

## **In the Footsteps of Wallace: The First Two Seasons of Archaeological Research in the Aru Islands, Maluku**

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The Aru Islands were connected to Greater Australia or Sahul until approximately 8,000 years ago, when they were separated by rising sea levels. While now forming part of the Indonesian province of Maluku, for a long time they comprised an elevated land mass on the edge of the Sahul continent (Map 1).

The presence on Aru of numerous marsupials and the cassowary attest to this shared history. Indeed the biogeographical significance of the Aru Islands has long been highlighted by naturalists such as Wallace (e.g., Ride 1972, Wallace 1869). While the waters to the east of the Aru Islands are relatively shallow, reflecting the previous landbridge with New Guinea and northwest Australia, the continental shelf to the west slopes steeply, with the 100 m isobath located as little as 10 km away. Due to their optimal position, the Aru Islands have the potential to register a multitude of maritime colonizing events through time.

Aru was part of a continuous landbridge to both Australia and New Guinea for at least the first 40,000 years that *H. sapiens sapiens* occupied Sahul. It was only approximately 12,000 years ago that rising sea levels began to encircle the island group, separating it from Australia, and possibly as late as 8,000–9,000 years ago that it was completely separated from New Guinea.

The Aru Islands and their now inundated Pleistocene coastal plains are located on two of the major colonizing routes into Sahul, as proposed by Birdsell (1977: 122). Five possible colonizing scenarios were pro-

posed in this seminal paper (see Map 2). The first route of interest passes through Maluku via Buru, Seram, and finally the Kei Islands, with a landfall directly on the Aru uplands. The second route passes along the Lesser Sundas to Timor then via Maluku through Wetar, Babar, and Tanimbar, with landfall on the Pleistocene coastline in the vicinity of the Aru group. The key point is that branches of both the postulated primary northern and southern colonizing routes pass through, or close to, the Aru Islands. This feature, combined with the fact that they are positioned right on the edge of the Sahul Shelf, make them prime targets for investigating initial and subsequent maritime colonizations.

The Aru Islands also have the advantage of being composed in part of limestone, with a substantial belt of karst located near the central western coast (see Map 3). Rockshelters and caves occur in the karst and the alkaline environment has the potential to provide excellent faunal and botanical preservation. In fact, the oldest radiocarbon dates for occupation of Australia, in the order of 40,000 B.P., now come from a limestone cave located in the Kimberley Region of northwest Australia (O'Connor 1995). Another unique feature of Aru is the presence of substantial channels connecting the west and east coasts. These *sungai* not only connect major littoral zones, they also penetrate deep into the interior, thereby providing easy access by watercraft to uplands and dense rainforest. The tidal channels have been formed either by jointing or by previous drainage (cf. Fairbridge 1966, Verstappen 1959).

### **Results of the 1995 reconnaissance survey of Aru**

Initial reconnaissance surveys in 1995 focused on the northwest islands, as these lay closest to the edge of the continental shelf. We hoped they might provide stratified sites with old and continuous occupation sequences. These islands included Kobraor, Wamar, Wokam, Ujir, and Wasir (see Map 3). A considerable amount of time was spent liaising with *kepala desa* (village leaders) and communities in order to thoroughly explain our long-term objectives and to identify any known sites. After traveling to the various islands from the capital Dobo, the general strategy was to carry out formal discussions and interviews, address *adat* issues, and then carry out systematic surveys and site inspections with community representatives. The joint Australian–Indonesian survey team in 1995 consisted of Veth, Spriggs, and Jatmiko from Pusat Penelitian

Arkeologi Nasional (Puslit Arkenas) in Jakarta. A detailed account of the 1995 field season has been published by Veth et al. (1998).

Most of the geological formations surveyed on the islands were unsuitable for cave/rockshelter formation. Where caves were found, they were either post-transgression sea caves of recent origin or contained running water and thus were unsuitable for human occupation. Our initial strategy to target cave sites on the northwestern islands closest to the edge of the continental shelf in the hope of finding evidence of early occupation thus proved unsuccessful. Suitable caves in this part of Aru appear to be restricted to the karst formation (see Map 3).

Thirteen sites were recorded on the five islands in 1995. These included two caves with cultural deposits, three further caves of primarily religious significance containing Chinese and Dutch porcelain, five midden complexes, at least three of them with associated pottery, a substantial "Islamic" settlement, possibly with an associated shipwreck, and an early Dutch fort (originally built c. 1650 A.D.) and nearby stone church. These sites have the potential to address the key research areas outlined by Spriggs (this volume).

