The first settlement of Remote Oceania: the Philippines to the Marianas

Hsiao-chun Hung1, Mike T. Carson2, Peter Bellwood1, Fredeliza Z. Campos3, Philip J. Piper4, Eusebio Dizon5, Mary Jane Louise A. Bolunia5, Marc Oxenham1 and Zhang Chi6

1. School of Archaeology and Anthropology, Australian National University, Canberra ACT 0200, Australia. 2. Micronesian Area Research Center, University of Guam, Mangilao, GU 96923, U.S.A. 3. School of Humanities, University of Hong Kong, Hong Kong. 4. Archaeological Studies Program, University of the Philippines, Diliman, Quezon City 1101, Philippines. 5. Archaeology Division, National Museum of the Philippines, Manila 1000, Philippines. 6. School of Archaeology and Museology, Peking University, Beijing 100871, China.

Abstract
We document the longest sea-crossing undertaken by humans prior to the settlement of Polynesia, this being a crossing of 2300 km of open sea at circa 1500 BC from Luzon in the Philippines to the Mariana Islands in western Micronesia. A style of pottery decoration is described that is shared by the northern Philippines and the earliest settlements in the Marianas, together with contemporary evidence for open sea fishing and the manufacture of similar shell artifacts.

Introduction
The human settlement of the remote islands of Oceania beyond the Solomon Islands has been a topic of enquiry since the 18th century. The modern mainstream view relates this settlement to a migration of Austronesian-speaking Neolithic populations, sailing from 1350 BC via equatorial latitudes in eastern Indonesia into the western Melanesian islands, and then via the Lapita cultural complex into Polynesia and central/eastern Micronesia (Kirch 2000; Summerhayes 2007). However, another corner of the western Pacific witnessed a remarkable feat of ocean crossing perhaps a century or two before the Lapita spread, and over a much greater open ocean distance than any known Lapita movement.

The Mariana Islands are the northernmost islands of Micronesia, consisting of more than one dozen islands in a north-south trending arc between 13 and 20 degrees north, and situated across open sea about 2300 km east of Taiwan and the Philippines (Fig. 1). The earliest sites have been found in the larger southern islands of Guam, Tinian and Saipan (Fig. 2). These oldest sites date to 1500-1400 BC and contain red-slipped and decorated pottery that is closely paralleled in sites in the northern Philippines.
Linguistic and Genetic Origins of the Chamorro Population of the Mariana Islands

The indigenous Chamorro language of the Marianas belongs to a widespread ‘Western Malayo-Polynesian’ (WMP) grouping, that currently lacks any overall subgrouping structure, within the larger Austronesian language family (Blust 2009) (Fig. 3). WMP languages are spoken in the Mariana and Palau Islands in western Micronesia, the Philippines, Malaysia, much of Indonesia, coastal southern Vietnam, and as far west as Madagascar. Their origins, together with those of all other extra-Formosan Austronesian languages, can be sourced to a linguistic reconstruction, termed ‘Proto-Malayo-Polynesian’, that underwent its initial period of differentiation somewhere in northern Island Southeast Asia. The Formosan languages of Taiwan are not Malayo-Polynesian, and trace back to deeper separations in the overall Austronesian family tree. The major Malayo-Polynesian language subgroup known as Oceanic, associated at its proto-language stage with Lapita settlement in the Bismarck Archipelago, was also a fairly early separation from Proto-Malayo-Polynesian (Ross et al. 1998; Pawley 2002). However, the WMP classification for Chamorro reflects a linguistic origin fundamentally separate in proximate terms from that of the Lapita-associated Oceanic grouping, and Chamorro and Proto-Oceanic share no unique subgrouping innovations. Chamorro reflects an origin directly within Island Southeast Asia, not western Oceania.

Most linguists currently favour the Philippines as the most likely source for Chamorro and the inhabitants of the Marianas. Both Blust (2000) and Reid (2002) suggested the central or northern Philippines, with Chamorro as a primary or at least very early split from Proto-Malayo-Polynesian. Reid notes that Chamorro lacks the merger of *d and *z that is found in Philippine languages, and so must have separated from the rest of WMP at a very early date. Blust (2000) adds that Chamorro pakyo ‘typhoon’ continues directly the Proto-Austronesian term *baRiuS for typhoon, suggesting that the migration route of the ancestral Chamorro never took them out of the typhoon belt at the northern edge of the tropics. All in all, a Luzon, or at least northern Philippines, origin for Chamorro involving a direct west to east sea passage seems to be indicated by the linguistic evidence.

