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EARLY HUMAN OCCUPATION OF THE EAST KALIMANTAN RAINFOREST (THE UPPER BIRANG RIVER REGION, BERAU)

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I INTRODUCTION

1.1 Background

There has been debate in recent years within anthropology about the origin of the nomadic hunter-gatherers in the tropical rain forests of Borneo and other parts of Southeast Asia. According to Headland & Bailey (1991:115), it has traditionally been assumed that these tropical rain forest hunter-gatherers are "remnants of paleolithic populations that have been subsisting in their forest habitats for millennia and have only recently come into contact with sources of domesticated plants and animals".

1.1.1 Headland and Bailey's Hypothesis

In separate papers, Headland (1987) and Bailey et al. (1989) challenged this view and proposed a hypothesis that “hunter-gatherers could never have lived in tropical rainforest without direct or indirect access to cultivated foods” (Headland & Bailey 1991:116). They argued that although the rain forest is the most productive terrestrial ecosystem on earth, it may be a food-poor environment for hunter-gatherers, especially in terms of starchy foods which are most needed by humans.

To illustrate the limited availability of starchy foods, Headland (1987) used the Agta (Negrito hunter-gatherers) of Eastern Luzon. He pointed out that in that area wild plant foods are not readily available for humans. There are only six or seven types of wild tubers which are seasonal and widely scattered, and one wild palm which can be found in limited numbers. On top of that, the exploitation of these plants is time consuming and labor intensive. Therefore, the Agta “may never have lived for long periods isolated and independent from agricultural neighbors, following a paleolithic life style” (Headland 1987:465).

Headland and Bailey also explored the ethnographic and archaeological literature to support their hypothesis. They concluded that today humans can only live in the rainforest because it has long been exploited by agriculturalists and therefore is a disturbed environment with more plants and animals edible for humans. Human
occupation in the rain forest is also possible because the hunter-gatherers fulfill their needs for food by trading forest products with agriculturalists who live near the forest.

1.1.2 Responses to Headland and Bailey’s Hypothesis

The Headland and Bailey hypothesis stimulated other researchers to investigate the subject and a number of criticisms ensued (Brosius 1991; Endicott and Bellwood 1991; Bahuchet et al. 1991).

1.1.2.1 Brosius Research on the Penan of Sarawak

Brosius pointed out that the weakness of Bailey and Headland’s hypothesis lies in its generality. He criticized them for using a vague, shifting and inconsistent definition of hunting and gathering (Brosius 1991:129). For example, Bailey and Headland regarded foraging and agriculture as two different things, whereas “in fact, the distinction is not clear, either conceptually or with respect to the biological and demographic processes of the resources being exploited” (Brosius 1991:131).

Bailey et al. (1989) regarded the rainforest today as long modified by agriculturalists, and therefore more habitable for hunter-gatherers. Brosius argued differently. He mentioned the possibility that forest plants were disturbed by hunter-gatherers during exploitation, causing considerable changes in the distribution and density of certain plants. Therefore, not only agriculturalists but also hunter-gatherers have the capacity to create a new ‘artificial’ environment more favourable for humans, enabling hunter-gatherers to survive solely in the rain forest. Furthermore, Brosius argued that it was a result of trading with agriculturalists that led hunter-gatherers into consuming agricultural products, leading to negligence of their own forest resource management and eventually the depletion of these resources. He concluded that “contrary to the assumption that hunter-gatherers could only have occupied tropical forest with the advent of agriculture, it seems that the opposite scenario is equally likely: that it is agriculture itself which has led to the current dearth of carbohydrate resources in most tropical forest ecosystems” (Brosius 1991:133).

Brosius’ observations of the Penan of Sarawak, who occupy the deep forest area within several days walking distance from the nearest agriculturalist settlement, showed the ability of this people to occupy the rain forest independently. He found that the Eastern Penan trade forest products for various useful items, but not for food. Although they often conduct trading activities, the Eastern Penan are self-sufficient and can live without dependency upon agriculturalists.
This self-sufficient condition was achieved because of the presence of the *Eugeissona* sago palm, which became the main carbohydrate resource of the Penan hunter-gatherers. The Penan manage to exploit *Eugeissona* effectively, not only to enhance the production of starch and viable seed but also to maintain a sound harvesting strategy which avoids a foreshortened harvest cycle (Brosius 1991:143).

1.1.2.2. Endicott and Bellwood Research on The Batek De', Malay Peninsula

The study of Endicott and Bellwood (1991) on the Batek De', a Semang people (Malaysian Negritos), living in the Lebir River watershed in Southern Kelantan and the northernmost tributaries of the Tembeling River in Pahang, showed that independent foraging can be and has been carried out in the lowland tropical rainforest of the Malay Peninsula. In this paper Endicott discussed the ethnography of the Batek people, while Bellwood explored the archaeological literature.

Endicott analyzed the diet of the Batek and found out that the environment occupied by them was rich in wild plant foods, including various tuber species (19 species) and many kinds of seasonal fruits. Besides the wild foods they collected, the Batek also traded rattan for additional foods (23% of the total diet) from neighbouring agriculturalists.

The environment that the Batek occupied consisted of disturbed and undisturbed forest. Headland and Bailey's research suggested that the plant foods available in disturbed forest are more abundant than in undisturbed forest. However, the Batek's use of resources did not clearly show a preference for either forest type. Based on the data collected, Endicott suggested that "without trade and before the Malays planted their fruit orchards, life would have been more difficult for the Batek....., but not impossible" (Endicott and Bellwood 1991:169).

Bellwood examined the archeological record for the northern and central regions of Peninsular Malaysia and referred to at least nine limestone cave and shelter sites which indicate inland rainforest occupation by hunter-gatherers. He suggested that there was a small but stable inland population of foragers who occupied the rainforest prior to the coming of the agriculturalists.

Endicott and Bellwood concluded that the possibility of independent foraging actually depended on "a great diversity of resources which are moderately abundant, non-seasonal, or complementary in their seasons, and which can be effectively harvested by small, flexible, mobile groups" (1991:181).
1.1.2.3 Bahuchet, McKey and de Garine Research on The Aka, Congo Basin

Bahuchet, McKey and de Garine (1991), who studied the Aka, the pygmy foraging peoples of the western Congo Basin, discovered that these people, like the Batek De’, have had a long trading relationship with agriculturalists and their wild plant foods have been extensively replaced by cultivated food. However, they believe that in the past, before the arrival of cultivated foods, the Aka could have lived in the rainforest solely on wild plants.

Bahuchet et al. pointed out that wild yams and other edible tubers were easily available in the Aka environment and could have been exploited more heavily than today (1991:236). Some clumps of tubers apparently are completely unutilised today. This evidence became the foundation of their argument that “the limited use of wild plant foods cannot be attributed to scarcity that prevents any greater use of them, but instead is due to their replacement by cultivated plant foods that became available upon contact (often ancient) of the Aka with farming villagers, a replacement that has continued until the present” (Bahuchet et al. 1991:236). The implication is that the Aka could have supported themselves independently of the agriculturalists.

1.1.3 The Bailey and Headland Counter Argument

Bailey and Headland (1991) realised that their hypothesis, that hunter-gatherers never lived in tropical rainforest without direct or indirect access to cultivated foods, was controversial. The responses and criticisms from various scholars made them aware of additional factors allowing recognition of rainforests as a more productive and accessible environment to human foragers than often recognised (Bailey and Headland 1991:263). They noted that the rainforests occupied by hunter-gatherers are dissimilar, with different characteristics in terms of climatic variation, soil composition and plant and animal species composition. All of these factors affect the plant food resources available for humans: the types, distributions, seasonality and abundance.

Their assumption that shifting cultivation had been carried out in the rainforests for millennia was also criticised for not making a clear distinction between hunter-gathering and cultivating. This issue is important because it is now clear that hunter-gatherers could manipulate plants in their favour without practising systematic cultivation (Bailey and Headland 1991:265). The way hunter-gatherers exploited wild plant foods, consciously or unconsciously, affected their abundance and distribution. Bailey and Headland noted that “it is probably more realistic to think of humans as lying along a continuum from foraging, with minimal impact on the distribution and
abundance of resources, to purposeful forest clearing and crop cultivation” (1991:266).

The problem is, when did humans stop being hunter-gatherers and become cultivators? In order to clarify their hypothesis, Bailey and Headland maintained that “in the absence of purposeful forest clearing for the purposes of cultivation of domesticated or semi-domesticated plants, humans have never subsisted for sustained periods in tropical forest environments” (1991:266-7).

Bailey and Headland also pointed out two sets of data that were mostly ignored or minimised by those who regarded rainforest as a productive environment for humans (1991:269). First, the palaeo-environmental evidence indicates that before 8,000 years ago most of the areas covered by rainforests today were drier and consisted of open forests. Therefore, they argued, archaeological sites found in the rainforests today do not necessarily indicate that at the time of their occupation they were covered by rainforest. Second, the clearing of rainforests for cultivation began as early as 9,000 years ago. They suggested that forests had been manipulated by humans since the beginnings of their existence. Therefore, it is difficult to know how the rainforest looked before occupation by cultivators.

Bailey and Headland also indicated that some scholars were inconsistent in their argument for the independence of hunter-gatherers from agriculturalists. They pointed out that some hunter-gatherer communities, which had been described as isolated from agriculturalists were mentioned by others as having a trade relationship with agriculturalists, or even behaving as cultivators. They also noted that in some cases the hunter-gatherers were actually occupying forests disturbed by agriculturalists (Bailey and Headland 1991:270-1).

Bailey and Headland noted that, so far, studies on hunter-gatherer communities contain "only circumstantial evidence and must consequently rely on speculation rather than hard quantitative evidence" (Bailey and Headland 1991:276). Therefore, they proposed a research program specially designed to test their hypothesis, including detailed ecological studies of the density, distribution, and life histories of edible resources in various rainforest environments (Bailey and Headland 1991:276-7). In order to falsify their hypothesis that humans were unable to live in tropical rainforest without access to cultivated foods, Bailey and Headland proposed to include experimental studies reconstructing the costs and benefits of gathering, hunting, and travelling in rainforests using various technologies (1991:278). They hoped that ecological and experimental studies, integrated with time studies of the handling cost of
wild plant foods and other activities related to food processing, should be able to provide accurate information on the possibility of survival in rainforest.

At the end of their response, Bailey and Headland mentioned that none of the ethnographic and ecological evidence presented to falsify their hypothesis had convinced them that their original hypothesis is unsound (1991:281). However, they were willing to modify their hypothesis in the light of archaeological evidence from Malaysia, and possibly other regions if convincing evidence was available.

The debate is still open. Not only do ecological and experimental studies have to be done, as Bailey and Headland proposed, but archaeological research is also a priority. If Malaysian archaeology can provide such information, no doubt other regions have the same potential.

1.2 Research Aims

The research reported upon in this thesis attempts to demonstrate, in an eastern Borneo context, that the hypothesis that “hunter-gatherers could never have lived in tropical rainforest without direct or indirect access to cultivated foods” is not persuasive. It aims to explain how hunter-gatherers in the tropical rainforest of East Kalimantan survived and exploited their environments before the arrival of farming.

