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– ARTICLE –

Mid-Holocene Social Networks in Far Eastern New Guinea

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ABSTRACT:

Stylistic and distributional studies of prehistoric stone mortars and pestles are used to examine what connections existed during the mid-Holocene within Far Eastern New Guinea, and beyond to the Huon Peninsula and West New Britain. The finds from Far Eastern New Guinea demonstrate strong stylistic similarities with those found mainly on the Huon Peninsula and associated islands. How such cultural links were established may be due in large part to the existence of the New Guinea Coastal Current. All finds with provenance come from areas suitable for subsistence agriculture. Those with complex shapes and/or decoration come from areas capable of producing an agricultural surplus. Clusters of such finds, especially those on the Trobriand, Woodlark and Misima islands, and on the mainland at Cape Rodney to Cloudy Bay, Central Province, and Tufi, Oro Province, mark the location of important social and economic foci in the mid-Holocene.

Keywords: Papua New Guinea, stone mortars and pestles, mid-Holocene, agriculture, Central Province, Milne Bay Province, Oro Province, New Guinea Coastal Current

INTRODUCTION

The discovery of a mid-Holocene stemmed tool on Misima Island (Seligman and Joyce, 1907), which would have originated from either West New Britain or Manus, raises the question as to whether such a connection can be confirmed. This paper uses stone mortars and pestles to examine what connections existed during the mid-Holocene within Far Eastern New Guinea and its offshore islands, as well as between this region, the rest of New Guinea and West New Britain. Far Eastern New Guinea and its offshore islands include all of Milne Bay Province, as well as the eastern parts of Oro and Central provinces (Figure 1). No mid-Holocene archaeological sites are known from this area.

Elsewhere in New Guinea stylistic and distributional studies of prehistoric stone mortars and pestles have provided valuable insights into the ongoing interaction between the inhabitants of Papua New Guinea's highland, lowland and coastal areas, and West New Britain, in the mid-Holocene (Swadling 2004, 2005, 2013; Swadling and Hide 2005; Swadling *et al*. 2008; Torrence and Swadling 2008). In Far Eastern New Guinea stone mortars and pestles, along with one stemmed obsidian tool, are currently the only indicators of internal and external connectivity for far Eastern New Guinea during this period.

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Stone mortars and pestles are of particular interest as these artefacts occur where taro (*Colocasia esculenta*) is, or was formerly grown. The distribution of mortars and pestles may well be related to a region's agricultural potential. In this respect understanding the extent of interregional connectivity may help to assess when different crops were distributed.

DATING OF STONE MORTARS AND PESTLES

Direct dating of stone mortars and pestles has only been obtained in the highlands. There they occur in archaeological deposits that have been radiocarbon dated between about 8000 and 3000 calBP (Swadling 2004, 2005; Swadling and Hide 2005). Indirect dating of these artefacts is based on their general absence from recent environments such as the Sepik-Ramu floodplain which formed after 4000 calBP (Chappell, 2005) as well as their absence from Lapita assemblages that first appeared about 3300 calBP (Torrence and Swadling 2008). Based on their known antiquity, the presence of stone mortars and pestles in Far Eastern New Guinea and offshore islands implies mid-Holocene occupation.

Two distinctive types of stemmed obsidian tools are known from the mid-Holocene. These are retouched prismatic blades (Type 1) and those made on Kombewa flakes (Type 2) (Araho *et al*. 2002). An example of a Type 1 stemmed obsidian tool was found on Misima Island in the late nineteenth century. A gold miner found it in a mining shaft at four metres below the surface (Seligman and Joyce 1907: 327–328, Plate 8). When Sir William Macgregor (1890a) was on Misima in 1889 he learnt that there were

about 400 miners on the island, and because the island's main creek and its tributaries had been searched and washed, shafts were now being sunk into the creek's lower terraces. When published by Seligman and Joyce (1907), the artefact was part of the collection of David Ballantine, a government officer. The current whereabouts of this obsidian tool is unknown. The manufacture of these artefacts has been dated in West New Britain as commencing before 6160–5740 cal BP and ceasing by 3480–3160 cal BP. Sourcing studies indicate that they were made from obsidian obtained from either the Willaumez Peninsula area of West New Britain or Lou Island in Manus Province (Torrence and Swadling 2008; Torrence *et al.* 2013).

A number of artefacts collected on Kiriwina might be stone skeuomorphs of these mid-Holocene obsidian artefacts. Most of these skeuomorphs are comparable to Type 2 stemmed tools and complete items are shaped like the obsidian find from Biak (see Torrence and Swadling 2008: 602, Fig. 2b). This is the case with Cat. No. E13724 held at the Queensland Museum. Other damaged examples collected by Malinowski are held at the British Museum (including Cat. Nos. M259, M260, M261 and M262, see Norick 1976: 253, Plate 1). Malinowski did not collect any information about these items. A Type 1-like stone fragment is also held at the Queensland Museum, Cat. No. E14518. No comparable artefacts have been reported from other islands or from Far Eastern New Guinea. These finds from Kiriwina are also of interest as they are imports to this coralline island.

MORTAR AND PESTLE FINDS AND DISTRIBUTION

The greatest concentration of mortars and pestles occur on the mainland of Papua New Guinea, New Britain, New Ireland and the islands of Milne Bay. Some 2,000 mortars and pestles come from this region. Less than 15 have been found in West Papua.

Stone mortar and pestle finds have been widely reported on New Guinea's eastern tip and offshore islands (Figure 1, Table 1). Villagers in this region, as elsewhere in Papua New Guinea, do not know who made these artefacts, but say they are occasionally unearthed in places such as gardens, eroded shorelines or found in rivers.

The only finds that have any stratigraphic context come from Woodlark Island. In the 1890s there was also a gold rush at Woodlark. De Vis, a curator at the Queensland Museum (De Vis n.d. [1906], 1907: 12) reports that two pestles were found in the bed of a former river course in the Busai prospect area. The miner told Captain Barton, a government official, that they were found under about a metre of superficial gravel along with dugong, turtle, crocodile and shark bones. Observations made later by the government geologist E.R. Stanley (1912: 198–199) makes the proposed association of these pestles with the fossil finds unlikely. Stanley drew a schematic section of the alluvial deposits found at Busai (Figure 2). The mortar and pestle he reports were found in the sandy loam beneath the surface clay whereas the complete remains of a crocodile were found in the underlying black silt. Stanley (1912) does not

