

Mid-Holocene Social Interaction in Melanesia: New Evidence from Hammer-Dressed Obsidian Stemmed Tools



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INTRODUCTION

PROPOSALS THAT LARGE-SCALE INTERACTION and ceremonial exchange in the Pacific region began during the time of Lapita pottery (c. 3300–2000 B.P.) (e.g., Friedman 1981; Hayden 1983; Kirch 1997; Spriggs 1997) are seriously challenged by the extensive areal distribution of a class of retouched obsidian artifacts dated to the early and middle Holocene (c. 10,000–3300 B.P.) and known as “stemmed tools” (Araho et al. 2002). Find spots of obsidian stemmed tools stretch from mainland New Guinea to Bougainville Island and include the Trobriand Islands, various islands in Manus province, New Britain and New Ireland (Araho et al. 2002; Golson 2005; Specht 2005; Swadling and Hide 2005) (Fig. 1). Although other forms of tanged and waisted stone tool are known in Melanesia (e.g., Bulmer 2005; Fredericksen 1994, 2000; Golson 1972, 2001), the two types defined by Araho et al. (2002) as “stemmed tools” comprise distinctive classes because they usually have deep notches that delineate very well-defined and pronounced tangs.

Type 1 stemmed tools are made from prismatic blades and have large and clearly demarcated, oval-shaped tangs. In contrast, the Type 2 group is more variable. It is defined primarily by the use of Kombewa flakes (i.e., those removed from the bulbar face of a large flake) for the blank form, as described in detail in

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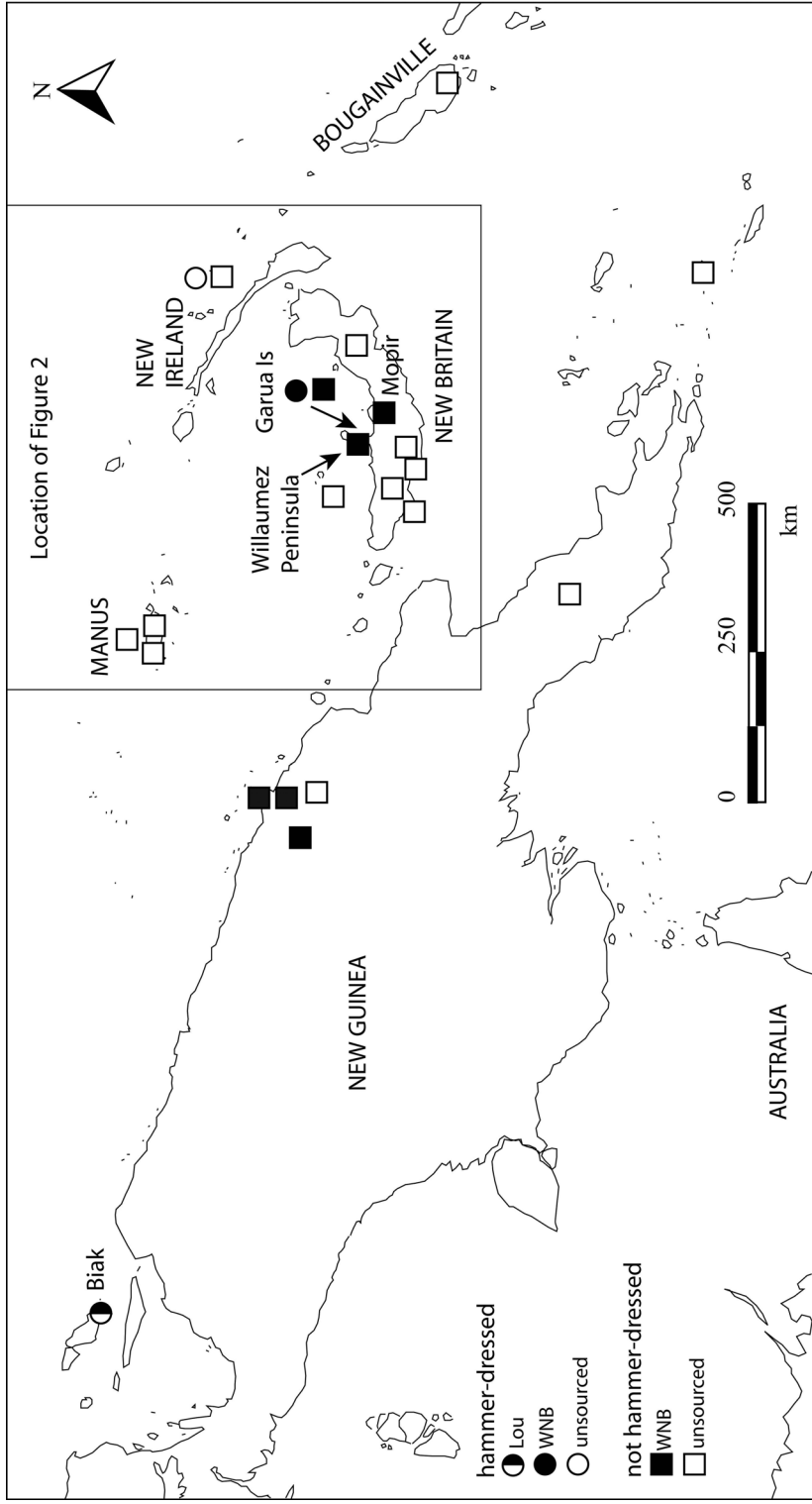