1.3 The Research Region

The research area is located on the upper Birang River, in the Berau Region, East Kalimantan (Map1.1). Limestone outcrops with many caves and rock shelters cover the area. Many of the caves produce valuable bird’s-nests and have long been exploited by the local people. At the time of my field work, 60 caves were being exploited for nests by people from Tanjung Redeb, who made their base camp at Tepian Manunggur, beside the Birang River, not far from where the river emerges from Liang Aput cave. Tepian Manunggur is located at 02° 27’ 41" North and 117° 24’ 38" East (Map 1.2). This base camp had permanent buildings made of wood, which were occupied all year long. However, this base camp was actually full of people only during harvest time. For this research I was able to use one of the permanent buildings at Tepian Manunggur, which lay only 15 minutes walk from the sites.

Access to Tepian Manunggur is by road or river. The logging road from Tanjung Redeb crosses the Birang River downstream from Tepian Manunggur. The road is rough but passable for 4WD vehicles. It takes approximately one and a half-hours driving from Tanjung Redeb to reach this bridge. From here people have to walk
Map 1.2 The Upper Birang Sites

LEGEND

- Excavated area
- Path
- Brind natural hulls
- Contour lines intervals (2.5m interval)
- Cave ceiling

SECTION A - A'
upstream for about one hour to reach the base camp. Direct access via the river requires a *ketinting*, a small boat (5 hp engine). It takes seven hours from Tanjung Redeb to reach the base camp by *ketinting*.

The Berau area was chosen for several reasons. A large part of Borneo is covered by rainforest, therefore searching for remains of ancient human occupation without any prior knowledge of the area is extremely time consuming. The forest has covered the occupational sites and changed the whole surroundings, preventing recognition of the sites. The abandoned hamlets of sedentary peoples may be recognised by the presence of certain fruit trees in the middle of what is now a forest. Such places are usually in an elevated area where the inhabitants had good views of the surroundings and therefore could anticipate any attack from their enemies. Such occupational sites are plentiful in the Pujungan area, but these sites are normally only about a few hundred years old. Sites occupied by hunter-gatherers are more difficult to find, because they did not leave prominent marks in the landscape and particularly because they never lived permanently in one place.

In this case, remains of hunter-gatherer activities should be sought where artefacts are more likely to be preserved. Limestone caves and rock shelters seem to be ideal, and many important archaeological discoveries have occurred in such places. Thus, we have the examples of the Great Cave of Niah in Sarawak (Majeed-Lowe 1981; Majid 1982; Barker et al. 2000; 2002a; 2002b), Madai and Baturong Caves in Sabah (Bellwood 1988), the caves of Central Kalimantan and the upper Mahakam in East Kalimantan (Chazine 1994), and Gua Babi in South Kalimantan (Widianto et al. 1997) (Map 1.3).

Many areas in Borneo have limestone formations with hundreds of caves and rock shelters with potential for ancient human occupation. Most of them are remote and difficult to reach, but Berau is relatively accessible. It was expected that Berau would contain similarly early sites to those listed above, especially as big caves and rock shelters were prominent. Berau has another advantage. In this region many of the caves have long been exploited for their bird’s-nests. Therefore, the caves are generally well known to the local inhabitants and thus relatively accessible for purposes of exploitation.

Since most of the bird’s-nesters, especially the cave owners or collection supervisors, live in Tanjung Redeb they are normally registered in the Kabupaten government office. Therefore, contacting them to get information was easy. They knew exactly the number and locations of the caves, their sizes, travel times, and most
appropriate seasons for visits. They also nominated guides for visits. This easy availability of reliable information in the capital city of Tanjung Redeb was one of the reasons why Berau was chosen as the research area.

Another advantage of Berau is the presence of a small population of semi-nomadic hunter-gatherers, known as Basap or Punan Basap. Various local groups of Basap people are scattered around the Berau Region. Formerly, all appear to have been hunter-gatherers. But at the time of my research, the upper Birang was the only place in Berau District occupied by Basap still living at least partly as hunter-gatherers. The other Basap, such as those at Teluk Sumbang, live as agriculturalists and have already moved into permanent settlements.

1.4 The Conduct of the Field Work

The research was conducted in two periods of fieldwork. The first period was in August 1998, and the second in October-December 1998. The first period of fieldwork involved surveying the upper reaches of the Birang River, including the Sembrata valley to the west of the Birang, in order to find suitable limestone rock shelters for excavation. Initially, the survey attempted to target rock shelters used by the Basap people, based on an assumption that the prehistoric occupants of the same area, if there were any, would have had similar preferences to the hunter-gatherer Basap in recent times. Such rock shelters were located inland, most of them more than half a day in walking distance from the base camp at Tepian Manunggur.

There were several difficulties in finding such Basap caves or shelters. First, and sometimes most difficult, was to find a Basap man able and willing to show the way to the rock shelters. Since Basap residences were scattered and the people themselves were often moving, locating them was not always easy, unlike contacting the cave owners and the collection supervisors in Tanjung Redeb. To overcome such problems the strategy was changed. Rock shelters that were still being used by the Basap were no longer a priority. Instead, other rock shelters or caves more accessible from Tepian Manunggur were surveyed. From this survey, two sites, Kimanis (a rock shelter) and Lubang Payau (a cave), were considered the most appropriate for excavation. A test pit opened at Kimanis indicated that the site was rich in animal, shells and lithic artefacts,

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1 Most of the caves had to be reached by boat. In the rainy season, rivers were often flooded and dangerous for travel. On certain rivers where logging activities were present, big floating logs were a major problem. In dry season the rivers were often very low, requiring a lot of boat pushing, and often the river could not be traversed by boat at all.
as well as being used as burial place, so this site was chosen for major excavation in the second field trip.

The second field period consisted mainly of excavation, in three sites in the same limestone massive:

(1) Lubang Payau, a bird’s-nest cave at 206 m above sea level
(2) Liang Gobel, a small rock shelter at 205 m above sea level
(3) Kimanis, a big rock shelter in front of a bird’s-nest cave at 230 m above sea level.

At the beginning of the second field work period, the bird’s-nests of Kimanis Cave were being harvested. Therefore, excavation could not be started immediately in the rock shelter. Instead, Lubang Payau was excavated first. During the excavation, Liang Gobel, a small rock shelter located approximately 60 metres from Lubang Payau, was also found and excavated. The Kimanis shelter was excavated last.

The excavations were conducted with the assistance of three Indonesian archaeologists: Dubel Driwantoro from Pusat Penelitian Arkeologi Nasional in Jakarta, and Vida Pervaya Kusmartono and Agung Rahardjo from Balai Arkeologi Banjarmasin in South Kalimantan. A technician, Mudjiono, from Balai Arkeologi Yogyakarta, conducted the mapping of the area and the rock shelters. Seven local workers were employed to assist with the digging.

A second task undertaken during my fieldwork involved the collection of ethnographic information from the local Basap hunter-gatherer populations, especially concerning their knowledge of forest resources and their environments in general. Such information might be expected to give some understanding about how prehistoric populations might have used the rock shelters. However, collection of ethnographic information was only a minor activity in my fieldwork, owing to the mobility of the Basap and time constraints.

In terms of the techniques used during excavation, spits were 5 cm thick in all sites, except for Kimanis square D5, which was excavated in 10 cm spits. 2 mm sieves were used, and coordinates were measured from a datum point located at the south-west corner of each square. Each item or concentration of items was stored in a resealable plastic bag labelled with provenance details - registration number, site, square, spit and year of excavation.
1.5 The Analytical Units Identified in Each Site

For analytical purposes it was necessary to divide the deposits excavated in each site into approximate chronological and cultural units. Each unit was delineated in terms of assemblage characteristics (content and density), as well as stratigraphic considerations. An analytical unit can consist of several stratigraphic layers, or alternatively one layer can be split between two different units. These units are discussed further in the relevant chapters below, but at this point Table 1.1 presents them in summary form (KMS = Kimanis, LPY = Lubang Payau).

**Table 1.1 Analytical Units Identified in the Excavations of KMS/C4, KMS/C8, KMS/TP and LPY/C3.**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>SPIT/DEPTH (CM)</th>
<th>KMS/TP</th>
<th>KMS/C4</th>
<th>KMS/C8</th>
<th>LPY/C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1 - 10 (0&lt;≤50 cm)</td>
<td>1 - 10 (0&lt;≤50 cm)</td>
<td>1 - 10 (0&lt;≤50 cm)</td>
<td>1 - 8 (0&lt;≤40 cm)</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>11 - 21 (50&lt;≤105 cm)</td>
<td>11 - 23 (50&lt;≤105 cm)</td>
<td>11 - 27 (50&lt;≤135 cm)</td>
<td>9 - 18 (40&lt;≤90 cm)</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>-</td>
<td>24 - 34 (105&lt;≤160 cm)</td>
<td>-</td>
<td>19 - 32 (90&lt;≤160 cm)</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>-</td>
<td>35 - 42 (160&lt;≤200 cm)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>-</td>
<td>43 - 61 (200&lt;≤295 cm)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
II. THE ENVIRONMENT

2.1 The Present day Environment
2.1.1 The Administrative Setting

The *kabupaten* (district) of Berau covers 2000 km$^2$ and consists of nine *kecamatan* (subdistricts) and 78 villages. The nine *kecamatan* are Tanjung Redeb, Gunung Tabur, Sambaliung, Talisayan, Pulau Derawan, Kelai, Segah, Teluk Bayur and Bidukbiduk. The last two *kecamatan* are *kecamatan penghubung/perwakilan*, affiliated to Tanjung Redeb and Talisayan respectively (Map1.1).

2.1.2 The Landscape

Kabupaten Berau is dominated by a hilly to mountainous landscape. Kecamatan Tanjung Redeb, which is also the capital of Kabupaten Berau, is located at the confluence of the Kelai and Segah Rivers. These in turn join the Berau River, which drains into the sea approximately 50 km to the east. Tanjung Redeb is situated at an altitude of 5 to 55 meters above sea level and has an annual temperature range between 21.5$^\circ$C and 32$^\circ$C, with 90% humidity, and an annual rainfall of 228 cm (Biro Pusat Statistik 1996). No detailed information is available for other parts of the region, especially remote areas such as the upper Birang drainage basin, where the research was conducted. However, since the whole region is located at an equatorial latitude the climate everywhere is typically equatorial with a relatively constant temperature throughout the year and high humidity, as recorded for Tanjung Redeb.

Compared to other parts of East Kalimantan, especially inland regions, Berau has a dry climate. The area around Tanjung Redeb and the whole coastal strip, about 10 to 25 km in width, has a mean annual precipitation generally less than 2000 mm. The rainy season has slightly more rain than the dry season and most falls between November and February. Further inland, including the upper Birang area, rainfall is between 2000 and 2500 mm (Vos 1983:34).