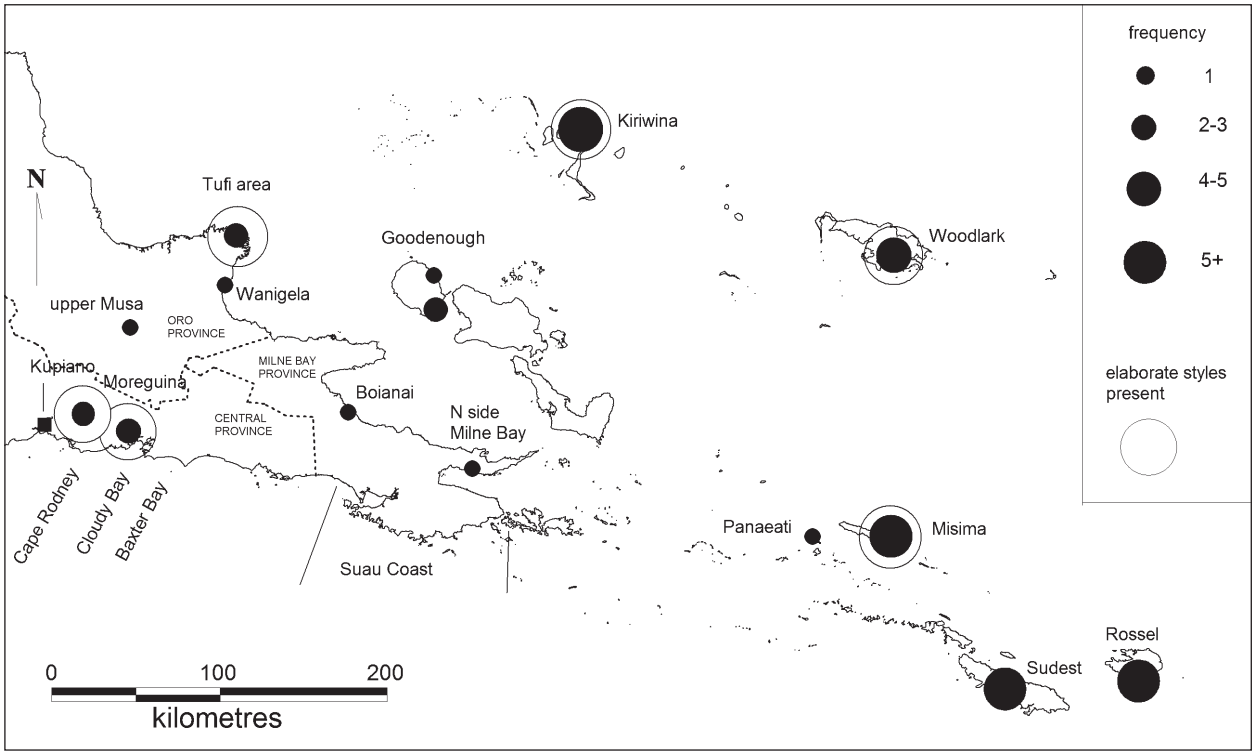

Figure 1. Distribution of mortars and pestles in Far Eastern New Guinea and offshore islands

Table 1. *List of stone mortars and pestles from Far Eastern New Guinea and offshore islands. Note these artifacts are prohibited exports from Papua New Guinea*

Artifact	Location	Reported by	Date	Held
Kiriwina, Trobriand Island				
pestle	Losuia	—	1955	PNG National Museum
pestle	Labai	F. Gerrits	1970	PNG National Museum
mortar	Gusaweta	F. Gerrits	1970	reported
mortar	Mwatawa	F. Gerrits	1970	reported
mortar	Losuia	T.Craig	1974	PNG National Museum
pestle	Kiriwina	J. Friede	2007	Jolika collection
pestle	Mwatawa	G. Burenhult	2002	reported
Woodlark Island				
pestle	Busai	C.W. De Vis	1907	Queensland Museum
pestle	Busai	C.W. De Vis	1907	reported
pestle	Woodlark	—	—	PNG National Museum
pestle	Busai	E.R. Stanley	1912	reported
mortar	Busai	E.R. Stanley	1912	reported
Misima Island				
mortar	Kaubwaga	M. Sullivan/P. Hughes	1985	reported
mortar	Kaubwaga	M. Sullivan/P. Hughes	1985	reported
mortar	Yomwani (Umoni)	M. Sullivan/P. Hughes	1985	reported
mortar	Boiou – exposed by tidal wave	Rev H.K. Barlett	1952	Luaga church, Misima
mortar	Misima	Rev H.K. Barlett	1948	? South Australian Museum
pestle	Misima – in garden	Rev F.S. Kemp	2000	reported
Panaeati Island				
mortar	Panaeati	Rev H.K. Barlett	1956	South Australian Museum
Sudest Island				
pestles/15	western part of island	H. Beran/A.J.P. Meyer	2003	reported
Rossel Island				
pestle	Rossel	Sir W. Macgregor		Queensland Museum
pestle	Rossel	Mr Jackman	1928	Cambridge Museum
pestle	Rossel	—	—	PNG National Museum
pestle	Pumo	J. Liep		PNG National Museum
mortar	Rossel	W.E. Armstrong	1928	reported
pestles	Rossel	B. Shaw	2015	reported
Goodenough Island				
mortar	Belibeli	P. Lauer	1976	reported
mortar	Wailagi Mission a	V. Kewibu/G. Summerhayes	2004	reported
mortar	Wailagi Mission b	V. Kewibu/G. Summerhayes	2004	reported
mortar	Wailagi Mission c	V. Kewibu/G. Summerhayes	2004	reported
South Papua				
mortar	near Moreguina a, Central Prov.	A. Bamford	1981	PNG National Museum
mortar	near Moreguina b, Central Prov.	A. Bamford	1981	PNG National Museum
mortar	Gebea, Central Province	N. Aiso	1985	PNG National Museum
mortar	Godaguina, Central Province	—	1984	PNG National Museum
Tufi Cluster – other Oro				
pestle	Cape Nelson, Tufi coast	F.R. Barton	1908	British Museum
pestle	Cape Nelson, Tufi coast	F.R. Barton	1908	British Museum
mortar	Fauna, Tufi coast	L. Bonie	1983	PNG National Museum
mortar	Wanigela, Collingwood Bay	C.G. Seligman/T.A. Joyce	1907	British Museum
mortar	upper Musa, Oro	Papua Annual Report'	1926	reported
Other mainland New Guinea				
mortar	Tagorewa, N side Milne Bay	Atkinson	1931	reported
mortar	Boianai, Goodenough Bay	P & NG Villager'	1957	reported

cite de Vis's article and it is likely that the pestle he mentions is a further find to those reported by de Vis (1907). The pestle deposited at the Queensland Museum (Cat. No. E1589) is decomposed and partly kaolinised. The other was described as being very similar, just differing somewhat in shape (de Vis 1907). What happened to it is not known, but a stylistically similar pestle with comparable weathering is held in the PNG National Museum and Art Gallery (Cat. No. 1982.024). There is no way of determining whether it is the other find mentioned by de Vis or even the one reported by Stanley as the available documentation only attributes it to Woodlark.

MORTAR AND PESTLE STYLES

Although mortars and pestles have a wide distribution in Far Eastern New Guinea and offshore islands, elaborate forms have a more restricted distribution. Elaborate examples are more than basic artefacts due to the care given to their more complex shape and decoration. They only occur on three islands, namely Kiriwina, Woodlark and Misima, and on the mainland in the Cape Rodney to Cloudy Bay, and Tufi areas (Table 1 and Figure 1). The information presented in this section is based on the database constructed by the author.

The most elaborate mortar reported for the islands is a bossed pedestal mortar seen in a plantation near Kaubwaga on Misima. Marjorie Sullivan and Phillip Hughes made a field sketch of this mortar (Figure 3). A plain pedestal mortar (reported to be shaped like a chalice) was found on Kiriwina but was not collected. The only other shaped mortar, for which the author has adequate information, is a carefully shaped rimmed mortar found at the mission station at Wailagi on Goodenough Island (see Wailagi 2 in Figure 3). Other mortars from the Milne Bay islands are bowls made in boulders.

A number of bossed bowl mortars have been found in Far Eastern New Guinea, but so far are absent from the offshore islands. They come from the Cape Rodney to Cloudy Bay, and Tufi areas of the Central and Oro provinces respectively (Figure 3). Bossed bowls are widely found in Papua New Guinea and east as far as the Willaumez Peninsula on West New Britain, the latter being one of the two source areas for stemmed obsidian tools (Swadling 2013; Torrence and Swadling 2008).

Most pedestal mortar finds in Papua New Guinea have been made in the highlands. The finds from Kaubwaga on Misima and Moreguina, inland of Cape Rodney on the South Papuan Coast, are some of the most elaborate ones documented from lowland or coastal New Guinea. Other decorated pedestal mortars from coastal New Guinea are the Finschhafen find (Figure 3) and two finds from the shore and islands of the former Sepik-Ramu inland sea (Swadling *et al.* 2008: 282, 285).

Some plain pedestal mortars have been reported. A fragment was found in the mounds at Wanigela[2] in Collingwood Bay and one is reported from Kiriwina. Further west undecorated pedestal mortars are known from the highland valleys of Central and Oro provinces.

Mortars with anthropomorphic or zoomorphic faces are absent from the Milne Bay islands but the Moreguina pedestal face mortar (Figure 3) is an example for Far East-

2 The Wanigela find collected by Charles Monckton was deposited in the British Museum in 1905 and reported by Seligman and Joyce (1907: 331). As the shoreline on which the mounds at Wanigela stand is recent alluvium it is likely that the people who made these mounds brought this fragment to use as a stone resource. The mounds date from 1410 cal BP to 680 cal BP (Brian Egloff personal communication 2011).