Fig. 1. Map showing the location of obsidian stemmed tools. With the exception of Garua Island, Willaumez Peninsula, and Mopir where numerous stemmed tools have been found, the symbols represent a single find spot.

Araho et al. (2002). Since Kombewa technology is extremely rare in stone tool assemblages from Melanesia, this trait alone easily separates Type 2 stemmed tools from other retouched tools. The diagnostic characteristics of Type 1 and 2 stemmed tools with lengths generally greater than 750 mm clearly distinguish these tool types from other waisted or tanged chipped stone tools in this region.

Examples of obsidian stemmed tools, mostly found in surface contexts, were reported decades ago (cf. Bulmer 2005; Golson 1972, 2001) but, lacking firm chronological context, their significance was not appreciated until relatively large numbers were recovered from stratified and well-dated deposits in recent excavations in New Britain, Papua New Guinea (e.g., Specht et al. 1988; Torrence et al. 1990). Their chronological assignment to the early and middle Holocene is based on their consistent recovery from radiocarbon-dated soils or from deposits within a well dated tephrastratigraphy and their absence in contexts dating to other periods (Araho et al. 2002:62). In New Britain large stemmed tools are found in soils buried underneath either the radiocarbon-dated W-K1 volcanic tephra (c. 6160–5740 B.P.) or the W-K2 tephra (3480–3160 B.P.) (Petrie and Torrence 2008). In contrast, Lapita pottery is always stratified above and therefore younger than the W-K2 tephra.

Araho et al. (2002), Torrence (2003, 2004a), and Specht (2005) suggested that these large stemmed tools functioned as ceremonial valuables “to create and maintain social links between and within groups and to mark status differences” (Araho et al. 2002:77). This hypothesis is based on the use of manufacturing techniques that require considerable effort, skill, and care, and a raw material easily associated with specific, localized places, as well as the distinctive shapes, shininess, symmetry, and fragility of the tools. More recently, Specht (2005), Swadling and Hide (2005:307), and Pavlides (pers. comm.) have reported additional examples. Together with Golson (2005), all these scholars have also proposed that the distributional data of obsidian stemmed tools, shell adzes, and mortars and pestles provide considerable tangible evidence for wide-scale social interaction during the mid-Holocene, long before the existence of Lapita pottery and colonization into Remote Oceania (cf. Torrence and Swadling 2008).

Little is known about the social relationships that have been proposed as responsible for the impressive spatial distribution of the stemmed tools. Did these artifacts circulate within a system of ceremonial exchange on the Willaumez Peninsula, where most examples have been recorded (Fig. 1)? Were the far-flung cases merely rare leakages from that system or was the entire region where they occur linked through social interaction, and if so, in what ways? We address these questions through a series of analyses stimulated by a newly reported obsidian stemmed tool from Biak Island in West Papua (Friede 2005:I, 41; II, 86) (Fig. 2). Research focused on three unusual characteristics of the Biak artifact has significantly altered our understanding of stemmed tools. Firstly, geochemical sourcing techniques identified the raw material as derived from obsidian outcrops in Manus rather than West New Britain where stemmed tools are common finds. Secondly, the highly unusual technique of hammer-dressing was used in its manufacture. Thirdly, the Biak provenience greatly extends the spatial distribution of stemmed tools. We consider the significance of these findings for social interaction during the mid-Holocene period and for Pacific prehistory in general.