Current research on Chamorro mtDNA indicates a rarity of the widespread Oceanic mtDNA haplogroup B4, which is also differentiated in the Marianas from other Malayo-Polynesian populations by a unique mutation at base 16,114. Instead, most Chamorro belong to haplogroup E lineages that occur widely in the Philippines and Indonesia (Vilar et al. 2008; Tabbada et al. 2010).

The Earliest Marianas Sites

This report deals with only the earliest portion of Mariana Islands prehistory, approximately 1500 through 1000 BC. The earliest sites occur in shoreline-oriented settings during a period of slightly higher sea level (about 1.8 m) than the present, and are associated with thin-walled, red-slipped pottery termed Marianas Red by Spoehr (1957). After 1000 BC, significantly different pottery types
are evident (Moore 1983, 2002), along with a lowering of sea level (Dickinson 2000) and a substantial re-configuration of coastal ecosystems.

The Achugao site on Saipan is by far the most informative for the earliest Marianas pottery, yielding the largest volume of recovered material (Butler 1994, 1995). This large collection (143 decorated pieces) is especially important because of its size, since decorative elements are present on only 1% or less of the sherds. Other sites are valuable for their precise and confident dating of the earliest settlement period, but have limited pottery collections (e.g. Carson 2010; Clark et al. 2010).

As reported by Butler (1994, 1995), the early Achugao ceramics exhibit only two major vessel forms. The dominant form (85% of all rims) is a small to medium-sized restricted vessel, sometimes carinated, with a sharply everted rim and a rounded base. The other (15% of all rims) is a simple unrestricted hemispherical bowl. Other vessel forms have been reported from other sites but in very low frequencies and with extreme fragmentation (Carson 2008).

The earliest component of Marianas Red is a thin-walled, often red-slipped, calcareous sand-tempered ware. The decorated sherds show complex, predominantly rectilinear incised patterns, although some are curvilinear, with the zones between the major elements packed with rows of tiny, delicate punctuations. Stamped circles border the decorative bands and sometimes occur within them (Fig. 4, sherd group 2). Lime-filling is evident in most of the decoration. Similar decorated and red-slipped pottery is shown in Fig. 5, recovered by Pellett and Spoehr (1961) from the House of Taga site on Tinian Island and now stored in the Bishop Museum in Honolulu.

**Comparable Pottery from the Philippines**

The red-slipped, circle- and punctate-stamped pottery from several sites in the Cagayan Valley on Luzon is the most similar reported, so far, to that from the Marianas, although this similarity need not mean that the first settlers migrated specifically from the Cagayan Valley itself, which obviously has an inland location. The associated dates for Cagayan sites with red-slipped pottery fall between 2000 and 1000 BC, thus commencing before but overlapping with the earliest Marianas dates (Table 1 and Supplementary Information).

Of the Cagayan Valley sites, Nagsabaran has been most productive for defining the pottery and other material culture of this period (Hung 2005, 2008; Tsang 2007; Piper et al. 2009a). It lies on the south bank of Zabaran Creek, that joins the Cagayan River from the west, about 22 km above its mouth on the north coast of Luzon. Excavations in this 4.2 ha site between 2000 and 2009 have revealed a lower alluvial silt deposit that contains red-slipped pottery, trapezoidal-sectioned stone adzes (some stepped), baked clay penannular earrings and two Taiwan jade bracelet fragments. The late Neolithic and Iron Age layers above the silts are contained within a large riverine shell midden. The radiocarbon dates for the lower alluvial layer at Nagsabaran are rather mixed, since much of the
alluvium was clearly redeposited from elsewhere in the site or its vicinity, and the layer was disturbed by the digging of some very large post holes from the base of the covering shell midden. However, in Table 1 it can be seen that the dates in trenches P1 and P7 maintain a reasonable degree of stratigraphic order. The dating results support an overall range for the Cagayan red-slipped, stamped and incised pottery between 2000 and 1000 BC.

Basically, the early period Marianas pottery resembles a sub-set of the more diverse Nagsabaran pottery. Decoration is also quite rare in Nagsabaran, on about 1% of sherds or less, and consists of punctate, circle-stamped and incised motifs, often with lime-infill. The Nagsabaran motifs, in which one or more rows of stamped circles lie parallel to incised bands filled with comb-like punctate or dentate stamping, are all extremely similar to those of the earliest Marianas Red, as well as to the zonal decoration on some Lapita pottery from the Santa Cruz Islands (Fig. 6, and see Spriggs 1990:86) and New Caledonia (Fig. 4, groups 1 and 3). The Nagsabaran pottery includes a greater variety of vessel forms than occur in the Marianas (for instance, a vertical-walled bowl with a ring foot), and the large sherds found in this site indicate that decoration sometimes covered most of the vessel exterior.

