LATE PLEISTOCENE/HOLOCENE HUNTER-GATHERERS OF SULAWESI

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ABSTRACT: In this article first the geographical and zoogeographical position of Sulawesi, then briefly archaeological research in Sulawesi and finally the first preliminary results of archaeozoological research on the subfossil island fauna will be discussed.

KEYWORDS: Indonesia, Sulawesi, archaeozoology, hunter-gatherer, *Sus*, *Anoa*, *Babyrousa*.

1. INTRODUCTION

Sulawesi or Celebes is one of the larger islands of 'Island Southeast Asia' (fig. 1). Geographically it is situated between the Sunda Shelf in the west and the Sahul Shelf in the east (fig. 2). The Sunda Shelf, with an area of almost two million square km, is a shallow sea generally less than 100 m deep. The Sunda Shelf unites Sumatra, Java and Kalimantan or Borneo with Malaya and the Asian mainland. During the last glaciation the sea-level may have been some 175-200 m lower than at present. The Sunda Shelf was at that time one vast land mass. The Makasar Trough, which is over 2000 m deep at present, remained a seaway that prehistoric man had to cross to reach Sulawesi, even at the peak of the last glaciation. The Sahul Shelf lies north of Australia and unites Australia and New Guinea. Early man had to use boats or rafts to reach the islands of 'Island Southeast Asia' and Australia. Ollier (1985) described the main possible migrations routes for animals and people across 'Island Southeast Asia' (fig. 3).

It was Wallace who in 1860 noticed for the first time that the flora and fauna of Sulawesi differed from those of Java, Sumatra and Kalimantan, and was partly a mixture of the animal and plant species of both the Sunda and Sahul Shelves, whereas species such as the anoa, the babirusa and the large palm civet are only found on Sulawesi and some small islands in its immediate vicinity. The Strait of Makasar west of Sulawesi seems to be the western border of the distribution of the marsupials which mainly live in Australia and New Guinea.

According to Groves (1985), in 1977 George Gaylord Simpson pointed out that too many lines have been drawn by zoogeographers in 'Island Southeast Asia'. He recommended that two should be retained Huxley's line in the west and Lydekker's line in the east. Both lines delimit definable faunal regions. Huxley's line in the west forms the eastern and northeastern boundary of the Oriental region, Lydekker's line forms the western boundary of the Australian region. Between these regions there lies an area with many islands including Sulawesi: 'Wallacea'. The term Wallacea has been coined for this area by Groves. According to Groves there is no harm in using this term as long as we keep in mind the fact that the faunas of the islands differ from one another; in other words Wallacea is not a zoogeographical region. According to Groves the Sulawesi fauna can be explained by its geological history. It has been suggested (Ollier, 1985) that 'Island Southeast Asia' can have originated from two separate parts which later collided. According to this suggestion North and South Sulawesi belonged to one part, East and Southeast Sulawesi to the other (fig. 4). North and South Sulawesi collided with Kalimantan and obtained its fauna during the period of unification; according to Groves (1985) this is a Siva-Malayan fauna, that can be connected with the Siwalik faunas in Pakistan. Later North and South Sulawesi were united with the present east and southeast part; the whole island drifting into its present position at the end of the Pliocene. According to Groves (1985) the colliding of the two parts of Sulawesi must have taken place after North and South Sulawesi were disconnected again from Kalimantan. Otherwise the two endemic Phalanger species would have also been found in Kalimantan. The dwarf buffalo, anoa may be linked, according to Groves, to a small already neotonous Upper Siwalik buffalo (subgenus Hemibos). Also the fossil elephants, and pigs of Sulawesi have close relatives in the Siwaliks, while the marsupials are related to the Australian fauna. Only the babirusa has no known ancestor, either on Sulawesi or elsewhere.

