Continuity in Tropical Cave Use: Examples from East Timor and the Aru Islands, Maluku

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IN THIS PAPER WE EXAMINE the evidence for long-term cave use from the Aru Islands located in Maluku province of eastern Indonesia and from East Timor. Both study areas are located within the low-latitude tropical zone north of Australia and represent likely early stepping-stones for anatomically modern humans colonizing the continent of Sahul (Fig. 1). Excavations by the authors between 2000 and 2002 in East Timor at the cave sites of Lene Hara, Matja Kuru 1 and 2, and Telupunu, and in the Aru Islands at the cave sites of Liang Lemdubu and Nabulei Lisa in 1996 and 1997, have provided rich occupation sequences spanning the last 30,000 years (O'Connor et al. 2002*a,* 2002*b;* Spriggs et al. 1998, 2003; Veth et al. 1998*a,* 1998*b*). All of these caves are now located within secondary growth forest, but we know from detailed faunal analysis of the Aru sites and from general climatic data that the boundaries and nature of these forests and the distance of some sites from the sea have changed significantly through time (cf. O'Connor et al. 2002*a*:302). Despite this, we suggest that these caves demonstrate a continuity of use through time. Reviews of cave archaeology in tropical Southeast Asia often stress the homogeneity, protein paucity, and impenetrable nature of rainforests, conveying a sense of the caves' centrality and isolation from other habitation sites in the landscape (Bailey et al. 1989; Bailey and Headland 1991). We challenge this portrayal, arguing that the cave sites we have studied formed locations within much larger cultural landscapes.

THE EAST TIMOR CAVES

In East Timor, Ian Glover carried out an extensive test-pitting and excavation program in the Baucau, Venilale, Laga, and Baguia regions in 1966–1967 (Glover 1969, 1986). The oldest dated site was a small deep cave/fissure named Uai Bobo 2 in the interior, from which he obtained an age of ca. 13,400 B.P. A range of other cave sites both in the interior and near the coast returned a range of dates

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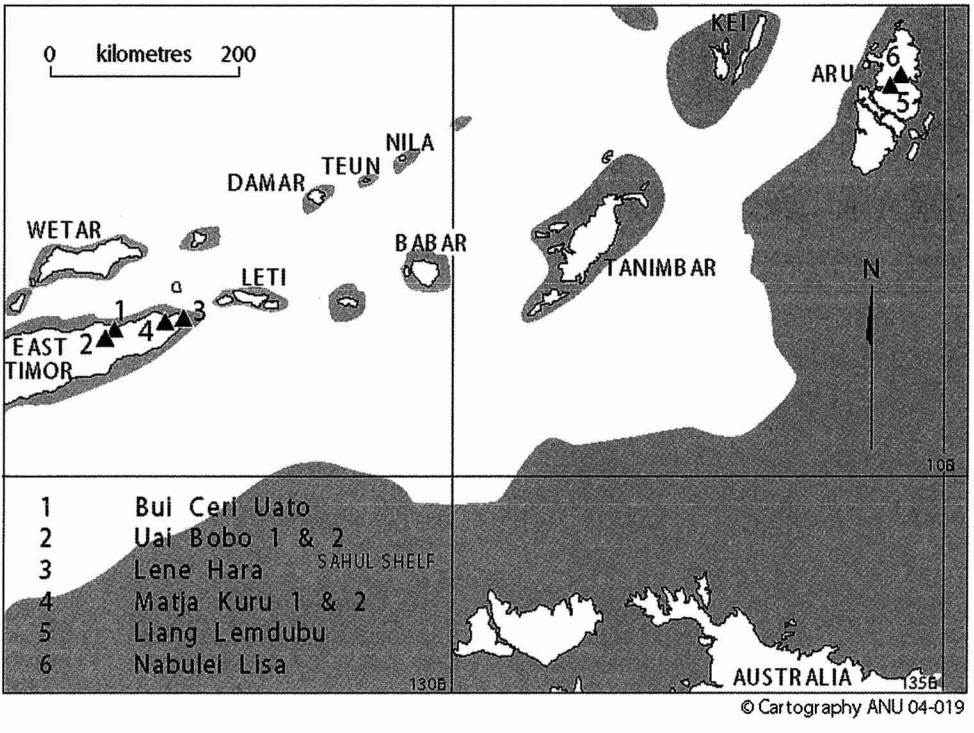

