

6

Otoia, ancestral village of the Kerewo: Modelling the historical emergence of Kerewo regional polities on the island of Goaribari, south coast of mainland Papua New Guinea

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Introduction

This paper presents a model for the occupation of the Kikori River delta and the first archaeological results from excavations undertaken in Kerewo lands on the large river delta

island of Goaribari, western Gulf of Papua (Gulf Province), Papua New Guinea (PNG) (Figure 1). The site of Otoia 1 is situated along the northwestern end of Goaribari. Ethnographically this region encompasses the lands of the Kerewo in the eastern Kiwai language area, who at the time of initial European contact in the 1870s, exerted socio-political control and/or competitive influence from the Turama River in the west, to Paia Inlet in the east, and upstream at least as far as Kopi in the north (e.g. Knauft 1993:27; Weiner 2006). The Kerewo are the largest tribal-linguistic group in the coastal Gulf of Papua region. Prior to the colonial period, Kerewo villages were organised around large men's longhouses (*dubu daima*), each of which was compartmentalised into clan sections, membership of which was determined through agnatic descent. Local oral traditions recall that at Otoia, for example, there were originally two longhouses, called Gewo and Ubo Gewo. Clan membership at Gewo consisted of Kibiri, Atenaramio, Karuramio, Hide'ere, Guei, Pinei and Neboru, while the Ubo Gewo clans were Neauri, Kurami, Gibi, Adia'amudae and Neboru. When clans became too large, they split into separate units and differentiated themselves by adopting names according to the position they occupied in the longhouse. For Kerewo, the three major sections of the longhouse were *tamu* (head of the house), *gobo* (middle of the house) and *nupu* (back of the house), thus the original Karuramio clan became divided into Nupu Karuramio and so on (Kenneth Korokai [Neauri clan], pers. comm.; Weiner 2006:32).

Kerewo oral traditions state that Otoia was the origin village for all the Kerewo, being the settlement from which the different clans fissioned and from which all subsequent villages in the delta were established (see Figure 1). At the time of initial European contact in the late 19th century, Kerewo society was characterised by ritual headhunting and constant raiding of nearby regions, with little inter-marriage taking place across linguistic/tribal boundaries. Residential mobility was extremely limited, with residence restricted to a number of very large and easily defended villages on Goaribari Island and the Omati River (Weiner 2006:41).

The archaeological site of Otoia 1 is an abandoned village location, one of several abandoned ancestral villages of the Kerewo on the islands of the Kikori-Omati Rivers delta. The site was visited and historically documented by Alfred Haddon in 1914 and the Australian photographer and explorer Frank Hurley in 1921. People continued to live at the village until the early 1970s, when the last of the villagers relocated to other Kerewo villages and to colonial administrative centres such as Kikori.

Early European accounts go to some lengths to point out that the delta villages of the Kerewo and nearby groups were generally very large at the end of the 19th century, unlike those of peoples found further inland, with populations typically estimated at 1000-2000 people within individual villages in the delta villages (e.g. Ryan 1913), in contrast to settlements upstream, which typically numbered fewer than 100 inhabitants (e.g. MacGregor 1894a; Murray 1914:10; Ryan 1914:170, 172; Woodward 1920; Flint 1923; Cawley 1925; Liston-Blyth 1929). Thus Ryan (1913, cited in Goldman and Tauka 1998:59) reported that 'West of Vaimuru [Baimuru] are the villages of the Urama tribe. Their villages are situated on land between Era Bay and Pai'a inlet, consisting of seven villages, with a population of about 4,000 people'. In 1917, the Acting Assistant Resident Magistrate for the Delta Division, C.L. Herbert (1917:87), wrote that the two villages of Ebi-ka-o and Mai-aki, a few minutes apart by boat and located in the Kikori River delta some 20 km east of Goaribari, had a combined population of about 3000 people. In 1920, Woodward (1920:63) concluded that the Aird River delta supported around 6500 people; that the Kerewo numbered around 4000; and that the Urama villages supported 2000 people. William MacGregor (1893) likewise reported seeing numerous large villages in the Kikori and Omati Rivers delta in 1892:

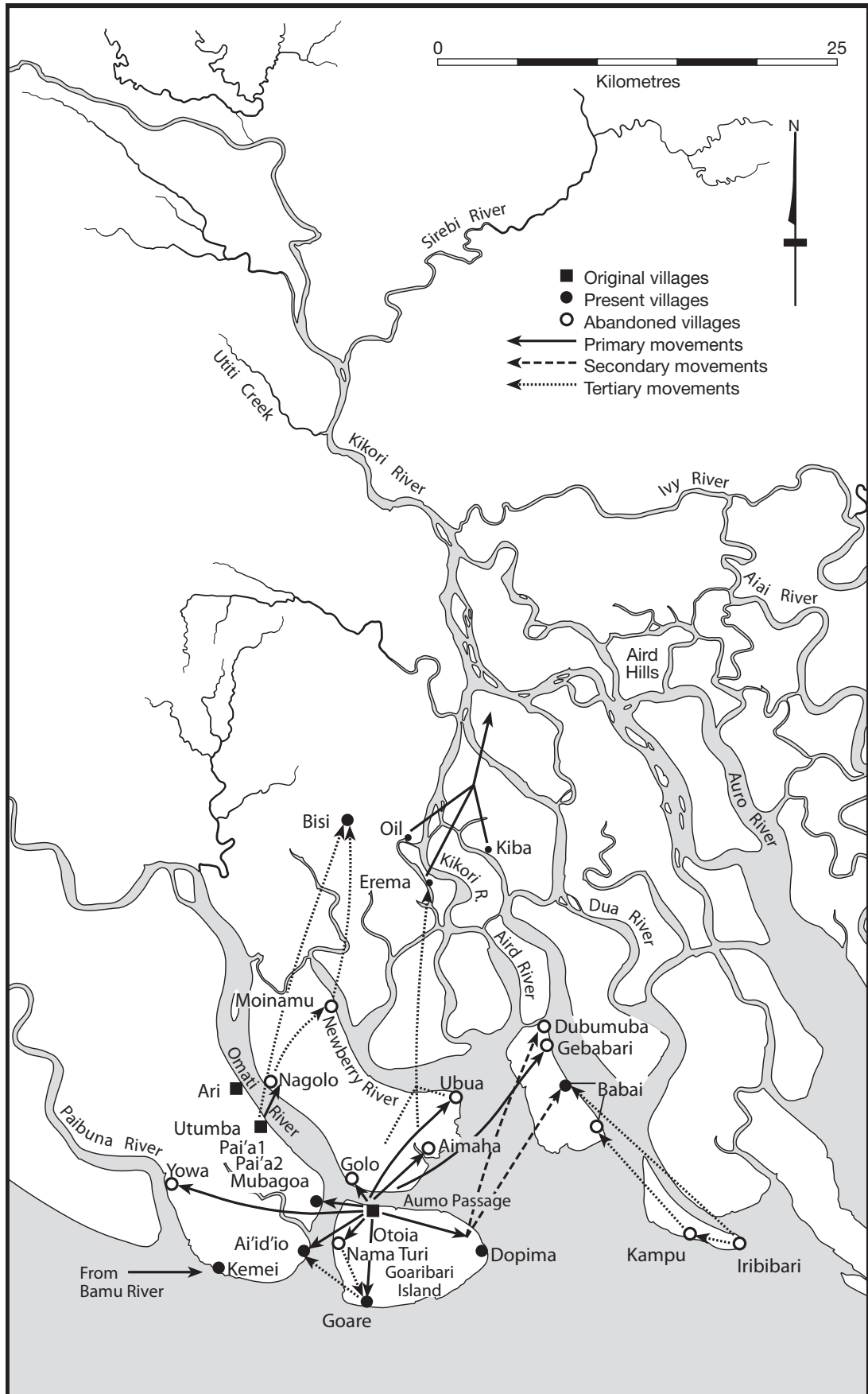


Figure 1. Map of the Kikori and Omati Rivers delta, showing Otoia as the original Kerewo village and the ‘traditional Omati villages and migration history’ according to oral traditions (after Goldman and Tauka 1998:63).

We proceeded to go through the Aumoturi channel, which cuts off Goaribari from the mainland. Entering it from the east end, we soon found ourselves in front of a large village Anawaida, [which seems to correspond with the village of Dopima in northeastern Goaribari] on its south bank. There are three or four very long houses, 300 to 400 feet each, and a number of smaller ones for the women and children. The village site was half swampy, but the coast there grows sago and some cocoanut trees. ... Near the western end of the strait there is another large village on the same bank Oteai [Otoia]. ... The Aumoturi joins a large river on the west side, which meets it at nearly a right angle, the two opening into the sea on the west side of Goaribari. We intended to examine this river, and it was decided that we should begin at its mouth. We accordingly steered for a large village on the right bank near the sea [probably Aiedio; see Figure 2]. It is a large and populous settlement, with a number of very long houses and many smaller ones. A large number of canoes came out to meet us ... About a mile and a-half further up the river there is, also on the right bank, a large village on a somewhat drier site [probably Mubagoa]. About four miles further up, on the same bank, is the great village of Baiaa [Pai-a], which seems to be the largest one I have seen in the Possession. Baiaa has over two scores of houses, many of them several hundred feet long. It is on land that would be about a yard above high water mark, and is firm enough to grow bread fruit and cocoanut trees. ... The village of Baiaa is about half a mile long, and presents quite an imposing appearance. ... On leaving our camp we found a large settlement on the right bank at a place called Naimesse. It was only a sago encampment. They had fairly good, small houses, not so large or substantial as those of the permanent villages. (MacGregor 1893:45-47)

In 1893, MacGregor (1894b, c) further reported that the villages of the Purari River delta a short distance to the east 'are numerous and very noisy', and that a 'large tribe was met with'



Figure 2. Longhouses in the village of Aiedio, opposite Goaribari (from *Papua Annual Report for the Year 1918-19*, Photo 4).

on the Gulf Province islands between the Era and Kikori Rivers (MacGregor 1894b:xix).

By contrast, in 1920 the Acting Resident Magistrate for the Delta Division, R.A. Woodward (1920), estimated that the total population of all the communities along the inland Kikori River, the 'Vero River' and the Tiviri Junction put together numbered a mere 500.