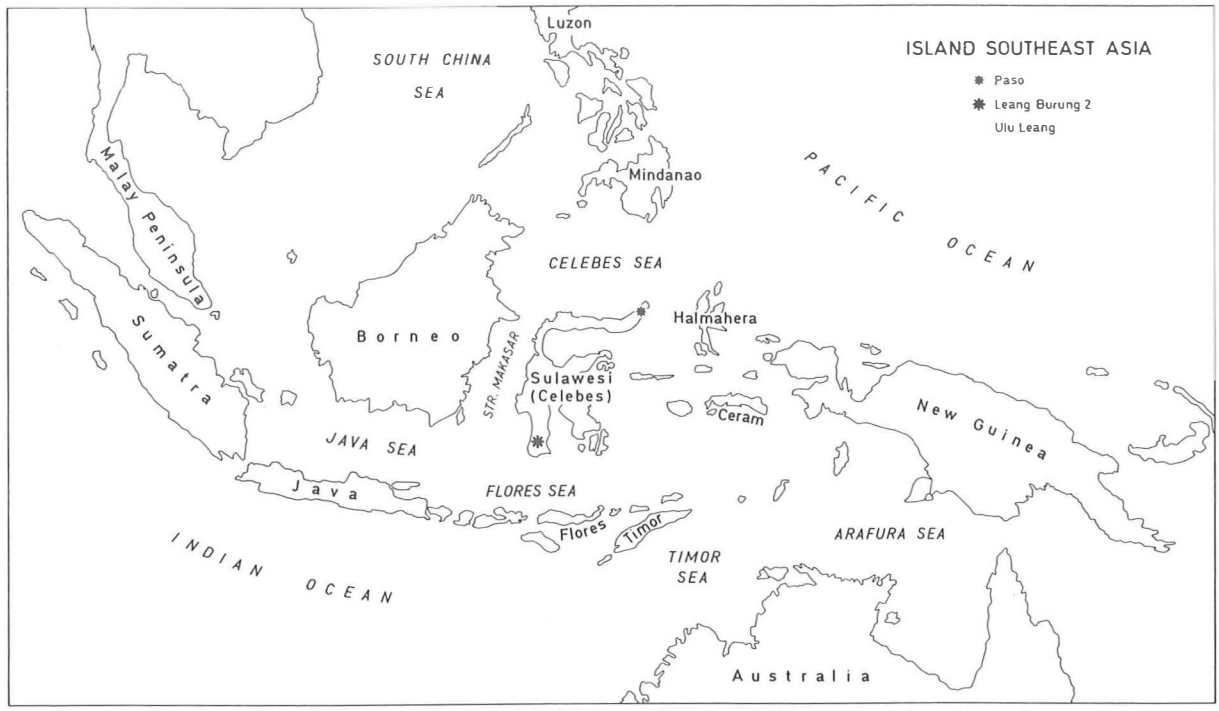

Fig. 1. 'Island Southeast Asia' with the sites of Ulu Leang I, Leang Burung 2 and Paso on Sulawesi (Celebes).

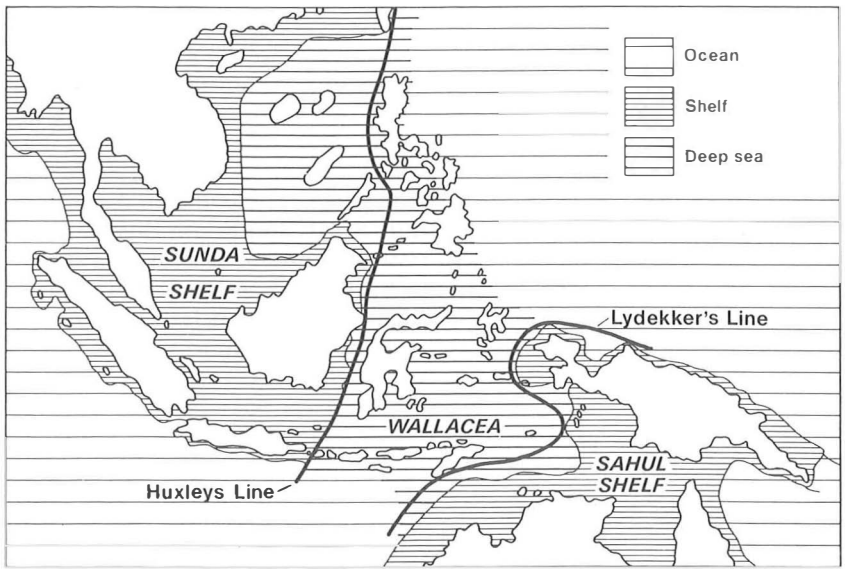

Fig. 2. Sunda Shelf, Sahul Shelf and Wallacea: the main geographical regions of 'Island Southeast Asia' (after Ollier, 1985).

2. ARCHAEOLOGICAL RESEARCH

At the beginning of this century the Swiss naturalists Fritz and Paul Sarasin (1905) travelled widely in Sulawesi. In the southwest, in the region that was then the principality of Boné, they visited the isolated mountain range of Lamontjang, where they came into contact with a community known as the Toale (people of the forest). These Toale lived in inaccessible mountain ranges where they used natural caves for shelter. The Sarasins undertook excavations in four of those caves. In the thirties van Stein Callenfels, Noone and Scence, and van Heekeren undertook excavations in the same area. Also in the 1940's and 1970's van Heekeren was excavating in southern Sulawesi. In 1969 a joint