The area east of Tanjung Redeb (Lower Berau) consists mostly of a broad flat river valley with coastal swamps dominated by mangroves and *nipah* palms, with some lowland rainforest. An extensive line of coral reefs lies along the coast. A large part of the inland mountainous region is a limestone formation rich in caves. There is no active
vulcanicity in East Kalimantan, although the main mountain ranges are igneous in origin (MacKinnon et al. 1996:9) A high mountainous area is located between the Segah and Kelai Rivers, which forms the border between Kecamatan Segah and Kelai. The highest peak is Gunung Mantam (2467 m). Mountain ridges with peaks exceeding 1000 m can also be found on the borders of Kecamatan Kelai, Sambaliung and Talisayan, with the Nyapa Mountains being highest (1400 m) (Map 2.1).

The rest of the region lies mostly at an altitude of 50 to 150 m, intercepted by hilly areas up to 700 m. The landscape of the region north of the Segah River is mostly lowland, with mountain ridges running from west to east along the northern border of Kecamatan Segah and Gunung Tabur. These ridges are mostly between 150 and 500 m in altitude, with higher peaks in several places.

Around the settled areas, which are mainly along the big rivers, large areas have been cleared for swidden agriculture and permanent gardens. The farmers plant rice, mostly in dry land plots although irrigated wet rice fields also exist. They also plant maize, cassava, sweet potatoes, peanuts, soybeans, cucumber, beans, chilli and eggplant, as well as fruits including bananas, durian, papaya and rambutan. Cash-cropping plantations in this region are largely of coconut, coffee, oil palm, rubber, pepper, clove and cacao.

Berau was once largely covered by forest, although today much of the area has been logged. Some patches have been replanted, especially with acacia, pine and sengon (Albizia spp.). Most of the pine and acacia provides timber for a big pulp factory established in this region.

One of the areas that has been logged heavily is the Birang River drainage basin, especially at the downstream end. A large part of the area is now left as an open woodland with several tree species which survived the logging, especially bengaris (Koompassia sp.). This species is protected because it is the main nesting tree for bees, which produce valuable honey for the local inhabitants.

Undergrowth and vines now dominate this cleared forest. Cleared areas have also been created by gardening activities. By the time of Spaan’s visit at the beginning of last century (Spaan 1903b), a large part of the forest along the river had been cleared for gardening. Today, many fruit trees can be seen along the downstream part of the river.

In the upper Birang, most of the forest is still untouched. The area around the Kimanis cave complex, Lubang Payau and Liang Gobel, is still covered by mixed dipterocarp forest, dominated by various kinds of meranti merah (Shorea spp.), kapur
Map 2.1 Topographical map of Kabupaten Berau. Based on TAD Atlas 1983.
(Dryobalanops), keruing (Dipterocarpus) and other tree species. Small patches of cleared land along the river are the results of gardening activities by the bird-nest collectors. Since the upper Birang region consists of limestone formation with rough terrain, logging is not as easy as in the lower Birang. Only a few trees have been felled, most by the bird-nest collectors who use the timber for building huts.

The forest is also exploited quite extensively for its non-timber products, which consist of rattan, kayu gaharu (aloe or gaharu wood), and bird's-nests. In some cases, collecting kayu gaharu has been very destructive. This fragrant wood is produced by a pathological condition in living Aquilaria trees when the heartwood is infected by fungus (MacKinnon et al. 1996:415). Collectors often cannot tell whether the trees contain gaharu or not, therefore a lot of trees are cut down wastefully.

Today, the Birang River area is one of the most exploited places for bird-nests, with 60 caves being exploited at the time of this research.\(^1\) The kabupaten is also exploited for its coal and gold, the latter mined near the Malinau estuary (a branch of the Segah, west of the Birang River), as well as on the most upstream branches of the Kelai River and near the border of Kabupaten Berau and Kabupaten Bulungan (Vos 1983:26).

During the Dutch colonial period, coal mining was concentrated at Rantau Panjang, inland from Teluk Bayur, the coal-loading port and settlement of the Parapattan Coal Corporation. These two places were connected by a railway, about a 40 minute journey apart (Allied Geographical Section 1944:57). Today, coal mining is concentrated around Tanjung Redeb, along the Lati and Sembrata Rivers. The Birang area also contains coal but has not yet been exploited, presumably because the quality of the coal is poor.\(^2\)

2.1.3 Flora and Fauna of the Berau Region

The vegetation of the Berau region is dominated by lowland rainforest, which includes wet swamp (mangrove and freshwater swamp) and dry lowland (lowland dip-

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\(^1\) Kimanis Cave, where the main excavation was conducted, produces the largest quantity of birds’ nests, amounting to more than one ton of black nests per year. Most other caves only produce several kilograms per year. There are two kinds of birds’ nests: black and white. The white nests are much rarer than the black but their value is ten times more than the black one. Since bird’s nests are so valuable and since some caves could produce a lot of them, thus attracting thieves, their exploitation is a serious business involving police and army officers. The right to exploit the cave is tendered by the government to the local business people.

\(^2\) Spaan mentioned that the whole hilly area around the downstream end of the Birang River is rich in coal (Spaan 1903b:655).
Map 2.2 Vegetational map of Kabupaten Berau. Based on TAD Atlas & MacKinnon et al. 1996.
terocarp and heath) forests (Map 2.2). Limestone and montane forests are also present.

Many tree species of the freshwater swamp forest are similar to those of the lowland dry forest, but the former is usually less rich in species, less layered in forest structure, and the trees have smaller diameters and heights (MacKinnon et al. 1996:129).

Lowland dipterocarp forest extends up to 600 m in altitude. The constant high temperature, high humidity, long hours of sunshine and year-round rainfall in this tropical regime provide perfect conditions for maximum tree growth (MacKinnon et al. 1996:175). The forest has a very complex structure and normally the canopy is layered, with emergents and the main canopy at the top, then lower storey trees, woody saplings, and forest floor herbs and seedlings (MacKinnon et al. 1996:179).

Lowland dipterocarp forest contains the most important commercial timber trees in Southeast Asia and many regions have been logged heavily or disturbed by shifting cultivation. Some mammal species can only live in undisturbed tropical lowland forest, but others can also adjust to changing environments. Yasuma (1994:21) has pointed out that mammals such as Bornean gibbon, white-fronted langur, giant squirrel, black-eared pigmy squirrel, long-tailed giant rat, sun bear, clouded leopard, marbled cat, muntjac and sambar deer can only inhabit, or prefer to live in, primary forest or tall secondary closed forest. On the other hand, the ruddy treeshrew, pangolin, moonrat, common palm civet and Prevost’s squirrel were observed in regenerating secondary forests. The bearded pig, Malay civet, short-tailed mongoose and porcupine are more adaptable and can live in both primary or tall secondary forest and in low secondary forests. The plantain squirrel can be found in gardens, villages and small forests close to human settlements, but is very unlikely to be found in undisturbed forests.

In Berau, mountain the lowland rainforest vegetation gradually transforms through successive altitudinal vegetation zones, which include the lower montane zone with dipterocarps at 800 – 1,200 m asl, oak-chestnut forest at 1,200 – 1,500 m asl, and upper montane forest (MacKinnon et al. 1996:320). Limestone forest can also be found in several parts of the Berau region. However, information on limestone forest in Kalimantan is still very limited. Preliminary botanical survey in Sangkulirang and other areas in Borneo suggests that limestone habitats support a rich flora with many limestone-specific species (MacKinnon et al. 1996:277). The lowland limestone forest in the Upper Birang area is mainly dipterocarp, dominated by large emergent trees which may reach 40 m in height (MacKinnon et al.1996:281).
Limestone forests in Kalimantan are not associated with any specific endemic vertebrates. Survey conducted in the Sangkulirang Peninsula revealed the presence of a typical Bornean lowland forest fauna, with species such as banteng (*Bos javanicus*), orangutan, gibbon, sambar deer, muntjak deer and mousedeer (MacKinnon *et al.* 1996:284). This landscape is similar to that of the Upper Birang area, where a similar fauna can be expected.

Limestone caves also contain insect-eating and fruit-eating bats and swiftlets. Various species of bats roost mainly in caves and some species use caves occasionally. The swiftlets of Borneo consist of four species and all nest in caves (MacKinnon *et al.* 1996:294). Kimanis and Lubang Payau Caves are inhabited by the black-nest swiftlet (*Collocalia maxima*). The caves also support communities of insects, snakes, toads, rats and small shrews (MacKinnon *et al.* 1996:291).

Bearded Pigs (*Sus barbatus*), the most common mammals in Borneo, are very common in the Berau region. They have conspicuous migrating habits during fruit seasons. Mass migrations occur once or several times a year and have been recorded from various parts of Borneo as well as the Malay Peninsula (Hislop 1954; Pfeffer & Caldecott 1986; Puri 1999). Such migrations bring a time of plenty for the indigenous people, who hunt the pigs. The Sumatran rhinoceros, which once inhabited the Mangkalihat Peninsula, including part of Kecamatan Sambaliung and the whole of Kecamatan Talisayan, is not found any more. No distributional details have been recorded for other mammals, reptiles, amphibians, fish, birds and invertebrates of this region, particularly in the Upper Birang area.

### 2.1.4 Geology

Compared to the other islands of Indonesia, the lack of systematic geological maps for Kalimantan is rather disappointing, especially for East Kalimantan. Therefore, it is rather difficult to give detailed geological information on the Berau region, particularly for the Birang River basin. This area is plotted as containing sedimentary rocks, which include coal and oil reservoirs (MacKinnon *et al.* 1996:24). The Upper Birang basin is of limestone, but this formation is not recorded on any geological maps. Neither is it recorded in the Atlas of East Kalimantan, produced by the East Kalimantan Transmigration Area Development Project (TAD), which features basic information on topography, geology, geomorphology, soils, vegetation, mineral deposits and agricultural potential (Vos 1983). The most comprehensive book on Kalimantan ecology written by MacKinnon *et al.* also misses this outcrop in its discussion of lime-
Map 2.3 Geological map of Kabupaten Berau. Based on TAD Atlas 1983.

LEGEND
- Quaternary
- Pliocene
- Middle-Late Miocene
- Early Miocene
- Oligocene
- Paleocene-Eocene
- Pre-Tertiary sedimentary rocks
- Kabupaten boundary
- Kecamatan boundary
stone habitats. However, in another section of this book a limestone forest formation is plotted along the Birang River, in a sketch map of Borneo showing heath, ultrabasic, ironwood and limestone vegetation formations (figure 5.1 in MacKinnon et al. 1996:242).

The Berau region contains rock formations from different geological periods, mostly Tertiary (Map 2.3). Only the Berau delta area and most of the coastal fringe is of Quaternary age. The Birang basin mainly consists of rocks of Paleocene-Eocene, Oligocene and Miocene origin. Early Miocene formations dominate the downstream area up to the Maning River confluence. This downstream area, including the area around Tanjung Redeb and Teluk Bayur, contains much coal (Bemmelen 1949:350). Further upstream, there are Oligocene formations. Paleocene-Eocene rocks account for the most upstream part of Birang. This upstream region is flanked by strongly folded and faulted mountains, mostly of limestone, and many caves and rock shelters can be found here.

2.1.5 Soil

Knowledge concerning soil variation in Kalimantan is still limited. Borneo soils suffer from weathering, leaching and biological activity (degradation of organic matter) (MacKinnon et al. 1996:27). The rocks are also poor in metal bases, therefore they are generally much less fertile compared to the basic volcanic soils of neighbouring Java (MacKinnon et al. 1996:27).