Although the delta region is a difficult environment in which to live, in the sense that almost everywhere the land is swampy and covered by saltwater mangroves rendering agriculture nigh impossible (see Haddon 1918; below), it clearly supported some of the largest and most densely populated ethnographic villages of the western Gulf Province lowlands (cf. Williams 1924). We suggest that a contributing factor was that the villages' position at the mouth of the Kikori and Omati Rivers placed them at the front end of redistributive networks inland to the north, and further to the west along the coast. This enabled the Kerewo to act as middlemen in aggrandising interaction networks with trade partners to the east, from which imported *hiri* ceramics were obtained. In their strategic positioning at the mouth of the major Kikori and Omati Rivers, the Kerewo of the delta region controlled the redistribution of pottery to the expansive populations residing along the Kikori and Omati Rivers. We argue that, initially at least, the Kerewo may themselves have depended to a significant extent on the pottery trade for access to inland products such as stone and supplementary plant produce to sustain themselves while living in a difficult environment from which they were supporting growing populations. Trade in supplementary plant produce is supported from oral accounts and the fact that many food plants will not grow in the delta because of its low-lying nature and periodic inundation by saltwater; even sago is not as prolific in the lower delta islands as elsewhere in the Gulf region.

That the *hiri* trade usually reached Goaribari via secondary means is supported by a range of historical and oral sources. Nigel Oram (1982) recorded that the Motu ceramic manufacturers divided the recipient *hiri* trade villages into four zones extending as far west as the Purari River (located 110 km east of Otoia). Present-day Kerewo oral traditions also state that pottery trade was indirect and came from their eastern neighbours, with no recollection of ever having been visited by Motu traders. Furthermore, Kerewo state that the Motu trade language was not spoken in the delta until introduced by missionaries at the turn of the 19th century (Kenneth Korokai pers. comm. 2008). This is supported by Dutton's (1982:82) linguistic study of the distribution of the Motu language in the Gulf, where he states:

... although we know that some North-East Kiwai speakers, notably the Urama, traded with the Koriki of the Purari Delta, the traditional end point of the *hiri*, they do not seem to have traded with the Motu directly for it is reported that it was only after European contact that the Motu went to Urama [58 km to the east of Goaribari] and then they had to stop off at Maipua to find a man to translate Motu into Urama.

In July 1878, Henry M. Chester, the Police Magistrate at Thursday Island in Torres Strait, undertook an expedition to the south coast of New Guinea in the steamer *Ellengowan*. At the Motu village of Boera, he obtained the following information on customary *hiri* trade voyages from local clan leaders:

We gleaned the following information from them. Their annual trading voyage commences in August, and extends about 100 miles to the westward. They call at all the villages to exchange their pottery ware for sago, and return to Boera with the first north-west wind in December. There are twelve villages to pass before arriving in the cannibal districts. Vaimuro is the last place of call, nine villages further on, and to them come people from three villages still further to the westward, Kerepo [Kerewa, aka

Otoia] being the last village with which they have intercourse. (Chester 1878:9)

We further suggest that *hiri* pottery redistribution networks may have contributed to the consolidation and possible expansion of headhunting cults for which the Kerewo were particularly feared during ethnographic times (see David *et al.* 2010). There is little doubt that the continuous raiding of neighbouring groups essential to Kerewo headhunting rituals kept neighbouring groups in constant fear of raiding parties (Knauft 1993; David *et al.* 2010). The sheer scale of such raiding can be seen from one account of a colonial punitive expedition sent to the Kerewo village of Dopima on Goaribari in the aftermath of the killing of the missionary James Chalmers and his associate the Rev. Oliver F. Tomkins on 8 April 1901:

In a report on the massacre, the Rev. H.M. Dauncey says, ‘in one of the dubus were over seven hundred skulls, and at another four hundred. Some of the other dubus were cleared before the party reached them, but I am within the mark in saying that there must have been ten thousand skulls in the twenty dubus burned’. (cited in Haddon 1918:180)

Indeed, David *et al.* (2010) suggest that persistent headhunting raids by the Kerewo in particular led to neighbouring delta and inland river-bordering tribal groups, themselves headhunters, relocating villages away from major waterways into more rainforest-hidden refugial locations, specifically for protection from headhunting raids.

In this context, through headhunting cults, in the Gulf Province river deltas actively configured regional polities, including settlement locations and regional alliances, reinforcing and defending hierarchical relationships between communities and individuals. Knauft (1993:196) thus states for headhunting practices in the broader contiguous Western-Gulf Province coastal region, including the Kerewo as the easternmost Kiwai-speaking group, that:

Kiwai headhunting melded dimensions of warfare found variously among Marind, Purari and Asmat. ... coalitions of Kiwai in long-distance coastal raids could claim many victims, and some local groups were exterminated through headhunting. Kiwai were distinctive for their complex web of local and long-distance alliances. These provided opportunity for both substantial temporary coalition and large-scale death contracting and treachery. The detailed accounts obtained by Landtman (1917) illustrate how astute leaders could effectively ally with other settlements; sometimes they would even contract and aid third parties to travel long distances in fleets of canoes to carry out surprise attacks. Many heads and renown – as well as substantial payment – accrued to the attackers, while local political advantage went to the leader who contracted the killing ... The general sense one gets from the accounts of Landtman (1917), Riley (1925) and Beaver (1920) is that warfare among Kiwai themselves was driven by political disputes and revenge rather than ritual mandate.