### **Cave/rockshelter sites**

#### **Liang Lemdubu (Site 9)**

Liang Lemdubu is a large, double-entrance cave formed from an ancient subterranean river channel cut into karst limestone, somewhat resembling a long tunnel with both ends truncated. It is approximately 30 m in length, up to 8 m wide and is an average of 3 m in height. The cave represents a high point on the local landscape and is surrounded by reasonably dense rainforest and swamps. It has a small hole in the central portion of the roof that allows water and limited sediments to enter. This minor collapse appears quite recent. Stalactites and stalagmites occur also in the central third of the shelter and, where water drips from the former, a considerable collection of Dutch and Chinese porcelain has been placed, being covered in a coating of calcium carbonate. The water is believed to have sacred properties and the cave is of important *adat* significance to the local population.

The cave may be approached by boating to the upper reaches of Sungai Papakula (the very *sungai* on which Wallace stayed in 1857 for six weeks at the hamlet he called "Wanumbai"), and then by a three-hour

walk through rainforest. The densest concentrations of cultural materials on the extensive sediment floor of the cave are located near both of the driplines. Shell midden is found, including the mangrove species *Geloina* sp., *Anadara* sp., and *Terebralia* sp. Plain earthenware was also present, although in low numbers. Terrestrial fauna noted on the surface included deer, pig, macropod, and possibly cuscus. A low density of stone artefacts was recorded, although it appeared that numbers of the large *Geloina* valves had been retouched/utilized and had therefore also served as artefacts.

This site was seen as having the greatest potential to yield a long cultural sequence and was test-excavated in 1996 with spectacular results (see below).

#### **Liang Lisaibam (Site 8)**

This cave, also on Pulau Kobroor, is a smaller version of Lemdubu. It is located only 300 m from the nearest *sungai* and has maximum measurements of approximately 15 m in length, 5 m in width, and 2 m in height. It has well-developed middens at its entrances that contain the mangrove shellfish *Geloina* sp., *Terebralia* sp., and *Anadara* sp., as well as earthenware pottery and Chinese porcelain sherds. The most remarkable feature of the cave is the plethora of engravings on most of its surfaces. Motifs include abstract geometrics, anthropomorphs and stylized feet/hands, naturalistic representations including marine craft (specifically *perahu*), and writing in Arabic script.

#### **Liang di Karkur, Liang Belnarnar, Liang Batul Bakar (Sites 4, 6, 7)**

All three of these caves/rockshelters are associated with *adat* ceremonies and contain either burials, Chinese and/or Dutch porcelain, or engravings above their entrances in Arabic script. They contain limited occupation deposits. Because of this and their *adat* significance, they will not be excavated.

#### **Open midden sites with associated pottery**

Such sites were observed to be common on Wamar Island in coastal and near-coastal situations. Construction of the Dobo-to-Durjela vehicle track disturbed several middens near the village of Wangil (Site 10). Examination of areas where sand is currently being quarried near Wangil revealed red-slipped pottery sherds, some of complex vessel form, in a

shell-midden layer containing *Anadara* sp. and *Telescopium* sp., as well as turtle and large fish bones. On the surface of adjacent fields, a sherd from a Chinese *tempayan* or water jar and a piece of metal were found. It is not at all certain whether they are associated with the main midden deposit.

Shell-midden mounds were observed among the houses of Durjela village and appeared to predate the current village (Site 11). South of Durjela on a walking track close to the shoreline we visited an old village site in a cassava garden, called Karkur (Site 3). The site was marked by marine shell, earthenware pottery, some red-slipped, a stoneware *tempayan* sherd, and an iron knife. The site probably dates to the last few centuries and is 200 m north of Liang di Karkur.

Near the south coast of Wamar, along a vehicle track to the Pertamina oil complex and along a secondary vehicle track from it to Dibelakang Wamar village, were observed multiple shell-midden exposures associated with fossil beach-ridge systems (general site number, Site 12). Clearly there has been significant coastal progradation over time in this area. The area would repay further study as having the potential to provide a sequence of sites associated with beach deposits of different ages postdating sea-level stabilization.

