prey throughout, together with porcupines, monkeys (four species), and orangutan; gibbons were virtually absent (Harrison 1996). Other large mammals from the oldest levels include giant pangolin (now extinct), Malay pangolin, Malayan tapir, deer, and bovids (Hooijer 1963; Medway 1977a). The Sumatran rhinoceros (Medway 1965) and the Malayan bear also make rare appearances at higher levels. In addition to these mammals, fish, birds, monitor lizards, snakes, and crocodiles were also brought into the cave.

In Chapter 1, Section IV E, I discussed some of the faunal evidence suggesting that the Niah region may have had a drier and more seasonal climate during the period of the last glacial maximum. Some of the larger mammals such as rhinoceros and bear seem to have been more common at this time, and during the early Holocene a number of species (such as orangutan, rhinoceros, monkeys, and rats; Medway 1978) commenced a slight decline in size. The Malayan tapir also declined into local extinction. Medway (1977a) attributes these Holocene changes to the spread of dense forest and its nonclearance by human agency, an explanation also favored by Harrison (1995). Estuarine shellfish also increased in numbers in both the West Mouth and neighboring Lobang Angus as a result of the rise in sea level and the encroachment of the coastline.

3. Human Burials

The biological affinities of the Niah human remains have been discussed in Chapter 3, Section III B, and I will only add cultural details here. The single "deep skull" (see Plate 10), associated by Tom Harrisson (1975b:161) with a radiocarbon age of about 40,000 years, was found together with some long bones under a large stone. Barbara Harrisson (1967:143) has stated that the dated charcoal was taken from directly above the skull. Nevertheless, the fact
that it lies some 125 centimeters below all other human remains in the site suggests burial from a higher level. The problem cannot really be solved because all deposits surrounding the skull have now been excavated away, although there is no reason to doubt a date at some time in the late Pleistocene.

The other burials from the preceramic levels comprised flexed, sitting, and disturbed fragmentary remains, similar in configuration to those from Hoabinhian sites. A number of radiocarbon dates on bone collagen have been published (Harrisson 1975b; Brooks et al. 1977), and these suggest that the burials in a sitting ("Buddhalike") posture date between 12,000 and 6,000 BC, while the flexed ones (Plate 22) run from perhaps 9,000 BC onward. Several of the flexed burials occurred in later levels with pottery, so this mode is not of course a guarantee of an early date. Red ochre powder and traces of burning occurred on several burials (Harrisson 1967). Grave goods included an edge-ground pebble (unfortunately not with a dated burial), a rhinoceros femur pillow, a bone point, and an estuarine shell with red ochre. It should be noted that the only burial dated twice, number 147, has one published collagen determination of ca. 7,000 BP (Brooks et al. 1977) and another contradictory determination on bone from the same burial of ca. 13,600 BP (Harrisson 1975b).

The task of summarizing 35,000 years of preagricultural life around the Niah Caves is a difficult one. The flaked stone tool tradition reflects a poverty of raw material, and there are insufficient data to study trends in economy within these thirty-five millennia in any very useful way. The sequence clearly lacks the specialized flaking technologies that appeared in other nearby regions, yet the early adoption of edge-grinding suggests for Niah a fairly innovative prehistory somewhat unique to itself. It is also worth noting that Niah was probably almost 200 kilometers inland during the last glacial maximum, and that the cave of Guai Sireh in Sarawak, which has yielded a few riverine shellfish dated to ca. 20,000 years ago, was perhaps 500 kilometers inland (Ipoi and Bellwood 1991). This is important evidence in the light of the interior rain forest debate discussed in Chapter 5, Section I.

B. Sites in Eastern Sabah (Northern Borneo)

Between 1980 and 1987, an excavation project carried out in eastern Sabah under the aegis of the Sabah Museum in Kota Kinabalu documented a number of cave and open sites with deposits extending back for perhaps 30,000 years (Bellwood 1984, 1988). The situation of these sites is shown in Fig. 6.6; the caves and shelters are found in the Madai and Baturong limestone massifs, both of which contain networks of solution tunnels, some of which emerge into the open air as dry habitable locations (as in the Niah Caves). Baturong is in turn surrounded by a large area of water-laid deposits that are presumed to have
Fig. 6.6 The locations of the Tingkayu, Baturong, and Madai sites in eastern Sabah. See text for explanation of abbreviations.
been laid down in the bed of an extinct lake formed by the damming of an old course of the Tingkayu River by a lava flow extruded from the flanks of nearby Mount Mostyn (Plate 23). Although these sites are near the coast now, the low sea level conditions of the late Pleistocene may have placed them up to 150 kilometers inland.

In Fig. 6.6 I have shown the approximate boundaries of the old Tingkayu lake, as identified by previous soil and geological surveys and by fieldwork undertaken in 1981. The lake covered perhaps 100 square kilometers before it drained away as the outlet of the Tingkayu River eroded a gorge just north of Tingkayu village. The date of formation of the lake is probably indicated by a radiocarbon determination of 28,000 years ago from charcoal sealed beneath the end of the lava flow, which outcrops into the side of the exit gorge. By 18,000 years ago the lake appears to have been partly or wholly drained away, as shown by the occurrence of sediments of backwater alluvial origin deposited beneath archaeological layers of this age in the Hagop Bilo shelter (Magee 1988). These dates are highly significant because a number of open sites lie directly on the shoreline of the old lake; on locational grounds they may be considered as contemporary with the lake, and thus between 28,000 and 18,000 years old.

The major lake-edge sites, labelled TIN 1 and 2 in Fig. 6.6, lie close together on a small promontory that juts into the old bed close to the lake outlet. TIN 1 has been mostly destroyed by the bulldozing that led to initial discovery of the site, but TIN 2—excavated in 1980, 1984, and 1987—contained a discrete manufacturing floor for the bifacial tools that characterize the Tingkayu industry. Unfortunately, the acid forest soil in which these sites lie has left no traces of bone or charcoal and there are no direct dates for the tools themselves.