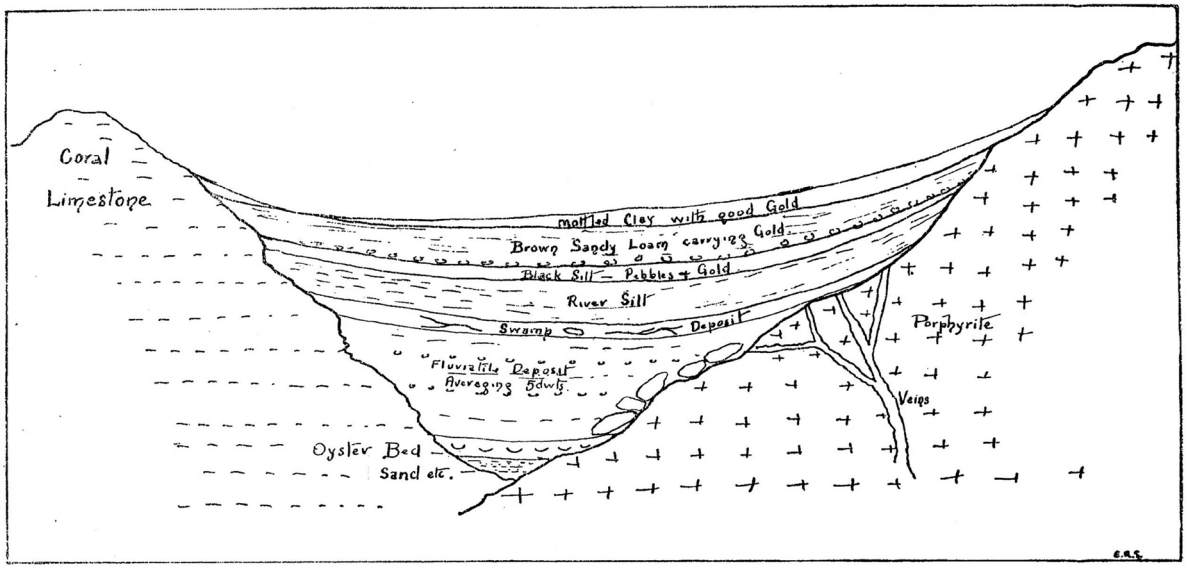

Figure 2. Schematic section of the alluvial deposits at Busai gold mining prospect (Source: Stanley, 1912).

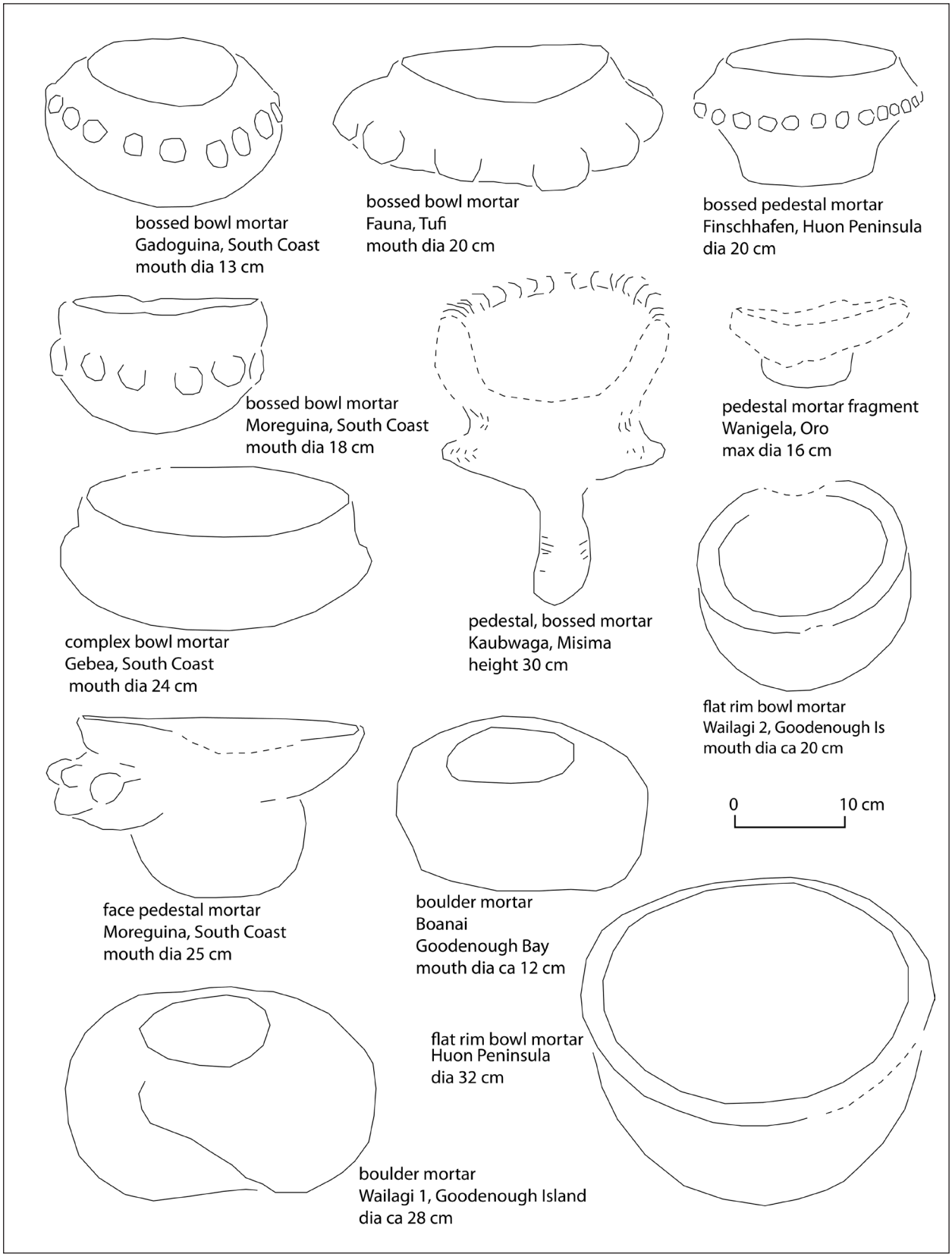

Figure 3. Mortars from Far Eastern New Guinea, and two similar finds from the Huon Peninsula. These artefacts are prohibited exports from Papua New Guinea.

ern New Guinea. Mortars with faces have a wide distribution but low frequency in Papua New Guinea. They are absent from the Bismarck Archipelago.

The elaborate pestles from the Milne Bay islands show more affinity with styles from the islands of Vitiaz Strait, the Huon Peninsula and coastal West New Britain, especially with regard to extensions. Islands in Vitiaz Strait as well as the Huon Peninsula are the centre for such elaborations. Figure 4 shows elaborate pommels from Kiriwina and Woodlark in Milne Bay Province, Umboi and Tuam islands in the Vitiaz Strait and Sattelberg and Finschhafen on the Huon Peninsula. A pestle pommel fragment comparable to the Tuam Island find has also been reported for the south coast of West New Britain. There is also some similarity between the less elaborate pestles from Cape Nelson in the Tufi area and the Huon Peninsula (Figure 4).