Within the town of Dobo itself, there are scattered shell-midden deposits exposed in the main football field adjacent to the Fany Hotel near the beachside memorial to the Battle of the Aru Sea. No pottery was observed in the exposed areas at this site (Site 13).

Bad weather prevented more detailed examination of the Wangil and Durjela middens, and only passing observations were made of the other surface sites. These sites have the potential to illuminate the last 4,000 years or so of Aru prehistory, but may turn out to be quite recent in age. The red-slipped pottery, at least superficially, resembles that known from early Neolithic contexts in the Philippines and Eastern Indonesia (Bellwood 1997, chapter 7).

#### **“Islamic” settlement, Ujir (Site 5)**

In secondary forest adjacent to the present village of Ujir on Ujir Island are the remains of a remarkable settlement site, consisting of structures made of plastered coral blocks, some of more than 2 m wall height. The plaster bears nonfigurative designs in relief. The structures are generally only a few meters square and some of them did not have any obvious

entrance doorways. They had small windows, some of semicircular form with designs surrounding them on both the inside and outside. It is possible that these structures were entered via the roof.

Although described locally as a “Portuguese Fort,” the style of the structures and the nonfigurative art would suggest an Islamic inspiration. It is possibly the site of a Malay or Macassan trading post. Historical research may reveal more about the origins of this substantial settlement. It is called Mai Abil (‘deep river’) and there is a substantial sheltered harbor adjacent to the site.

During 1996 a second visit was made to the site and further areas were investigated. These included a possible stone revetment structure along the side of the harbor that incorporates a feature called Yan Fulada (lit. ‘Dutch steps’). The site is adjacent to or part of the traditional location of Ujir village, which lies just inland of a supposed human-cut ditch (called Fu Abil) and includes the substantial remains of a large mosque. There is a large scatter of Chinese and Dutch porcelain and bottle glass concentrated within the supposedly artificial channel and also adjacent to the old mosque. A large gunflint was also found at the mosque site. There is a cannon and a large stone mortar in the intertidal zone adjacent to this structure. A cannon from the old mosque site has been relocated within the grounds of the current mosque in Ujir village, and a cannonball and anchor are said to be located on the other side of the harbor from the old village. The site warrants further investigation. It is used as a source of stone by local villagers and so is under active threat at present.

#### **Dutch fort and church, Wokam (Sites 1 and 2)**

The first fort on the site was built sometime after 1650 A.D. and is known locally as Kota Lama Wokam (Wokam old village). It is under the custodianship of the Education Department and is occasionally visited by tourists. The fort is adjacent to the beach and commands the entrance to the channel between Wokam and Wamar Islands. The coral block walls are in generally good condition, and measure approximately 50 by 35 m with the longest axis parallel to the beach. There are remains of corner bastions, and attached to the west, sea-facing wall is a rectangular blockhouse.

Among the internal structures are a stone-walled building in the southern half of the fort with five internal rooms and with its external walls well-preserved. Foundations of another stone building are also

visible in the southern half of the fort. In the northeast corner is a stone-lined well. Coconuts have been planted within the walls. There is an entrance on the sea side immediately south of the blockhouse and a blocked larger entrance opposite it in the east, inland side with door slots preserved. Porcelain and bottle glass sherds are found inside the fort and there are dumps of porcelain and bottle glass outside the fort to the east, and between the fort and the church.

South of the fort are the remains of a stone church, with its walls remaining to the full height in some places. The church has three windows on each side and a small door to the seaward side as well as a larger one at the inland, eastern end. The present site of Wokam village is immediately south of the church site. Valentijn (1858 [1722], vol. 3, 36–38) described Wokam as the main village in the Aru Islands and noted that around 1700 A.D. there were a sergeant, a corporal, and 10 or 12 soldiers stationed in the fort.

#### **The 1996 excavation of Liang Lemdubu and Reconnaissance survey of Central and Southeastern Aru**

Funding for three further years of research in the Aru Group was obtained from the Australian Research Council in 1996. The 1996 team consisted of O'Connor, Spriggs, and Veth, Husni Mohammad from Puslit Arkenas, Branch Manado, and Widia Nayati, a lecturer in the Department of Archaeology at Gajah Mada University, Yogyakarta. The research was again sponsored in Indonesia by Puslit Arkenas in Jakarta and Universitas Pattimura in Ambon. During October and November 1996, about three weeks were spent in excavating Liang Lemdubu and a further week on reconnaissance survey using a local 15-m motor vessel.