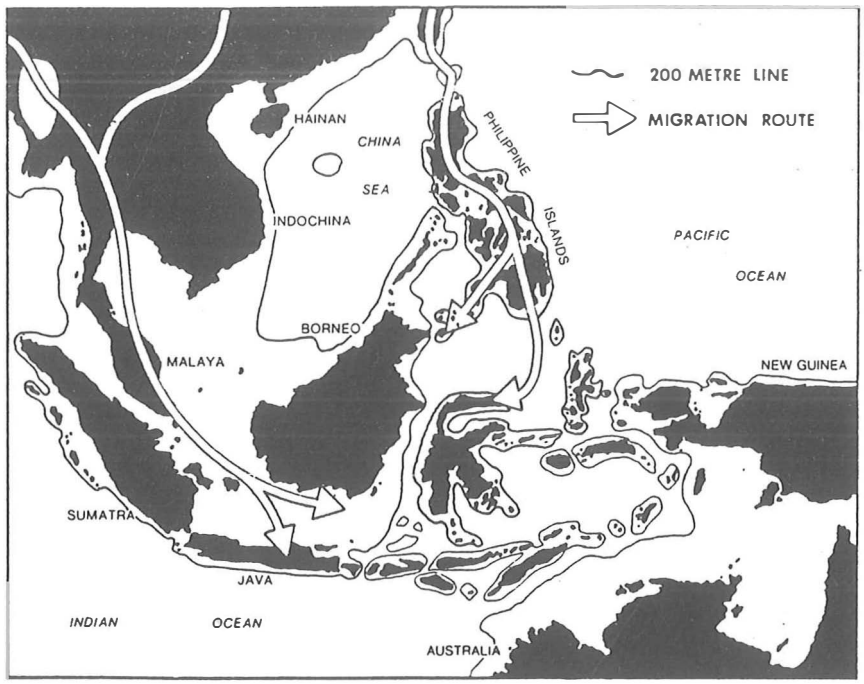

Fig. 3. Possible migration routes for animals and people across 'Island Southeast Asia' (after Ollier, 1985).

Indonesian-Australian archaeological expedition started the excavation of the cave Ulu Leang I (Glover, 1976; Clason, 1976). In 1973 these excavations were continued by Glover of the Institute of Archaeology of London, together with Hadimuljono of the Archaeological Survey of Indonesia, based in Udjung Pandang. They also undertook excavations in the abri of Leang Burung 2 (Glover, 1981). The cave assemblages of South Sulawesi are often grouped under the title of Toalian, named after the supposed band of hunter-gatherers encountered by the Sarasins. In 1974 I.M. Sutayasa of the *Pusat Penelitan Purbakala than Peninggalan Nasional*, in Jakarta in Indonesia and P. Bellwood of the Department of Prehistory and Anthropology of the Australian National University excavated a number of trial trenches in the shell mound of Paso in northern Sulawesi (Bellwood, 1976).

The cave of Ulu Leang I is situated at the foot of the 'tower-karst' formation at the western edge of the volcanic rocks of the central mountain range overlooking the flat alluvial coastal plain in the west of Southwest Sulawesi (Glover, 1976). The cave is about 15 m wide and 20 m deep; the cultural deposits were maximally 1.50 m deep (fig. 5). A small canalized stream flows directly in front of the cave. Only a small part of the cave was excavated. All earth was washed through $^{1}/4$" and $^{1}/8$" sieves. A large number of bones was thus collected (Clason, 1976). The bones were embedded in layers of freshwater shells. The bones were in most cases well-preserved but chipped into small splinters.

Fig. 4. A suggested origin of 'Island Southeast Asia' as two separate parts which will later collide (after Ollier, 1985/after Audley-Charles et al.).