We argue that because of the indirect nature of the trade, and the reliance on intermediary groups for access to imported pots and shell valuables, control over supply provided not only a powerful stimulus to largely command this interaction itself, but also a means to muster political and military support and to prevent competition from rival groups occupying the lower reaches of the Kikori River system. Over decades, generations, and some four to five centuries of permanent village settlement at the strategic mouths of the large river systems, the Kerewo and their neighbours in the Purari River delta where the westernmost regular direct *hiri* trade took place, grew into controlling coastal polities. These social entities manipulated and

managed regional economies, territorial interactions and social relations through headhunting cosmologies that enabled powerful alliances to be formed and that spread fear among neighbouring populations. Kerewo domination of regional networks from a relatively resource-poor base involved control over incoming trade products, leading to further aggrandising of the Kerewo realm.

Previous archaeological research

In order to test this model, a series of excavations at ancestral village sites was planned in the Kikori delta. Our major aims were three-fold:

1. To determine whether the establishment of the large Kerewo villages coincided with or shortly followed the commencement of the ethnographic *hiri* trade, as known by the well-documented Motu genealogies for the origins of the *hiri*.
2. To determine whether the sequence of Kerewo villages known from local oral traditions concur with the sequence evidenced by the archaeological record.
3. To determine the extent to which the lower (coastal) Kikori River archaeological sequences (including the Goaribari villages) correspond with the mid Kikori River archaeological sequences. Ethnographically, imported trade ceramics entered the Kikori River via the coast, in exchange for mass-produced sago starch manufactured with tools made from stone pounders imported through inland trade systems. A key question asked of the upper, mid and lower Kikori River sequences thus concerns the antiquity of the articulating stone-sago-pottery production system and trade relations, and the effects of these trade relations on regional demography and village polities.

With these aims in mind, this paper represents our first results of excavations in the lower Kikori River coastal region. Here we present archaeological evidence for the age of the Kerewo origin village of Otoia.

Archaeological research in the Kikori River region was previously carried out by Sandra Bowdler (pers. comm., cited in David 2008:466) and James Rhoads (e.g. 1980, 1982) in the 1970s, and subsequently by Bruno David (e.g. 2008; David et al. 2007, 2008) from 2005 onwards. David Frankel and Ron Vanderwal (1982, 1985) undertook archaeological excavations at Kinomere village on the island of Urama shortly to the east in the 1980s. David et al. (2007) established a late-Pleistocene antiquity for settlement of the mid Kikori River with earliest radiocarbon dates of 13,000 cal BP, the only Pleistocene site yet found in the southern PNG lowlands.

David (2008) describes human occupation of the mid Kikori River system as a series of pulses separated by long periods of absence. These hiatuses in localised and possibly regional occupation occur between 8000 and 2750 years ago, 2750 and 2000 years ago, 2000 and 1450 years ago, and lastly between 950 and 500 years ago. The earliest archaeological evidence of village establishment in the mid Kikori River region coincides with the first appearance of ceramics from 1450 to 950 years ago, followed by a renewed period of village establishment and the presence of ceramics after 500 years ago. David (2008) suggests that this latest occupational pulse is likely linked to the onset of the ethnohistorically recorded Motu *hiri* trade in this part of PNG (David 2008; cf. Chalmers 1895; Seligman 1910; Dutton 1982).

Excavations at the lower Kikori River delta site of Emo, an ancient Porome village site in the nearby Aird Hills, also show a pattern of intermittent pulses of occupation beginning 1840 years

ago and signalling the earliest appearance of pottery in that area. After 1530 years ago, pottery discard rates increase substantially, which corresponds closely with the first known appearance of pottery in the mid Kikori River region some 1450 years ago (David *et al.* 2010).

Site description

The island of Goaribari, like all Kikori River delta lands except for the highly localised Aird Hills, is very low-lying (maximum elevation = 1 m above sea level), consisting of accumulated sedimentary mud from the Kikori and Omati river systems. During those times of the year when king tides and storm events occur, large parts of Goaribari are inundated. This has precipitated abandonment and relocation of delta villages, at least in the recent historical past. A government Patrol report from 1924 thus states that ‘Kerewa [Otoia] was at one time the parent village of the Goaribari District and the remains, broken sticks underwater were pointed out to me as part of the old DUBU [longhouse] which extended along the bank for at least 700 or 800 yards, by erosion of the river and big floods the DUBU broke away and many of the people left the village to form settlements in other parts of the district’ (Woodward 1920, cited in Weiner 2006:22).

There are currently only two small villages (Goare and Dopima) remaining on Goaribari Island, both of which are periodically inundated. Due to encroaching sea levels, each of these villages has been moved progressively inland over the years, so that local people now refer to the current Goare village as Goare 5 and Dopima village as Dopima 3 (both sets of villages facing the sea along the southwestern and eastern sides of Goaribari respectively) (Figure 3). The dynamic nature of the river delta has also meant that the coastline of these islands is constantly changing over time, affecting settlement patterns and, with this, the archaeological record. Thus, large parts of the site of Otoia (which faces inland and thus is river- rather than sea-bordering) no longer exist, as much of the land encompassing the old village has eroded into the main channel of the Kikori River delta. The steep, deeply cut river bank at Otoia has exposed a line of house posts running for more than 100 m parallel to the river bank, approximately 1 m below the current ground surface (Figure 4). These were identified by Kerewo clan leaders as the posts of a men’s longhouse (*dubu daima*) at Otoia. While visiting Otoia in the early 1900s, Haddon (1918:177) described one of these longhouse structures:

The *dubu daima* is a very long pile-dwelling varying from about 100 to over 200 yards in length. The ridge is horizontal, or rises slightly at the front end and is supported by a central row of poles. There is a platform entrance usually at one end and several side entrances. A gangway extends along the whole length of the interior, on each side of which are a number of cubicles ... I found the one at Dopima was nearly 201.3m (660 feet) long, 10m (33ft) wide and the floor was 1.98m (78in) above the ground.