Numerous pestles have been found on Sudest and Rossel Islands and a planter is recorded as discarding what was probably a plain mortar on Rossel (Armstrong 1928:30), but elaborate forms are absent. This suggests that the inhabitants of these islands, as with the later *Kula*, were not major nodes in the social networks operating between

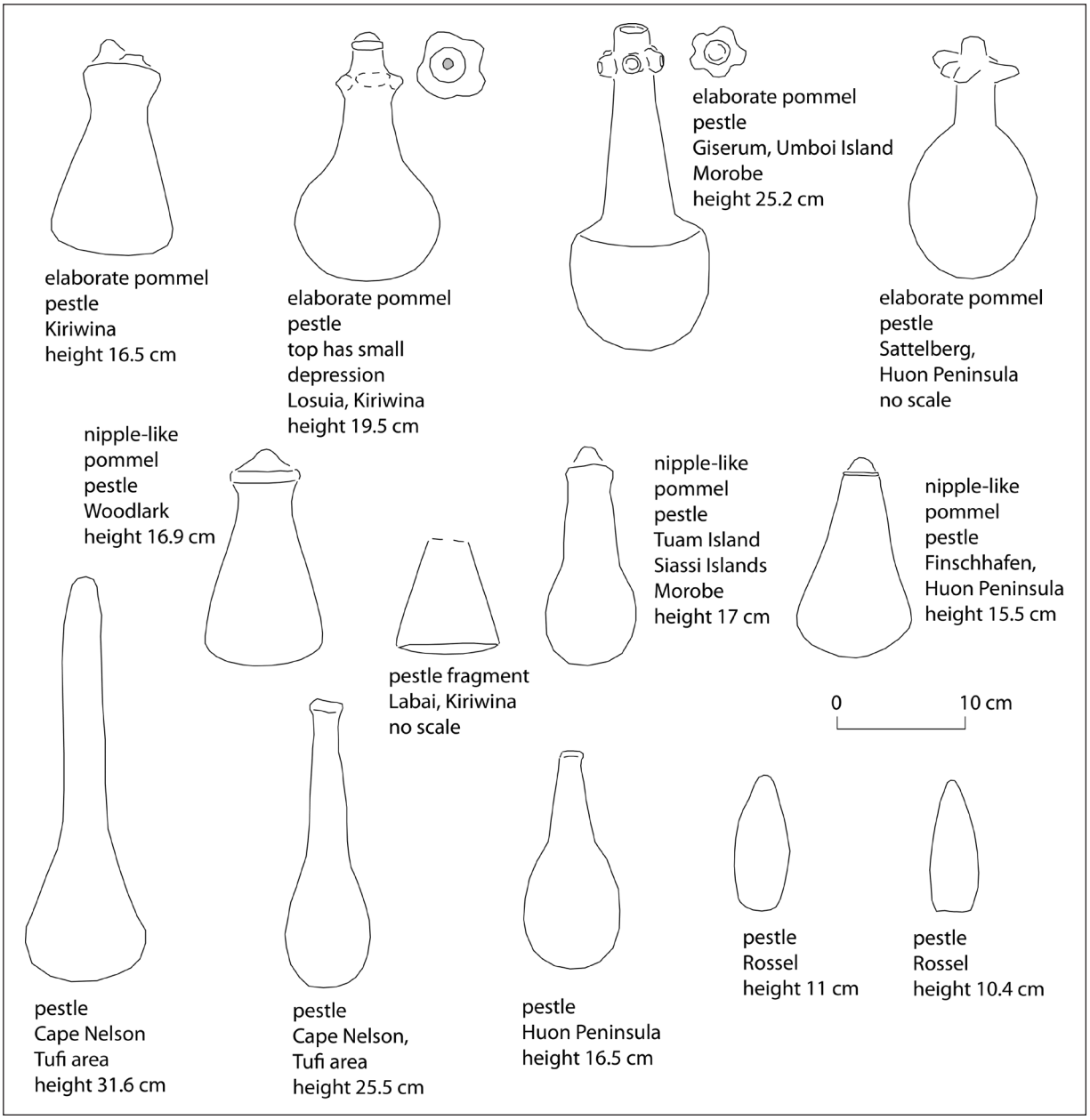

Figure 4. Pestles from Far Eastern New Guinea (based on author's database). These artefacts are prohibited exports from Papua New Guinea.

the islands and mainland in the mid-Holocene.

What is striking is the total absence of any bird mortars or bird pestles from the offshore islands of Far Eastern New Guinea. This is curious, as a bird pestle with truncated wings has been found on the south coast of Papua New Guinea. This pestle was collected at Wonia on the Oriomo River in the Trans Fly region of Western Province. It is probably no coincidence that a smaller stylistically similar pestle comes from near the foothills of the central highlands. It was found in the Ningerum area, which is drained by the Ok Tedi, a Fly River tributary. These finds, like other comparable finds from the Markham and upper Gira rivers in Morobe and Oro respectively, and islands of the former Sepik-Ramu inland sea associate bird pestles with truncated wings in coastal/lowland New Guinea with access via major rivers or an inland sea to the mountainous interior (Swadling 2005). The absence of these artefacts in this study region may be explained by the lack in Far Eastern New Guinea of a mountainous interior rich in bird of paradise species. Likewise few bird of paradise species are found on the offshore islands. Historical observations indicate that, unlike on the western tip of New Guinea, plumes were not a major trade item obtained by islanders from the mainland (Swadling 1996).

AGRICULTURE IN THE LOWLAND AND COASTAL AREAS OF PNG BY THE MID-HOLOCENE

In New Guinea taro is thought to be of lowland origin, as this is the area with its greatest phenotypic variety (Yen 1991). It is not known where the initial domestication of taro and other lowland crops occurred in New Guinea (Denham, 2004), but by the early Holocene taro, along with *Musa* bananas and a yam, had been introduced to the Upper Wahgi valley in the highlands (Denham *et al.* 2003). Environmental and archaeological studies in lowland areas, particularly in West New Britain, demonstrate that forest cover was being cleared and burnt by the mid-Holocene and that potential cultivars were present. Those identified so far are bananas and sugarcane (Lentfer *et al.* 2010).

MORTAR AND PESTLES AND AGRICULTURE

All the mortar and pestle finds with provenance come from areas suitable for subsistence agriculture. The shaded areas in Figures 5–9 show the extent of land suitable for subsistence agriculture as determined by Hanson *et al.* (2001:54, 68, 82).

Elaborate style mortars and pestles only occur on large islands known for their agriculture and capacity to produce an agricultural surplus, namely Kiriwina, Woodlark and Misima. This pattern is not unexpected as the inhabitants of these islands are known for their capacity to not only provide garden food for feasts, but also to supply islands with little fertile land with food (Damon 1983:314–5; Liep 1981:304; Macgregor 1897:72; Montague 1995:64–5). These large islands were also important cultural foci as their surplus garden production allowed specialist manufacturers to be supported. Carved wooden artefacts were made on all islands in the nineteenth century, but the Trobriands, Woodlark, Misima and the Suau Coast were where these artefacts were made for inter-island export (Macintyre 1983:207).

SIGNIFICANT ISLAND FINDS

Trobriand Islands

In the Trobriand Islands all seven mortar and pestle finds come from Kiriwina Island. Two are attributed to Losuia and one to Gusaweta (Table 1, Figure 5). Both Losuia and Gusaweta are where administrators, missionaries or European traders were located and it is likely that these artefacts were brought there for sale. Another find is only attributed to Kiriwina. Only three finds (a pestle from Labai and a mortar and pestle from Mwatawa) are likely to indicate where the original finds were made. They fall into the area Malinowski (1935:13) calls Kiriwina district (Figure 5). He defines this district as economically perhaps the richest in the Trobriand Islands, being politically dominant, socially the most exulted and almost exclusively dependent on agriculture. Its dominance was such that the entire island is now known as Kiriwina. The pestle and mortar finds from Labai and Mwatawa respectively suggest that this part of Kiriwina has long been an important socio-political centre. The finds from the Trobriands are listed in Table 1 and three pestles from the Trobriands are illustrated in Figure 4.

Woodlark

Most agricultural land on Woodlark is found in the north-central part of the island (Figure 6). In the 1850s, an Italian missionary reported that taro was the most important food in Woodlark (Salerio *et al.* 1983:68). The pestles and mortar found by goldminers came from the alluvial deposits at Busai in the central part of the island. De Vis (1907:12) reports it is likely that the pestle Cat. No. E1589 was made of diabase or diorite, a rock type found on Woodlark. The finds from Woodlark are listed in Table 1 and one pestle is illustrated in Figure 4.

Misima

Most of the agricultural land on Misima is found at the eastern end of the island (Figure 7). This is where two of the three provenanced mortars were found. It is also the location of the main creek where the Type I stemmed obsidian tool was excavated from a shaft in one of its lower terraces. The finds from Misima are listed in Table 1 and one mortar is illustrated in Figure 3.