Fig. 1. The Sahul shelf and East Timor, showing major sites excavated and discussed in the text.

all in the Holocene period. As noted by Pannell and O'Connor (this volume), Glover argued that these caves were not representative of general settlement and subsistence patterns and were likely to be skewed toward specialized kinds of activities. During our background review of his excavation data, however, it became clear that some of the cave sequences, such as Bui Ceri Uato, located adjacent to a permanent spring near the coast, shared many of the characteristics one might expect of a generalized habitation site, with intensive occupation continuing both before and during the Neolithic phases of its occupation (Table 1). These attributes included extremely high artifact densities, high proportions of retouched/utilized implements, and a diverse assemblage of economic fauna, indicating that the site probably acted as a central locale for a wide range of activities.

Glover's detailed analysis of lithic and faunal suites from four sites illustrates that there are major differences in assemblages depending upon their position in the landscape and the configuration of the caves themselves. For example, the Bui Ceri Uato cave site is a very extensive shelter providing a substantial protected surface area for both earlier hunter-gatherer groups and later agricultural groups (who may have incorporated the cave within a village complex). The dense assemblages are dominated by cherts and have a significant marine faunal component. The numerous pounders, anvils, and grindstones recorded further suggest the cave's use as a major habitation site (Glover 1986:110–116). The greatest density of stone artifacts was recorded in horizon IV: concentrations of

TABLE 1. FREQUENCIES OF STONE ARTIFACTS AND MNI (MINIMUM NUMBER OF INDIVIDUALS) FOR MURIDS AND SHELLFISH AT BUI CERI UATO[a]

HORIZON	DATE (B.P.)	WASTE FLAKES	CORES + TRIMMING FLAKES	UTILIZED FLAKES	FLAKES WITH GLOSS	SECONDARY WORKING	MURIDS MNI	SHELL MNI/ RICHNESS
X–IX	0–750	742	29	171	—	33	1	32/19
VIII	750–1500	2,284	56	122	2	67	1	116/29
VII	1500–2500	4,101	97	117	12	112	2	161/31
VI	2500–3500	6,376	166	119	20	195	3	207/27
V	3500–4500	5,714	147	159	11	132	6	163/25
IV	4500–5500	4,837	143	149	11	139	6	211/25
III	5500–6500	4,898	149	169	18	81	5	333/25
II	6500–7500	5,558	157	207	4	112	11	349/28
I	7500–8500	1,803	77	54	—	35	1	189/19
Total		36,313	1,021	1,267	78	906	36	1,761

[a] Total volume excavated approximately 8 m^3. Data from Glover 1986:96–125.

up to 15,000 flakes per m^3. In contrast, Uai Bobo 2 cave, situated in the interior at 600 m altitude, is a small, cramped setting containing assemblages of much lower density lithics (with a maximum of only 1270 flakes per m^3), has only one basal processing stone (thought by Glover to have been used for flaking), and lacks the major marine economic shellfish suites (shellfish are largely present as industrial items, such as ornaments). (See Table 2.) Similarly, Uai Bobo 1 cave registers a maximum artifact density of 2000 stone artifacts per m^2.

Glover (1986:207) provided a measure of the intensity of occupation for these three sites by calculating the discard rate of stone artifacts with secondary working both for pre- and post-pottery levels. The rates do not show a marked change in order of magnitude between earlier aceramic levels and those clearly containing pottery (Table 3). These and other important differences between the cave assemblages led us to wonder to what extent cave occupation might in fact be embedded in larger settlement/subsistence systems and to what degree caves represent accurate sampling points of wider land-use patterns and behavioral variability within territories through time.

Our surveys since 2000, covering extensive coastal tracts east from Laga Lagoon on the coast and from Mehara within the interior forests, have resulted in the recording of numerous cave and rock shelter sites (O'Connor et al. 2002*a;* Spriggs et al. 2003). Many of these sites were named and had evidence for recent activity, and some were being used as residential bases. Following the recording of these and other categories of cave sites, our increasing impression was that a wide variety of both secular and sacred activities was documented within caves and therefore that they had the potential to inform on larger settlement/subsistence patterns. The possibility existed that such widespread use of caves also existed in the past, and that East Timorese caves always formed integral parts of both domestic and totemic landscapes.