Associated with these posts and eroding from the bank are high densities of artefactual material. These include stone artefacts such as adzes, axes and grindstones, but more prominently a great variety of organic artefacts, including remnants of canoe paddles, arrows, canoes, notched pieces from houses and a high density of cut wood (chips) identified by Kerewo as the debris from woodworking (archaeological organic artefacts are equally well-preserved in other nearby Kerewo river-bordering sites; e.g. Figures 5 and 6). No pottery was found eroding from this bank, although it is found elsewhere on Goaribari (e.g. at Goare), and at Aiedio across the Omati River channel.

The present ground surface at Otoia is muddy and heavily vegetated, dominated by tropical wet rainforest species including Nipa (*Nypa fruticans*) and coconut (*Cocos nucifera*) palms



Figure 3. Goare 2 village site, Goaribari, showing good preservation of longhouse posts in intertidal zone. This settlement was abandoned approximately 60 years ago. The current Goare 5 village can be seen in the background.



Figure 4. In situ longhouse posts at Otoia, exposed by tidal erosion. Note collapsed bank behind Hansen Iburi and the presence of posts behind the collapse.

interspersed with mounded crab (*Ocypodidae*) burrows. A single 1 m x 1 m test excavation square was positioned close to the river bank adjacent to eroding artefacts, as far away as possible from evidence of crab disturbance and on the most elevated location. The excavation square was thus located approximately 1 m from the river bank, close to a large coconut tree in



Figure 5. Well-preserved woven band made from plant matter from Goare 2.

A



B



Figure 6. A: Part of a house cross beam. B: Cut wooden piece, possibly floor slat.

a location that was once directly underneath a men's longhouse, as informed by oral traditions and the eroding cultural materials. We note that as most of the ancient village site of Otoia had already eroded into the adjacent river channel, only a very small undisturbed area remained available for excavation, and indeed the excavation square had almost completely eroded into the river channel on our return one year later (Figure 7).

Stratigraphy

The excavation square contains four distinct Stratigraphic Units (SU) (Figure 8). SU1 is a thin, 1 cm deep, mossy, surface vegetation layer. SU2 extends down to a maximum 32 cm below the ground surface, and consists entirely of densely matted coconut root with little or no soil deposit and no cultural material. SU3 is a culturally sterile red clay extending down to a maximum depth of 56 cm below ground. The upper levels of SU4 include the SU3-SU4 interface, which extends to a depth of 86 cm before giving way to the homogenous grey clayey mud of SU4 proper, which extends to the base of the excavation at a depth of 170 cm below ground.



Figure 7: The remaining portion of the Otoia 1 excavation square one year after excavation.

Chronology

Dating of the archaeological sequence was carried out on excavated wood and charcoal (Table 1). Radiocarbon dates on wood artefacts were conducted on in situ samples where the wood was clearly artefactual, identified as such through the presence of cut marks. The radiocarbon-dated charcoal samples were also retrieved in situ and plotted in three dimensions. The pattern of radiocarbon dates indicates that all the wooden artefacts date to approximately the past 200 years, with the oldest dates coming from XU36 at 165.3 cm depth, within a calibrated age range of 0–306 cal BP (highest probability within the 2 sigma range is 145–215 cal BP; see Table 1). Of the two charcoal radiocarbon determinations, one is in the ‘modern’ range near the top of the cultural layer in XU23, and the other is dated to 456–537 cal BP (highest 2 sigma probability) near the bottom of the cultural deposit in XU33 at 150.7 cm depth. In spite of the slight inversion of the oldest date on wood and the oldest charcoal sample, the absence of historically known fires in this wet tropical rainforest area indicates that all charcoal in this region is anthropogenic, and implies that the oldest radiocarbon date of 456–537 cal BP at Otoia is most likely to be indicative of village establishment.