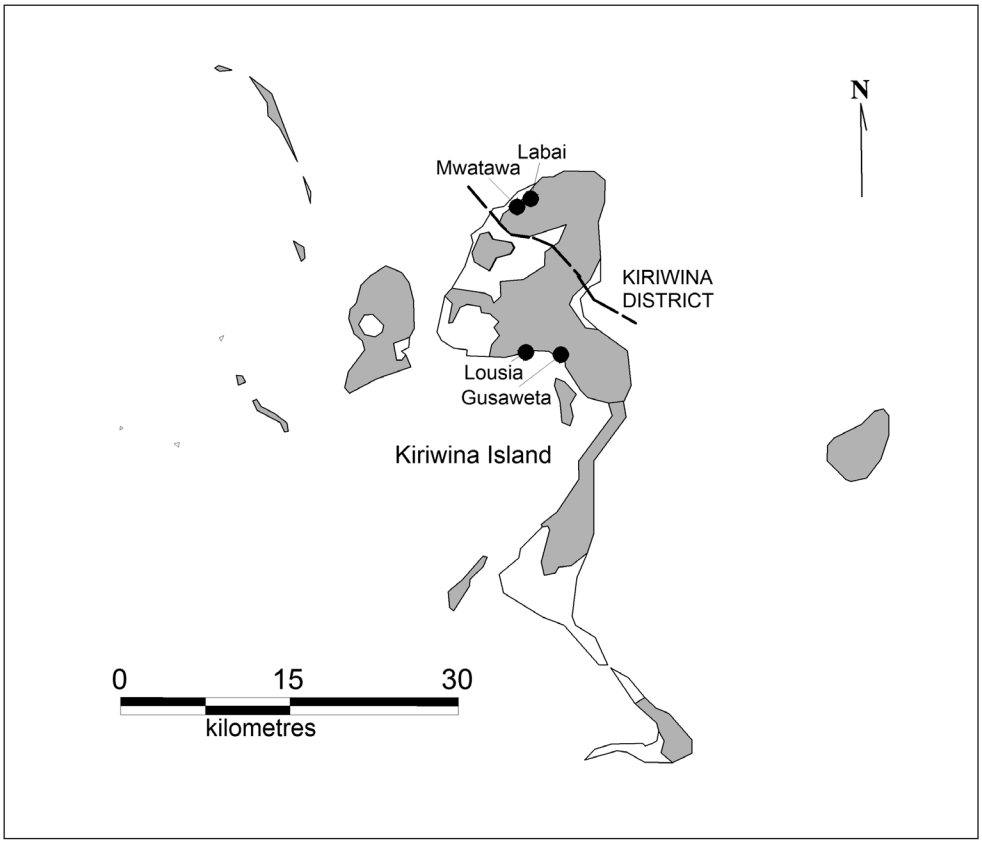

Figure 5. Distribution of mortars, pestles and agricultural land in the Trobriand Islands (Shaded areas: land suitable for subsistence agriculture).

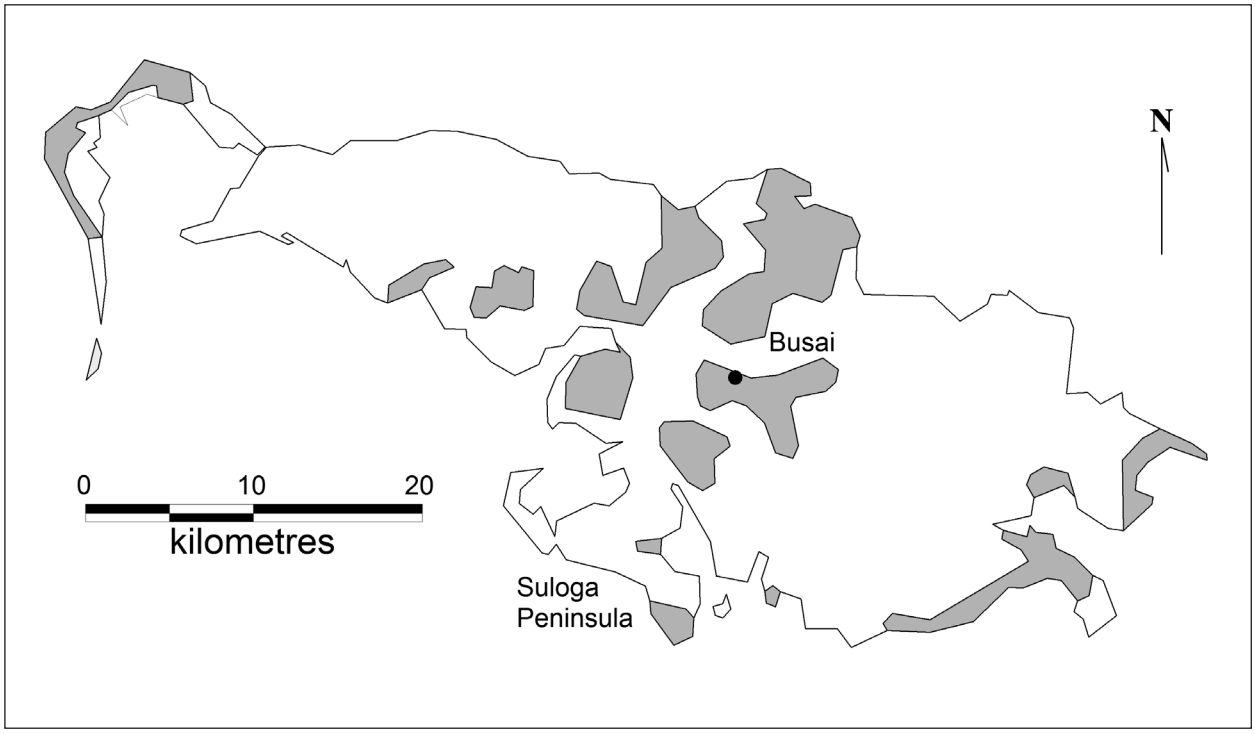

Figure 6. Mortars, pestles and agricultural land on Woodlark Island (Shaded areas: land suitable for subsistence agriculture).

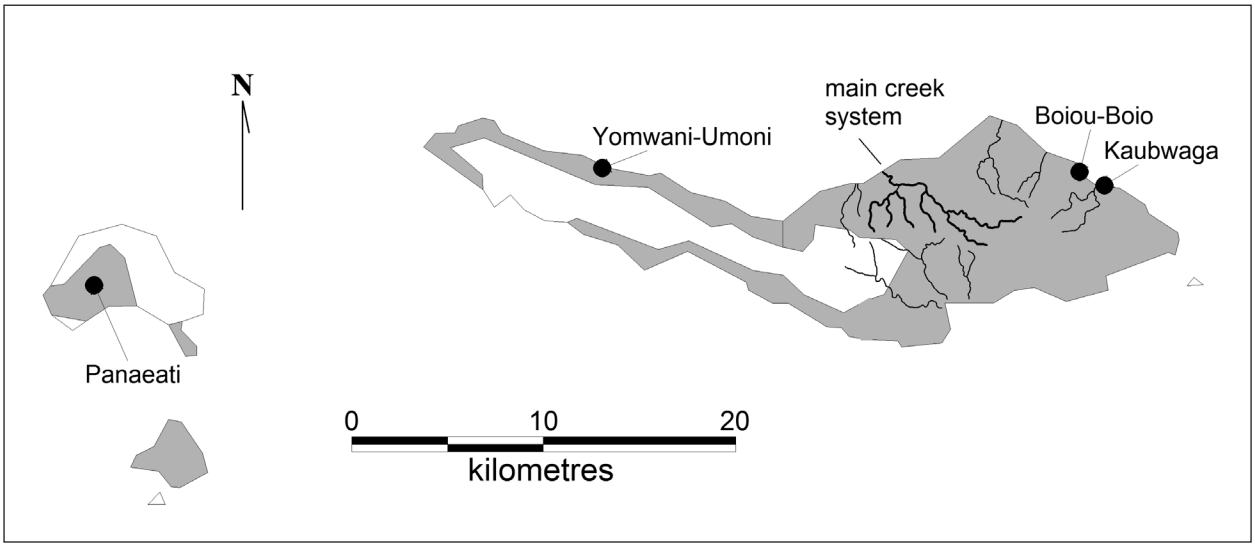

Figure 7. Distribution of mortars, pestles and agricultural land on Misima and Panaeati islands. Also shown is the location of the main creek where the stemmed obsidian Type 1 tool was found (Shaded areas: land suitable for subsistence agriculture).