The soils of the Berau region were mapped by the Soil Research Institution, Bogor, in 1981. The region includes four types of soil: (1) alluvium (which covers 8.72% of the region), (2) podzols (4.49%), (3) a complex of red-yellow podzols, latosols and lithosols (17.83%), and (4) latosols (68.96%) (Kabupaten Daerah Tingkat II Berau 1986:22) (Map 2.4).

Alluvial soils occur in relatively fresh sediment deposition regimes and are mainly found in the lowland and coastal regions and around the main river basins of Segah and Kelai. These soils have variable textures because the parent materials are usually stratified by former stream channels (Thompson & Troeh 1973: 388-9). They are usually the most fertile soils and most of the agricultural activities in this region are concentrated on the areas of alluvial soils.

Podzols are typically formed under evergreen forest in sandy parent material with imperfect drainage (Thompson & Troeh 1973:386). They are low in clay and are highly acid and very unfertile. The red-yellow podzols, often known as ultisols, have
low fertility levels, with low levels of calcium, phosphorous, nitrogen and potassium, and are sensitive to erosion (Kabupaten Daerah Tingkat II Berau 1986:22). “They usually only produced a good crop for the first years, or about the time it took for the nutrient reserve in the biocycled organic matter to decompose and be taken up by the crop plant or be leached from the profile” (Buol et al. 1980:298). These loam and clay soils have only limited agricultural use and only support “shifting cultivation, with a short cropping regime and a longer fallow to allow fertility to recover” (MacKinnon et al. 1996:28).

Lithosols are shallow soils formed on imperfectly weathered hard rocks (Thompson & Troeh 1973:389). They are very common on steep topography, very subject to erosion, and not very fertile. Latosols are the best known soils of the tropics and cover the largest area of Berau region. These yellow to red soils have different fertility levels, depending on the parent material. The older the parent material the redder the colour and the less fertile it becomes (Kabupaten Daerah Tingkat II Berau 1986: 22).

The lower part of the Birang River area is covered by a complex of red-yellow podzols, latosols and lithosols, while the Upper Birang, where the studied cave sites are located, consists of latosols.

Since the soils of a large part of the Berau region are so infertile, it is not surprising that only small parts of the region have any potential for agriculture. These areas are mainly located along the alluvial river basins and in some inland patches. The inland and more rugged areas such as the Upper Birang can only support slash and burn agriculture, in which nutrients from vegetation are released into the soil as ash from burning.

2.2 Borneo in the Pleistocene

The alternating glacial and interglacial conditions during the Pleistocene Epoch affected the Indonesian archipelago greatly. This period was marked by periods of great sea level fluctuation, and often more seasonal climates than now. The Sunda Shelf beneath the South China and Java Seas emerged as dry land during the periods of low sea level, when mainland South East Asia, Sumatra, Java, Borneo, and Bali were connected by land bridges (Voris 2000). Sediment cores taken from the north Sunda Shelf indicate that at the Last Glacial Maximum (LGM) the sea level dropped to 116 m below present level (BPL) (Hanebuth et al. 2000:1034). From 21,000 to 11,000 years ago it rose at a fluctuating rate, divided into four stages by Hanebuth et al. Between
21,000 and 19,000 years ago it rose slowly from -116 to -114 m BPL, at a rate of 0.10 m per 100 years. Then, between 19,000 and 14,600 years ago it rose moderately fast, from -114 to -96 m BPL, at a rate of 0.41 m per 100 years. Between 14,600 and 14,300 years ago the rise was dramatic, from -96 to -80 m BPL at a rate of 5.33 m per 100 years. Finally, between 14,300 and 13,100 years ago, the rise was more gradual, from -80 to -64 m BPL at a rate of 1.33 m per 100 years. Sea level curves from other areas such as Barbados, Tahiti and New Guinea also indicate similar patterns.

Voris (2000) provides a series of maps that show estimated areas of exposed land in the Indo-Australian region during the Pleistocene, at sea levels of 10, 20, 30, 40, 50, 75, 100 and 120 m BPL. He also provides estimated percentages of time that sea levels were at or below selected levels for the past 17,000, 120,000 and 250,000 years. Voris based his reconstruction of past sea levels on present day depth contours, using the assumption that “within the 250,000-year time frame and a 120-m sea-level change, tectonic uplift and subsidence, tidal scouring and the accumulation of sediments were either relatively minor factors affecting present day depth contours or .... are well understood and can be factored into estimates of sea level” (Voris 2000:1155).

The information on Sunda Land sea level changes presented here is extracted from Voris. His time divisions are rather different from those derived from the sediment core provided by Hanebuth et al. (2000). At 120 m BPL, c. 17,000 BP, the Sunda Shelf occurred as a huge landmass that included the exposed massive lowland connecting the islands of Sumatra, Java and Borneo, and the southeast part of the Asian mainland. At this time, Hainan and Taiwan were connected to mainland China, Sri Lanka was connected to India, and the islands in today’s South China Sea, such as Natuna, were part of the exposed Sunda shelf. However, Borneo and Palawan were not connected by a land bridge although the strait that separated them narrowed to only about 12 km in width (Voris 2000:1155). Borneo and Sulawesi were separated by a narrow but deep sea, with the narrowest part located adjacent to the southeast part of Borneo where the land emerged as a peninsula. At 17,000 BPL, the Sahul Shelf merged as a broad landmass that connected New Guinea and Australia with all of today’s Gulf of Carpentaria being emergent. The distance between Timor and the Northern Territory was reduced to only about 100 km.

At 100 m and 75 m BPL (c. 15,000 and 13,000 BP), the exposed areas of the Sunda and Sahul shelves were more or less similar to those of 120 m BPL. At 75 m BPL there is a possibility that one or two large fresh water lakes or swamps emerged in the area occupied by the present-day Gulf of Siam (Map 2.5 and 26).
At 50 m BPL (c. 11,000 BP), the Malay Peninsula, Sumatra, Java and Borneo were still connected by an extensive land bridge (Map 2.7). However, the small islands in today’s South China Sea were now separated from the mainland, as also was Taiwan. The Gulf of Thailand, Java Sea and Gulf of Carpentaria became significant seas.

At 40 m BPL, the Malay Peninsula, Sumatra, Java and Borneo were still connected by a land bridge, but perhaps the connection between Sumatra and Borneo (via Bangka, Belitung and the Karimata Islands) was reduced to only 150 km wide (Voris 2000:1164). At 30 m BPL this land bridge may have been broken (Map 2.8), and at 20 m BPL it is likely that the Malay Peninsula, Sumatra, Java and Borneo were all separated (Map 2.8). New Guinea and Australia were still connected by a land bridge across Torres Strait when the sea level was only 10 m BPL. Voris also points out that sea levels were at their maximum lows for relatively short periods of time; and at or below 30 m BPL for over 60% of the past 150,000 years (Voris 2000:1165).

Throughout the coastal area of Southeast Asia, Late Quaternary shoreline indicators such as oyster shells and corals have been found several meters above present sea level. Many have been radiocarbon dated to the mid-Holocene, suggesting that sea levels over the Sunda Shelf reached a maximum about 4-5 m higher than the present level (Tjia 1987:9; 1991:1). However, it should be noted that this height was not achieved in all parts of the archipelago due to isostatic rebound processes and tectonic movements. After reaching its postglacial maximum the sea level fluctuated with a general descending trend. Tjia speculated that “this trend may reflect isostatic adjustment of the ocean floors after their rapid loading by melt water in the period 18,000 to 10,000 years BP.” (Tjia 1987:9). Similar sea level fluctuations to those recorded by Tjia have also been observed in southwest Sulawesi (Verstappen 1997:416).

During the last glacial, when sea level dropped 120 m, the coastal lowlands of Borneo were greatly extended. But the eastern part was separated by deep sea, which never became a land bridge, from Sulawesi. In the northern region the sea was deeper than in the southern, and here the coastline remained similar to that of the present, apart from the infilling of bays. Even when sea level dropped to 120 m BPL, not much extra land was exposed. But the southeast part of Borneo south of the Mahakam River consisted of much shallower sea and the shelf was exposed quite extensively. At 120 m BPL, or even at 75 m BPL, a large area of emergent land formed a peninsula, leaving a narrow
Map 2.5 Southeast Asia during the Pleistocene, with the sea level at 100 m below present level.
Map 2.6 Southeast Asia during the Pleistocene, with the sea level at 75 m below present level.
Map 2.7 Southeast Asia during the Pleistocene, with the sea level at 50 m below present level.
Map 2.8 Southeast Asia during the Pleistocene, with the sea level at 30 m below present level.
channel separating Borneo and Sulawesi by only about 25 km.\(^3\)

A large part of the coastal area of Kabupaten Berau, especially in front of the Berau estuary, is protected by a chain of small coral reef islands. Today, the sea between the mainland and these islands is less than 100 m deep.\(^4\) Beyond these islands the sea drops abruptly. Basically, the 100 m BPL contour runs along the line of these reefs.

At 100 m BPL, the coastline of Kabupaten Berau must have been between 16 and 60 km beyond the present alignment (Allied Geographical section 1944: map 23). The mouth of the Berau River is an extensive estuary, consisting of many islands surrounded by shallow water. When sea level was at 100 m BPL, this area would have extended outwards to approximately 60 km from the present coastline. The area north of the Berau estuary would only have been extended by about 20 km. However, the coastline around the tip of the Mangkalihat Peninsula is very steep, so the coast here would only have moved outwards a small distance.

When the sea rose to 75 or 50 m BPL the coastline still remained similar to the 100 m BPL configuration. At 30 m BPL the area around the mouth of the Berau River would have extended about 35 km from the present coastline, and the area north of the Berau River about 13 km. At only 10 m BPL the exposed land would still have extended around the Berau River mouth to about 24 km offshore.

The environment of the upper Birang River area, which is now located about 60 km (in a straight line) from the coast, should not have been much affected by the changing coastal environment. However, global climatic changes could have had an impact on the whole region in terms of lowered temperatures and longer dry seasons during glacial maxima, even though various scholars have pointed to different magnitudes for different regions (Verstappen 1975:8-9).

For instance, Petersen proposed a hypothetical reconstruction of last glacial climate and vegetation at Niah. He suggested that temperatures were 5-7°C cooler than present and that precipitation was much lower (Petersen 1969:72). A cooler climate for Sunda land was also suggested by Verstappen, who pointed out that there was “a drop in average temperature of 3° - 5° C in equatorial regions during the ice ages and possibly a rise of 2° - 3° C with respect to present values during the interglacials” (Verstappen 1975:9). The lower temperatures were accompanied by lower rainfall and a more pronounced dry season, trends emphasized by the greater continentality of the region.

\(^{3}\) Today the gap that separates Borneo and Sulawesi is more than 100 km.
\(^{4}\) This excludes Maratua, Kakaban and Muara Islands further offshore, all located in deep sea.
during periods of low sea level. However, it seems that the lowlands did not experience cooling as much as the highlands (Flenley 1997; Urushibara-Yoshino & Yoshino 1997). Snowline and palaeovegetation data from Australia, New Guinea, New Zealand and South America also indicate that between 18,000 and 15,000 years ago the mean temperatures in the tropics were 4° to 6° C lower than today (COHMAP members 1988:1049).