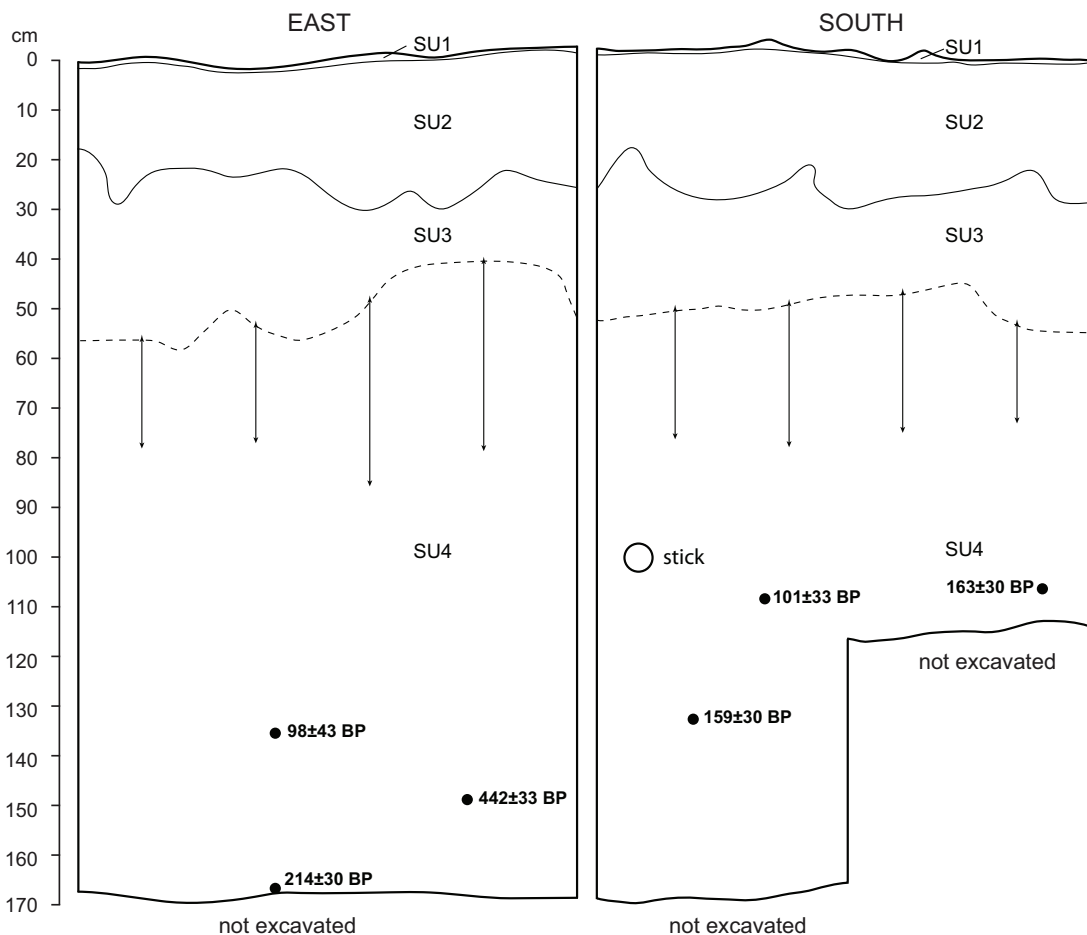


Figure 8. East and south section drawings, Otoia 1 excavated square.

All of the dated wooden artefacts appear to be contemporaneous at an archaeological time scale. That these artefacts all belong to a single village phase is supported by a radiocarbon date from an in situ sharpened wooden stake extending vertically from XU29 to XU36 (135 cm to 165 cm depth) and dated to sometime between 0–285 cal BP (164–231 cal BP at highest 2 sigma probability). A radiocarbon date obtained from an in situ house post eroding from

the river bank 1 m from the excavation square indicates an age range of 0-304 cal BP (139-222 cal BP at highest 2 sigma probability). This is an almost identical age range to that of the lowest dated wood in the excavation square (145-215 cal BP at highest 2 sigma probability). The upper parts of this post had been exposed through water erosion caused by river activity, but still extended down into buried sediments for some 40 cm depth, the bottom extending to just below the maximum depth of the Otoia 1 excavation – that is, close to the same depth as XU36.

Table 1. Radiocarbon determinations, Otoia 1 Square 1. All radiocarbon determinations are AMS dates. Calibrations on Calib 6.0 (Stuiver and Reimer 1993), using INTCAL09 curve selection. *Top of post.

XU	Depth below surface (cm)	Laboratory #	Sample type	¹⁴ C age (years BP)	Calibrated age BP (95.4% probability)
21	106.6	Wk-23998	wood	163 ± 30	0-36 (0.195) 68-118 (0.116) 131-230 (0.512) 244-287 (0.177)
23	112.9	Wk-23058	charcoal	101 ± 33	0-0 (0.007) 13-148 (0.700) 188-196 (0.012) 212-269 (0.281)
29	133.8	Wk-23059	coconut	98 ± 43	0-0 (0.013) 11-150 (0.666) 175-176 (0.002) 186-270 (0.320)
29-36	135.0*	Wk-24000	wood	159 ± 30	0-37 (0.193) 65-118 (0.139) 124-158 (0.119) 164-231 (0.372) 243-285 (0.176)
33	150.7	Wk-23060	charcoal	442 ± 33	337-348 (0.023) 456-537 (0.977)
36	165.2	Wk-23999	wood	214 ± 30	0-19 (0.143) 145-215 (0.511) 267-306 (0.346)
		Wk-25465	wood (longhouse post)	199 ± 32	0-30 (0.176) 139-222 (0.554) 259-304 (0.270)

We interpret the Otoia 1 chronometric chronology as indicating initial village establishment around 450-500 years ago, with construction of this particular longhouse at approximately 139-222 cal BP (see also Frankel and Vanderwal 1982, 1985, who report similar dates for the important nearby delta village of Kinomere). The deepest dated piece of wood in the excavation within XU36 revealed a comparable radiocarbon age for an in situ house post eroding from the river bank. We posit that the more recent dates reflect the period of occupation of the longhouse said by local clanspeople to have been located on the exact spot of the excavation.