If the Tingkayu stone industry (Fig. 6.7) really does belong to the Lake Tingkayu stage, it shows a unique level of skill for its time period in Southeast Asia. The tools are mostly made on a locally quarried tubular chert; the precise source is not known and may no longer exist, or it may be buried somewhere in the vicinity of the site. Many of the tubular blanks were worked into large bifaces and into smaller and quite remarkable lanceolate knives, the latter apparently representing the main goal of the manufacturing process. Only one lanceolate was found complete (in TIN 1: see Fig. 6.7, middle right); it has very fine surface flaking, but broken segments and points with varying degrees of finish are common. In fact, most of the bifaces in the site were found broken, occasionally in two parts that could be refitted; most complete specimens were presumably taken away for use elsewhere. In TIN 2 one excellent biface 14 centimeters long broke during manufacture and an artisan tried to continue flaking one of the parts into a smaller tool, but eventually gave up (Fig. 6.7, top left). The use-wear that occurs on a few bifaces suggests utilization of mainly the side edges, despite
Fig. 6.7 The Tingkayu chert biface industry. The top three tools are points/knives in finished or almost finished states. The two large bifaces at bottom show signs of use wear but may in origin be discarded preforms.
the overall pointed shapes. Hence, they could have served combined functions as both projectile points and knives.

The majority of the tools were found in the bulldozer-disturbed area of TIN 1, but the stratigraphic evidence from TIN 2 strongly suggests a single unified industry. The sites have also yielded large numbers of bifacial reduction flakes, plus a steep-edged thumbnail scraper and a few flaked cores. In the first edition of this book I also referred to pebble tools and horsehoof cores (shown as Fig. 6.14 e–j in the first edition of this book), but these are all of a different kind of chert not found stratified in the excavated working floor at TIN 2. There is strong reason to suspect that many could have been made by heavy bulldozing equipment (Bellwood 1988:72). Alternatively, they could be from a layer of a different period originally above the TIN 1 site that has been totally disturbed. Unfortunately, it is not possible to check on this now, and the safest course is to remove these tools from consideration owing to the doubts about their provenance.

At present this bifacial industry is quite unique in the whole of Southeast Asia, except for one apparent lanceolate found years ago in a tin mine in Kedah in Peninsular Malaysia (Stein Callenfels 1936b). Although similar forms do occur in northern Australia, they all seem to postdate 4000 BC. It seems likely to me that this tradition was developed locally, perhaps to meet a specific need in this rather unusual lacustrine environment. In eastern Asia there are remote parallels for the lanceolates in the late Pleistocene (post-18,000 bp) Diuktai tradition of northeastern Siberia (Michael 1984; Yi and Clark 1983) and in several regions of Japan after about 18,000 years ago, but these occurrences are so distant that they can be no more than noted at the present time. The possibility of a link with the bifacial industry in the basal layer of Lang Rongrien in southern Thailand is discussed on pages 160–161.

During the Lake Tingkayu period the Baturong massif formed a towering limestone island, and the rock shelters along the base of its southern cliff were all drowned. After the lake drained away the Tingkayu open sites were abandoned. In the shelter of Hagop Bilo (BAT 1 in Fig. 6.6) the basal and culturally sterile alluvial sediments were overlain by midden deposits in alluvium dating between about 18,000 and 12,000 years ago. These midden layers contain mainly three species of lacustrine gastropods, and marine shells are absent. The animal faunas (Cranbrook 1988a) include pig, sambhur deer, mouse deer, porcupine, monkey, rat, snake, tortoise, monitor lizard, birds, and other small unidentified species. The stone tools of this period lack the bifaces and comprise a fairly typical Indo-Malaysian pebble and flake industry with single- and multi-platform cores, utilized flakes, and flat-based and steep-edged, domed, scraper-like tools, all made of chert. Features of some interest include a class of long bladelike knives (Fig. 6.8), perhaps functional descendants of the Tingkayu lan-
ceolates, and the presence of an opal phytolith gloss on the working edges of some tools. This gloss is widely reported from other sites of this period and later in Southeast Asia (see Section IIIC below), but was absent in the Tingkayu industry where open situations may not have been conducive to its survival—had it once existed. Another tool of interest from Hagop Bilo is a large bone spatula similar to those from Niah. Tablets of scratched red ochre were also recovered.

Soon after 12,000 years ago the Hagop Bilo shelter was in turn abandoned. The absence of marine shells in the deposits suggests that its inhabitants were mainly inland dwellers, as one might expect with the shoreline perhaps 100–150 kilometers away. By 10,000 years ago, however, the Madai Caves (Plate 24) may have been coming within easy reach of the approaching coastal resources, and the cave users apparently moved seaward from BatuRon to Madai at this time. The largest of the Madai Caves, Agop Atas (MAD I; see T. and B. Harrisson 1971 for earlier excavations here), today contains a substantial Idahan village occupied seasonally for bird’s-nest collection. Above MAD 1 lies the smaller Agop Sarapad (MAD 2); both caves were intensively inhabited by hunters during the early Holocene, between about 10,000 and 7,000 years ago.