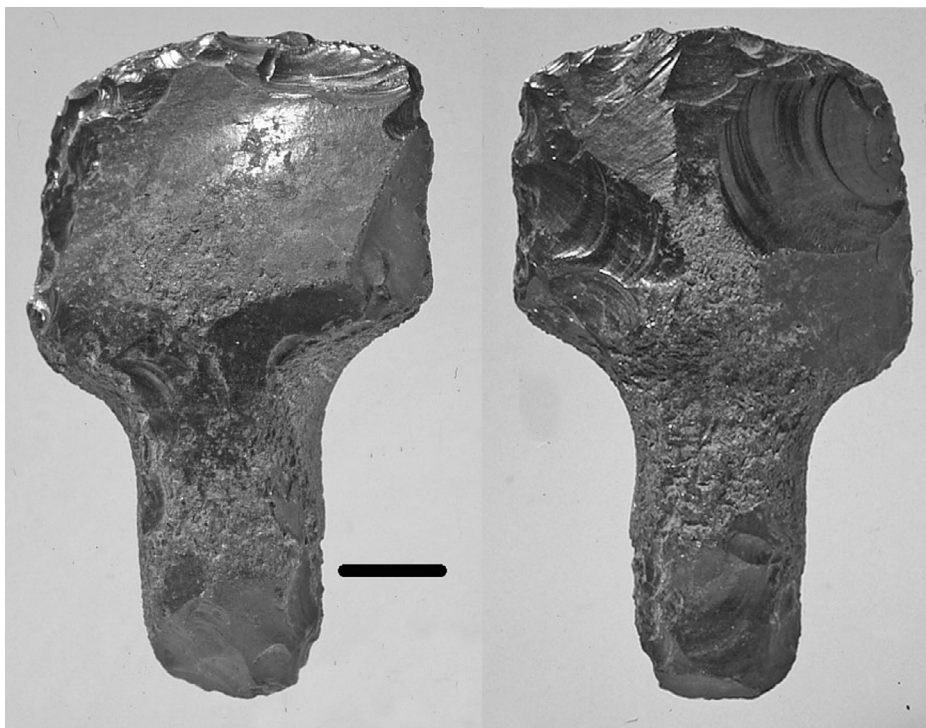


Fig. 2. Obsidian stemmed tool found on Biak: (left) hammer-dressing is visible both on the stem and on the middle of the blade; (right) hammer-dressing has obscured most of the original surface of the flake, but a portion is visible on the top left. Scale bar is 3 cm. (Photo by R. Torrence)

BIAK TOOL

The Biak tool clearly fits the criteria for a Type 2 obsidian stemmed artifact because it was made from a large Kombewa flake and bears a prominent tang created by deep notches (Fig. 2). At 132 mm in length, it is within the range of the large Type 2 tools proposed as valuables (cf. Araho et al. 2002; Specht 2005:381; Torrence 2003, 2004*b*). Although the tool does not come from a secure archaeological context, we believe that the distinctive similarity with the well-dated obsidian stemmed tools from New Britain is close enough to propose that the Biak tool belongs to the same typological group and therefore also dates to the mid-Holocene.

The stem on the tool was first shaped by bifacial flaking on what was probably the proximal end of a large Kombewa flake. Irregularities created by the flaking were then partially removed by hammer-dressing. The direct, hard hammer blows created a uniformly even, but rough-textured, surface with numerous, small impact points (Fig. 3). Hammer-dressing has obscured flaking on the stem, except for several flat scars at the base. The hammer-dressing was also applied on both sides of the tool to surfaces that were originally smooth and shiny. On one flake surface the hammer-dressing is continuous with that on the stem (Fig. 2, right),