Such changes affected the distributions of plants and animals. Unfortunately, very few pollen data are available from Borneo. However, data collected from Sumatra, Java and New Guinea indicate a consistent series of events, as Flenley (1985:61) pointed out:

Late Pleistocene vegetation zones were everywhere depressed and/or compressed. The gradual change to present vegetation took place everywhere between 14,000 and 8600 BP and especially between 12,000 and 9000 BP.

The series of maps produced by Adams and Faure (2000) for world vegetation and ecosystems at 18,000, 8000 and 5000 C14 years ago shows that Borneo was always covered by tropical rain forest. However, they admit that their map for the last glacial maximum may show too much forest, according to evidence for late Quaternary savanna development in lowland western Kalimantan, as well as indications of periodic non-forested conditions in northern Borneo (Adams & Faure 2000:3).

A possibility of savanna and monsoon forest development in eastern and southern Borneo during the Pleistocene has also been suggested by Whitmore (1981:38). Such conditions also occurred in the Philippines, Sulawesi, and large areas of Sumatra, Java and New Guinea. However, Borneo, which lies in the core region of ever-wet rainforest on the Sunda Shelf, might have not experienced drought as pronounced as Java. Some parts of Borneo must have remained as humid tropical rainforest during Pleistocene glacialis, but other parts might have supported more open forest. MacKinnon et al. (1996:175) added that “The area covered by rainforests may have expanded and contracted several times during the Pleistocene, but they remained essentially unchanged in character and composition.”

The only region in Borneo to have a detailed record of climatic change and its impact on the environment during the late Upper Pleistocene is Sarawak, particularly

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5 Adams and Faure compiled information on various relevant palaeoclimatic indicators in an attempt to understand how the Earth has changed since the peak of the last ice age, around 18,000 radiocarbon years ago (about 20,000 – 21,000 years ago in ‘real’ years).
the Great Cave of Niah. As mentioned earlier, Petersen suggested a cooler Pleistocene climate for Sarawak (including Niah Cave), with mean annual temperature of 20-22°C, strong winds, about half as much precipitation as now, and a definite tendency toward winter drought (1969:74). Such conditions would not support the evergreen rainforest existing in the region today.

Based on the presence of large mammals such as rhinoceros and elephant, assumed to prefer more open forest, and the presence of arboreal mammals in the Upper Pleistocene Niah deposits, Petersen suggested that a more open forest should have covered the area during the late Upper Pleistocene (Petersen 1969:75). The Niah Cave faunal analysis conducted by Medway supported the indication of environmental change, as Majid (1982:33) has pointed out:

Despite the general similarities between the late upper Pleistocene and Holocene faunas which preclude any major change in climate or general habitat, there are suggestions of minor changes. Local extinctions of such animals as the tapir, giant pangolin, together with evolutionary changes in body size of species such as the orang-utan, leaf monkey, the long-tailed macaque, barking deer, and Muller’s rat, suggest a progressive alteration of environmental conditions.

Furthermore, the presence of lesser gymnure and ferret badger, which in Borneo today are only distributed in the sub-montane region above 1000 m, indicate cooler conditions at that time. Their later disappearance from the archaeological assemblage has been interpreted as due to the inability of these two species to adapt to postglacial warming (Medway 1977b:64).

The disappearance of Malayan tapir about 8000 years ago in Niah is also interpreted as reflecting the inability of this animal to adapt to a denser postglacial forest. Medway pointed out that Malayan tapir favoured open forest, since its diet would have consisted of herbaceous and shrubby vegetation along the forest edge, along tracks, or in disturbed or secondary growth (Medway 1977b:65). Furthermore, Medway (1977b:65) explained that “unlike the Sumatran Rhinoceros, the Malayan tapir does not push over or break down the woody plants on which it feeds and hence cannot by its own activity maintain an environment suitable for itself.”

From the faunal assemblages excavated in the Niah Caves, Majid (1982:34) concluded that:

...during the late Upper Pleistocene, when the Sunda Shelf was exposed, Sarawak was probably 5 – 7°C cooler, with half as much precipitation and characterized by a winter drought. Many different animals roamed in a more open forest. Some of these animals have become extinct while others have gone through morphological evolutionary changes. With the rise in sea level at the end of the Pleistocene, about 11,000 years ago, temperatures and rainfall
increased, and the vegetation and fauna became more of the rain forest type that we see today.

A more open forest condition during the oldest period of human habitation in Niah has also been emphasised by Cranbrook (2000:83):

...such an assemblage of large mammals – aquatic and terrestrial, grazing, browsing and arboreal, with a variegated mix of predators – could only exist in an environment consisting of a mosaic of closed forest alternating with scrub, bush, or parkland, and including extensive areas of swamp, lakes or large rivers. A landscape of this kind exists in the ‘moist woodland zone’ of tropical Africa (terminology of Hall & Moreau 1970). This zone indeed supports a rich mixture of arboreal and ground-dwelling medium and large mammals. The fauna also includes the African giant pangolin Smutsia gigantea, whose habitat is “mainly forest and forest mosaics but survives in high-rainfall secondary grasslands where it can shelter in thicket covered termittaries” (Kingdon 1997). It may be a semi-open, wooded landscape of this sort, rather than any version of present day rain-forests, that was the home of the early modern people of northern Borneo, at least 40 000 years ago.

Presumably, to a certain extent such conditions also occurred in the Upper Birang River region during the late Pleistocene. The dense rainforest that covers the region today might have been more open during the late Pleistocene.
Figure 5.5 Sections through the KMS/C4 deposits

LEGEND
A  Dark brown ashy silt
B  Dark yellowish brown sandy silt
C  Brown ashy silt
D  Dark brown silt
E  Dark brown ashy silt
F  Very dark greyish-brown silty sand
G  Dark greyish-brown silty ash
H  Brown ashy silt
I  Dark greyish-brown silt
J  Dark brown ash
J1  Reddish yellow ashy silt
G  Secondary burial
S  Ash lenses from human activities
Ro  Roof fall
DP  Datum point (altitude above sea level)
*  Charcoal sample
#  Fossil water shell sample
The indigenous people of the region, generally known as Dayak (an exonym), can be divided into five main groups (Guerreiro 1985): Segai (Ga'ai), Kenyah, Punan, Lebu and Basap. The Segai/Menggæ (autonym) / Ga'ai (Kenyah and Kayan) / or Segayi (Berau Malay) are part of the Modang linguistic sub-group and occupy the Kelai River (Tumbit Dayak, Long Lanuk, Lesan Dayak) and the upper Segah near Long La'ai (Guerreiro 1985). According to tradition, they came to this region during the 18th century from Apo Kayan (Guerreiro 1985). They practice agriculture and were once known as head-hunters.

The Kenyah (Uma' Baka) arrived in the Berau region and settled at Long Gie on the upper Kelai at the beginning of the 20th century. They originated from Apo Kayan. Later, other dialect groups of Kenyah (Uma' Kulit and Badang) arrived. The Kenyah people living at Tepian Buah came from Bulungan in 1974 and those who are living at Malinau arrived in the area in 1982 under the *Pemukiman Masyarakat Terasing* resettlement project. This project was originally for the Punan, but they were reluctant to live in the settlements specially built for them, therefore, the government encouraged the Kenyah to settle in this area. The Kenyah language belongs to the Kenyah sub-group of the Kayan-Kenyah group (Würm & Hattori 1983, sheet 41). The Kenyah practice agriculture and today they are the most abundant group among the Dayaks in the Berau region.

The Punan, of whom there are several different groups, include Punan Kelai who occupy the upper reaches of the Kelai River (Long Gie, Long Keluh, Long Lamcin, Long Palai and Long Sului) and Punan Segah (known also as Punan Malinau/Melanau) who live along the Segah River. They are classified as members of the Modang sub-group of the Kayan-Kenyah linguistic group (Würm & Hattori 1983, sheet 41).

The Lebu (Lebbu/Labu) and Basap (Bassap/Basep) are the least known subgroup in this region and differentiation between them is still unclear. Lebu and Basap have different distributions and are present not only in Kabupaten Berau, but also in Bulungan in the north and Kutai in the south. They seem to consist of separate groups, although some of them may have the same origin. According to the Dutch administrator of Berau, there were three local Lebu groups in 1937: Lebbu Pena'an (upper Lesan River), Lebbu Mepalu (upper Inaran and Tabalar Rivers), and Lebbu Lesan (Lesan River) (Ensigg, 1937, quoted from Guerreiro 1996:1).

The Lebu were originally hunter-gatherers. The Lessan group was introduced to rice cultivation by the Segai people towards the end of 19th century, while the Lebbu Inaran, who had less contact with the Segai but communicated more with the Malays,
remained as gatherers and practiced simple horticulture (Guerreiro 1996:1). The Lebu of the Lesan River occupied three villages: Merapun, Merabu and Panaan (Guerreiro 1985:114).

Guerreiro mentioned that these Lebu peoples were linguistically related and came from the same area, the mountainous area at the source of the Lasan, Karangan, Inaran and Tabalar Rivers. Their original language was Sanimban. However, as time passed, dialectal and cultural differentiation occurred between the people who call themselves Lebu and the Basap proper (Guerreiro 1996:2). Therefore, Guerreiro states that the Lebu are just part of a larger Basap group (1985:108). He adds that the Sanimban language was also understood by several Basap local groups in the Berau region, such as those living at Biatan Hilir, Biatan Hulu, Lempakè, Bapinang River, Beraya River and Pattung, all located in Kecamatan Talisayan (Guerreiro 1996:2).

The Basap people are distributed more widely than the Lebu, and those who occupy the Birang River area seem to be more related to the Punan Sajau of the Bulungan region in the north than to the Lebu. This may explain why Würm and Hattori’s ethnolinguistic map categorises the two subgroups differently: the Basap belong to the Rejang-Sajau subgroup of Rejang-Baram languages, and ‘Labu’ is assumed to be a Malay dialect. However, ‘Labu’ is also referred to as ‘Labu Basap’ and it may originally have been a dialect of Basap (Würm and Hattori 1983, sheet 41). To further complicate the issue their map has the term ‘Labu Malay’ on the coastal area near Dumaring, while the real locations of Lebu people on the Lasan, Inaran and Tabalar Rivers are not identified on the map at all.

Würm and Hattori’s ethnolinguistic map (1983, sheet 41) differentiates four Basap groups in Kabupaten Berau: Binatang Basap, Dumaring Basap, Berau Basap, and Sajau Basap. The Binatang Basap are placed in the interior of Mangkalihat Peninsula. They occupy the border area of Kecamatan Talisayan and Kabupaten Kutai, the latter comprising the larger area. Dumaring Basap are placed in the upper Tabalar River, in Kecamatan Talisayan. Berau Basap are placed to the north of Tanjung Rede, including the Birang River, Kecamatan Gunung Tabur, while the Sajau Basap are placed along the Gie River in Kecamatan Kelai. Another Sajau Basap group is placed to the north of Pimping River and in the Sajau River area, where the name originated, in Kabupaten Bulungan. Another Basap group from this Kabupaten occupies the delta area of Bulungan River and they are identified in the map as Bulungan Basap. Besides Binatang Basap, Kabupaten Kutai is also occupied by Karangan Basap who inhabit the southern
Karangan River.