Excavation of the large solution cave of Lene Hara, situated in a raised limestone terrace at the far eastern tip of East Timor and only 1 km from the coast, has provided a record for occupation back to ca. 35,000 B.P. (O'Connor et al.

TABLE 2. FREQUENCIES OF STONE ARTIFACTS AND MNI (MINIMUM NUMBER OF INDIVIDUALS) FOR MURIDS AND SHELLFISH AT UAI BOBO 2[a]

HORIZON	DATE (B.P.)	WASTE FLAKES	CORES + TRIMMING FLAKES	UTILIZED FLAKES	FLAKES WITH GLOSS	2ND WORKING	MURIDS MNI	SHELL (ORNAMENTS)
XIII	600–900	25	1	6	—	—	6	—
XII	1400–1700	8		1	—	1	19	—
XI	1900–2200	12		2	—	—	15	—
X	3200–3800	168	3	14	2	9	152	1
IX	3800–4300	1058	3	36	27	40	24	11
VIII	5000–5200	1205	15	61	23	45	20	24
VII	5700–6200	2190	27	79	44	95	108	11
VI	5900–6500	324	—	17	9	18	39	5
V	6300–7000	273	5	14	3	19	73	1
IV	7400–8200	71	—	2	1	5	321	—
III	9300–10600	6	1	—	—	—	549	—
II	10,600–12,200	—	—	—	—	—	719	—
I	13,800–15,800	—	—	1	—	—	355	—
Total		5,340	55	233	109	232	2,400	53

[a]Data from Glover 1986:161–94.

2002*b*). The deposits contained pottery in the upper levels, with stone artifacts, marine shell, and small quantities of other economic fauna throughout the sequence. Species include fish, marine turtle, small murids, snakes, lizards, crabs, and dogs, as well as now extinct giant rat. A uniform flake-based lithic assemblage on red chert was recovered that is similar to Pleistocene assemblages described from northern Australia (cf. O'Connor and Veth 2000*b;* O'Connor et al. 2002*b*). Marine shells were dominated by rocky platform species including *Strombus, Trochus, Lambis, Turbo,* and *Nerita.* Importantly there do not seem to be major changes in the proportions of these shellfish or the lithic assemblages throughout the deposit.

The site appears to comprise two phases of occupation. The first phase of the deposit built up ca. 35,000–30,000 years ago, when the site probably acted as a transit camp between the coast and inland. Changes in sea level and access may have resulted in lack of use from then until the Holocene and more intensive use during the last few thousand years of Neolithic occupation of East Timor, when the site may have served as a shelter convenient to local gardens. Despite the cave being (re)incorporated into an agricultural context, it still registers similar marine and "exotic" lithic resources and may well have continued to be used as a transit

TABLE 3. AVERAGE NUMBER OF YEARS CALCULATED BY GLOVER (1986:207) FOR THE DISCARD OF ARTIFACTS WITH SECONDARY WORKING AT THREE SITES HE EXCAVATED

SITE	PRE-POTTERY LEVELS	POTTERY LEVELS
Bui Ceri Uato	1 every 11 years	1 every 4 years
Uai Bobo 1	1 every 30 years	1 every 12 years
Uai Bobo 2	1 every 26 years	1 every 26 years

point from the coast to the interior. Even today the walk up the four levels of marine terraces from the spectacular beaches facing Jaco Island to the village of Tutuala is long and steep, with few protected habitation or rest-stop locales such as Lene Hara en route.