#### **Liang Lemdubu excavation**

As mentioned earlier, Liang Lemdubu is a cave of special *adat* significance, and it should be noted that *adat* ritual and the continuous involvement of *adat* specialists was facilitated during the course of the excavation. The following impressions of the excavation are written just after returning from the field and before any analysis of the material has taken place. Any conclusions given here should therefore be taken as extremely preliminary assessments.

Our initial judgment was that the deposits immediately inside the driplines at both ends of the cave were likely to be the deepest and the

least disturbed by water action, roots, and major roof-fall events. We excavated in 5-cm spits, wet-sieving all materials through fine mesh (1.5 mm), and recorded volumes of recovered materials and sorted all cultural residues in the field. Initially a 1x1-m test-pit (Test-pit 1) was dug at the west end of the cave. This reached sterile deposits, apparently weathered bedrock, at approximately 50 cm below surface level. The test-pit revealed a homogeneous loose gray-brown sediment that changed to an orange-brown mottled clay immediately above the sterile, basal deposit. The Upper Unit contained charcoal, terrestrial fauna, earthenware, marine shellfish, a fragment of bronze, and stone artefacts. Shellfish dropped out in the Middle Unit, but it contained terrestrial fauna, stone artefacts, and minimal charcoal. The Lower Unit included a sparse assemblage of fauna and occasional stone artefacts. From this first test-pit, it became apparent that the deposits at Lemdubu contained a phenomenal quantity of terrestrial fauna, reflecting resources from a wide range of habitats, including rainforest and open savanna.

Test-pit 2 was located near a massive in situ boulder at a mounded portion of the deposit at the eastern end of the shelter. To some extent this excavation represented an expanded version of Test-pit 1. The excavation of 1x1 m reached sterile deposits at >160 cm below surface level and contained a remarkable quantity and range of terrestrial fauna. For example, spits 24 and 25 each yielded 14 medium-sized bags of bones. Much of this material is in a good state of preservation and includes a substantial amount of cranial material and teeth that may be used to identify species and possibly indicate the existence of now extinct species. As expected, a major marsupial component was seen through the presence of small to medium sized wallabies (macropods), cuscus (phalangers), bandicoots, and native cats (dasyurids). Lizard, snake, cassowary (both bone and shell), deer, and dog are also present, the last two only in the uppermost units. The faunal assemblages represent the densest and most extensive ever experienced by the researchers in the Indo-Pacific region.

Dating the deep deposits of Test-pit 2 will be facilitated by the presence of charcoal and marine shellfish down to Spit 7, the occasional occurrence of marine shell or charcoal through to Spit 25, and two flowstone features that occur between Spits 27 and 30. Fauna appears to have been discarded due to human agency down to Spits 28/29. The minimal faunal remains from basal Spits 30 and 31 are assumed to be due to

natural agencies. The lowest stone artefact was recovered from Spit 29 and this is bracketed by the flowstone layers.

While it is impossible to estimate the age of the deposit with any certainty, the fact that marine shellfish are generally absent below Spit 8 (c. 6,500 B.P.?), that geological features (two separate flowstone layers) bracket the base of the deposit, and that extremely dense faunal assemblages are present all suggest a Pleistocene antiquity for the site. Samples of marine shellfish, charcoal, and flowstone will be submitted for dating in the near future.

The excavations have also yielded assemblages of stone artefacts. There appear to be long-term continuities in the technology of artefact production, in that the industries are essentially percussion-flake-based, with the modified component represented simply by retouched/utilized flakes. These provide no grounds to argue for specialized scraper categories or the later appearance of a small-tool component, and certainly no indication of the Hoabinhian. There do appear to be consistent changes in the dominant lithologies used through time, however, with silicified calcretes, cherts, silcretes, and chalcedonies all making an appearance. The flaked-stone technology is therefore very similar to key Pleistocene sites excavated from Northern Australia (cf. Veth and Hiscock 1996).

### **The 1996 Reconnaissance Survey**

A further 10 sites were located during a week of survey along Sungai Manumbai and some of its branches and on islands off the east coast of the "mainland." The islands visited were Penambulai, Workai, and Batu Lei, although a very short period of time was spent in each location. We were told of many more sites than we had time to visit during the 1996 season.