SIGNIFICANT MAINLAND FINDS

Cape Rodney to Cloudy Bay region, South Papuan Coast

One artefact was collected at a beach village, the others come from the low-lying alluvial plains and coastal hill country lying inland between Cape Rodney and Cloudy Bay (Allen *et al*. 2002: 83; Guise 1985: 13–4; Plates 10–12), see Figure 8. The elaborate face pedestal mortar, the only face mortar from Far Eastern New Guinea, and the other elaborate bowls found suggests that that during the mid-Holocene the Cape Rodney to Cloudy Bay region was an important social centre on the South Papuan Coast. This general region has probably long been an important social centre. In 1889 Sir William Macgregor (1890b) found that the Aroma, located to the west of what is now Kupiano, numbered some 4,000 people and were the most powerful group east of Port Moresby. Today if this region is extended to include from Hood Point to Baxter Bay, it has the second highest village population density in Central Province after the plains west of Bereina. The modern population clusters in this region are at Hood Point, just west of Kupiano and Baxter Bay (Hanson *et al*. 2001: 51). The finds from the Cape-Rodney to Cloudy Bay region are listed in Table 1 and four mortars are illustrated in Figure 3.

Tufi region

Finds in the Tufi region come from the lower slopes of the Topographers Range, the most prominent coastal feature between the Huon Gulf and Milne Bay. Mount Victory the highest point of this range, at 1925 metres, is visible from far out to sea. For seafarers travelling between the Huon Gulf and the Milne Bay islands this would have been a useful landmark. Finds from the Tufi region are listed in Table 1, two mortars are illustrated in Figure 3 and two pestles in Figure 4.

CONNECTIONS WITH THE REST OF NEW GUINEA

The mid-Holocene mortars and pestles found on the Huon Peninsula along with those in West New Britain demonstrate strong stylistic similarities with those from Far Eastern New Guinea. How such cultural links were established may be due in large part to the existence of the New Guinea Coastal Current.

During the NW monsoon (December to March) the New Guinea Coastal Current flows eastwards along the North Coast of New Guinea, through Vitiaz Strait and along the Morobe coast to the eastern tip of New Guinea. In the SE monsoon (April to November) the current reverses and flows along the shoreline from the eastern tip of New Guinea to the North Coast (Steinberg *et al*. 2006). The trade spheres that developed on the Morobe coastline (Swadling 1986: 212, Figure 5) would have utilised this current. In more recent times Fergusson Island obsidian was traded down-the-line to Collingwood Bay (Egloff 1979); via the Morobe coastline to the Eastern Highlands (Watson 1986) and onwards to Ali, Seleo and Tarawai islands on the North Coast (Golitko *et al*. 2012; 2013).

In the early twentieth century wooden mortars and pestles or beaters for making ceremonial puddings were extensively used in villages that were once linked by the trading spheres that used the New Guinea Coastal Current. Ceremonial puddings, generally consumed as a paste or dumpling, were widely made in or near the coastal parts of Sandaun, East Sepik, Madang, Morobe, and parts of West

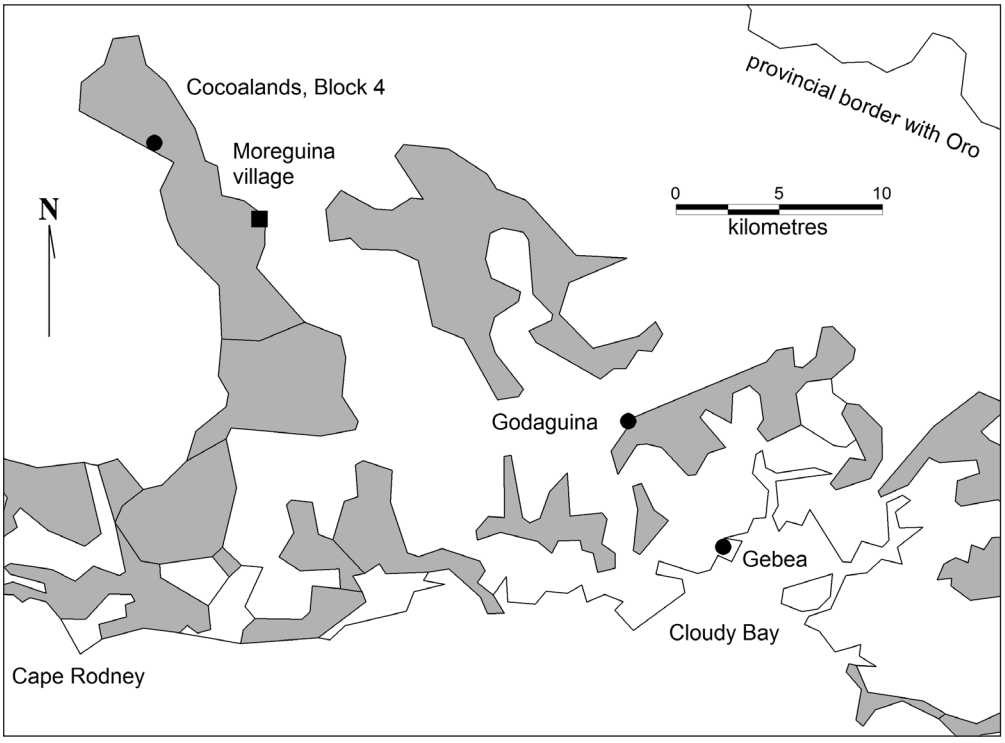

Figure 8. Distribution of mortars and agricultural land in the Cape Rodney to Cloudy Bay region (Shaded areas: land suitable for subsistence agriculture).

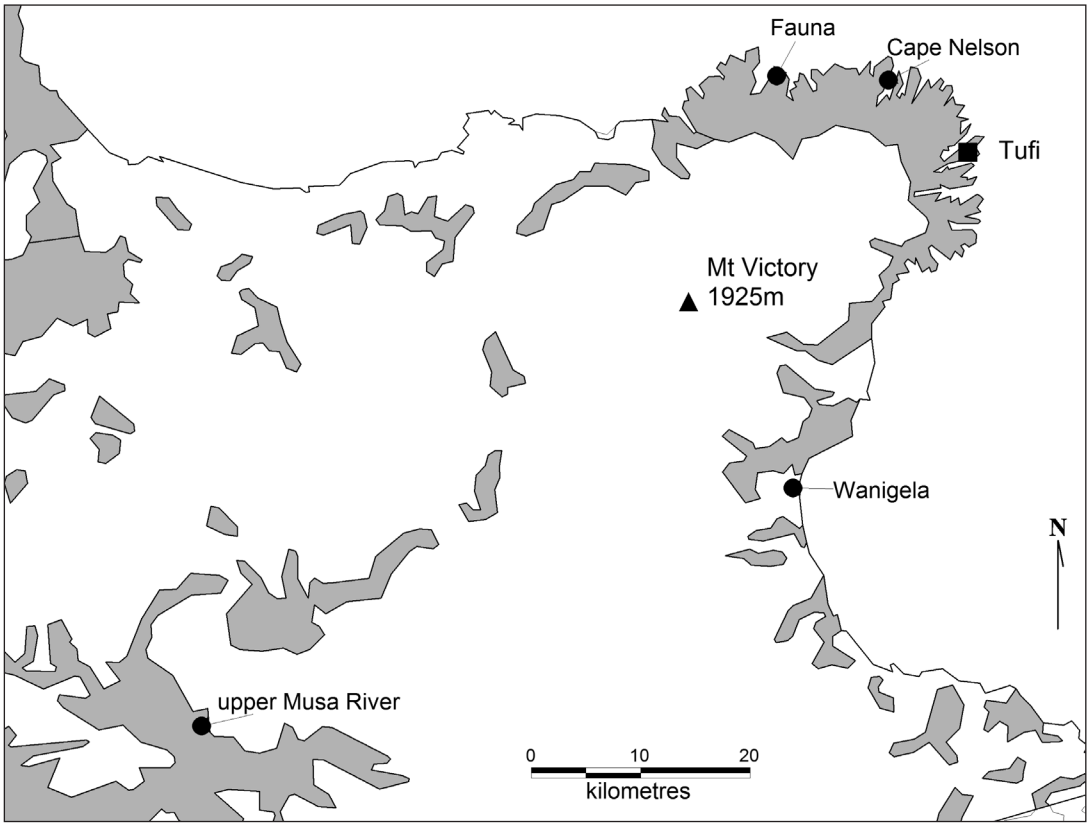

Figure 9. Distribution of mortars, pestles and agricultural land in the Tufi region (Shaded areas: land suitable for subsistence agriculture).