The early Holocene human deposits in MAD 1 lie in an acidic guano deposit; thus only stone tools survive, with some charcoal—all animal bones have totally dissolved. But the MAD 2 cave has much better conditions, for here the people deposited a large shell midden against the cave wall that has created and maintained its own alkaline environment; bone survives in quite good condition, although both caves are too damp for any plant organic matter to have survived. The MAD 2 midden thus tells the best story: It has yielded thousands of stone tools of local river-pebble chert—an industry similar to that from

Fig. 6.8 Elongated bladelike chert flakes from Hagop Bilo.
Hagop Bilo but lacking the bladelike knives (Fig. 6.9). There is a heavy emphasis on pebble tools, large steep-edged tools, multiplatform and horsehoof (single-platform) cores, and utilized flakes, many of which have glossed edges. A number of large pitted anvils or grindstones occur, some coated with red ochre (Fig. 6.10). Hammerstones are also common, either for stone toolmaking or for food or ochre preparation on the anvils. The food remains in the midden include many shells of the estuarine mangrove shellfish *Batissa* and *Anadara*; clearly the inhabitants were now visiting the encroaching coast fairly frequently. Most shells, however, are of the three same riverine shellfish species that were eaten earlier at Hagop Bilo. The animals hunted were also similar, with the addition of larger creatures such as the orangutan, cattle, and rhinoceros; these appear to have been absent at Hagop Bilo, but the small sample size makes this uncertain. Remains of the wild dog *Cuon alpinus* and Javan rhinoceros have also been identified from Agop Sarapad by Cranbrook (1988b), and recent research by Terry Harrison (pers. comm.) has led to the identification of tiger. These are the only secure reports of these animals from prehistoric contexts in Borneo (Table 1.1), and they no longer live on this island.

After 7,000 years ago the two Madai caves were abandoned. I am unable to see any clear explanation for this, except to suggest that the inhabitants may have moved to a coastal location, or perhaps dwelt elsewhere in an unexcavated part of the cave system. However, there seem to be no other caves suitable for long-term habitation in the Madai massif; this implies strongly that the population did move away. For about 4,000 years the caves remained unoccupied; then a new and totally different cultural assemblage made its appearance. I will describe this in the next chapter.

**C. The Southwestern Arm of Sulawesi**

The southwestern arm of Sulawesi has produced one of the best preceramic sequences of late Pleistocene and Holocene stone tool working in the whole Indo-Malaysian Archipelago. I have already looked at the rather enigmatic open-site industry of the region around Cabenge (Chapter 2, Section III-D5). Archaeological excavations have also been carried out since early this century in caves and shelters in the towerlike karst topography that is particularly well developed in the Maros region inland near Ujungpandang (Makassar). Many sites here have produced assemblages belonging to the industry of backed flakes and microliths known as the Toalian, which I will describe in the next section. The Toalian postdates 7,000 years ago and overlaps with the appearance of pottery in the region. However, earlier assemblages are now known as a result of several seasons of fieldwork in the Maros shelters of Leang Burung 2 and Ulu Leang 1.
Fig. 6.9 The Agop Sarapad (MAD 2) chert industry. Top: pebble tools. Second row: cores. Third and fourth rows: flakes, some with edge gloss. Drawn by Lakim Kassim.
Fig. 6.10 Hollowed mortar of volcanic rock from Agop Sarapad.
Leang Burung 2 (Presland 1980; Glover 1981) has produced an industry characterized by unretouched flakes and small multiplatform cores of chert from levels dated between 29,000 and 17,000 years ago, according to radiocarbon determinations on freshwater shell. Some flakes have an edge gloss of a type found widely in this region (as in Hagop Bilo, above), suggested here to result
from the cutting of stems or leaves (Sinha and Glover 1984), possibly for mats or baskets. In addition, there are at least four elongated bladelike flakes with faceted striking platforms (Fig. 6.11a, b). These are significant because they suggest a degree of conscious core preparation prior to flake removal that is not found in any other Southeast Asian industry of this period. There are, however, no recognizable prepared-platform cores in Leang Burung 2 and the technique seems here to have played quite a minor role. Its invention may have been independent of occurrences elsewhere—it does not appear to continue on into the Holocene period in the Sulawesi sites.

Also found in Leang Burung 2 are pieces of red ochre, but bone points are absent, as are fishbones and marine shells, as the sea was presumably very far from the site at this time. The industry seems to continue (after a possible gap) into the lower levels of the shelter of Ulu Leang 1 (Glover 1976). These date from the early Holocene and contain rare estuarine shells from the coast, which had approached to within 35 kilometers of the shelter by 6,000 years ago (Glover, E. 1990). In Ulu Leang there is a distinctive range of steep-edged domed tools and horsehoe-shaped cores of white chert, similar to the Agop Sarapad industry of the same date from Sabah (Fig. 6.11c, d, e). Bone spatulæ also appear in basal Ulu Leang 1; this bone tool tradition is elaborated in the succeeding Toalian industry.

D. The Northern Arm of Sulawesi: The Paso Midden

The Paso shell midden (Bellwood 1976a) lies close to the shoreline of Lake Tondano, in the inland volcanic terrain of the Minahasa Peninsula. The midden is about 30 meters in diameter, averages 1 meter in depth, and consists of lenses of loose lacustrine shell interstratified with occupation layers. The latter contain an obsidian flake industry, bone points, red ochre, and prolific faunal remains. The site is radiocarbon dated to about 6500 BC.

The obsidian, collected locally, is vesicular and coarse; lumps were mostly smashed to obtain sharp chips and chunks, although flakes were struck individually from multiplatform cores as well. There are no pebble tools (one would perhaps not expect them in a raw material of this type), and no edge gloss has been observed, perhaps due to low visibility rather than total absence. A few chunks and flakes were retouched, often into steep-edged and high-backed forms like those of Agop Sarapad and basal Ulu Leang 1. The faunal remains from Paso and from the contemporary (pre-Toalian) layers at Ulu Leang 1 have been identified by Clason (1986, 1987). Pigs (Sus celebensis) were most popular in both sites and occurred with anoa, babirusa, macaque monkeys, rodents, and the two Sulawesi species of marsupial tree-dwelling cuscus (Phalanger celebensis and P. ursinus). The lake-edge situation of Paso allowed for considerable hunting
of water birds (rails, coots, geese, ducks), pigeons, and doves, while the karst-
riverine situation of Ulu Leang led to more frequent catches of tortoises, snakes,
and occasional fish. In neither assemblage are there indications of animal
domestication.