Similar decorated red slipped pottery occurs in other Cagayan Valley sites of the second millennium BC, such as Magapit (Hung 2005, 2008). Circle-stamped pottery was also very common between about 1300 BC and AD 1 in the Batanes Islands, between Luzon and Taiwan, although punctate stamping and the use of incision to define decorative zones do not occur here (Bellwood & Dizon 2005). In Taiwan, fairly rare impressed pottery occurs by about 1500 BC, including circle-stamping in the late Neolithic site of Yingpu in central Taiwan (Tsang 2000) and punctate stamping in the Yuanshan assemblage at Dabenkeng near Taipei (Chang 1969: Plates 82D & 84D). Taiwan, however, has no Neolithic pottery with both circle- and punctate-stamping, even though it does have the oldest red-slipped pottery in Island Southeast Asia, this being present in small quantities with incised and cord-marked pottery in the oldest Neolithic sites (c. 3000 BC), becoming dominant after 2200 BC in eastern and southern Taiwan (Hung 2005, 2008). Elsewhere in the Philippines, the geographic range of the circle- and punctate-stamping represented in the Cagayan Valley extended at least as far south as Masbate Island in the central Philippines, where similar punctate-stamped pottery was reported by Solheim (1968).

Elsewhere in Island Southeast Asia, very small amounts of punctate stamped pottery occur in parts of East Malaysia (Sabah) and eastern Indonesia, again in association with red-slipped surfaces (Chia 2003; Chazine & Ferrie 2008; Peter Lape, Daud Tanudirjo, Truman Simanjuntak and Anggraeni, pers. comms). But the available illustrated motifs are very small and difficult to relate precisely to any in Luzon or the Marianas. Because of the importance of this pottery style in the Cagayan Valley, it is possible that substantial innovation in pottery decoration might have taken place in Luzon itself.
From a purely geographical perspective, the northeast coast of Luzon rather than the inland Cagayan Valley might have been the most likely source for Mariana settlement, but so far the single known Neolithic site here is Dimolit (Peterson 1974a, 1974b), on Palanan Bay. This site contains plain red-slipped pottery similar to that reported from the Cagayan Valley sites, but without any impressed decoration. The closest parallels for the earliest decorated Marianas Red pottery so far are thus in the Cagayan Valley.

**Coastal and Maritime Economies**

All of the known early Marianas sites dated 1500-1000 BC may be described as *shoreline-oriented*, founded on sand spits, narrow beach fringes, in sea-side rock shelters, or in other marginal settings at or very near sea level. This distinction sets these sites apart from a generic coastal setting expected of almost any island society. Most definitively, the Ritidian site in northern Guam provided evidence of earliest occupation 1460-1300 BC within a shallow inter-tidal lagoon setting directly overlaying coral reef dated to 2370-2020 BC (Carson 2010). Accounting for a sea-level high stand between 3000 and 1000 BC about 1.8 m higher than present (Dickinson 2000), early period Marianas site settings must have been substantially different from the modern broad sandy beaches.

A close relationship with the sea is unquestionable from this perspective, and early period Marianas sites often contain abundant marine shell midden, mostly of *Anadara antiquata* shells. Vertebrate faunal materials are extremely few in number, perhaps due to discard patterns, depositional contexts, or preservation qualities. The limited vertebrate fauna includes fish and bird bones, and possibly native fruit bat, in the earliest sites. The earliest rat bones appear around AD 900-1000 (Wickler 2001; Pregill & Steadman 2009). Pig, dog, deer, and cattle were introduced to the Marianas only after Spanish contact.

The limited scope of faunal remains in the Marianas is rather curious, given the existence of pig, dog, chicken and rat in variable abundance at most other sites in the larger Asia-Pacific region. For example, at Nagsabaran, imported domesticated pig appears as early as 2000 BC (Piper *et al.* 2009a & b), and dog bones date at least to 500 BC. Both pig and dog were present by 2800 BC in Taiwan (Tsang *et al.* 2006). Rat bones usually coincide with the earliest human settlements in Oceanic islands, so their apparently late arrival in the Marianas is deserving of explanation, perhaps related to the remote location and the difficulties of transporting live animals over such a vast distance, given the likelihood of crew hunger, even starvation, while afloat.