New Britain and Milne Bay provinces. After World War II there was a marked decline in pudding making, in part due to the decline of taro in the late 1950s and its replacement by manioc. The only pudding that Thomas Harding saw made while in the Siassi region in the 1960s was at the mainland village of Sio in 1963 (personal communication 2005). Unfortunately the practice is poorly described or illustrated in the literature, but many artefacts are held in museum collections (Gubag *et al*. 1996; Swadling 1981: 52, 58–9; Yen 1976; Young 1998: 166–7, 220).

Another similarity between much of the North Coast of PNG and the Trobriands and Woodlark islands in Milne Bay are cultural restrictions on coconut cultivation. In the late nineteenth century the residents of small, low, neighbouring islands provided the inhabitants of the North Coast mainland, as well as Kiriwina and Woodlark islands with coconuts. On the North Coast coconuts were abundant on islands such as Bilibil, the Siassi group and Tami and were traded by island-traders to the mainland (Harding 1967: 32, 128, 232). In the case of Kiriwina they were obtained from the Lusancays, especially the main islands of Kawa and Simsim, and in the case of Woodlark they came from Budibudi Atoll (Damon 1983: 314–5; Montague 1995: 64–5). On Kiriwina people of rank owned the few coconut stands (Austen 1945–6: 19).

Another link between the Bismarck Archipelago and certain islands in Milne Bay is the likely introduction by human agency of a large tree snail. A study of the genotypes of partulid tree snails indicates that *Partula similaris* now found on Woodlark, Goodenough and Boiaboiawaga islands originated in the Bismarck Archipelago. Boiaboiawaga is located off East Cape. In addition to the genotyped examples *Partula similaris* is also recorded for the Trobriand Islands, Ibuarai at East Cape, Budibudi Atoll and Rossel Island (Foighil *et al*. 2011).

MORTARS AND PESTLES AND LAPITA

When stone mortars and pestles ceased to be used in Papua New Guinea roughly coincides with the appearance of Lapita pottery in coastal areas. Torrence and Swadling (2008) propose that mid-Holocene social networks provided the conduit for the spread of Lapita in PNG. But it is hard to reconcile how geometric designs that once decorated some stone mortars and figures came to feature on Lapita pottery, as our current perception is one of archaeological discontinuity between these cultural traditions. Nevertheless, this perception of discontinuity does not explain the continuity of geometric designs, including comparably arranged design fields (Swadling n.d.) or the continuity in paste pudding making in certain coastal and lowland areas within PNG, including Milne Bay. In addition, pounded taro paste puddings, along with Lapita pottery were subsequently introduced to Polynesia by its initial colonists.

New light is being shed on the nature of coastal-highlands interaction by the 3000 year old pottery, some clearly coastal in origin, recently reported from Wañelek at 1710 metres above sea level in the Bismarck Schrader Ranges (Gaffney *et al*. 2015). Wañelek lies midway between the reported examples of mortars and figures, which have design fields filled with geometric designs, from the Sepik-Ramu and the Highlands.

ANTIQUITY OF OCCUPATION IN FAR EASTERN NEW GUINEA AND ITS OFFSHORE ISLANDS

Currently the oldest radiocarbon date from an archaeological site in Far Eastern New Guinea is from Wari Island in Milne Bay Province. It is an AMS shell (tridacna) date of 2600–2800 cal BP, associated with plain ware, from the basal cultural deposit in the Kasasinabwana shell midden (Negishi and Ono 2009: 29–30). Another indication of offshore island occupation from 3000 to 2500 BP is the Fergusson Island obsidian recovered from Lapita sites, one dating to 1100 B.C., in the Reef Islands, Santa Cruz Group, Solomon Islands (Green and Bird 1989), and the other, from at least 2500 BP, at Caution Bay, located just west of Port Moresby on the South Papuan Coast (McNiven *et al*. 2011). Pushing the occupation of this region back even further are the stone mortars and pestles reported here. They indicate that in time the alluvial deposits and eroding shorelines of this region should yield mid-Holocene sites but their discovery will probably depend on chance exposure. Unfortunately the alluvial areas on Woodlark and Misima islands were extensively churned over in the late nineteenth century by gold miners.

CONCLUSION

The mid-Holocene of coastal and lowland Papua New Guinea in general has a low visibility of archaeological sites, but stone mortars and pestles, along with stemmed obsidian tools are proving to be useful indicators of economic and social life in this period. Their distribution is also providing insights into both local and inter-regional networks.

This study shows that the large islands of Kiriwina, Woodlark and Misima because of their capacity to produce an agricultural surplus have long been important economic and social centres. The same seems true for the Cape Rodney to Cloudy Bay finds as they occur in the region that historically has the second highest population density for a cluster of villages on the South Papuan Coast. This study has also shown that the people inhabiting Far Eastern New Guinea and its offshore islands had their strongest inter-regional links with the Huon Peninsula and West New Britain. This interaction can be seen as a cross link with another network that joined the central highlands via the Sepik-Ramu inland sea/ New Guinea North Coast with West New Britain. Whether these ties in

the mid-Holocene were due to epic voyages by culture heroes or more regular down-the-line contact is not known.

Dedication

This paper is dedicated to the memory of Herman Mandui my former colleague and successor at the PNG National Museum and Art Gallery.

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References

Allen, B.J., Nen, T., Bourke, R.M., Hide, R.L., Fritsch, D., Grau, R., Hobsbawn, P. and Lyon, S. Central Province. 2002. *Agricultural systems of Papua New Guinea*, Working Paper No. 15. Canberra: Australian National University.

Araho, N., Torrence, R. and White, J.P. 2002. Valuable and useful: mid-Holocene stemmed obsidian artifacts from West New Britain, Papua New Guinea. *Proceedings of the Prehistoric Society,* 68: 61–81.

Armstrong, W.E. 1928. *Rossel Island*. Cambridge: University Press.

Austen, L. 1945/46. Cultural changes in Kiriwina. *Oceania*, 16: 15–60.

Chappell, J. 2005. Geographic changes of coastal lowlands in the Papuan Past. In Pawley, A., Attenborough, R., Golson, J. and Hide, R. (eds.), *Papuan Pasts: cultural, linguistic and biological histories of Papuan-speaking peoples*. Canberra: Pacific Linguistics, Australian National University, pp. 525–539.

Damon, F.H. 1983. What moves the kula: opening and closing gifts on Woodlark Island. In Leach, J.W. and Leach, E. (eds.), *The Kula: New Perspectives on Massim Exchange*. Cambridge: Cambridge University Press, pp. 309–342.

Denham, T.P. 2004. The roots of agriculture and arboriculture in New Guinea: Looking beyond Austronesian expansion, Neolithic packages and indigenous origins. *World Archaeology*, 36: 610–620.

Denham, T.P., Haberle, S.G., Lentfer, C., Fullagar, R., Field, J., Therin, M., Porch, N. and Winsborough, B. 2003. Origins of agriculture at Kuk Swamp in the Highlands of New Guinea. *Science*, 301: 189–193.

Egloff, B. 1979. *Recent Prehistory in Southeast Papua*. Terra Australis 4. Canberra: Australian National University.

Foighil, D. Ó, Lee, T. and Slapcinsky, J. 2011. Prehistoric anthropogenic introduction of partulid tree snails in Papua New Guinean archipelagos. *Journal of Biogeography*, 38 (8): 1625–1632.

Gaffney, D., Summerhayes, G.R., Ford, A., Scott, J.M., Denham, T., Field, J., Dickinson, W.R. 2015. Earliest pottery on the New Guinea Mainland reveals Austronesian influences in Highland environments 3000 years ago. *PLoS ONE,* 10(9): e0134497.