E. Eastern Timor and Flores

From four caves in eastern Timor, Glover (1977a, 1986) has excavated an indus-
try with basal dates of about 13,000 years ago. It continued with little change
into the ceramic period, which began here during the late third or second mil-
lennium BC. The tools are primarily chert flakes (there is also some obsidian),
and the retouched forms are mainly steep-edged scrapers. A number of the
unretouched flakes have an edge gloss, and there are also a few long, thick
blades (Fig. 6.12). Basically, this Timorese industry has much in common with
those just described from Sabah and Sulawesi, but it does seem to be a little dis-

tinctive in its predilection for long, bladelike artifacts.

The Timor fauna of the period prior to 2000 BC is dominated by several spe-
cies of extinct giant rats that survived until about 2,000 years ago, together with
fruit bats, snakes, reptiles, fish, and shellfish (other placental mammal species

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig6_12.jpg}
\caption{Stone tools from Uai Bobo Cave 2, East Timor: (a, b) bladelike flakes with steep retouch; (c, d) flakes with edge gloss. Mid-Holocene. Courtesy: Ian Glover.}
\end{figure}
such as pigs and deer were all introduced into Timor after 2500 BC). Remains of gathered plants in the early levels include seeds or fragments of the perennial cereal Job’s tears, betel vine, areca nut (the ingredients of betel chewing), and candlenut (Aleurites) (Glover 1977b:18). An undated industry from several open sites on Flores may be related to the Timor material. I have already referred to these sites in Chapter 2, Section IIIDS, as some components may be of considerable antiquity, possibly contemporary with an extinct species of Stegodon.

F. The Northern Moluccas

Since the first edition of this book was published, the record of early modern human colonizing activity has been expanded remarkably, at and just beyond the eastern fringe of the Indo-Malaysian Archipelago. Dates for the initial settlement of Australia are now being pushed beyond the 40,000-year “radiocarbon barrier,” perhaps as far back as 60,000 years ago according to recent luminescence dates. Sites in Papua New Guinea indicate that some coastal regions of the island were settled by at least 35,000 years ago, and the Highlands by about 30,000 years ago. Cave sites in the Admiralty Islands, New Britain, New Ireland, and the northern Solomons also reveal that humans were crossing water barriers, in some cases perhaps out of sight of land, by 30,000 years ago.

These early maritime colonizers in the western Pacific made flake tools like those in contemporary sites in Indonesia, ate marine fish and shellfish, and by at least 20,000 years ago appear to have been trading small amounts of obsidian from New Britain to New Ireland. Although the navigational capabilities of these early settlers were perhaps not great—they were apparently unable to migrate beyond the Solomon Islands—they did achieve a 200-kilometer crossing from either New Guinea or New Ireland to the Admiralty Islands by at least 13,000 years ago. These were presumably intentional voyages, undertaken for purposes of colonization (for the new Melanesian data see Spriggs in press; Allen and Gosden 1992; Smith et al. 1993).

The ancestors of these Pleistocene pioneers must have come from Indonesia. Recent research here, on the islands of Halmahera, Morotai, and Gebe in the northern Moluccas, is helping to fill in some of the gaps that currently exist for late Pleistocene human activity between Sulawesi and Papua New Guinea (Bellwood et al. 1993). On Gebe, a sequence of human activity extending back for over 32,000 years has been recovered from two coastal caves called Golo and Wetef, located about 1 kilometer apart (for locations see Fig. 3.2). The lowest levels of both caves contain stone flakes, coral cooking stones, and burnt marine shells, but unfortunately little else. A major phase of human activity seems to have commenced in Golo cave (Wetef being still under analysis) around 12,000 years ago, when edge-ground adzes of Tridacna and Hippopus
shell (Plate 25) appeared in the record and circular settings of coral blocks were placed on the cave floor (Plate 26). The latter represent the oldest examples of deliberate human construction yet found in the Indo-Malaysian Archipelago.

In the upper layers in both caves, between about 10,000 and 3,000 years ago, there is a sudden appearance of wallaby (*Dorcopsis* sp.) and cuscus (*Phalanger alexandrae*) bones, together with occasional bones of fish and reptiles. The wallaby appears to have been introduced to Gebe by human agency, but whether from Halmahera or New Guinea is not known. The cuscus may be an endemic Gebe species (Flannery and Boeadi 1995), but the absence of both the wallaby and the cuscus in the lower layers of the cave, despite excellent shellfish preservation, makes one wonder how long they have been on the island. Human introduction of both in the terminal Pleistocene seems to be a possibility. Bones of the two species also make an appearance in another Gebe cave called Um Kapat Papo at about 7,000 years ago. In Golo, these bones are found in association with many volcanic cooking stones, small bone points, and with an extended human burial that was placed in a shallow grave filled with soil mixed with powdered red ochre; many discarded faceted tablets of red ochre were found in the soil around and above the skeleton, but there were no grave goods. Finally, after about 3,000 years ago, pottery appears in the Golo record, and there is also a large series of adzes made on *Cassis cornuta* shell lips that find a parallel in sites of this age in the western Pacific. The Golo and Wetef sequences are still provisional, but it is evident that these sites will produce one of the longest and most detailed late Pleistocene records for any region of eastern Indonesia.