Cultural materials

All of the excavated cultural material is found within SU4, with the greatest densities of stone artefacts, bone, cut wooden pieces, coconut shell, seeds and charcoal occurring between XU20 at 107.6 cm and XU32 at 149.6 cm depth (Table 2).

Table 2. Excavated material from Otoia 1.

XU	Stone artefacts		Bone	Wood chips		Coconut shell	Other plant	Seeds	Charcoal	Shell	Crab
	#	g	g	g	NISP		g	g	g	g	g
1							1247				
2							1888				
3							2543				
4							2004				
5							1584				
6							4351				
7							3042				
8							1567				
9							1109				
10							2391				
11							3033				
12							1836				
13							1784				
14							1829				
15							1570				
16	2	4.58		0.54	133		478		0.19		
17				1.25	24		238	0.22	1.06		
18				3.48	55		252	0.61	1.98		
19	1	0.22		10.2	108		246				
20				31.68	207	x	196				
21				51.72	850	x	212	2.20	1.68		
22	1	1.28		144.71	2612		197	0.20			
23			0.01	234.63	3510	x	303	0.65	4.40		
24	1	0.19		217	5500	x	198	1.58	3.60		
25				294	3520	x	292	2.89	7.49		
26	1	0.02		141.5	1580	x	186	0.13	1.43		
27	1	3.99	1.84	363.38	6500	x	126	0.01	1.69		
28	2	2.25		250.69	2250	x	211	1.82	1.40		
29				148.73	1250	x	96	0.42	5.20	0.25	
30	1	0.39	0.01	72.23	400	x	17	0.71	3.36		
31			0.03	40.49	528	x	29	0.73	4.08	0.05	0.10
32				31.55	286	x	31	0.68	3.60		
33				25.17	233		8	0.25	1.73		0.15
34				19.58	204		4	0.22	2.17		
35				34.49	221		8	0.12	2.54		
36				36.92	245		5	0.21	2.50		
37	1	0.01		30.07	215		3	0.44	2.85		

Wooden chips

Cultural material in the site is overwhelmingly represented by plant remains consisting predominantly of cut wood chips. With no stone source occurring within the swampy Kerewo lands, during ethnographic times local material culture consisted predominately of wooden items. By analogy, the high density of cut wood chips found in the excavation and eroding from the river bank are thus likely to be the bi-products of wooden items, especially from house and/or dugout canoe manufacture. These wood chips are also precisely the size range and form of wooden manufacturing debris seen today at locations where houses or canoes have been recently constructed (Figures 9 and 10). The highest density of excavated wood chips came from XU27, with a NISP count of some 6500 chips (Table 2). Most of the wooden chips are angular with straight sides, usually forming a square or rectangular shape. The chips range from less than 1 cm to 12 cm in length, with most exhibiting clear evidence of having been cut.

Seeds

A large number of seeds were retrieved from the excavation. Taxonomic identifications were carried out by Joanne Bowman at the University of Queensland. In total, 23 types of seed and nut were recovered from Otoia 1. As a comprehensive floral reference collection is not yet available for the region, many of the excavated seeds could not be identified despite their distinctive morphologies. Identified taxa include *Cocos nucifera*, *Pandanus* sp. and specimens from the Cucurbitaceae and possibly the Malvaceae families. Coconut (*C. nucifera*) is the most abundant taxon recovered, with unidentified seed Types A, B, E and K also appearing



Figure 9. *Dubu daima* at Kaimare, Urama Island. Note the high density of house post supports (Hurley 1921).



Figure 10. Horizontal line of wooden artefacts eroding from the Otoia 1 cultural layer. Artefacts include wooden house pieces, pieces of dressed wood and large quantities of cut wooden chip.

in considerable quantities. Seed Type O is a single intact specimen from the Cucurbitaceae family recovered from XU25. The size of this seed suggests that it is from one of the smaller species of cucurbits, perhaps a variety of gourd. Types N and P are reinform seeds likely to be from the family Malvaceae, possibly from the genus *Hibiscus*. Specimens labelled Type D are legume seed pods. Most other types had only a single occurrence in the assemblage. All of the identified plant species have either an ethnographically described subsistence or economic use and remain key resources today (Table 3).

Table 3. Summary of archaeobotanical analysis.

Taxon	NISP	Weight (g)
Cocos nucifera	52	91.2812
Pandanus sp.	1	22.3332
Cucurbitaceae (Type O)	1	0.0325
Malvaceae? (Type N)	1	0.0123
Malvaceae? (Type P)	1	0.0169
Fabaceae (Type D)	3	0.0295
Type A	11	1.1258
Type B	31	1.0532
Type C	1	1.5413
Type E	32	0.3673
Type F	1	0.0520
Type G	1	0.0371
Type H	1	0.0508
Type I	1	0.0082
Type J	1	0.0029
Type K	15	0.0544
Type L	1	0.0005
Type M	1	0.0203
Type Q	1	0.0287
Type R	2	0.1090
Type S	1	0.0508
Type T	2	0.0127
Type U	1	0.0133

Stone artefacts

The small sample of stone artefacts (N=11) retrieved from Otoia 1 was dominated by flaked pieces made on a coarse volcanic (basalt) material (Table 4). The two complete flakes represented the largest artefacts in the sample, and were also made on basalt. As there is no source of stone within Kerewo lands, the raw material had to have been imported from elsewhere, the nearest possible source being the Aird Hills some 37 km to the northeast. Although showing no signs of having been ground or polished, the coarse-grained nature of the stone and the fact that it is basalt suggests it would be most suited for adze or axe manufacture.