The presences and distributions of Basap people have been recorded by various people since the 19th century, such as Dewall (1855), Span (1903a), Rutten (1916), Ensig (1935, quoted from Guerreiro 1996), Mallinckrodt (1928), Guerreiro (1996) and Arifin (1998) (Appendix 3.1). The various names of the Basap peoples are taken from the places where they live, usually from the name of a river. The modern Basap population is estimated by Guerreiro as more than 2000 people (Guerreiro 1996:5).

It seems that the Lebu and Basap around Kecamatan Talisayan may be related to each other linguistically, but the Basap who live in Kecamatan Gunung Tabur are probably not related or only remotely related to those from Kecamatan Talisayan. This is probably the reason why Guerreiro (1996:12) suggested a division for the Basap into (1) the nomadic hunters-gatherers of the Birang drainage basin (and the upper Uluk River, north of Gunung Tabur), and (2) the rice agriculturists of the Teluk Sumbang, also known as Punan Basap.

In 1985, the Basap from Kecamatan Gunung Tabur, from the Lati, Birang, Sembrata and Pura rivers (northern branches of Segah River) and those who lived near the border of Bulungan, were resettled by the government in the Lati River area, east of the Birang River. The Social Department in collaboration with the Departments of Religion, Agriculture, Health and Culture/Education worked together to educate these Basap during a five year project. After five years the supervision of the project was handed down to the local government. By that time most of the small children had attended school. However, this settlement has been slowly abandoned. The Basap have gone back into the forest and prefer to live as semi-nomadic hunter-gatherer and simple horticulturists. Today, only Bugis live in this settlement, originally included in the resettlement project to encourage the Basap to stay and to teach them agriculture.

Unlike Lati, at Teluk Sumbang the resettlement of the local Basap was successful. This project started in 1991 and by 1996 there were 137 people resettled in a new village upslope from Teluk Sumbang. They now practice agriculture and at the time I visited they were harvesting their banana plantation. This project is now under the supervision of the local government in collaboration with Daisy Timber, a logging company. In 1996, only four Basap still lived in the traditional way on the mountain, but occasionally they came down to the village to visit their relatives.

Guerreiro points out that related Lebbu and Basap people could be found at Kecamatan Tanjung Palas, in the Sajau River area north and northeast of Tanjung Selor,

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1 Unfortunately, there is no information on the affiliation of this language group.
the capital city of Kabupaten Bulungan. These groups were often referred to as Punan or Basap.

Pauwels (1935:344), in his article about the Punan people from Bulungan Regency, mentioned a group of people called Punan Sajau who were similar to the Basap of the Berau region. These people were different from other Punan because they had no contact with the Kenyah people, the agriculturalists. Therefore, these Punan had not adopted the settled habits. However, they already had contact with merchants from Bulungan and sometimes they also went to Bulungan.

According to Pauwels (1935:344) there were 340 Punan Sajau at that time in six small groups: (1) the Punan Sajau in the lower Sajau River, between the fields and gardens of the Bulungan people, (2) the Punan Batu in the upper Sajau, at Benau, an isolated group still underdeveloped with almost no contact with other Punan, (3) the Punan Binai, on the Binai and Rangau rivers, (4) the Punan of the Selor River, near Tanjung Selor, living between Bulunganese gardens, (5) the Punan Sebubuk of the Sebubuk River, the source of the Binai River, and (6) the Punan Mangkopadi, near the village of Tanah Kuning with which they had a permanent relationship, and where they had started to make gardens.

Pauwels described them as physically not as healthy as the other Punan from Bulungan, who lived at higher altitudes. They did not have body tattoos or elongated ears and only had very limited body ornaments, such as armlets (Pauwels 1935:344).

These Punan people were mentioned earlier by L. Rutten (1916:236). He felt that the indigenous people of the area consisted of the most primitive Dayak tribes, which in north Kutai, Berau and Bulungan were commonly called Basap (Rutten 1916:238). Rutten mentioned that many of the Basap people, especially those who lived in the coastal areas, had made contact with Malay, Bugis or other Dayak tribes and had therefore adopted the Malay way of life. The influence of European goods (i.e. canned foods, kerosene, matches and cloth) had by this time changed the Basap way of life. Intermarriage between the Basap and the other groups also occurred. However, many Basap were still isolated from other tribes and were living as hunter-gatherers.

In 1986, Hoffman differentiated the Punan Sajau into three groups: (1) the Punan Batu, who live along the headwaters of the Sajau River, in the coastal district of Tanjung Palas; (2) the Punan Binai, derived from the Punan Batu, who live along the Binai River, a small branch of the Sajau; and (3) the Punan Sajau who also originated from the Punan Batu but now live in a village on the lower Sajau. This third group practised rice agriculture and moved into this area in about 1955. Hoffman added that
these three Punan groups originated in Berau Regency (Hoffman 1986:12). They moved into Bulungan Regency in about 1920. Hoffman mentioned that the Basap of the upper Birang were similar to these Punan.

During my preliminary survey in the Berau region, in 1996, I visited the Birang River area (Ariffin 1998). I interviewed a Basap man, who mentioned that the Basap who lived along the Birang and Sembrata Rivers originally came from the Sajau River at Bulungan. He claimed they moved to the Birang and Sembrata Rivers in about 1965. They did not practice rice agriculture, but only made gardens and relied heavily on forest products and hunting activities. This Basap man also mentioned the presence of another Basap group from Bulungan, specifically from Tanah Kuning on the Lati River, a Tributary of the Berau, further to the east of the Birang River.

Similar information was gathered by Whittier (1974:46), who mentioned that the Punan Sajau (Punan Batu) of Kabupaten Berau once lived along the headwaters of the Sajau River in Kecamatan Tanjungpalas. However, he did not say when these Punan Sajau started to move into Berau. He added that a group of Punan Sajau who lived further up the river lived in or at the mouths of bird’s nest caves (Whittier 1974:46). It seems that movements of people from the Sajau to the Birang rivers, and vice versa, have been common since a long time ago. Today, when there is no work to be found in the Sajau River area, Punan Sajau sometimes move to the Birang River to find their relatives, the Basap, who can help them to find work in bird's nest collection.

The close relationships between the Punan Sajau and Basap Birang can be seen clearly in their dialects, since both speak the same language. In fact, the Basap of Birang regard themselves as Punan. If asked, they will say that they are Punan Basap.

The Orang Benua’ regard the Basap way of life as of low standard, to be looked down upon. It is not surprising that they called them Basap, which according to my guide from Tanjung Redebe is actually a derogatory word in Berau, meaning kampungan (country bumpkin). This helps to explain the naming of the various Basap groups in the region. As Guerreiro (1985:116) has mentioned, “Basap seems to be an exonym given by the coastal Malays to different hunter-gatherer groups in the Sangkulirang-Bengalon area in Kutai and Talisayan in Berau”, as well as in other Berau areas. Tillema also mentioned that the Basap regarded this name as insulting (Tillema 1939:136).

The term Punan itself is an exonym referring to various groups of people who traditionally lived as nomadic hunter-gatherers, but who today are mostly fully or partially settled (Sellato 1994:14). As Sellato (1994:15-6) points out, different terms have been and still are used by the farming groups in various regions of Borneo to refer
to these nomads:

Hence the most common terms of reference: "upriver people" (alo ot), in Central Kalimantan; "mountain people" (uku, tau 'uku, bukit) in Sarawak and West Kalimantan; "forest people" (tau tocan) in West Kalimantan; and the terms penan, penan, penan (of controversial etymology, but which some authors say may mean "to wander in the forest") used in Kalimantan, Sarawak, and Brunei. The term Basap is also used, referring to the nomads who live close to the coasts of East Kalimantan.

A better division and understanding of the Basap and Lebu sub-groups can only be settled with further linguistic studies of these people.

3.2 The People of the Upper Birang River Area

At the beginning of this century, Spaan (1903b), visited the Birang River and found that along the lower river there were several settlements isolated from each other and occupied by Buginese or Suluk people (Spaan 1903b:655). These were agriculturalists in debt to the family of the Sultan of Berau, working to pay it off. Further inland from the river, there were smaller Buginese and Suluk communities. These people planted rice, banana and especially sirih. Spaan noted that this lower river area was very fertile, but pigs and monkeys did a lot of damage to the fields.

Spaan also noted that not far above the Malattan River, one of the Birang branches, there was a Segai settlement. These Segai did not practice headhunting any more, unlike the other Segai. They did not have any contact with other Segai and lived in peace with other tribes around them (Spaan 1902a:516). Previously about 50 people occupied this settlement, but at the time of Spaan’s visit only a couple of Segai people were present. Instead, 13 Basap people occupied this settlement.

These Basap had already made gardens and were related to the Basap hunter-gatherers who lived further inland (Spaan 1903b:656). The men were still wearing loincloths (cawat), but the women were dressed like Malay women and looked like Moslems, although they were still unconverted to Islam.

Spaan recorded that there were at least another four Basap settlements or camps along the river: (1) Malatan, between the source of the Maning and Lati Rivers, 200 people, (2) Tepian Batu, at Bengungu River, 26 people,2 (3) Kiahm Bejamban, 14

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2 The way the Basap from Tepian Batu chose the site to build their shelters was similar to that of the Basap from Sajau River, as noted by Rutten. He mentioned that shelters tended to be built on hill or ridge tops often far from rivers (Rutten 1916:240), in contrast to the Malay who preferred to build their shelters near rivers so they had easy access to water.

3 The relationship between the Benua’ and Basap people was often a patron-client relationship. Malay/Benua’ people of Sambaliung sultanate, for example, regarded the small number of Basap people who lived in scattered places as weak people, and therefore they were always head-hunting targets for other Dayak groups (Spaan 1901b:199). Furthermore, they were not able to live without rice and salt. Their weaknesses and need for imports made them dependent upon the Sultan, who in return gave them protection. Tillema mentioned that until 1807 the Malay aristocrats regarded the Basap as their property
people, and (4) near the Totoong River, 10 people.

The health of these Basap groups varied, the more upstream the less healthy they were. At the time of Spaan’s visit, the last Basap group was starving, since not many animals could be hunted (Spaan 1903b:667). This group of Basap had originated from the Bulungan area, on the other side of the mountains to the north. The Sultan from Gunung Tabur, who had the right to exploit the Birang River area, ordered this Basap group to guard the bird’s-nest caves of the upper Birang from Bulungan thieves (Spaan 190b3:667). However, they were not allowed to roam further downstream to the Paliki estuary, since that area belonged to another Basap group.

At the time of Spaan’s visit not many people were living in the Birang River basin, although previously this area had a much denser population. The depletion was caused by the head hunting raids by the Segai people, and also because the Berau Sultans and their officials had sold the inhabitants as slaves (Spaan 1903b:669). Tillema mentioned that about 80 people were occupying the area at the beginning of the 20th century (Tillema 1939:81).