Another cave called Gua Siti Nafisah on the southern Halmahera mainland has preceramic levels of mid-Holocene date (ca. 5,500 to 3,000 BP), in which the same wallaby species as that found in Golo occurs together with an extinct bandicoot. Both animals became extinct on Halmahera only within the past 2,000 years, perhaps due to overhunting and dog predation. Surprisingly, Siti Nafisah has no flaked stone tools at all, only manuports (mainly cooking stones) and a few bone points; this is perhaps the only case in Southeast Asian archaeology where a site has turned out to have absolutely no flaked lithic technology, and the circumstance is a little hard to explain. Stone tools do occur, however, in two caves adjacent to each other on the southern coast of Morotai—Daeo 2 and Tanjung Pinang—that have a sequence extending back to 14,000 years ago. But here there are absolutely no ground-dwelling marsupials at all, only fish (interestingly confined to the Holocene layers when the sea was close to the sites), rodents, and cuscuses. The Morotai sites have a fairly amorphous stone industry made on flaked beach pebbles (Plate 27), again with volcanic cooking stones, bone points, and ochre.

These three Moluccan site complexes give much food for thought, partly
because they are so variable in their marsupial records and their stone industries. Unlike the Melanesian sites, there is no good evidence for stone tool transport from island to island. The absence of marsupials (except cuscus) from Morotai is also a mystery given the possibility of the translocation of wallabies to Gebe and similar cases of animal translocation reported from Melanesia (Flannery and White 1991). One receives the impression of small, isolated groups of hunter-gatherers in the Moluccas, perhaps with economies based on sago and canarium nut exploitation, as well as coastal fishing and mammal hunting. The stone tool industries are very simple in technology, as they are in the Melanesian islands.

On the other hand, some hints of external contacts do occur after 15,000 years ago. For instance, the heavy Tridacna shell adzes found in Golo Cave are paralleled in contemporary layers in Pamwak Cave in the Admiralty Islands (Fredericksen et al. 1993) and also possibly in the southern Philippines (Ronquillo et al. 1993). The use of ochre tablets seems to have been fairly universal all over the archipelago by this time; the Golo examples are quite similar to those from Hagop Bilo in Sabah (above). It is also at about 14,000 years ago that we have the first evidence of a human presence on Morotai. In this regard, although the northern Moluccan islands are to some degree intervisible, we must beware of assuming that visibility need always mean accessibility. Some of the smallest islands like Gebe might only have been intermittently occupied, especially prior to 15,000 years ago. After this time it might be that people became better equipped for interisland travel on a regular basis, but further research on this question is required.

F. Comments

The above sections detail preceramic sites or site complexes for which there is ample information. Other sites of late Pleistocene to early Holocene date include the cave of Tianko Panjang in the Sumatran highlands near Lake Kerinci (Bronson and Asmar 1975), which has yielded unretouched obsidian flakes and chips dating from about 11,000 BP onward. In the Philippines we have the long industrial sequence of chert tools dating back for 30,000 years from the Tabon Caves on Palawan (Fox 1970, 1978), plus the preceramic industries from sites such as Musang Cave in northern Luzon (Thiel 1988–1989) and Balobok shelter in the Sulu Archipelago (Ronquillo et al. 1993). These Philippine industries all fit well within the Indo-Malaysian pebble and flake repertoire.

All the industries I have discussed (especially the cherts and obsidians) are characterized by flake production with stone hammers from multi- or single-platform cores. Core smashing appears to have been as important as systematic
flaking in some sites with poor-quality stone; this has been emphasized by Coutts and Wesson (1980) for the Philippines, where they refer rather colorfully to a category of "smash and grab" industries. Retouch is often steep and high-domed "scraper" forms are quite common, as is an edge gloss on sharp flake edges. Although flakes often have bladelike proportions, there is no sign of any systematic attempt at blade production until about 6,000 years ago (see below).

The basic core, flake, and pebble characteristics of these late Pleistocene and early Holocene preceramic industries, including the Hoabinhian, find fairly close parallels in the "core tool and scraper tradition" (Bowler et al. 1970) of Australia and the New Guinea Highlands, both of which were first settled from Indonesia before or around 40,000 years ago. These similarities are not surprising, and it is easy to misinterpret localized variations relating to raw materials as the results of cultural variation. On the other hand, some of the variation obviously does represent human intent, especially the technologies represented at Leang Burung 2 and Lake Tingkayu. Farther east there is also an unusual focus on large-waisted axelike tools in the Huon Peninsula of Papua New Guinea and in the Papua New Guinea Highlands, dating back in the case of the former location to perhaps 40,000 years ago (Groube et al. 1986). Such waisted tools have not yet been found in the Indo-Malaysian islands, but they appear occasionally and perhaps independently in some Hoabinhian sites (see Fig. 6.2).

III. THE Flake AND Blade TECHNOCOMPLEX OF THE MID-HOLOCENE

In parts of the Philippines, Sulawesi, and Java there are a number of assemblages dated to after 5000 BC that demonstrate regionally varied emphases on the production of small blades, and sometimes on other specialized tools such as "microliths" with blunted backs and small projectile points. In all cases these new technologies appear as accretions added to the old and continuing tradition of unprepared flake production.

In a previous book (Bellwood 1978:71), I quoted a definition by Morlan (1971:143) of blades as "elongate parallel-sided flakes with parallel arrises or parallel-sided facets on their dorsal faces. Blades are struck (by indirect percussion) from prepared, polyhedral cores." The Upper Paleolithic industries of much of the Old World were focused on the production of blades of this type, and in Japan, northern China, and northwestern India it is now clear that they were widespread by at least 20,000 years ago (Chen and Olsen 1990). In Island Southeast Asia and Australia, however, blades form only a small minority component of most assemblages in which they occur, and true cylindrical or conical blade cores are generally very rare. Many of the "blades" found in this region fall into Morlan's category of bladelike flakes, which are less symmetrical than
true blades and which lack the parallel ridges. Nevertheless, because cores of a subprismatic shape do occur in small numbers and because I believe that both blades and bladelike flakes were produced intentionally in some sites, I will refer to the industries described in this section as the “flake and blade technocomplex.”