Table 4. Summary of stone artefact analysis.

	Flaked pieces	Flakes
Number	9	2
Mean weight (g)	0.58	3.85
Mean max. dimension (mm)	12.93	33.65
Mean length (mm)	-	17.5
Mean width (mm)	-	26.7
Mean thickness (mm)	-	4.45

Charcoal, bone and shell

Only small quantities of charcoal were present throughout the cultural layers. Similarly, bone, shell and crab remains have a very limited archaeological presence at the site. The bones are all of fish; as with the shell and crab fragments, they are too small to allow further taxonomic identification.

Discussion

The cultural material at Otoia 1 signals activity-specific discard and post-depositional factors mostly falling within the late pre-European contact to early contact periods of the 1800s to mid 1900s. All of the radiocarbon-dated material (except the charcoal sample from XU33) falls within this age range, with some minor chrono-stratigraphic inversions. A degree of stratigraphic integrity can also be surmised from the distribution of stone artefacts within the major cultural stratum spanning XU16 at 86.6 cm to XU37 at 169.8 cm depth. The presence of larger artefacts in the upper portion of the deposit suggests that downward movement of stone was limited in extent. The two oldest radiocarbon determinations also come from the lowest XUs. The in situ vertical-sharpened stake found between XUs 29 and 36 at depths spanning 135 cm to 165 cm below ground shows conclusively that major reworking of the deposit has not occurred.

The predominance of wooden artefacts and the low densities of stone artefacts probably reflect the lack of a local stone source in the immediate region. The unexpected absence of pottery in the excavation (given its presence on the surface at the nearby ancestral village sites of Aiedio and Goare) may be explained as a sampling issue relating to not only the size of the excavation but the spatial locality of the excavation square, placed as it was at the location of a men's longhouse. Ethnographic records among the Kerewo show that clay pots were used for cooking and the preparation of food took place in the women's houses (*upi daima*), which were spatially separated from the men's longhouses. Thus, the lack of pottery in the excavation and from the eroded river bank may relate to this gendered division of labour, space and artefacts. This explanation could also account for the small quantities of food remains (bone and shell) and charcoal retrieved from the excavation. The large quantities of cut wooden chips may be indicative of the construction of the longhouse itself (see Figure 9 for an indication of the large amount of woodworking that goes into the construction of a longhouse), or of subsequent woodworking by men in the longhouse, in particular of wooden sacred boards such as skull racks housed in the longhouse.

The radiocarbon age of 456–537 cal BP on charcoal closely mirrors the dates for the latest phase of village establishment and the late ceramic pulse in the mid Kikori River, arguably linked to the ethnohistorically recorded Motu *hiri* trade, as postulated by David (2008). Excavations undertaken by Frankel and Vanderwal (1982, 1985) at Kinomere on Urama Island, 58 km east of Otoia by sea, also similarly returned a basal radiocarbon determination for initial village establishment around 410 ± 80 BP (296–553 cal BP). The much earlier dates for occupation of the mid Kikori River and at the Emo site in the Aird Hills (David 2008; David et al. 2010) during earlier occupational pulses are from considerably more stable physical environments than the delta. While it is possible that earlier evidence of delta occupation has been destroyed by river flow and tidal erosion, cyclonic events and sea level rise, we argue that it is more likely that large villages in the delta region only emerged with the onset of regular large-scale trade partnerships in the form of the Motu *hiri* some 450–500 years ago (see David et al. 2010). That this environment was less than ideal for human occupation is supported by Haddon (1918:177), who states that 'Owing to the swampy nature of the country they [Kerewo] have poor gardens'. Although phases of pottery trade occurred well before 450–500 years ago along the mid Kikori River, such trade came with a different set of socio-historical contexts, and for much of the sequence appears to have been less intensive and/or regular than the ethnographically described *hiri* trade traceable genealogically to the past 450 years, and thus probably did not trigger the development of large, permanent delta villages at that time.

Conclusion

The contemporaneous onset of the large, domineering villages of Otoia (Kikori River mouth) and Kinomere (Purari River mouth) some 450-500 years ago, coincident in timing with the most recent ceramic pulse of the mid Kikori River, suggests significant causal relations between the establishment and growth of large, centralised village settlements at the mouths of large rivers, politico-economic control over redistribution networks, and the regular arrival of mass-produced (principally Motu ceramic and shell valuable) trade goods in the Gulf of Papua delta region. Although more work is now required to obtain a more robust chronology of village establishment for the past 450-500 years in the lower Kikori River and nearby river deltas, along with focused excavation of a series of pottery sequences in the West Papua-Western Province-Gulf Province region, our initial results clearly show how local and regional landscape history needs to consider not only physical environmental conditions, but just as importantly the network of social relations that enabled the cultural landscape to develop into its very particular configuration. In this sense, our initial results go some way to elucidating settlement temporal trends in this region, and to explaining the historical roots of the ethnographic situation through the workings of the Kikori River delta environment as a socialised, peopled landscape.

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