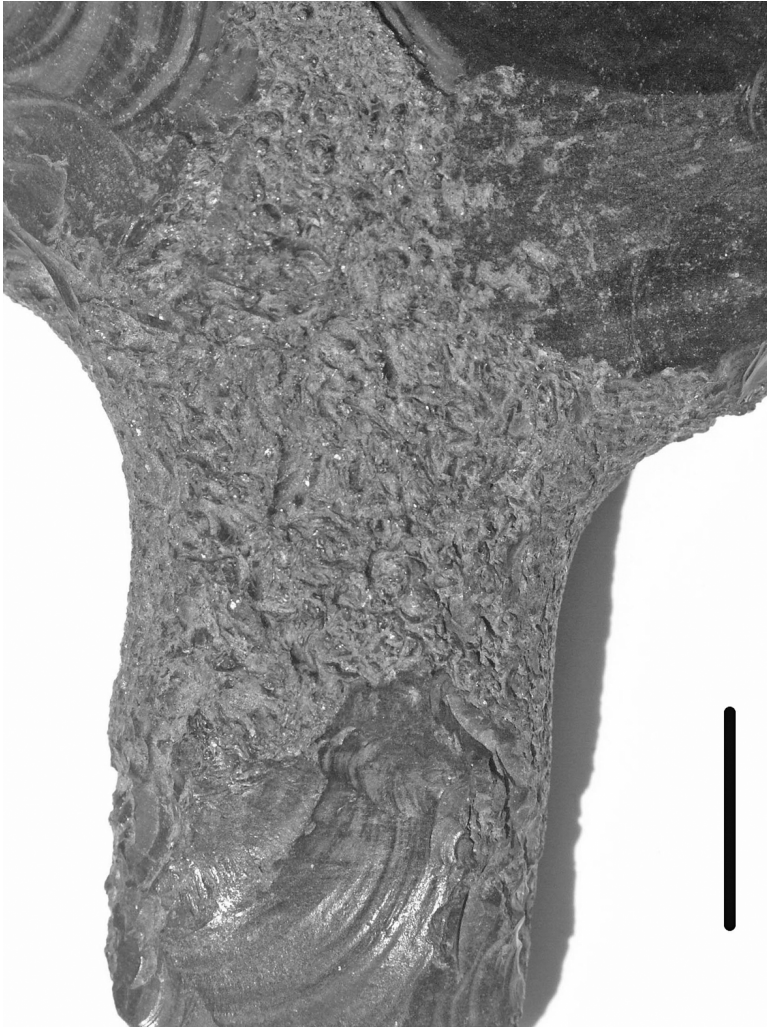


Fig. 3. Close-up of hammer-dressing on the stem of the Biak tool. Scale bar is 2 cm. (Photo by R. Torrence)

whereas on the other there is an isolated, circular patch of hammering on the blade of the tool (Fig. 2, left). As indicated by flake scars with different degrees of weathering, the tool has been extensively reworked. Areas of retouch around the entire working edge include two large, invasive, fresh scars struck from opposing sides, which stretch across much of the surface of one face (Fig. 2; right; cf. Specht 2005: Figs. 28.4, 28.5).

John Friede (2005: II, 86), a private collector who kindly loaned the artifact to Swadling for analysis, reports that the new stemmed tool was “found in a cave on Biak Island with Japanese war relics.” We have no information about whether the tool was excavated or was found on the surface. It seems highly unlikely that the tool had been transported to the island by a Japanese soldier. Biak had been of

little strategic importance to the Japanese until faced with the westward advance of the Allied forces along the coast of New Guinea. The island has no natural harbors and fresh water is not readily available. In an effort to stop the advancing Allied forces, the Japanese decided to make Biak a key air base, as it was within fighter range of many existing air bases in Dutch New Guinea. Late in 1943, they began constructing airstrips in the southeastern part of the island on the coastal plain. The troops sent to protect and hold Biak did not come from the Pacific, but were sent from China (Smith 1953:280, 281, 299). Sketches by an American soldier show a range of defensive walls constructed in the Biak caves (Riegelman 1955). It seems likely that in building these, any archaeological deposits would have been highly disturbed. Given the historical data to hand, the most parsimonious assumption is that the Biak stemmed tool was deposited in the cave during prehistory and was uncovered during the construction of defenses by the Japanese or, perhaps, through more recent activity. Regardless of the lack of stratigraphic integrity for the Biak tool, its strong resemblance to Type 2 stemmed tools made on Kombewa flakes provides strong support for accepting a mid-Holocene date for its manufacture.