### **Cave sites**

Three of these were visited in lands controlled by Wakua Village, on both sides of Sungai Manumbai. They were Liatai, "Alan 1," and "Alan 2" (Sites 14, 15, 16). Of these, only "Alan 2" (Site 16) seemed to have excavation potential. It is a large cave of several chambers, which may have more than one entrance, about 20 m above a mangrove swamp along a branch *sungai*. The entrance is quite small but this appears to be because of possibly recent stalagmitic growth. There are excavatable sediments, at least near the cave mouth. The cave had several chambers,

but observations were cut short because of the presence of a substantial colony of large cave bats.

Liatai (Site 14) is about 3 m above the high-tide mark adjacent to Sungai Manumbai. It is about 2 m wide at the mouth and does not exceed this width inside, running back about 15 m. A small hearth was found just inside the entrance, but no other cultural remains were seen. "Alan 1" (Site 15) is on the same side of the *sungai* as "Alan 2," in a cliff face about 20 m above the *sungai* and going through from one side of a headland to the other in a series of chambers. It is currently used for collecting bird nests. Some shellfish is present at the main entrance, but what cultural deposit there is seems to be extensively disturbed by animal burrows. Sites 14 and 15 have little archaeological potential.

We were taken to the cave of Nabulei Lisa (Site 22) by villagers from Dosi. It was located about 50 m from Sungai Nyanyafafi, a branch *sungai* coming off Sungai Doimaar (or Dosimaar) at a point where the *sungai* runs with fresh water at low tide. It is situated about 20 m above the *sungai* on the edge of an area of karst.

Remarkably, it is another example, like Lemdubu and Lisaibam, of a former subterranean river system, forming a tunnel open at both ends. The cave is massive: about 40 m long, 30 m wide, and about 20 m at maximum height. About half of its floor area is covered by large roof-fall boulders, but a significant area of occupation surface remains—on two levels. This is covered, particularly near the cave wall, by an extremely dense surface midden of mangrove shells (mainly *Geloina*, *Anadara*, and *Terebralia*, though with a wider representation of species than encountered at other cave sites). Animal bone and pottery sherds were also present. The former included several deer mandibles and the latter were mainly earthenware, but also including some Chinese and Dutch porcelain.

Although we would not expect this site to have deep cultural deposits, it would certainly provide information on Holocene exploitation patterns in a location adjacent to a mangrove-fringed *sungai*. We were told of other caves in this area, away from the *sungai*, with which it could be usefully compared.

**Former village sites**

Six of these were visited, all identified as former villages by informants from Jambu Air (Barakan Island), Afara and Beimun (Workai Island), Batu Lei, and Dosi (Wokam Island).

Site 17, Jambu Air Lama, is on the south coast of Penambulai Island, across the channel from the present village of Jambu Air. We were told that it was abandoned because of an outbreak of disease, which on the basis of the porcelain and glass bottle assemblage must have occurred within the first half of the nineteenth century. The people then dispersed to several smaller settlements. Active erosion of a maximum 5 m high sand cliff is depositing large amounts of midden material in the intertidal zone along several hundred meters of beach between a small *sungai* and an area of mangrove swamp. In section, the midden is about 25 cm thick in the cliff-face. Behind the eroding cliff-face are some areas of low midden mounds.

The assemblage consists of large amounts of Dutch and Chinese porcelain sherds (some of the latter possibly as old as the 13th century), earthenware (similar to that produced in the Batu Lei area up to the present), Dutch square liquor bottles of early 19th-century type, mangrove shellfish, and occasional dugong bones. The density of material suggests a rich trading entrepôt associated with an extensive reef system between this island and the “mainland” of Aru.

Site 18, Sirlasi, is the ancestral village of the inhabitants of Afara, Longgar, and Beimun on Workai Island, and of Gomo Gomo Island. Together they form a single language group, separate from the language of the Jambu Air people. We were told that the uncertain supply of freshwater forced its abandonment. Again, an early nineteenth-century date seems likely on the basis of the ceramic and glass bottle assemblage, which is very similar to that from Jambu Air Lama. One bottle had a round lozenge labeled “JOHN ALBERTY VIEUX COGNAC 1815 BORDEAUX” and others included potentially datable inscriptions and motifs.