At present there appear to be two kinds of industries within the flake and blade technocomplex: the unretouched blade industries of the Philippines and the Talaud Islands of northeastern Indonesia, and the backed flake-blade and microlithic industry—termed the Toalian—in southwestern Sulawesi. At the end of this section I will also consider some undated industries, perhaps related to the Toalian, that have been found on Java. The Philippines, Sulawesi, Java, Australia, and possibly southern Sumatra encompass the distribution of industries in this technocomplex; they seem to be completely absent in the preceramic from Borneo, eastern Indonesia, and New Guinea (although Borneo and Timor do have Neolithic blade industries; see Chapter 7).

A. The Philippines and Talaud

Industries in which a component of small unretouched blades is added to a continuing flake tradition occur in the Philippines and in the Talaud Islands south of Mindanao. In Duyong Cave, near Tabon Cave on Palawan, Fox (1970) excavated an industry with small bladelike flakes struck from what he originally termed “prepared cores,” although he later stated that such cores were not present (Fox 1979:236). The tools occurred in a midden of marine and estuarine shell dated to the sixth millennium BC. Possibly similar industries have been described from Cebu by Tenazas (1985) and from a small island called Buad off the western coast of Samar by Cherry (1978). No clear chronologies are available for these sites, and both late preceramic and Neolithic associations seem likely. Blades account for up to 50 percent of the Buad collections, and some pieces have glossed edges or traces of a mastic used in hafting.

The most detailed information on an industry of this type comes from the rock shelter of Leang Tuwo Mane’e on Karakellang Island in the Talaud Islands (Bellwood 1976a, 1985). This shelter was originally cut by the sea into a cliff of coral limestone and was then uplifted to a habitable level by about 4000 BC. The basal deposits produced an industry comprising blades and bladelike flakes (about 50 percent of all flaked stone), together with some rather rudimentary prismatic cores, made on a grey chert (Fig. 6.13). Retouch is virtually absent, but some edge gloss occurs. Around 2000 BC or later pottery appeared in the site, and at this time there was a surprising and unexplained change away from the grey chert toward a nodular brown chert used for the production of a much less refined flake industry that continued into the upper layers of the site. The blade
Fig. 6.13 Chert blades (a–g) and subprismatic cores from Leang Tuwo Mane’e, Talaud Islands. Dated ca. fourth millennium ac. Flake (c) has an edge gloss.
industry is thus restricted mainly to the preceramic levels and the date of its actual appearance in Talaud cannot be determined from this site. Both preceramic and ceramic layers contained large numbers of shellfish of no less than ninety-four species from a wide range of reef and mudflat habitats (Heffernan 1980). Apart from pig in the ceramic layers, however, no mammal bones were present; the Talaud Islands had only a limited native fauna of rats, bats, and a species of marsupial phalanger (the latter being also potentially a translocated species).

B. The Toalian

The most important industry of the flake and blade technocomplex is undoubt edly the Toalian of southwestern Sulawesi, which apparently commenced during the fifth millennium BC with an array of microliths (small-backed flakes and geometrics) of types seemingly unique in the Indo-Malaysian Archipelago. Toalian assemblages have been excavated since 1902 from caves and shelters scattered across the southern half of the southwestern peninsula of Sulawesi. During the 1930s and 1940s some rudimentary typological successions were established by Stein Callenfels (1938) and Heekeren (1949). In Heekeren’s last major summary (1972), by which time about twenty sites had been excavated, he felt justified in supporting a three-phase sequence commencing with plain blades, followed by a second phase with backed flakes and blades and geometric (crescentic and trapezoidal) microliths, and culminating finally in a third phase with bone points, serrated and hollow-based stone points, and pottery.

As a result of recent excavations there is now much more information on the Toalian. Two sites, Leang Burung 1 (Mulvaney and Soejono 1970, 1971; Chapman 1986) and Ulu Leang 1 (Glover 1976, 1977a, 1978a; Glover and Presland 1985), are located in the Maros limestone region north of Ujungpandang. Recent Indonesian excavations in caves in Pangkajene Kepulauan, north of Maros, promise to add further data (Anggraeni 1986).

Ulu Leang 1 has the most complete sequence. I have already considered the basal industry of flakes and steep-edged tools in this site, dated to the early Holocene (see Section IIIC). The Toalian tool types (Fig. 6.14) appear in higher levels dated from before 6,000 years ago and occur within a continuing industry of flake tools and bone points, although the steep-edged tools fade in importance. The most important new tool type is a small flake or blade with straight or oblique blunting down one side and often around the butt (similar to a “backed blade” in Australian terminology). Some of these backed forms have distinctly crescentic or trapezoidal shapes and are commonly referred to as geometric microliths. The present trend (Chapman 1986; Glover and Presland 1985; Allen 1991b) is to refer to these new Toalian forms, backed blades and
Fig. 6.14 Toalian stone tools from Ulu Leang: (a, b) Maros points; (c–h) small flakes and blades with blunted backs; (i) bipolar microcore; (j) blade with edge gloss; (k) retouched scraper; (l, m) bone points. Similar bone points are also widespread in the northern Moluccan sites. From Glover 1977a. Courtesy: Ian Glover.
geometrics alike, as microliths. Other artifacts that occur throughout the Ulu Leang sequence include glossed flakes, small bipolar cores, bone points, and bivalve shell scrapers (Willems 1939).

Sometime after 6,000 years ago another type of small stone implement, the "Maros" serrated and hollow-based point, appeared in the sequence. Maros points presumably served as arrowheads or spearheads and became common after 4,000 years ago, by which time pottery had already made its appearance in the Toalian caves (as at Ulu Leang 1). From a regional perspective the possibility thus arises that the Maros points were used by native hunters living in some kind of exchange relationship with adjacent Austronesian-speaking cultivators, as recent hunters have done from time to time in parts of Southeast Asia (see Chapter 5). It is not clear whether the Maros points represent indigenous innovation from a Toalian matrix or whether they represent an imported technology. If the latter, the source is unknown.