Additional excavations were carried out at Lene Hara cave in late 2002. The first excavation was farther inside the cave and revealed a very similar sequence to that recovered in 2000, again with only a minor Neolithic component. The second and third excavations were located in a second and lower chamber of the cave some 30 m from the previous two. Here a very rich sequence was revealed that dates from approximately 10,000 radiocarbon years (cf. O'Connor and Veth 2005). It included pottery, numerous bone fragments of both marine and terrestrial fauna, dense concentrations of shellfish, and at a depth of ca. 50 cm a Neolithic burial. In a nearby square, excavation to a depth of over 2 m revealed pottery, remains of dog, cuscus (phalangerid), deer, and monkey. Pottery was recovered down to ca. 60 cm, with shell beads, giant rat remains, shellfish, and two polished shell fishhooks below (only two hooks have previously been recorded in East Timor; Glover 1986). A full discussion of the implications of pre-Austronesian fishing technology dated to between 9000 and 10,000 years ago is presented in O'Connor and Veth (2005). Different portions of this large site clearly register different phases of occupational history, but there remain remarkable consistencies between the lithic and marine faunal assemblages from the "compressed" Pleistocene assemblages and those recovered from the "expanded" Holocene and Neolithic sequences. We suggest that it was the location of the cave within a larger settlement/subsistence system through time that determined the dominant economic lithic and faunal assemblages found within it.

Located within the interior of the eastern portion of Lautem Province is a large freshwater lake west of the village of Mehara named Ira Lalaro. Today it yields two species of fish and a turtle species, actively caught by local villagers. Its periphery is used for wet rice cultivation.

Matja Kuru 1 cave is located a few hundred meters north from Lake Ira Lalaro (O'Connor et al. 2002*b*). Although it produced a near-basal date of 13,690 ± 130 B.P.[1] (ANU-11616, marine shell), most of the deposit built up ca. 5600–4600 B.P. It contained lake fauna such as freshwater turtles and fish, coastal resources such as shellfish and fish, and terrestrial fauna such as large rodents. There are consistencies in the lithic and faunal assemblages, with the noticeable loss of the giant rodents by Neolithic times. This cave appears to have served as a temporary habitation for exploiting many of the resources locally available from the lake, forests, and open grasslands. The continuous presence of marine shellfish throughout the sequence is of interest, as they would have had to be transported over 10 km overland following the most direct route from the northern coastline.

Matja Kuru 2 is a few hundred meters to the east of Matja Kuru 1 in the same cliff line. A substantial amount of deposit appears to have built up over the last 3000 years, when the site appears to have functioned as an occasional garden shelter. Cultural material is generally sparse, but a notable feature was a stone-lined oven in Spits 19–25, apparently dating to about 10,000 B.P. (the date immediately below in Spit 26 is 9650 ± 55 B.P.: NZA-16137, chiton shell). A dog burial was found in Spit 25, dug down from higher up, and was directly dated on bone by AMS to 2967 ± 50 B.P. (Wk-10051). Most pottery occurs in Spits 1–19. A near

basal date on marine shell of 32,200 ± 300 B.P. (OZF-785) provided a similar age to the basal dates for Lene Hara cave. Concentrated marine shell was found in the basal deposits associated with this date. There were simple shell beads found nearly to the base of both Matja Kuru 1 and 2.

The chronology of use of Matja Kuru 1 and 2 seems to have been complementary. Matja Kuru 2, like Lene Hara, appears to have been attractive as a temporary campsite ca. 30,000 B.P. After apparent abandonment during the Last Glacial Maximum, the site was occasionally reoccupied around the Pleistocene-Holocene transition, but became much less attractive, perhaps after the opening of a hole in the roof at the back of the shelter. Matja Kuru 1 had been a bedrock and boulder-floored cave with no sedimentary buildup and so was not used until ca. 13,000 years ago. Its sudden attraction then may well have been because, unlike Matja Kuru 2 at that time, it did provide good shelter. Human use led to the accumulation of occupation deposits and the creation of a conveniently flat surface near the front of the shelter that progressively expanded farther back. Deposit built up rapidly in the mid Holocene period, when the cave saw its most concentrated use as a regular camping spot.

When the shellfish recovered from the Matja Kuru 1 and 2 sites are considered in combination, there is evidence for the collection, transport (>8 km), and discard of these marine resources over a very long period of time (Fig. 2). At Matja Kuru 2, shellfish are common from Spit 49 to Spit 40, when the pattern of occupation at this specific site appears to have changed significantly. Shellfish are nearly absent during the period bracketed by dates from Spit 41 of 31,060 ± 310 B.P. (NZA 16177) and from Spit 32 of 11,173 ± 55 B.P. (NZA 16138). These are both AMS dates on marine shell. The near-basal date of 13,690 ± 130 B.P. (ANU-11616) for the nearby Matja Kuru 1 cave site falls within the tail end of this bracket of dates. From the beginning of occupation of Matja Kuru 1, shellfish are registered in substantial quantities for each spit through to the present. There is a likely gap in occupation at Matja Kuru 2 that may coincide with arid conditions in the Last Glacial Maximum.