The Basap of the Upper Birang River belonged to Datu Maulana, who lived with his people in a small village in the estuary of the Birang River (Spaan 1903b).3 As in other parts of the Berau region, the Basap had to pay tribute to the Sultan and his families and in return they received protection.

3.3 The Basap of The Upper Birang Today

The Basap of the Upper Birang include those who live in isolation along the upper Sembirata River, in the mountainous areas north of the Birang and Sembirata River, and near the bird’s-nest caves along the Birang and Maning Rivers. They are related to each other by intermarriage ties, but also show some differences. Those who live closer to outsiders have adapted more to the modern way of life and consume more city products, and those who live in isolation are living in a more traditional way.

The Basap of the Upper Birang area call themselves Punan Batu or Punan Basap. They are scattered through the open forest of the region in small groups, often consisting of only one nuclear family. There are about five or six groups, no more than 30 people altogether. Some of them make gardens, but occasionally they leave the garden for a few days or even weeks to collect in the forest. During this time they occupy simple shelters in the forest, or rock shelters (Photo 3.1).
I encountered three groups. First, I stayed for three days with Kusui's family, consisting of a couple with their three daughters, joined by a Kayan man from Bulungan. They lived in an abandoned wooden building constructed by the logging company beside the Birang River. Second, I stayed with a group of several families (12 people, three of them children) in the upper Sembrata River for two days. The last group was a family of three people who lived in a small rock shelter in the upper Birang. I passed their shelter during my survey of the Basap rock shelters, and later met them again during our journey to a rock shelter further inland.

3.3.1 Kusui's family
During my first field trip, Kusui with his wife Siba and their three daughters, were living in a semi-permanent wooden building beside the logging road near the Birang River. They were joined by Tobias, a Kayan man from Bulungan, for several months, and worked together collecting gaharu wood. But gaharu trees were scarce and they were planning to move to another place. Kusui made his living by collecting gaharu, rattan, bird's-nests and honey.

Before the bird’s-nest caves were exploited under local government supervision, the Basap were free to collect and sell bird’s-nests. Kusui could collect about 10 kg of black bird’s-nests and 1 to 2 kg of white bird’s-nests per year. In 1985 the price for 1 kg black bird’s-nest was A$400 and of white bird-nest A$3300. Today, they can only harvest bird’s-nests from small caves that are not controlled by the government and which produce only about 100 to 200 g of black bird’s-nests each year. On my second visit, Kusui and other Basap were working under government supervision as bird’s-nest collectors in Kimanis Cave. During harvest time (about 10 to 20 days) they were paid A$100 each. Kusui’s sold the results of his foraging to a Chinese trader at Tarjung Redeb. Usually he was paid with money, but often with food.

Before the 1998 economic crisis in Indonesia, rattan was a highly sought commodity. Normally, Kusui received 60 kg of rice in exchange for 10 rolls of rattan, or 60 kg of rice, 20 kg of sugar and one packet of cigarettes for 100 rolls of rattan. But at the time of my visit nobody was asking Kusui to find rattan anymore.

During my first visit, Kusui was busy making darts (langa'). Plain langa' would be used to kill small animals such as mouse deer. Pointed langa' were for bigger animals: pig or deer. Kusui made his points from food cans. He mentioned that the points could also be made from snake teeth or bamboo. The points were smeared with

in this region, the Segah people regarded the Punan as their property (Tillema 1939:78).
poison made of a certain tree sap.

Kusui and his family relied heavily on products from the city, although they still consumed forest products collected in the traditional way. Most of their belongings were city products, such as aluminium cooking pots, aluminium and plastic plates and mugs, metal cutlery, plastic jerry cans, plastic buckets, biscuit tins, plastic bags, blankets, mosquito nets, plastic mats, plastic tarpaulins, clothes, towels, tooth brushes and tooth paste, soap, needles, fish hooks, wrist watches and radios.

Traditional Basap artefacts were only represented by gamung (baskets with rectangular bases and round tops), kapil (small bags with lids, to keep tobacco and other small things), and the upit (blowpipe) and its telo (dart container). The blowpipe was actually purchased from Kenyah people at Tanjung Redeb. From my observations, the Basap never made blowpipes. They only made the langa’ (dart) and telo (dart container).

Practically, Kusui’s family had all the property owned by typical village people. However, their hygiene awareness was more limited than in the other societies. They did not care about the rubbish lying around their living area. Dogs roamed everywhere, licking food scraps from the floor or the plates.

Kusui’s family usually ate rice that they got from the loggers or bird’s-nesters. Sometimes they got it for free, but often they paid with money. They also consumed other city food such as noodles and salty fish, but most of the meat and vegetables they procured from their environment.

Normally, Kusui was the one who went hunting, but if he was not around Siba often went hunting herself. When Kusui went hunting, often the whole family joined him. The dogs would chase the animal, followed by Kusui who ran after them. His dogs, ten of them, would surround the hunted animal until Kusui arrived to kill it. When the family arrived, the animal was already killed and Siba helped Kusui with butchering. Pigs were usually cut into two and taken to the camp, but deer would be cut into smaller pieces. All parts of the body were taken to the camp. Wild fruits, yams and vegetables were also gathered from the forest, but Kusui’s knowledge of exploiting forest products was not as good as that of the Basaps who lived along the Upper Sembrata river.

When I returned for my second period of fieldwork, Kusui’s family was living on the other side of the river near the bird’s-nesters base camp where I stayed. Kusui had joined the bird’s-nesters. Most of the time he was in the cave, leaving behind his family which was at that time joined by Siba’s sister and her two children and one male
relative. They lived in a shelter built by Kusui and opened a small garden, which was planted with corn and cassava.

3.3.2 The Basap of the Upper Sembrata

The Basap of the upper Sembrata River lived in simple shelters built in the middle of their gardens. Two shelters were occupied at the time of my visit and we spent the night during our stay there in an abandoned shelter nearby.

The shelters that were occupied had different sizes. The one that we occupied was old and already deteriorated but still habitable. It was located on the edge of the newly open garden, under big trees. It was a small shelter, about 3 x 4 metres. Under the roof and on the shelf many artefacts were still left intact and half of them were still usable, such as a blowpipe, *teko* (dart container), machete, bamboo container, plastic bottle, aluminium cooking pot and plates, and broken radio and cassette recorder.

The second shelter was inhabited by the Japar family, which consisted of a couple with their two small children. It was also small, about 3 x 4 metres. The third shelter was much larger, about 10 x 4 metres, because there were several families living in it (seven adults and one child). It was a long rectangular shape with quite a large kitchen space in the middle. Half of the northern part was occupied by a raised platform with two different levels. The sleeping platform was about one metre above the ground, and the platform in front of it about 60 cm. At the southern end there was another platform, much smaller and used as a sleeping area. The shelters were made very roughly, without any effort to construct them neatly.

The roofs were made of palm leaves with one side quite low, extending down to the platform, to protect the inhabitants from cold wind in the night and rain splash. Almost all utensils and belongings were hung from the roof. The big shelter had many containers made from bamboo tubes about 30 cm long, covered by bamboo lids. They contained pig fat. These bamboo containers were hung in the roof together with *kapil*, plastic bottles, small ceramic jars filled with pig fat or honey, plastic bags filled with clothes, and other things ((Photo 3.2)

The kitchen area had a three-shelf construction, approximately 75 cm in width and 200 cm long. The shelves were made of wooden poles with the first shelf about 40 cm from the ground, the second 90 cm and the third 120 cm. The first shelf was used for smoking the meat, the second and third shelves to store food, especially meat. Smoking was used to make the meat last longer.

At the time of my visit the Basap were cooking a pig killed earlier. A fire was lit
on the ground under the shelf where pieces of pork were laid to be smoked. Beside the shelf, a big cooking pot filled with the pig head was hung from the roof (Photo 3.3). It was being boiled using the same fire that smoked the pig meat. Another fire was built near the north sleeping platform to cook some poisonous wild fruit. The fruit was boiled in a large wok placed on three oblique wooden poles (Photo 3.4).

After our visit, all of the Basap at Sembrata moved to the forest to harvest fruit trees, leaving their garden and most of their belongings behind for a few weeks. They left their big cooking pots and jars of pig fat with the lids tightly wrapped, safe from animal disturbance (Photo 3.5). Only small items were taken away.

The Basap who lived here looked dirtier than Kusui’s family, especially the males. Most of the males had long hair to their waists and were still wearing loincloths, although some of them wore shorts or trousers. The women wore T-shirts and sarongs. One of the Basap, Ringin, was regarded by the others as a knowledgeable person about rock shelters in the area. He knew the location of every cave and rock shelter in the region and was employed by the bird’s-nesters to look after the caves and report thefts of nests.

3.3.3 The Basap of Liang Blik

During my journey from Upper Sembrata to Apu Tuju, the farthest rock shelter still being used in the area, we passed a small rock shelter, Liang Blik, occupied by three people, who were out hunting at that time. A wooden platform about 50 cm high was present. The rock shelter did not have an even floor, but the platform attached to the wall of the shelter had enough space for three people to live.

Nothing was left on the platform, and all the possessions of the occupants, such as ceramic jars, cooking pots and plastic bags were hung from the ceiling of the shelter. This secured their belongings from being disturbed by animals (including their own dogs). It seems that

3.3.4 Basap Forest Knowledge

The Basap mostly consume fruit, tubers and other forest foods as well as vegetables from their garden. They do not plant rice, but occasionally they get rice from the agriculturalists or the bird-nesters. They have a very good knowledge of forest products. They know at least nine different kinds of wild yam which can be harvested in a year-round cycle, some growing in rocky areas, such as limestone outcrops, and others in the soil. Not all of these yams are delicious to eat. The Basap have preferences. One
of the most delicious and commonly eaten yam is called \textit{keriting}, which grows about 0.5 - 1 metre underground and can be as big as a human leg. Another is called \textit{abat}, which can grow as big as a 10 litre jerry can (Photo 3.6). The less favourable yams, such as \textit{tagi} which taste rather bitter, are only eaten when there is no other choice.

Finding the plant and digging the roots seems to be easy, although time consuming. When we were excavating at Kimanis, a young Basap boy, Kuseu, used to visit us and at lunch time would disappear for an hour, returning with a handful of \textit{jaranang} yams which grow in rocks and are easy to dig, more than enough for his lunch (Photo 3.7). Kuseu also showed me six different wild yams (\textit{abat, jaranang, keriting, tagi, pari} and \textit{abuk}) that grow along the path from the base camp to Kimanis.

The Basap also know various plants with edible shoots, as well as several different kinds of sago. However, they never eat sago. Sago is commonly eaten by Punan people all over Kalimantan, but is known mainly as a famine food by them. Presumably, for the last several decades the Basap in the Birang area always had enough food, and therefore never had to consume sago.

Fruits are plentiful in the forest. Most are seasonal and often the Basap will move to a rock shelter or temporary shelter near fruiting trees, leaving their garden for several weeks. Some of the fruits are poisonous and need to be processed before they can be eaten.