A marine-oriented subsistence pattern may therefore be expected for the sea-faring Malayo-Polynesians who crossed 2300 km of ocean in order to settle the Marianas. Terms for sails and outriggers were among the shared vocabulary of Proto-Malayo-Polynesian communities (Pawley & Pawley 1994), suggesting skilled open-sea navigation and possibly the ability to capture large and
powerful marine prey. Judith Amesbury (2008b) reviews all the recorded data on bones of large pelagic fish species such as marlin (Istiophoridae) and dolphinfish (*Coryphaena hippurus* - Coryphaenidae) from Marianas archaeological sites, evident as early as 500 BC. Unfortunately, only a miniscule fish bone sample has been recovered from the initial settlement period (Leach & Davidson 2006; Amesbury 2008a), and most of the occurrences of marlin and dolphinfish lack precise commencement dates. So it is still unclear to what extent prehistoric Marianas fishermen caught these species between 1500 and 1000 BC.

The Eluanbi site in southern Taiwan, c. 2000 BC, has provided good evidence of a similarly specialised offshore fishing technology (Li 2002b), and a recent analysis (Campos & Piper 2009) throws surprising light on Neolithic seagoing capabilities. In total, Pit 4 in Eluanbi II produced 3581 fragments of bone, of which 2573 were marine fish (71.85%), 516 mammal (14.41%), 303 marine turtle (8.46%), and the rest unidentified. As in the Marianas sites, the fish bones suggest the dominance of specialised offshore fishing for very large groupers (Serranidae), dolphinfish, and other large pelagic carnivores such as marlin or sailfish. Dolphinfish bones, but so far not marlin, also occur in two separate occupation layers at Savidug in the Batanes Islands, dated 1200 BC to AD 1, and then after AD 1000 (Campos 2009).

Dolphinfish vertebra sizes at Savidug and at Eluanbi II indicate that individuals between 90 and 180 cm long were being regularly caught, with the largest reaching over 200 cm, and potentially weighing more than 30 kg. Some species of Istiophoridae can weigh more than 900 kg and be over 400 cm in length (Nakamura 1985); some specimens from Eluanbi probably exceeded 250 kg based on size comparison of the caudal vertebrae with modern specimens. Moreover, large Coryphaenidae and Istiophoridae are highly migratory epipelagic fishes that must be caught offshore using trolling hooks, sometimes baited with flying fish, pulled along the surface of the water by moving vessels.

Although dolphinfish appear regularly in warm seasons (seasonality dependent on geographic location) throughout the Pacific, they have been rarely recorded elsewhere in the archaeology of the Indo-Pacific region. Instead, the focus of prehistoric fishing throughout most of the western Pacific appears to have been on inshore reef fishes (Leach *et al.* 1988; Leach & Davidson 2006). As Leach and Davidson note, the prehistoric Marianas and southern Taiwan were clearly exceptions, and we can now add the Batanes Islands to the list. There are also ethnographic accounts of dolphinfish exploitation by the Yami of Botel Tobago (Lanyu), an island with a Batanic native population located off the southeast coast of Taiwan (Hsü 1982; de Beauclair 1986).

Fishing gear is rare in Marianas archaeological sites in the earliest period, 1500-1000 BC, but the few known pieces include fragments of simple one-piece rotating hooks made of *Isognomon* and rarely *Turbo* shell. Later contexts, mostly post-dating AD 1000, include the same simple rotating hooks plus a range of V-shaped or L-shaped gorges, and compound two-piece hooks and trolling lures (Thompson 1932; Spoehr 1957; Reinman 1970; Ray 1981). At one site in Guam, several bone
and shell points of trolling hooks were found in layers post-dating AD 900-1000, but one possible nacreous shell lure shank was in a layer pre-dating 500 BC (Dilli et al. 1998, IV: 215). Simple shell one-piece rotating hooks and trolling lures with possible stone shanks and bone points also occur at Kending (Li 2002a:69) and Eluanbi II in southern Taiwan, c. 2000 BC (Li 1983), together with gorges and net-sinkers (Li 1997, 2002a, 2002b: 58,63 & Tsang et al. 2006). The trolling hook points found in both the Marianas and southern Taiwan are similar in shape, even though the dates for the Marianas specimens are currently younger.