A similar pattern can be noted for the artifact discard numbers and weights summarized in Tables 4 and 5. Artifacts occur in appreciable numbers from the near-basal levels of Matja Kuru 2 dated to 32,200 B.P. and then decrease significantly from the archaeological record by Spit 39—approximately the same time as the shellfish are lost. Stone artifacts are registered in significant numbers, however, from the near-basal levels of Matja Kuru 1. Despite the possible "swapping" of general occupation between the two proximal caves, at either end of the heightened aridity of the Last Glacial Maximum where a regional hiatus might be registered between ca. 30,000 and 14,000 years ago, the caves appear to be occupied in a consistent and broadly comparable fashion.

Despite the introduction of agriculture between 4000 and 3000 years ago and the presence of pottery and dog, the function of these cave sites as temporary habitation bases for exploiting both proximal and distant resource zones seems to have remained relatively unchanged. Their location appears to have determined their role in the settlement/subsistence system for both hunter-gatherer and then gardening societies. Even today villagers hunt along these cliff lines with dogs and blowguns in search of cuscus and other fauna and use the caves as temporary camping spots.

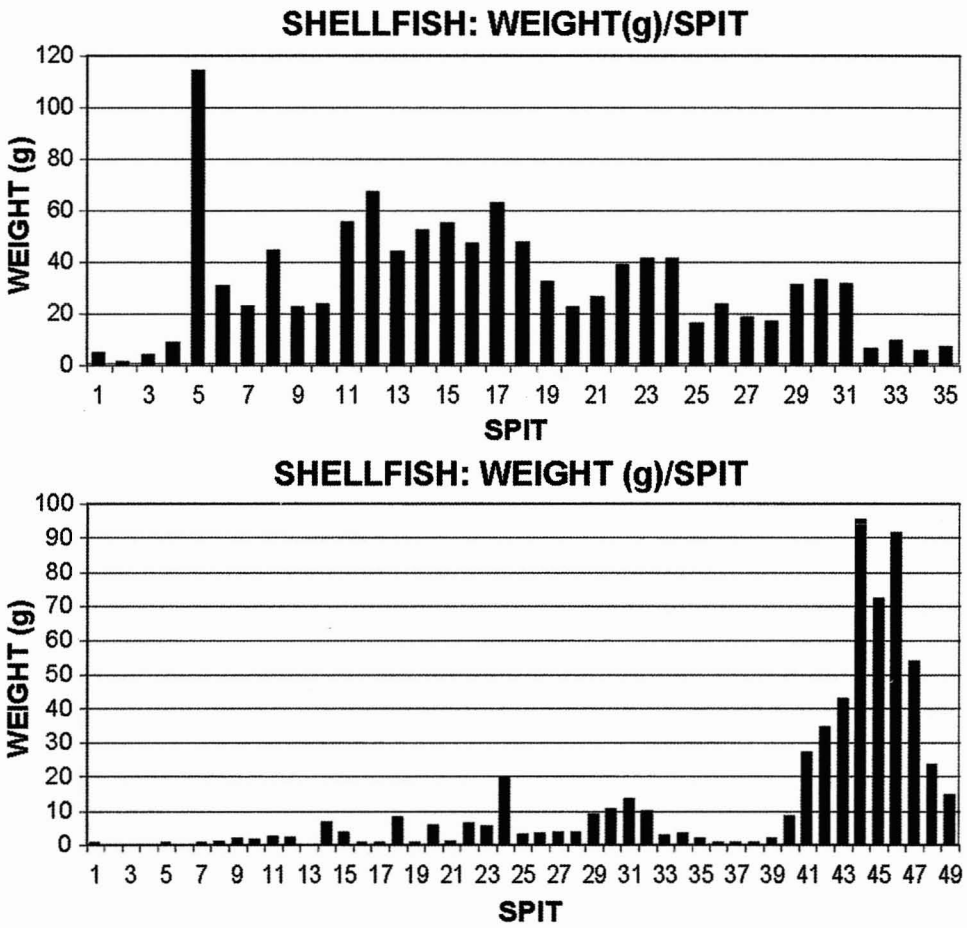

Fig. 2. Shellfish weight (g) per spit for Matja Kuru 2, Square D (below) and Matja Kuru 1, Square A (above). The distribution of shellfish at Matja Kuru 2 peaks between ca. 31,060 B.P. and 32,200 B.P., followed by a possible hiatus in occupation/deposition to resume by Spit 32, which is dated to 11,173 B.P. Deposition of shellfish at Matja Kuru 1, which has a near-basal date of 13,690 B.P., is registered in almost every spit to the present.

The last cave site excavated was Telupunu in the Com area of the north coast, also toward the eastern end of the island. The cave is at 260 m above sea level. Excavation yielded a thin ceramic horizon dating to within the last 2000 years, on top of a preceramic deposit with sparse artifactual and shell and bone material to about 1.5 m below the surface. Although the density of cultural material was low, the site is notable in