The site of Leang Burung 1 (Plate 28) is later in date than Ulu Leang: Its deposits appear to date within the last two millennia BC. They have pottery throughout, meaning again that they are probably contemporary with the dispersal of agricultural peoples in the general region. As in upper Ulu Leang 1, microliths and Maros points are both present. Chapman (1986) stresses the importance of edge gloss in this site (on 24 percent of used tools) and also notes the absence of steep-edged tools, pebble tools, and edge-ground tools (the latter, to my knowledge, appear to be absent in all Toalian sites). At Leang Burung 1 the microliths (including the Maros points) comprise about 35 percent of all retouched tools, which in turn comprise only 6 percent of the total of stone artifacts. At Ulu Leang the corresponding percentages are 20 percent and 6 percent.

The Ulu Leang 1 sequence generally supports the essentials of Heekeren's second and third phases (i.e., backed microliths succeeded by Maros points), but the site has no earlier phase with plain blades. This need not mean that this earlier phase does not exist in all other Toalian sequences, for as I have shown it is present without later typological elaboration in the Talauld Islands. The question of intentional blade production in the Toalian is in fact a difficult one. Chapman feels that it was practiced at Leang Burung 1; about 10 percent of flakes here had blade proportions, although no prismatic cores were found. Heekeren (1972:Plate 63b) also illustrates a series of blades from the site of Pangganeang Tudea (near the southern tip of the peninsula) that remind me closely of the blades from Talauld. However, Glover and Presland (1985) deny the existence of a blade technology at Ulu Leang. After analyzing the stone tools from the much older site of Leang Burung 2 (see Section IIC), together with those from Ulu Leang, Presland (1980) concluded that a blade technology was not evident in these particular Maros sites, although flakes did become smaller by
about 20 percent in average size over the whole period represented (over 20,000 years). However, no one has challenged the significance of the sudden appearance of the new microlithic forms around 6,000 years ago. These raise the question of outside parallels, which I will consider later.

The Toalian industry continues on well into the pottery phase at most excavated sites. In itself it reveals no clear evidence for the agricultural economy that must surely have been developing in some parts of Sulawesi after 2000 BC, unless this is in some way reflected in the appearance of the Maros points. Even as late as AD 1000 the retouched and glossed flakes still occur at Batu Ejaya near the southern end of the peninsula (Chapman 1986), although most of the microliths have by now disappeared and the serrated Maros points appear to have been replaced by plainer round-based forms. The late survival of the Toalian here may document a continuing tradition of hunting and gathering, perhaps amongst indigenous non-Austronesian speakers contemporary with cultivators.

The economic evidence from the Toalian sites includes a range of hunted and gathered resources. Riverine shellfish are very common, and Glover (1977b: 52) found remains of wild seeds and nuts at Ulu Leang, although carbonized rice grains appeared in the site only after AD 500 (Glover 1985). In Section IID, I described the animal remains from the lower levels of Ulu Leang. The faunas from other Toalian sites (Hooijer 1950a) were drawn from a similar range of Sulawesi mammals: the two species of cuscus (Phalangeridae), macaque monkeys, civets, anoa, Sus celebensis, and babirusa. A small quantity of art found on the limestone walls of Toalian sites has been described by Heekeren (1950b, 1972:119–120), although none can be dated. Hand stencils and wild pigs were depicted in red ochre; the former are of great interest because of the worldwide occurrence and great antiquity of this motif. Some of the hand stencils, interestingly, lack one or more digits. Motifs including both hand and foot stencils, as well as depictions of animals and canoes, are reported by Anggraeni (1986) from the caves in Pangkajene Kepulauan, north of the Maros region.

C. The Sampung Industry of Eastern Java

This industry (Plate 29), called the “Sampung bone industry” by Heekeren (1972:92), is best known from a cave called Gua Lawa near the village of Sampung, between the Lawu and Liman volcanoes in central Java. The site was excavated by Stein Callenfels in 1931; although the methods were rather crude and the site obviously disturbed, he did provide a section drawing in his report (1932) that shows the vertical distribution of all the artifacts found within a 2-meter-thick occupation deposit. The lowest of three apparent levels of occupation produced a number of stone projectile points with hollow or round
bases, but without the serrated edges characteristic of Maros points. Hollowed stone grindstones and spherical rubbing stones with traces of red ochre also appeared in this layer, but no records were published of the basic flaked stone industry that was also present.

Above the lowest level, and apparently extending over about half of the excavated area within the cave, Stein Callenfels found a lens of bone and antler points and spatulate, with more stone mortars, a few possibly downward-disturbed potsherds, and a polished adze. Pottery, metal, and a general mixture of other material then occurred in the top layer, with four bone fishhooks. Flexed burials, at least one under a stone slab and including one child with a shell necklace, were indicated as stratified within the middle layer with the bone tools; all have been classified as Australomelanesian (see Chapter 3, Section III B).

At face value (and there is no other way to interpret this site now), the Gua Lawa sequence indicates a possibly preceramic industry of bone tools and stone arrowheads very similar to the nonserrated Toalian types, together with "flakes and blades without secondary working and many retouched shell scrapers" (Heekeren 1972:94). In a previous account of this site (Bellwood 1978:76), I included the bone tools with the top pottery-bearing layer, but then changed my mind in favor of a preceramic date in the first edition of this book. Now I am not so sure; some sherds occur to the base of the sequence and it is clear that the Maros points in Sulawesi overlap substantially with the Neolithic. Further research in this region of Java is required before the Gua Lawa bone tools and stone points can be dated with certainty.