Plants are exploited for not only food, but also to make artefacts from rattan, bamboo and wood. Palm leaves are used to make huts and baskets, various plants for medicine or poison, \textit{damar} resin for lighting in the night. Some \textit{damar} fragments were discovered in the excavation of Kimanis. The Basap still use it today, but they are more reliant now on kerosene lamps.
Photo 3.1 An abandoned Basap camp in one of the rock shelters in the Upper Birang area.

Photo 3.2 The Basap hang most of their belonging in the ceiling to prevent them being disturbed by animals.
3.3 A Basap cooking place.

3.4 Three wooden supports used in the Upper Birang region for cooking.
Photo 3.5 Pig fat stored in stoneware jars secured by wooden poles.

3.6 A young Basap woman preparing a wild yam (abaf) for dinner.
3.7 Kuseu preparing his lunch, some wild yam (*jaranang*).

Photo 3.8 Pig skulls on a wooden pole near a Basap’s hut, Upper Sembrata River.
Photo 3.9 A Basap man returning from hunting with half of a pig that he killed on his back. The other half was carried by another man.
3.3.5 Basap Knowledge of Wild Animals

The Basap know well the behaviour and habitats of various animal species in their territory. Hunting is mostly done with the aid of dogs, of which they keep large numbers, often outnumbering people. They also ambush wild animals along their tracks, at mineral sources, and hiding near fruiting trees. They also use many kinds of trap, especially for smaller animals.

The animals hunted by the Basap vary. The most common are pig (*Sus barbatus*), deer (*Cervus unicolor, Muntiacus muntjac* and probably *M. atherodes*) and mouse deer (Tragulidae spp.). They also exploit sun bear; white rat (*besala*, as big as a cat); *boang* (*Helarctos malayanus*); three different monitor lizards (Varanidae sp.); four different civets: *temalet* (probably *Viverra tangalunga*), *mu'i* (probably *Arctictis binturong*), *pugo* (probably *Prionodon linsang*) and *ketan* (probably *Arctogalidia trivirgata*); slow loris, *kukang* (*Nycticebus coucang*); pangolin, *su'ab* (*Manis javanica*); two kinds of porcupine: *totung* (*Hystrix brachyura*) and *te'an* (*Thecurus crassispinis*); wild cat (*Felidae*); five kinds of tortoise (*kailut, ketib*, and *unyan* (as big as a rice sack, live on the ground in swampy and mountainous areas), *kalop* and *itip* (live in the water, they have different kind of shell patterns); two kinds of soft shell tortoise (*labi-labi* - *kerahang* (big) and *keka'pi* (small)); birds such as pheasant and wild chicken (*dataa*); various kinds of monkey: *uwa-uwa* (*Hylobates muelleri*), *bekantan* (*Nasalis larvatus*), *warek* (*Presbytis rubicunda*), *bangkui* (*Presbytis hosei*), *lutung* (*Presbytis sp.*); orang utan (*Pongo pygmaeus*); snakes; insectivorous bat (*iyob*, *Microchiroptera* sp.); fruit bat (*ngemawak*, *Macrochiroptera* sp.); crocodiles; and other animals. They also eat fish and shellfish.

The Basap are very aware of the importance of meat in their diet, and regard the animals as their equals. They both inhabit and exploit the same environment, therefore they have to respect each other. To pay their respect to the animals, the Basap keep mandibles and skulls on wooden supports, although such treatment only applies to animals that dogs bark at, such as pigs, deer and mouse deer. The aim is to prevent the spirit of the animal from getting angry. The skulls and mandibles are stored in different places in order to prevent the hunting dogs being attacked by animal spirits and died. On a tree branch near an old shelter at the Basap settlement in the Upper Sembrata, a number of pig mandibles were piled up, while the skulls were put on another tree not far away (Photo 3.8).

This habit of accumulating particular elements of animals in particular places may be significant for understanding distributions of bones in archaeological deposits.
There is a possibility that the prehistoric inhabitants of the sites had similar habits.

Since the Basap live in a tropical environment, almost the entirety of each animal has to be eaten immediately before it decays. The Basap preserve the meat by boiling, grilling or frying in order to keep it edible for several days. Grilled and smoked pig meat can be kept for about four days. Boiled and then fried venison (friended in pig fat) can last a week. Even when meat begins to smell, it is still eaten.

Extra meat is kept in a container, such as a gawung (rattan basket) or biscuit tin, and hung from the roof of the rock shelter or put on the shelf above the hearth in order to prevent it being disturbed by dogs or other animals.

Pig is the most common animal hunted and is not only valued for its meat but also the fat that is used for cooking. This fat can be stored for more than a year in ceramic jars, bamboo tubes or plastic jerry cans, and can also be used in lamps.

The Basap regarded honey as an important energy source, usually found in very tall trees such as Koompasia sp. Beehives can be very big, containing more than 25 litres of honey. Collection requires special skills.

3.3.6 Basap Knowledge of Agriculture

Ringin, a Basap man who lived at Sembatra River, once mentioned that the Basap who lived in the Sajau River area opened fields for rice cultivation, but when they moved to the Birang River area, rice cultivation become tabooed and therefore they only made gardens. However, Ringin did not explain further why rice cultivation become tabooed.

The Basap open the forest by the slash and burn method. The big trees are felled and leaves and small branches are burnt before the plot is planted with yam, banana, taro, cassava, chilli and corn. All the seeds are acquired from other tribes or bought in Tanjung Redeb. The plants are left to grow until they are ready to harvest. The Basap do not weed their gardens and often leave them unattended for several weeks while they go into the forest to procure wild fruit. Each garden can only be planted once because the soil loses its nutrients very rapidly. Around the Birang River, patches of regrowth forest formerly used for Basap gardens can still be seen.

3.3.7 Exchange Activities and the Impact of Contact with Other Societies

Generally, food derived from the forest is plentiful in the Birang River area. However, the Basap tend to barter or ask for food and other useful items, such as kerosene, clothing, blankets, mosquito nets, torches, batteries, and cooking pots from their neighbours. The easy availability of rice, sugar, tea, coffee, noodles, salt, MSG and
tobacco, for instance, has made them more reliant on these products than on their traditional foods, which is understandable, since they are physically easier to obtain. Formerly, the Basap bartered forest products for earthenware pots, blowpipes, machetes, dogs and cloth.

The tendency to rely more on city products is very common among traditional indigenous people. Their dependency is stronger when their contact with other groups becomes more intense. Such a situation was recorded by Rutten (1916:242) for the Sajau River area. Here, the most 'primitive' Basap could live without rice, and relied heavily on forest products. They only rarely planted bananas or corn near their shelters. However, barter between the Basap, who provided forest products, and Malays from Bulungan, who brought rice and imported goods, became more common. Because of that, the Basap became more adapted to consuming rice and other imported foods and lost their 'savage nature'. They gradually became more like the Malays who lived in permanent settlements and made gardens.

Early in the 20th century, Spaan also recorded that rice was traded for rattan. During his visit to the Birang area he met a Sambaliung man at Tepian Batu, who had spent 14 days there in order to acquire rattan from the Basap in exchange for his rice (Spaan 1903b:658).

When contact with outsiders became more intensive, exchange of forest products began to involve money. Recently, the Basap became more active and started to work for logging companies or bird’s-nesters as labour, and were paid in cash. They also expected cash for gaharu, rattan and honey, although city products were still being used for payment in part.

The impacts of such intensive relationships can be seen in various aspects of Basap life. For example, their contacts have enabled them, especially the men, to speak several tribal languages as well as Indonesian. Since they are always a minority it is necessary for them to speak several languages, whereas the dominant populations around them would never learn Basap.

Contact with other tribal groups has led to marriage between Basap women and men from other tribes. Spaan mentioned that one of the Basap women from Tepian Batu had married a Buginese, but still pursued her tribal lifestyle instead of living in a permanent settlement like the Buginese (Spaan 1903b:650). The husband lived with her.

Intensive contact with other societies obviously affected the Basap way of life considerably. Access to and possession of 'city' products has given them various advantages and improved their living conditions. The introduction of simple
horticulture, which may have occurred more than a century ago, has changed their mobility patterns, and some groups have become sedentary, for instance the Basap of the Sajau area. However, many Basap still maintain their nomadic habits, occupying simple huts beside their gardens at the fringes of the forest, or occasionally occupying rock shelters or huts in the more isolated and forested areas of the upper Birang. When they live in an isolated area without access to ‘city’ products, they manage to survive on the animals and plants available in their surroundings, since they maintain their knowledge of forest survival.

It might be assumed that the traditional Basap way of life was very very similar to that of the prehistoric inhabitants of the Upper Birang area. The prehistoric inhabitants must have occupied the rock shelters on a temporary basis, depending on the availability of food around them. Presumably, they could survive solely on forest products. Furthermore, it is likely that the open areas close to the Upper Birang have developed only quite recently. In contrast, the Lower Birang area was opened up much earlier by agricultural people.

The Basap have plenty of carbohydrate food sources, as demonstrated by Kuseu, who easily procured different wild yams in a relatively small area. Protein is obtained by hunting (Photo 3.9). There may be times of food shortage, as Spaan observed during his visit to the Upper Birang area at the beginning of the 20th century. However, there is no doubt that the Upper Birang area in its pristine state was capable of supporting a small community of mobile hunters and gatherers.
IV. THE PREHISTORY OF BORNEO

4.1 The First Human Occupation of Borneo

Geologically, Borneo is part of the continental shelf extension of Mainland Southeast Asia that is termed Sundaland. This was a vast land that emerged when the sea level dropped to about 120 metres during the glacial periods of the Pleistocene, connecting the Malay Peninsula, Sumatra, Borneo, Java and Bali. This happened several times during the Pleistocene, with the last full exposure during the Last Glacial Maximum about 21,000 years ago (Hanebuth et al. 2000:1034). During the interglacial periods, when the sea level rose to about the present level, the land bridge that connected Mainland Southeast Asia and these islands became drowned, leaving the islands as they are today.

Presumably, the first human occupation of Borneo occurred during one of these glacial periods. Unlike Java, where early human fossils of *Homo erectus* are present in large number, Borneo has none at all. Bellwood suggested that “Perhaps in Borneo no bone could survive in the hot, wet and acidic conditions, but it is also possible that early humans simply did not inhabit the equatorial rainforest and preferred the more open and drier environments of Java.” (Bellwood 1992a:8). So far, the oldest human remains found in Borneo belong to a modern human, known as the “deep skull”, which was associated with charcoal radiocarbon dated to 39,600 ± 1000 years BP (Kennedy 1977:33). The Niah Cave Project has recently dated the skull more securely to c. 43-44,000 BP (Barker et al. 2002a:153; 2002b:97). This skull, which was found in the West Mouth of Niah Cave, showed close morphological affinities of cranial structure with recent Tasmanian and Australian groups (Brothwell 1960:339).

The deep skull was not the only human material found in Niah. There are more than 200 other burials that belong to later periods (Majid 1982:23). These burials can be divided into two groups: first a series of flexed, seated, and fragmentary burials (14,000 – 3,500 BP) and second, extended burials in coffins or mats (possibly from 4,000 BP – less than 2,000 years ago) (Bellwood (1997b:84). The first group do not seem to represent recent Southern Mongoloids, while the second appear to be more closely related to them.