The site is on a peninsula above low, limestone cliffs and has views to sea on three sides. It looks out over an extremely large area of reef flat and so controls an extremely rich marine environment. The core of the site is an area of dense midden at its southern end, with midden mounds up to 3 m in height. There seemed to be a wider range of earthenware rim forms at this site than at Site 17, although the fabric was similar. Notable

finds included porcelain sherds and at least one piece of earthenware that had been flaked into round discs, perhaps for use as counters in a board game, and also a stone pestle decorated with incised designs on its sides. A similar, though smaller, type of settlement to Jambu Air Lama seems to be indicated by the remains.

Site 19, Tanjung Goljurong, is situated on the east coast of Workai, north from Beimun. It appeared to have been abandoned earlier than sites 18 and 19, as it had small amounts of porcelain but no bottle glass. The earthenware assemblage was similar to the previous sites, however. The dense shell-midden deposit at this site appears to be up to 1.5 m deep.

Site 20, Wangang, is a few hundred meters south of the present village of Batu Lei, on the island of that name. The villagers were reticent about giving us information about the history of the site, or details of any other sites in this area. Wangang is situated on low, limestone cliffs adjacent to a small embayment. Although not examined in situ, large quantities of ceramics and bottles, both square and round, were clearly visible in the intertidal silt below the cliffs. The site is currently under coconuts and showed signs of having been recently gardened.

A fairly sparse scatter of material over a limited area of the headland may not do justice to the size or importance of the site when the material dumped over the cliff is taken into account. The site was abandoned within the last 70 years, as a man of that age whom we met had been born there. It contained some early 20th-century Dutch ceramics as well as earlier Dutch and Chinese porcelain. Several pieces of Dutch porcelain had the name "Petrus Regout and Co, Maastricht, Made in Holland" and in one case had what appeared to be writing in Thai script below. One piece from this company also included the date 1836.

There are further scatters of midden material between this site and the village. Currently there are about 7 to 8 female potters active in the village, although this was said to be a significant decline on previous numbers. Several other villages of the same language group on nearby islands also make pottery, which is widely distributed in Aru. A superficial demonstration of technique suggested that the pots are made by impact from a solid lump with paddle-and-anvil finishing. At least in Batu Lei, pottery making appears to be a dying art and should be recorded as a matter of urgency.

Site 21, Nyanyapati, is a former settlement site located close to and on the other side of Sungai Nyanyafafi from Nabulei Lisa cave on Wo-

kam. It is an ancestral site for one of the Dosi families. Houses there would have had to be of stilt construction, given the rough limestone surface and the tidal range in the area. Such houses can be seen today close to the site. Only occasional sherds of porcelain were seen in the area, including 20th-century Dutch and Indonesian types. It appeared to represent only a hamlet-sized interior settlement.

Site 23, Dosi Namalau, is a large village site apparently abandoned about 1945 when several families came together to form the present village of Dosi. It is situated on the north bank of Sungai Manumbai on Wokam Island. Its location is significant as it is one of the few places along the *sungai* east of Papakulah village where limestone fingers down to the shore and larger vessels can anchor directly adjacent to the land. Steps have been cut into the limestone at this point to give access to the site, which is on the side of a limestone hill perhaps some 50 m above the *sungai*. On the sides of the hill, which appears to have been artificially terraced, is a dense scatter of mangrove shellfish, porcelain, earthenware, and occasional pieces of metal cooking pots and other artefacts. There does not appear to be any deep cultural deposit and the site may be comparatively recent in age.

At Dosi we were also told of other sites, such as a possible “Dutch Fort” with stone structures, which we were not able to visit this time.

### **Conclusions**

The discovery and excavation of Lemdubu has been the major result of the research so far. It has enormous potential for allowing understanding of the significant faunal changes that must have occurred as the sea level rose and the Aru Group went from being a series of low hills on the edge of a continent to becoming a comparatively isolated island group. Further changes that may have occurred with the introduction of other animals, such as pig, dog, and the deer, should also be elucidated by this rich assemblage.

The presence of mangrove shellfish in the upper levels at Lemdubu, the furthest interior of the caves examined so far, is of particular interest given the early observation by Wallace at a location only a few hours walk from the site, “Those who live on the coast have plenty of fish; but when inland ... [they] go to the sea occasionally, and then bring home cockles and other shell-fish by the boatload” (1869: 343).