preserving hearths and charcoal from top to bottom. (Charcoal was missing through post-depositional factors in the preceramic levels of all other cave sites.) A change in weathering regime within the cave is evident partway through the sequence, in the form of a layer of angular limestone spalls from the ceiling, which may bear witness to increased aridity during the Younger Dryas. Occupation evidence was very sparse during the accumulation of this deposit, but was denser in the basal cultural levels below, dating back to

TABLE 4. MATJA KURU 1: TOTAL STONE ARTIFACT COUNTS AND WEIGHT (g) BY SPIT

SQUARE A			SQUARE AA		
SPIT	NO. ARTIFACTS	WEIGHT (g)	SPIT	NO. ARTIFACTS	WEIGHT (g)
1	22	30.62	1	17	26.71
2	7	9.28	2	15	16
3	18	13.67	3	43	33.56
4	27	10.03	4	92	81.43
5	64	27.89	5	105	54.33
6	69	37.06	6	160	85.18
7	63	52.47	7	97	50.43
8	113	76.24	8	124	113.83
9	75	20.63	9	204	140.85
10	80	31.42	10	149	138.63
11	61	25.09	11	113	148.7
12	133	150.96	12	88	436.5
13	79	116.69	13	106	130.24
14	95	71	14	105	436.5
15	142	123.19	15	188	113.58
16	148	171.31	16	118	126.53
17	94	69	17	117	90.76
18	128	62.48	18	260	273.92
19	109	76.77	19	205	100.01
20	89	74.75	20	369	159.15
21	87	50.05	21	210	122.3
22	85	44.55	22	178	107.16
23	104	102.65	23	143	99.1
24	81	44.84	24	97	47.3
25	66	54.62	25	39	18.46
26	83	41.28	26	29	9.43
27	68	34.94	27	19	5.41
28	54	29.34	28	23	9.24
29	75	68.31	29	2	1.32
30	61	21.5	30	3	0.65
31	45	21.99			

13,695 ± 70 B.P. (NZA-16633, celtis seed). Apart from a short period of intensive use within the last 2000 years (and more recent use since 1975: Pannell and O'Connor, this volume), the cave appears to represent only occasional visitation, perhaps by hunting parties or people transiting from the north coast to the Los Palos plateau.

THE ARU ISLANDS CAVES

The Aru Islands were part of the continent of Sahul, which formed a continuous land bridge connecting Tasmania, Australia, and New Guinea until ca. 12,000 B.P. Until 1995 no excavation or systematic collection had been made of any pre-European archaeological sites in the islands. The authors and their Indonesian counterparts carried out the first regional surveys and excavations of prime stratified sites during 1995–1997. Two large limestone caves in particular, Liang Lem-