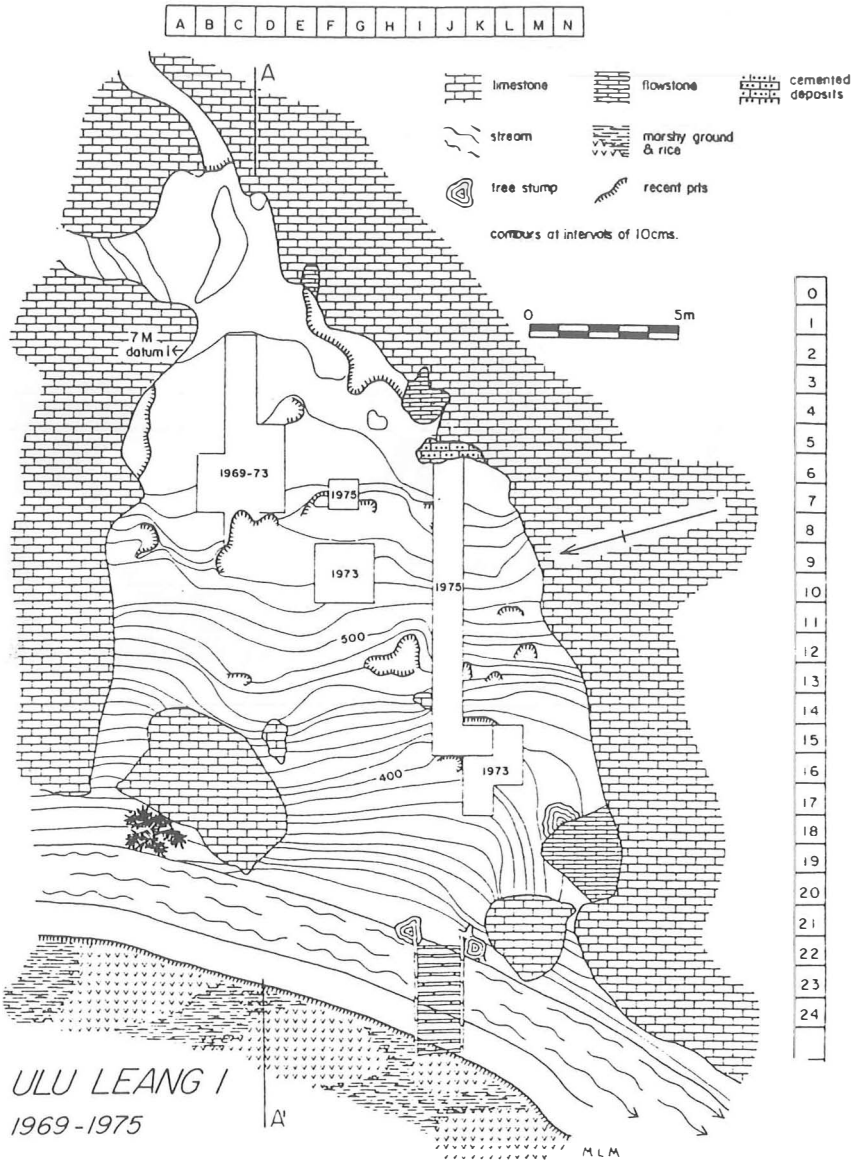

Fig. 5. Plan of Ulu Leang I showing the 1969-1975 excavation (courtesy Glover).

Leang Burung 2 (fig. 6) is not a real cave but rather an abri or rock shelter. In this case also only a small area was excavated. Glover (1981) observed 10 layers. Numerous bones were found, also embedded in layers of freshwater shells. These bones were not as well-preserved as those from Ulu Leang, and most had been burned to some extent.

The shell mound of Paso is situated on the southwestern shore of Lake Tondano in the vicinity of natural hot springs (Bellwood, 1976). The mound is estimated to be some 30 m in diameter and its maximum thickness, in the central part, is about 1 m. The mound is preserved because a Christian church was built on top of it. Because of the presence of this church it was only possible to excavate 10 trial pits of 1 m^2 each. The mound consists of small discrete lenses, averaging 10 cm in thickness, either of pure shell or of occupation debris in the form of ash, charcoal, black soil and broken shell (fig. 7). At the time of the occupation the site was close to the edge of the lake. The settlers began to dump food refuse consisting of shells in lenses outside and around their living area. In the course of time, they came to dwell on top of one or more of these lenses consisting of settlement debris, and used their former dwelling area for further shell dumping. Among the shells animal bones were well-preserved. The excavated areas both in Ulu Leang I and Leang Burung 2 in the south and in Paso in the north are too small to provide detailed information about the way in which the people lived here. Therefore it is also difficult to estimate the number