Archaeological fishing gear from the Cagayan Valley sites is limited in quantity, but two fish gorges, straight rather than L-shaped, have been found in the upper shell midden (c. 500 BC) at Nagsabaran, made respectively on a pig lower canine and a dog upper canine (Piper et al. 2009b). Both were split longitudinally and provided with a notch to secure the line. A similar specimen dating to c. 500 BC made from a pig canine was recovered from Anaro in the Batanes Islands.

In summary, it is clear that offshore trolling for large pelagic fish was carried out by at least 2000 BC in southern Taiwan, by 1200 BC in the Batanes Islands, and perhaps as early as 500 BC in the Marianas. We are not yet entitled to assume that this technology was carried by the first settlers of the Marianas, but, given the restricted occurrence in the western Pacific of this type of fishing and the associated equipment, even a secondary introduction from the Taiwan-Luzon region to the Marianas would still be highly significant.

The Origin of the Marianas Red and its Makers
Given the indefinite internal classification of WMP languages, we propose that the first settlers in the Mariana Islands, around 1500-1400 BC, shared an ease of communication with other WMP communities in Island Southeast Asia, facilitating commingling of groups and possible shifting residence over long distances. According to this view, multiple related groups potentially could have moved quickly in several directions at once. The first explorers to discover the Mariana Islands therefore may have possessed many cultural traits shared commonly throughout a broad region, but the successful colonisation resulted in strong similarities of pottery type and language linking with the northern Philippines.

Malayo-Polynesian speaking Neolithic populations had therefore mastered the sailing ability to cross 2300 km of open ocean by 1500 BC. However, the absences of pigs, dogs, chickens and rats in the Marianas suggest that the initial crossing might not have been repeated for a long time, even though both males and females must have been in the founding party, together with domesticated plants. A drift voyage at the mercy of dominant winds and currents would be extremely unlikely to reach the Marianas from any source area (Scott Fitzpatrick, pers. comm.; see also Callaghan & Fitzpatrick 2008), so an intentional voyage is likely. The reality, alas, is that we can never know, but any voyage that transported a founding human population over 2300 km of open ocean was
remarkable for this time period, whether intentional or not.

In conclusion, the earliest Marianas Red pottery records the first settlement in Oceania at 1500-1400 BC, slightly pre-dating the earliest Lapita pottery in Near Oceania at 1350-1300 BC (Summerhayes 2007, in press; Kirch 2010). Over twenty years ago, Spriggs (1990:20) emphasized Marianas Red as the smoking gun that required an insular Southeast Asian origin for the first colonists of the remote Pacific Islands (see also Spriggs 2007:113-114). As Rainbird (2004:85) has also observed, settlement of the Marianas from the Philippines ‘would constitute the longest sea-crossing undertaken by that time in human history.’ Therefore, the study of Chamorro origins is not only an issue of Austronesian migration, but also a significant episode in the evolution of voyaging technology (Craib 1999:483).

ACKNOWLEDGMENTS. Thanks to Dr. Brian Butler (Center for Archaeological Investigations, Southern Illinois University, Carbondale) for information on Achugao pottery. The October-November 2009 excavations at Nagsabaran were funded by the Chiang Ching-kuo Foundation (Taipei) and the Australian Research Council, and authorised by the National Museum of the Philippines. The research of Dr. Philip Piper was partly funded by a grant from the Office of the Vice Chancellor for Research and Development, University of the Philippines.

FIGURES:

Fig. 1. Taiwan, the Philippines and the Marianas. 1. Eluanbi & Kending, 2. Batanes Islands, 3. Nagsabaran (Cagayan valley), 4. Dimolit (east coast of Luzon).
Fig. 2. The locations of early settlements in the Marianas, c. 1500-1000 BC.
Fig. 3. The major Austronesian linguistic subgroups, and the early distributions of red-slipped and stamped pottery in the Taiwan/Philippine region and the Marianas. Also shown is the spread of Lapita pottery in Island Melanesia and western Polynesia, so far without any definite antecedent in Island Southeast Asia south of the Philippines.
Fig. 4. Similar pottery decoration involving punctate/dentate and circle stamping, in combination with incision, from Nagsabaran, northern Philippines (1), Achugao, Saipan, Mariana Islands (2), and Site 13 at Lapita, New Caledonia (3) (2. courtesy Brian Butler, see Butler 1994; 3. courtesy Christophe Sand, see Sand 1999: 46).
Fig. 5. Decorated pottery from the earliest layer at the House of Taga site in Tinian, excavated by Pellett and Spoehr (1961), photograph courtesy of Bishop Museum, Honolulu.