Wallace noted further that the diet of the interior groups of this area was largely based on plants. He comments, "Now and then they get wild pig or kangaroo, but too rarely to form anything like a regular part of their diet, which is essentially vegetable ... e.g. plantains, yams, sweet potatoes and raw sago; sugar cane, betel nuts, gambir and tobacco" (1869: 343). Our 1996 excavation results strongly suggest that his interpretation of an "essentially vegetable" diet is exaggerated. The elaborate trapping technology (see Healey 1996) and the hunting success we observed during our stay at Lemdubu, particularly targeting deer, also suggest that Wallace's observations were in error on this point.

During times of lower sea levels when Aru was joined to New Guinea and Australia, the sites of Lemdubu and Lisaibam may have been located as much as 40 km inland from the Pleistocene coastline, and Nabulei Lisa would have been even further inland. The role of the *sungai* are significant at this time, as they would have represented drainage systems and routes of access into the interior. It is worth noting that many faunal species of economic importance are found in the interior. Wallace notes, "To the mainland many of the birds and murids of the country are altogether confined; the Birds of Paradise, the black cockatoo, the great brush turkey, and the cassowary are not found on the detached islands" (1869: 333).

Of equal interest is the fact that these sites are located within dense rainforest in an area receiving over 5,000 mm per annum. It has been argued by Bailey et al. (1989) that there is no firm evidence globally for systematic exploitation and occupation of rainforest systems in the Pleistocene. More recently, this view has been contradicted by evidence from the interior of New Britain (in island Melanesia) that human occupation of rainforest environments in this region goes back to at least 35,000 B.P. (Pavlides and Gosden 1994). Bellwood and his colleagues (Bellwood 1996, Bellwood et al. 1993) now have evidence from Halma-hera for such an adaptation from at least the terminal Pleistocene and early Holocene. The 1996 excavation demonstrates that Liang Lemdubu shows a similar pattern of early inland rainforest occupation.

Our work on the islands of the northwest, closest to the edge of the continental shelf, has indicated that suitable caves and rockshelters do not exist in this part of Aru. Caves with excavation potential were only located within the interior limestone karst country, and even there they are uncommon. Further survey work is planned for subsequent seasons to

locate areas that may have further sites capable of yielding long occupational sequences.

A range of sources and observations made during the 1995 and 1996 surveys indicate there is a gradient in rainfall and vegetation assemblages from north to south through the island group. It is likely that the more open savanna country of the south will have hosted a different fauna and offered different dietary choices. We hope to locate and excavate sites that form a transect through the various environmental zones. There is also a need for palynological studies to examine climate history and to characterize the impact of humans on vegetation.

The location of large, pre-1850 village sites in the extensive reef systems on the east coast of Aru suggests a much greater involvement of this area with the wider world than seems to have been recorded historically. At least two of the sites, Jambu Air Lama and Sirlasi, appear to represent major entrepôts or distribution centers for traded products. Ujir in the northwest of the group appears to have had a similar function, perhaps more in relation to forest products, and possibly starting somewhat earlier in the period prior to Dutch penetration of the region.

Ricklefs (1993: 137) notes that the Dutch gained a monopoly over trade between Banda and Aru in the 1620s, but then generally withdrew from the trade in the 18th century, yielding their place to Bugis and Makassarese traders. Regular Dutch administration of Aru was not established again until after 1882, by which time several of the investigated village sites had been abandoned.

The 1995 and 1996 surveys have located a total of 23 sites that have the potential to address key research questions identified for Maluku (see Spriggs, this volume). Sites are likely to yield occupational sequences dating from the terminal Pleistocene through to the present. Given the unique location of the Aru group, further investigations will most certainly provide valuable insights into the genesis and evolution of maritime societies from the earliest colonists, to the Austronesians, and then later regional powers.

It is clear that the Aru Islands are in a prime position to test a number of models for shared histories between northern Australia, New Guinea, and island Southeast Asia and to examine the evolution of maritime societies. The planned work over the next few years will help initiate a range of new and significant projects.

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**Map 1. Aru in its Southeast Asian and Australian context. Shading indicates the maximum extent of the continental shelves at the Glacial maximum when Aru was part of the continent of Sahul. Significant Pleistocene archaeological sites in northern Australia are indicated.**

**Map 2. Five possible migration routes for early humans from Asia to the Sahul continent (after Birdsell 1977).**

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**Map 3. The Aru Islands, showing (shaded) the main area of limestone karst and sites recorded in 1995 and 1996.**