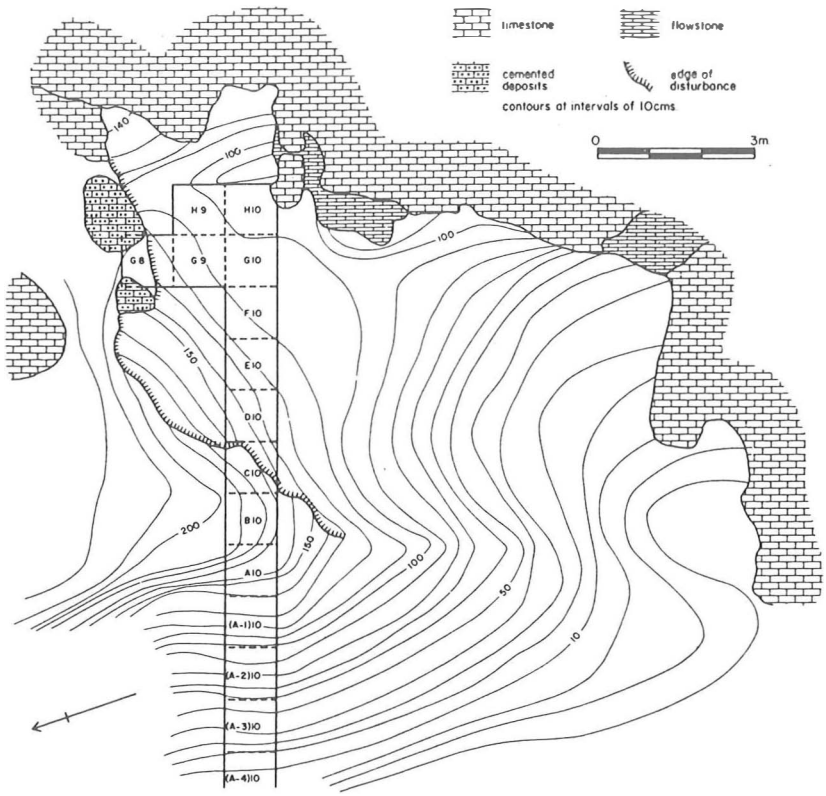

Fig. 6. Plan of Leang Burung 2 showing the 1975 excavation (after Glover, 1981).

of people who lived in or near the cave of Ulu Leang I and the abri of Leang Burung 2 or on the shell mound of Paso.

For all three sites there are ^{14}C dates available (Glover, 1981; Bellwood, 1976). Leang Burung 2 is the older occupation, the end of which may overlap with the beginning of Ulu Leang I. Paso is more or less contemporary with the beginning of Ulu Leang I. In Paso the habitation lasted three to five hundred years. It is surprising that the habitation of Leang Burung 2 lasted at least 10,000 years, ranging from before layer I with a date of 31,000 BP until 22,500 BP for layer V. The upper layers XI and XIa are not dated, but may be contemporaneous with the beginning of Ulu Leang I. The oldest layer of Ulu Leang I dates from c. 8000 BP and the youngest from 4000 BP. The date for Paso is also c. 8000 BP. Together the finds of Leang Burung 2, Ulu Leang I and Paso span the period when *Homo sapiens* could have arrived on Sulawesi in the Late Pleistocene, well into the period when the first farmers can be expected in Sulawesi at the end of the fourth millennium BC.

3. ARCHAEOZOOLOGY

Now we will look at the animal remains in more detail. The Sarasins (1905) already described the subfossil animal remains they collected during their excavations. In the 1940's Hooijer (1950) described remains collected during later excavations. I undertook the study of the material excavated by Glover and Hadimuljono in Southwest Sulawesi and by Sutayasa and Bellwood in northern Sulawesi (Clason, 1976; 1986). All three sites can be considered to be shell middens. Most of the shells belonged to freshwater species, which is not surprising since these are inland sites. The majority of the shells collected in Leang Burung 2 belonged to the freshwater gastropod *Brotia perfecta*. According to the excavator they were common, in fact densely abundant in some layers.

Also found in larger numbers are: *Melanoides crenulata*, freshwater stream edible; *Melanoides* cf. *granifera*, freshwater stream edible; *Thiara scabra* freshwater/brackish, not eaten and Viviparidae, freshwater streams, edible. Of 11 species less than three individuals in any one sample were found, among them small terrestrial and aboreal species. In Ulu Leang I the shells collected belonged for more than 80% to *Brotia perfecta*, which is still generally consumed by the present day Sulawesians. But also other species were found, such as: *Melanoides crenulata*, another edible freshwater gastropod; *Viviparus javanicus*; the brackish water species *Thia-*