The Gua Lawa fauna, apparently mainly from the middle layer with the bone tools (Dameron 1934), comprised a broad range of mammals. Dameron commented on the great predominance of teeth and leg bones of the animals represented—a taphonomically unusual circumstance for which no obvious explanation comes to mind—and gave the most numerous species as banteng cattle, followed by pigs (Sus scrofa rather than Sus verrucosus) and deer (Cervus, Muntiacus and Tragulus). Monkeys, Indian elephant, buffalo, and several large felines were also present. Four species in the site—Cervus eldi, elephant, clouded leopard, and wild water buffalo—are now locally extinct (see Chapter 1, Table 1.1). Palm civets and monitor lizards were also especially frequent.

The Gua Lawa type of industry is known from sites scattered all over the eastern end of Java. South of Gua Lawa a rock shelter in Gunung Cantalan produced round-based stone points and apparently many cranial bones of macaque monkeys (Heekeren 1972:99). Other sites occur to the north around Bojonegoro and inland from Tuban. Heekeren (1935–1936, 1937) also excavated three caves—Petpuruh, Sodong, and Marjan—near Puger in southeastern
Java, about 200 kilometers east of Gua Lawa. These caves produced the same (apparently) preceramic assemblage of round-based stone points, bone tools, shell scrapers and rings, and flexed burials. Pebble tools and flakes of quartz, chert, and obsidian also occurred, together with hammerstones and grindstones. Heekeren seemed to favor Hoabinhian affinities for these industries, but I find this most unlikely and would rather stress their close similarities with the Toalian, except for the obvious absences in eastern Java of the backed flakes and geometrics. A similar mid-Holocene date also seems quite likely.

D. Other Flake and Blade Industries in Java

A large number of sites in western Java, especially on the Bandung Plateau, have produced an undated but presumably preceramic industry of obsidian (Bandi 1951; Heekeren 1972:133–137; Anggraeni 1976). The sites still await detailed archaeological investigation, and the existence of a definite blade element seems to be rather uncertain. The available illustrations, however, leave no doubt that backed flakes, round-based and unifacially retouched projectile points, and a few crescentic and trapezoidal geometrics are present (Fig. 6.15). The sites may in fact be mixtures of several time periods, for a number of more archaic domed and steep-edged tools also occur, but the overall impression is of an industry that may be fairly similar to the Toalian. Some surface-collected obsidians from sites around Lake Kerinci and Jambi in south-central Sumatra (Hoop 1940) may also contain points and microliths. Glover and Presland (1985) report backed crescents from some of these sites, although such forms were absent in the excavated Tianko Panjang Cave.

E. The Flake and Blade Technocomplex in Broad Perspective

Reasons for the appearances of these new flake and blade technologies, both in the Indo-Malaysian region and in Australia, are topics that cause considerable dispute amongst prehistorians. One important fact that should be noted is that in Island Southeast Asia and Australia, these new technologies are always grafted onto old ones. There are no wholesale replacements in fully preceramic contexts of flake industries by blade industries, nor are there good reasons from the stone tool evidence to invoke large-scale human expansions into the region prior to that of the agricultural Austronesians. It is nevertheless difficult to decide for individual regions whether the new technologies were developed independently or whether they were adopted from an outside source. In some cases the answer may be a combination of both processes. In company with Glover and Presland (1985) and Dortch (1977), I feel that some significance must be allocated to diffusion for the technologies of microlith manufacture
Fig. 6.15 Obsidian-backed points, geometrics, and steep-edged tools from the Bandung Plateau, western Java. From Bandi 1951. Courtesy: Museum für Völkerkunde, Basel.
(backed blades and geometric), although it should not be forgotten that the
ability to produce elongated bladelike flakes was present at the sites of Leang
Burung 1 and Hagop Bilo well before the end of the Pleistocene. Indeed, many
Australian prehistorians today regard the “small tool industries” of Holocene
Australia as local developments quite unrelated to anything in Indonesia (e.g.,
Hallam 1977; White and O'Connell 1982).

I rather doubt that these questions of independence versus diffusion will
ever be resolved entirely, because stone tools of this kind—with the possible
exception of the Maros points—do not carry a large component of cultural as
opposed to purely functional information. But as far as backed blades and geo-
metries are concerned, the simple fact of coincidence in dates between Sulawesi
and Australia can hardly be overlooked. The backed blades and geometries so
characteristic of later Australian prehistory appear there from about 3000 BC
onward (Mulvaney 1985). Heekeren (1972:125) actually suggested that these
tool types diffused to Sulawesi from Australia, although the radiocarbon dates
as known at present do not provide much support for this view.

Perhaps the most likely region of outside influence on the islands of South-
east Asia in terms of these flake and blade industries is Japan. India is only a
remote possibility as the intervening Hoabinhian industries show no signs of
any of the developments under consideration, although an India/Sri Lankan
source of influence is favored by Allen (1991b). During the initial, early, and
middle Jomon periods of Holocene Japan, there is a range of hollow-based pro-
jectile points and blade tools that look a little like some of the Southeast Asian
eamples, although geometric microliths of the Toalian types are to my knowl-
edge not found there. An undated but presumably preceramic Holocene indus-
try with some blades has recently been reported from a site near Guangzhou in
southern China (Huang et al. 1982), but there seems to be no material of this
type from Taiwan or the Ryukyu Islands. Nevertheless, Japan and southern China
do provide a number of interesting though vague possibilities.

As with the appearance of edge-grinding, a development obviously quite
unrelated to the appearance of the flake and blade industries, there are a lot of
question marks when looking at the matter of origin. One cannot always rule
out independent development easily, but in the case of the microliths a history
of interaction and diffusion does seem to me to be more attractive. As always
the question arises: Why do these expressions occur in some areas and not in
others?