TABLE 5. MATJA KURU 2: TOTAL STONE ARTIFACT COUNTS AND WEIGHT (g) BY SPIT IN SQUARE D

SPIT	NO. ARTIFACTS	WEIGHT (g)	SPIT	NO. ARTIFACTS	WEIGHT (g)
1	1	0.04	26	10	2.84
2	1	0.73	27	11	11.03
3	1	0.9	28	17	76.78
4	5	0.76	29	30	12.47
5	1	1.02	30	24	12.14
6	1	0.06	31	57	56.85
7	0	0	32	31	36.91
8	2	11.08	33	18	16.81
9	3	0.45	34	17	12.11
10	3	0.88	35	5	1.41
11	0	0	36	9	2.09
12	0	0	37	2	0.31
13	5	1.44	38	5	0.38
14	3	33.23	39	8	1.32
15	7	4.35	40	23	17.04
16	8	3.35	41	43	4.67
17	3	0.53	42	54	53.4
18	9	4.78	43	47	46.55
19	5	0.66	44	60	42.02
20	6	3.25	45	63	51.85
21	6	2.18	46	42	65.38
22	8	4.29	47	35	35.06
23	10	1.62	48	28	17.91
24	9	1.22	49	5	1.34
25	15	5.48	Total	756	660.97

dubu and Nabulei Lisa, provided cultural deposits spanning the last 30,000 years (O'Connor et al. 2002*a;* Spriggs et al. 1998; Veth et al. 1998*a,* 1998*b*).

Liang Lemdubu is formed from a now truncated and previously subterranean river channel, surrounded by dense rainforest and located some 8 km from the nearest tidal waters *(sungai).* The cultural assemblages included major quantities of economic fauna, stone artifacts, and a secondary burial (O'Connor et al. 2002*a*:297–303). The fauna from the Pleistocene levels suggests that there was extensive savanna grassland around the site, probably during a time of lower precipitation bracketing the Last Glacial Maximum. Rainforest species were also present, probably from gallery rainforest aligned along the major *sungai* channels and freshwater drainage lines.

There was then a hiatus in the occupation with the end of the Pleistocene, following the insularization of the Aru group and the subsequent expansion of dense rainforest, before the cave was reoccupied probably near the beginning of the Neolithic. Fauna from these levels indicate an increase in aquatic taxa, the introduction of pig and dog, and the noticeable consumption of fruit bats. Wallabies and other open-grassland species such as bandicoots completely disappear from the record and are replaced by closed rainforest taxa, a trend most parsimoniously explained by changes in sea levels and climate: most aquatic fauna could be collected from the newly inundated tidal *sungai,* and the expansion of rainforest is

most easily explained by the effects of postglacial climatic amelioration. Apart from the introduction of domesticates and a minor pottery signal, however, the latter stages of occupation of Lemdubu do not suggest any dramatic change in its primary use—for the predation of abundant interior fauna—from ca. 30,000 years earlier.

Nabulei Lisa on Kobroor Island is another massive tunnel cave, in this case directly adjacent to a tidal channel. Its sequence shows a change from freshwater shellfish at the base (when the *sungai* was a river) to mangrove species ca. 8000 B.P. The lowest levels have a faunal suite very similar to that from contemporary levels at Lemdubu, a mix of grassland and closed-forest fauna, with wallabies, cuscus, and cassowary. Wallabies drop out of the sequence at the Pleistocene/Holocene boundary, but hunting continued, with a focus on rainforest species, estuarine fish, and shellfish. The small, amorphous, and unretouched stone artifacts are uninformative about hunting technologies.

DISCUSSION AND CONCLUSION

There have been major debates about the antiquity and nature of hunter-gatherer adaptations to rainforests, with particular focus on tropical assemblages (Bailey and Headland 1991; Bailey et al. 1989; Roosevelt et al. 1996; Spriggs 2000). When the arguments are broadened, however, to include the cool temperate and montane forests of parts of Sahul and to include Island Melanesia (see papers in O'Connor and Veth 2000*a,* and O'Connor et al. 2002*a*), there is clear evidence for a diversity of responses by nonagricultural peoples.