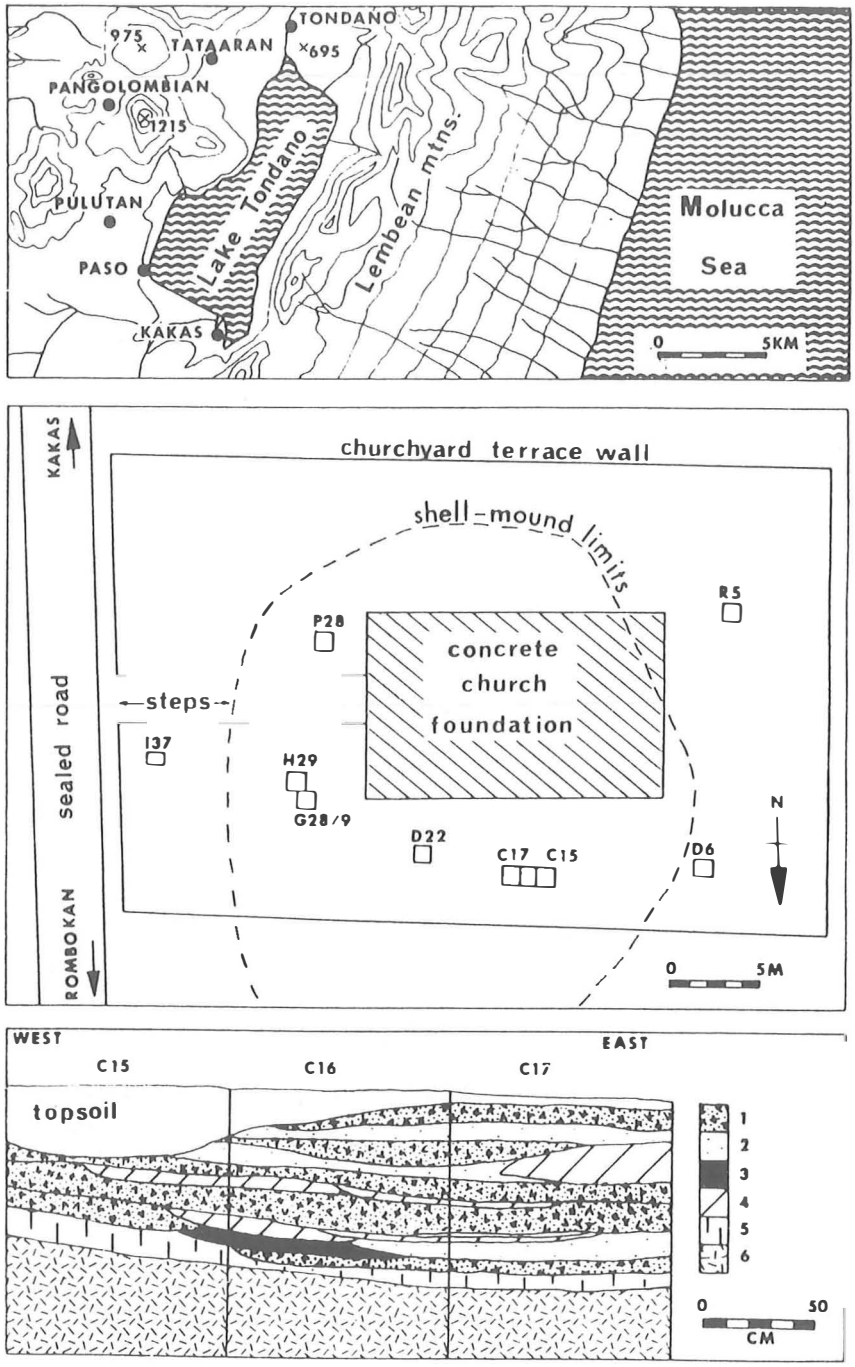

Fig. 7. The Paso site. Top: Lake Tondano and environs; centre: plan of the site, showing excavation trenches, church foundation and churchyard; bottom: section through trenches C15-17, north wall. Layers are as follows: 1. loose shell; 2. broken shell, black soil, and charcoal; 3. charcoal; 4. ash; 5. grey soil 5Y5/3; 6. light grey lake sand 5Y7/2 (after Bellwood, 1976).

ra cf. *scabra* that was too small for human consumption; *Batissa violacea*, a bivalve living in brackish water in a tidal region, the shells of which were used as scrapers; the bivalve *Telescopium telescopium*, of brackish water; the marine gastropod *Negritina pulligra*, which is edible; and the bivalve *Anadara granosa*, which is also edible. The shells of Leang Burung 2 and Ulu Leang I were identified by Emily Glover (Glover, 1981).

The shells from Paso have not yet been thoroughly identified, but the major species is a large gastropod from the Tondano lake called *renga* in the Minahasan language. Many shell lenses consist entirely of these shells, which according to Bellwood seems to be the only edible species produced by the lake. Some lenses of the Paso site also have a small number of marine bivalves of a single species about 2 cm wide called *wulle*. Certain small lenses

consist entirely of those shells, but their overall frequency is low and they had to be brought about 20 km to the site from the sea. Bellwood remarks that although tiny, they might have added some variation to an otherwise monotonous diet (Bellwood, 1976).

The majority of the animal remains I have studied belonged to vertebrates, with the exception of a small number of pincers of crayfish. To compare the sites with one another it is necessary to quantify the faunal remains in some way. The best known methods are those based on the Number of Remains (NR), the Minimum Number of Individuals represented (MNI) or the Weight (W). For a number of reasons it is difficult to quantify the remains of the Sulawesi sites and to compare them with each other.

Firstly the remains found in Leang Burung 2 and Ulu Leang I are small, the majority being unidentifiable splinters. The bones found in Paso are much larger and easier to identify. I have the impression that the inhabitants of the first two sites had places outside the cave and rock shelter where they deposited the larger remains of their meals. In the place where they lived only small parts were left that were not a nuisance for the inhabitants. In the same way the inhabitants of Paso lived next to their shell-middens, where they deposited meal refuse, and not on the midden. This explains why the bones of Paso were larger than those in the other two sites, where the refuse dumps were not found.

Secondly the bones of Leang Burung 2 are all burnt to some extent. Burnt bones can be counted in the same way as unburnt bones, but their weight differs from that of unburnt bones.