Golitko, M., Schauer, M. and Terrell, J.E. 2012. Identification of Fergusson Island obsidian on the Sepik coast of northern Papua New Guinea. *Archaeology in Oceania,* 47: 151–156.

Golitko, M., Schauer, M. and Terrell, J.E. 2013. Obsidian acquisition on the Sepik Coast of Northern Papua New Guinea during the last two millennia. In Summerhayes, G. and Buckley, H. (eds.), *Pacific Archaeology: documenting the past 50,000 years*. Dunedin, University of Otago, pp. 43–57.

Green, R.C. and Bird, J.R. 1989. Fergusson Island obsidian from the D'Entrecasteaux Group in a Lapita site of the Reef Santa Cruz Group. *New Zealand Journal of Archaeology*, 11: 87–99.

Gubag, R., Omoloso, D.A. and Owens, J.D. 1996. Sapal: a traditional fermented taro [Colocasia esculenta (L.) Schott] corm and coconut cream mixture from Papua New Guinea. *International Journal of Food Microbiology,* 28: 361–367.

Guise, A. 1985. Oral tradition and archaeological sites in the Eastern Central Province. *PNG National Museum Record*, 9.

Harding, T.G. 1967. *Voyagers of the Vitiaz Strait: A study of a New Guinea Trade System.* Seattle and London: University of Washington Press.

Hanson, L.W., Allen, B.J., Bourke, R.M. and McCarthy, T.J. 2001. *Papua New Guinea Rural Development Handbook*. Canberra: Australian National University.

Lentfer, C., Pavlides, C. and Specht, J. 2010. Natural and human impacts in a 35,000 year vegetation history in central New Britain, Papua New Guinea. *Quaternary Science Reviews*, 29: 3750–3767.

Liep, J. 1981. The workshop of the kula: production and trade of shell necklaces in the Louisiade Archipelago, Papua New Guinea. *Folk*, 23: 298–309.

Macgregor, W. 1890a. Despatch reporting visit of inspection to the islands of Tagula (Sudest) and Misima (St. Aignan). *British New Guinea Annual Report for 1889–90*, pp. 25–26 (Appendix A).

Macgregor, W. 1890b. Despatch reporting visit of inspection to District of Aroma. *British New Guinea Annual Report for 1889–90*, pp. 27 (Appendix B).

Macgregor, W. 1897. *British New Guinea: country and people*. London: John Murray.

Macintyre, M. 1983. Changing paths: An historical ethnography of the traders of Tubetube. PhD thesis, Anthropology, Australian National University, Canberra.

Malinowski, B. 1935. *Coral Gardens and their magic: a study of the methods of tilling the soil and of agricultural rites in the Trobriand Islands*. London: Allen and Unwin, volume 1.

McNiven, I.J., David, B., Richards, T., Aplin, K., Asmussen, B., Mialanes, J., Leavesley, M., Faulkner, P. and Ulm, S. 2011. New direction in human colonisation of the Pacific: Lapita settlement of south coast New Guinea. *Australian Archaeology,* 72: 1–6.

Montague, S.P. 1995. Kaduwaga: A Trobriand boat harbour. In Feinberg, R., *Seafaring in the contemporary Pacific Islands*. DeKalb: Northern Illinois University Press.

Negishi, Y. and Ono, R. 2009. Kasasinabwana shell midden: The

prehistoric ceramic sequence of Wari Island in the Massim, Eastern New Guinea. *People and Culture in Oceania*, 25: 23–52.

Norick, F.A. 1976. An analysis of the material culture of the Trobriand Islands based upon the collection of Bronislaw Malinowski. PhD thesis, Anthropology, University of California, Berkeley.

Salerio, C., Lithgow, D. and Affleck, D. 1983. Manuscript XVIII: Information on customs and practices of the people of Woodlark Island. *The Journal of Pacific History*, 18(1): 57–72.

Seligman, C.G. and Joyce, T.A. 1907. On prehistoric objects in British New Guinea. In W.H.R. Rivers, Marett, R.R. and Thomas, N.W. (eds.), *Anthropological essays presented to Edward Burnett Tylor*. Oxford: Clarendon Press, pp. 325–341.

Stanley, E.R. 1912. Report on the geology of Woodlark Island (Murua). *Papua. Annual Report for the year ended June 1912*. Commonwealth of Australia, pp. 189–208.

Steinberg, C.R., Choukroun, S.M., Slivkoff, M.M., Mahoney, M.V., Brinkman, R.M. 2006. *Currents in the Bismarck Sea and Kimbe Bay, Papua New Guinea*. Australian Institute of Marine Science and The Nature Conservancy. TNC Pacific Island Countries Report No. 6/06.

Swadling, P. 1981. *Papua New Guinea's Prehistory: An Introduction*. Port Moresby: National Museum and Art Gallery in association with Gordon and Gotch.

Swadling, P. 1986. Some ethnographic and archaeological continuities and discontinuities across the Asian-Pacific interface. Pertemuan Ilmiah Arkeologi IV, Cipanas, 3–9 Maret 1986, Vol. III. Konsepsi dan metodologi. Jakarta: Departemen Pendidikan dan Kebudayaan.

Swadling, P. 1996. *Plumes from Paradise*. Boroko: Papua New Guinea National Museum in association with Robert Brown.

Swadling, P. 2004. Stone mortar and pestle distribution in New Britain revisited. *Records of the Australian Museum, Supplement*, 29: 157–161.

Swadling, P. 2005. The Huon Gulf and its hinterlands: A long-term view of coastal-highlands interactions. In Gross, C., Lyons, H., and Counts, D. (eds.), *A Polymath Anthropologist: Essays in honour of Ann Chowning*. Auckland: The Department of Anthropology, University of Auckland, pp. 1–14.

Swadling, P. 2013. Prehistoric stone mortars. In Bolton, L., Thomas, N., Bonshek, E., Adams, J. and Burt, B. (eds.), *Melanesia: Art and encounter*. London: British Museum Press, pp. 78–82.

Swadling, P. (n.d.). Early art in New Guinea: Glimpses from prehistory. In Friede, J., Hays, T.E. and Hellmich, C. (eds.) *New Guinea Highlands: Art from the Jolika Collection,* San Francisco: Fine Arts Museums.

Swadling, P. and Hide, R. 2005. Changing landscape and social interaction: looking at agricultural history from a Sepik-Ramu perspective. In Pawley, A., Attenborough, R., Golson, J. and Hide, R. (eds.), *Papuan Pasts: cultural, linguistic and biological histories of Papuan-speaking peoples*. Canberra: Pacific Linguistics, Australian National University, pp. 289–327.

Swadling, P., Wiessner, P., and Tumu, A. 2008. Prehistoric stone artifacts from Enga and the implication of links between the highlands, lowlands and islands for early agriculture in Papua New Guinea. *Journal de la Société des Oceanistes*, 126–127 (1–2): 271–292.

Torrence, R. and Swadling, P. 2008. Social networks and the spread of Lapita. *Antiquity*, 82: 600–616.

Torrence, R., Kelloway, S. and White, P. 2013. Stemmed tools, social interaction, and voyaging in early-mid Holocene Papua New Guinea. *The Journal of Island and Coastal Archaeology*, 8:2, 278–310.

Vis, C.W. de (n.d.) [1906]. Fossil vertebrates from New Guinea. *Annals of the Queensland Museum*, 6: 35, plates 10–13.

Vis, C.W. de 1907. A Papuan relic. *Annals of the Queensland Museum*, 7: 12–13.

Watson, V. 1986. *Obsidian as tool and trade: A Papua New Guinea case*. Burke Museum Contributions to Anthropology and Natural History, No. 4. Seattle: Burke Museum.

Yen, D.E. 1976. Indigenous food processing in Oceania. In Arnott, M.L. (ed.) *Gastronomy: The Anthropology of food and food habits*, The Hague: Moulton.

Yen, D.E. 1991. Polynesian origins and cultivars: The question of origins. In Cox, P.A. and Banack, S.A. (eds.), Islands, plants, and Polynesians: An Introduction to Polynesian Ethnobotany. Portland: Dioscorides Press, pp. 67–95.

Young, M.W. 1998. *Malinowski's Kiriwina: Fieldwork photography 1915–1918*. Chicago: University of Chicago Press.