There is good evidence for the long-term exploitation of montane rainforest in New Guinea from its earliest occupation, with increasing proof of early human activity in lowland rainforest. In the Bird's Head region of West Papua, excavations in Toe Cave and Kria Cave indicate the long-term exploitation of lowland rainforest environments beginning ca. 20,000 B.P. (Jelsma 1998; Pasveer et al. 2002). There appears to be the same hiatus in occupation around the Last Glacial Maximum as in the East Timor caves, raising interesting questions about possibly changing configurations of land use in response to the redistribution of fauna and grasslands during this period of decreased precipitation and greater continentality. There is evidence for use of lowland rainforest from the West New Britain site of Yombon between 35,000 and 14,000 years ago (Pavlides and Gosden 1994). The rainforests that likely surrounded the East Timor sites prior to 32,000 years ago, before the possible distributional changes associated with the Last Glacial Maximum, abutted rich littoral zones.

In lowland areas such as Aru and northeastern Queensland in Australia, people in the Pleistocene occupied open environments such as savanna, grassland, or woodland, but used pockets of rainforest as part of a strategy focused on a mosaic of environments. Lemdubu Cave documents the presence of open savanna, with denser, lusher vegetation present in galleries along watercourses or other protected enclaves in the karst limestone. The spread of wetter forests in the Holocene presented difficulties for human exploitation: decreased faunal diversity and loss of the open savanna element with insularization caused the eventual cessation of occupation on the Aru Islands. It would appear that hunting and gathering groups did not continue to schedule use of Lemdubu once lowland rainforest

spread across the Kobroor Plateau. A change in use and scheduling of the cave is then registered with Neolithic occupation.

In short, Lemdubu was either accessible and useful as a hunting bivouac or casual encampment within a larger settlement system on the plateau, or dropped altogether from use because of regional vegetation change. Despite the excellent shelter it afforded, the cave does not appear at any time to have served as a major habitation site, an artifact production center, or any other kind of specialist site, until its recent use as a sacred water source. The same consistencies of use through long periods of time are registered also at Nabulei Lisa, with the predictable shift from freshwater to marine species as the river valleys were drowned and became tidal *sungai* during the early Holocene. Caves in the Aru Islands have served as parts of much larger cultural landscapes. They show the same degree of diversity of use and function between each other as might be expected of different categories of open sites associated with habitation bases versus task-specific localities. A regional perspective of hunter-gatherer organization is required to understand this diversity between caves. Nevertheless, there are strong continuities in the way these caves have been scheduled in land-use patterns through long periods of time. Our position is essentially in agreement with Glover's (1986:206) conclusion that he did not believe "there was any substantial change in the nature of cave use despite the possible subsistence changes which might have taken place."

The caves of East Timor and the Aru Islands were not "locked" within homogeneous and impenetrable rainforest systems, nor were they necessarily "central" habitation bases that on their own might inform on a plethora of behaviors at the regional level. They represent diverse components of a larger domestic and totemic landscape. This conclusion raises important questions about the way researchers interpret variability between cave sites in the Indo-Pacific region and emphasizes how important it is to understand the roles of specific caves in the wider regional context. The scale of territoriality, degree of mobility, and extent of trade and exchange of groups must all be considered if the placement of the caves within cultural landscapes is to be understood.

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NOTE

1. Radiocarbon dates quoted in this paper are uncalibrated.

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ABSTRACT

The Aru Islands and East Timor fall within the biogeographic region known as Wallacea and have lain within the tropics for the known history of human occupation. Recent research has identified archaeological sequences that parallel the older radiocarbon chronologies from Australia. Terminal Pleistocene hunter-gatherer assemblages recovered from at least six caves register the introduction of a Neolithic technocomplex after ca. 4000 B.P. in the form of pottery, domesticates, ovens, the industrial use of shell, and some endemic extinctions. However, there are also intriguing uniformities in the cultural assemblages: in the suites of artifacts discarded and assumed supply zones for those artifacts, in the economic faunal suites, and in the apparent level of intensity of occupation of the different sites. We concur with and extend the argument made by Glover (1986) that there was no substantial change in the nature of cave use in East Timor despite the possible subsistence changes that might have taken place. Their remarkable continuities reflect their similar placement within larger regional land-use systems through time: they represent diverse components of a larger domestic and totemic landscape, which appears to continue to this day. The scale of territoriality, degree of mobility, and extent of trade and exchange of groups must all be considered if the placement of caves within cultural landscapes is to be understood. KEYWORDS: Southeast Asia, cave use, Pleistocene, Holocene, cultural landscapes, Aru Islands, East Timor.