A third problem is caused by the remains of reptiles, amphibians and fish. The bones of the skeletons of those animals have many more skeletal elements than mammals and birds. And the numbers of single species may differ from other species of other genera and families. The most extreme is the *Python reticulata*, with 450 vertebrae and even more ribs. Of this species numerous vertebrae and ribs were collected in the cave of Ulu Leang I. On the other hand there are the terrapins or tortoises with a reduced number of skeletal elements, but with a carapace which breaks up easily into segments. Also remains of these animals were collected.

A fourth problem is posed by the remains of small species of rodents, birds, reptiles and amphibians which might have entered the cave and abri by themselves and died, or were brought by predators other than man. The larger bird and rodent species were probably eaten by man. In Paso the very small birds found in the other two sites are absent. The relatively large number of bird bones in Paso mostly came from ducks and pigeons.

The fifth problem concerns remains of flying foxes, *Pteropus* cf. *edulis*, with their very long, slender and light bones of the arm and hand, which carry the wings. These bones are very fragile and they readily break into numerous segments, which look like elongated beads.

The sixth problem concerns the long bones of the Celebes pig and the babirusa, which are rather similar when the epiphyses are missing.

Finally the molluscs, which certainly formed a part of the diet, have to mentioned. The problem is how to compare their contribution to the diet since few data are available as yet on numbers, live weight etc.

In the light of all these problems I have only counted the numbers of bones of the vertebrates and the pincers of the crayfish, which gives me the opportunity of comparing the sites to a certain extent. I have grouped the remains into six categories: mammals, birds, terrapin/tortoise, python, fish and crayfish (fig. 8). The mammals seem to have been the most important source of animal protein, certainly when we bear in mind the numerous mammal bones that could not be identified to

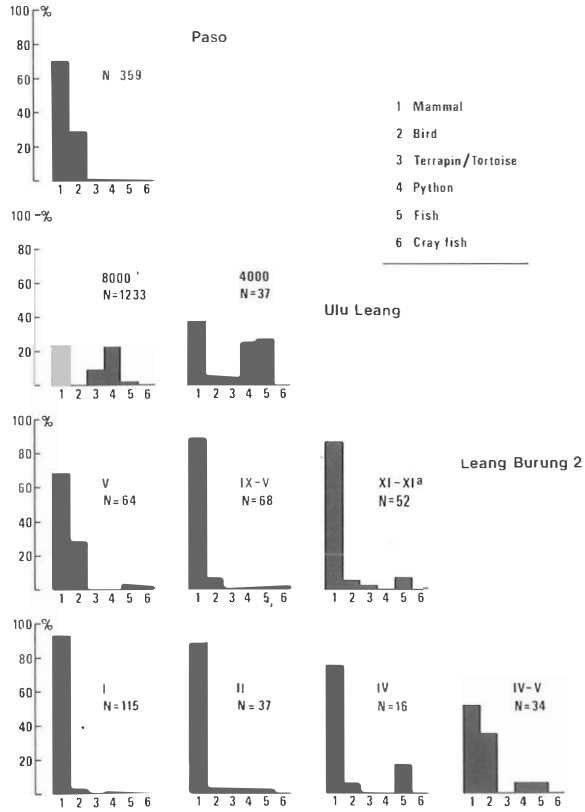

Fig. 8. The percentages of the animal groups found in Ulu Leang I, Leang Burung 2 and Paso, calculated for the sum of identified bones.

Table 1. The animal remains from Leang Burung I, Ulu Leang 2 and Paso.