Fig. 6. A Lapita sherd from Nenumbo, Gawa, Santa Cruz Islands (Melanesia), showing both the combination of circle- and dentate-stamped zones, and also the cross-in-circle motif that occurs on one of the Nagsabaran sherds shown in Fig. 4. (From Bellwood 1978: Fig. 9.12, courtesy the late Roger Green).
Table 1. Carbon-14 dates from Nagsabaran, Cagayan Valley, northern Philippines. The upper shell midden is represented by dates from P1 (Pit 1) excavated in 2000, and P14 (Pit 14), excavated in 2009. All dates from all pits that relate to the alluvial silt layers below the shell midden are listed in this table. See supplementary information for discussion. The Gakashin and National Taiwan University dates listed in this table are from Tsang 2007:94, and we do not have measured δ13C values.

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Dated material</th>
<th>Pit no. and depth below ground surface</th>
<th>δ13C</th>
<th>Conventional age (years BP)</th>
<th>Calibration (IntCal 09)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GX-26797</td>
<td>charcoal</td>
<td>P1, 80cm, shell midden</td>
<td>-12.5</td>
<td>2620±30</td>
<td>831-771 BC</td>
</tr>
<tr>
<td>GX-26798</td>
<td>charcoal</td>
<td>P1, 110cm, shell midden</td>
<td>-8.9</td>
<td>2560±30</td>
<td>805-553 BC</td>
</tr>
<tr>
<td>GX-26799</td>
<td>charcoal</td>
<td>P1, 150cm, shell midden</td>
<td>-26.4</td>
<td>7380±40</td>
<td>6380-6099 BC</td>
</tr>
<tr>
<td>GX-26800</td>
<td>charcoal</td>
<td>P1, 180cm, shell midden</td>
<td>-10.4</td>
<td>3420±30</td>
<td>1873-1632 BC</td>
</tr>
<tr>
<td>GX-26801</td>
<td>charcoal</td>
<td>P1, 230cm, shell midden</td>
<td>-12.6</td>
<td>2680±30</td>
<td>897-801 BC</td>
</tr>
<tr>
<td>ANU-13020</td>
<td>Batissa childreni</td>
<td>P14, 80cm, shell midden</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
<tr>
<td>ANU-13019</td>
<td>Batissa childreni</td>
<td>P14, 120cm, shell midden</td>
<td>-10.4</td>
<td>2528±31</td>
<td>731 BC -AD 175</td>
</tr>
<tr>
<td>ANU-13018</td>
<td>Batissa childreni*</td>
<td>P14, 140cm, shell midden</td>
<td>-13.7</td>
<td>2540±30</td>
<td>797-541 BC</td>
</tr>
<tr>
<td>ANU-13017</td>
<td>Batissa childreni</td>
<td>P14, 180cm, shell midden</td>
<td>-13.7</td>
<td>2540±30</td>
<td>797-541 BC</td>
</tr>
<tr>
<td>NTU-3799</td>
<td>Batissa childreni*</td>
<td>P1, 310cm, lower silts</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
<tr>
<td>ANU-13024</td>
<td>Batissa childreni*</td>
<td>P14, 210cm, shell midden</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
<tr>
<td>NTU-3798</td>
<td>charcoal</td>
<td>P7, 160cm, lower silts</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
<tr>
<td>ANU-13016</td>
<td>charcoal</td>
<td>P11, 170cm, lower silts</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
<tr>
<td>ANU-13014</td>
<td>charcoal</td>
<td>P14, 240cm, lower silts</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
<tr>
<td>ANU-13013</td>
<td>charcoal</td>
<td>P14, 240cm, lower silts</td>
<td>-13.7</td>
<td>2520±30</td>
<td>98.47% modern</td>
</tr>
</tbody>
</table>

* Sample originally published as charcoal  ** Piper et al. 2009a.
REFERENCES:


PAWLEY, A. & M. PAWLEY. 1994. Early Austronesian terms for canoe parts and seafaring, in A.


SOLHEIM, W.G. II. 1968. The Batungan Cave Sites, Masbate, Philippines, in W. G. Solheim II (ed.) Asian and Pacific Archaeology (Series No.2). Honolulu: Social Science Research Institute, University of Hawaii.


WICKLER, S. 2001. *The prehistory of Buka: a stepping stone island in the northern Solomons (Terra Australis 16)*. Canberra: Department of Archaeology and Natural History and Centre for Archaeological Research, the Australian National University.