Site	Leang Burung							Ulu Leang		Paso
Layer	I	II	IV	IV-V	V	IX-V	XI-XIA			
Approximate date BP	-	31,000	26,000	27,645	22,540	-	-	8000	4000	8000
Mammalia										
Marsupialia										
Phalangeridae										
Phalanger celebensis	4	-	-	-	-	-	-	3	-	2
Phalanger ursinus	16	-	1	7	8	10	4	7	2	10
Chiroptera										
Pteropodiadae										
Pteropus sp.	13	4	1	2	4	2	5	31	3	-
Primates										
Ceropithecidae										
Macaca sp.	-	5	-	-	5	2	-	22	4	2
Hominidae										
Homo sapiens	1	-	-	-	-	-	-	1	-	30
Carnivora										
Unidentified	-	1	1	-	-	1	1	-	-	2
Rodentia										
Large rodent > rat size	-	1	1	-	3	2	2	-	-	-
Rodent-rat size	5	9	1	7	16	31	12	-	2	-
Small rodent < rat size	3	-	-	-	1	-	10	-	-	-
Rodent	-	-	-	-	-	-	-	66	-	30
Artiodactyla										
Suiedae										
Sus verrucosus celebensis	14	10	3	2	6	9	9	664	2	142
Sus sp.	-	-	-	-	2	-	-	-	-	3
Sus scrofa	1	-	-	1	-	-	-	-	-	14
Sus/Anoa	11	-	-	-	1	-	-	32	-	4
Sus/Babyrousa	31	20	1	7	12	4	7	-	23	15
Babyrousa babyrussa	26	-	4	-	-	2	1	-	1	1
Cervidae										
Cervus sp.	-	-	-	-	-	-	-	-	-	1
Bovidae										
Anoa sp.	27	3	-	-	-	2	-	24	-	60
Unidentified										
Sus/Bab./Anoa size	586	23	-	62	25	58	2	-	9	214
Phalanger urs./Macaca size	6	10	-	3	11	7	5	-	20	22
Rodent size	3	2	-	1	-	-	-	-	3	42
?	476	338	47	118	403	103	301	5453	68	410
Aves										
Rallidae										
Rallus cf *striatus*	-	-	-	-	-	-	-	-	-	1
?	-	-	-	-	-	-	-	-	-	3
Anatidae										
Anas cf *querquedula*	-	-	-	-	-	-	-	-	-	3
Anas cf *gibberifrons*	-	-	-	-	-	-	-	-	-	5
Anas cf *superciliosa*	-	-	-	-	-	-	-	-	-	2
Anas sp.	-	-	-	-	-	-	-	-	-	45
Aythya sp.	-	-	-	-	-	-	-	-	-	5
?	-	-	-	-	-	-	-	-	-	30
Columbidae										
?	-	-	-	-	-	-	-	-	-	6
Unidentified bird	3	1	1	12	18	5	3	-	2	-
Reptilia										
Chelonia										
Terrapin/tortoise	2	1	-	-	-	-	1	120	2	1

Table 1 (cont.).

Site	Leang Burung							Ulu Leang		Paso
Layer	I	II	IV	IV-V	V	IX-V	XI-XIA			
Approximate date BP	-	31,000	26,000	27,645	22,540	-	-	8000	4000	8000
Ophidia										
Python cf *reticulata*	2	1	-	2	-	-	-	272	9	6
Unidentified snake	-	-	-	-	2	-	-	7	-	5
Squamata										
Varanidae										
Varanus sp.	-	-	-	-	-	-	-	3	-	-
Pisces										
Unidentified	-	1	3	2	2	1	4	24	10	3
Arthropoda										
Crustacea										
Unidentified crey fish	-	-	-	-	1	1	-	-	-	-
Mollusca	+	+	+	+	+	+	+	+	+	+

species. These are left uncounted in this case (table 1). Birds are of some importance in layer IV-V and V in Leang Burung 2, and in Paso; terrapin/tortoise and python are important in Ulu Leang I layer 8000; and python and fish are important in Leang Burung 2 layer IV and Ulu Leang layer 4000.

Seven mammal species could be identified. Remains of the small Celebes cuscus were found in Leang Burung 2, layer I, Ulu Leang I 8000 and Paso. The larger bear cuscus was found in all three sites and all layers with the exception of Leang Burung 2, layer II. Remains of *Pteropus* cf. *edulus* or flying fox were found in the two southern sites but surprisingly not in Paso. Even at the beginning of this century a special stew of these animals named *paniki ritja* was prepared in the Minahasa. The macaque was on the menu both in the south and the north. The rodents have not yet been identified to species and were divided into larger than common rat, smaller than common rat and as large as common rat size. By common rat size is meant the size of the skeleton of a white rat in the comparative collection of the B.A.I. Most numerous were the remains of the Celebes pig. Babirusa could be identified with certainty for all three sites, but in small numbers. The same can be said of the anoa. Only apart the bones of the birds of Paso were identified to species, and belonged to the slaty-breasted rail, the garganey which according the German ornithologist Heinrich, who collected birds in Sulawesi in the 1930's, is a very rare winter guest; the grey teal, a common bird in Sulawesi; the grey duck, which is not numerous but common; the tufted duck or Australian white-eyed duck, both species living on lakes, and pigeons not identified to species. There are 22 species of pigeons or doves living in Sulawesi and neighbouring areas.

It is interesting that no remains of domestic animals were found in the upper layers of Leang Burung I, 4000 BP. Glover (1972) reports remains of pig, dog and goat from East Timor at 5000 BP and also Medway (1977) reported the presence of the same domestic species from the Nia Caves in northern Kalimantan in the same period.

4. CONCLUSION

When we consider the evidence thus far collected we can conclude that there is little or no change to be seen in the spectrum of animal species hunted or collected in a period of more than 30,000 years. There is no indication that during the Ice Age the climate was much cooler than at present. There is only one indication thus far for the time of the year during which a site was certainly inhabited; the *garganey* from Paso, which species may indicate the period around the end of the year. The overall picture is one of stability during this long period. Much work has still to be done before we can present a more complete picture of hunting gathering in Sulawesi. The largest problem is that no complete reference collections of recent animals of the area are available.

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