CHARACTERIZATION STUDIES

PIXE-PIGME analyses have demonstrated that obsidian from all the major obsidian sources in New Britain (Gulu, Kutau-Bao, Baki, Mopir) was used in the production of stemmed tools (Araho et al. 2002; Rath and Torrence 2003) and that three stemmed tools in the Sepik-Ramu region of the New Guinea mainland were also made from New Britain obsidian (Specht 2005:384; Swadling and Hide 2005:307; Figs. 1, 4). Since the Biak stemmed tool is very similar in form

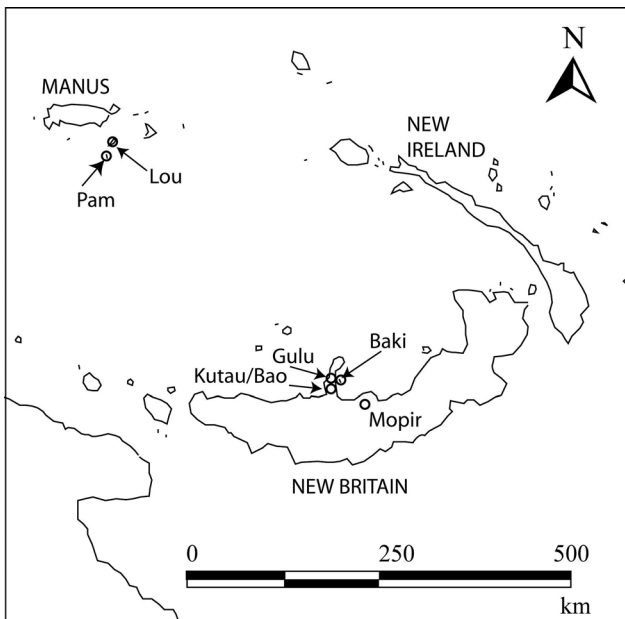


Fig. 4. Location of New Britain, Lou Island, and Pam Island obsidian sources.

TABLE 1. HAMMER-DRESSED ARTIFACTS: TYPES AND SIZES

STEMMED TOOL	TYPE	TOTAL	STEM	STEM	MAXIMUM
		LENGTH	LENGTH	LENGTH/TOTAL LENGTH	STEM THICKNESS
Biak tool	2, Kombewa, reworked	132	75	0.57	33
FAP M200	2, Kombewa	107	69	0.64	28
FAP M267	2, Kombewa	93	44	0.46	16
FAP M408	2, Kombewa	77	45	0.58	35
FAP M409	2, Kombewa	89	55	0.62	37
FAP M702	2, Kombewa, stem absent				
FAP M224	2, broken stem only				28
FAP M228	Noncortical flake				
FAO 1000/1010 5.1	Cortical flake				
Lihir Island (New Ireland)	2?, secondary flake, stem absent				

Notes: Measurements in mm. Sites FAP and FAO are located on Garua Island. For locations see Figure 1.

TABLE 2. HAMMER-DRESSED STEMMED TOOLS: SHAPES AND PROFILES

STEMMED TOOL	NOTCHING	BLADE SHAPE	WORKING EDGE	LONGITUDINAL SECTION
Biak tool	Moderate	Rectangular	Straight	Rectangular
FAP M200	Weak	Trapezoidal	Slightly convex	Lenticular
FAP M267	Moderate	Rectangular	Slightly sinuous	Rectangular
FAP M408	Weak	Triangular	Straight	Lenticular
FAP M409	Weak	Triangular	Straight	Lenticular
FAP M702	?	Semi-circle	Convex	Lenticular
Lihir Island (New Ireland)	?	Oval	Convex, slightly pointed	? rectangular

and manufacturing technique to these artifacts, one could reasonably infer that it was also derived from New Britain. To test this assumption, we employed a combination of PIXE-PIGME, LA/ICPMS, and INAA techniques to characterize the Biak tool and samples from six stemmed tools and two flakes from Garua Island that also have traces of hammer-dressing (Tables 1 and 2; Figs. 5–7). Ambrose obtained sufficient material for the geochemical study and then conserved the Biak artifact so the sampling region was invisible.

The first analysis used LA/ICPMS at the Australian National University to characterize the Biak artifact and two stemmed tools from site FAP on Garua Island. The results are presented in Tables 3 and 4 where they are compared to source samples. A correspondence analysis of the Papua New Guinea obsidian sources shows that the Biak tool clusters with source material from Lou and Pam Islands in Manus province (Fig. 8). In contrast, the stemmed tools from site FAP on Garua Island match the composition of sources from the Baki source, also on Garua Island. The East Fergusson cluster comprises samples from Dobu Island,

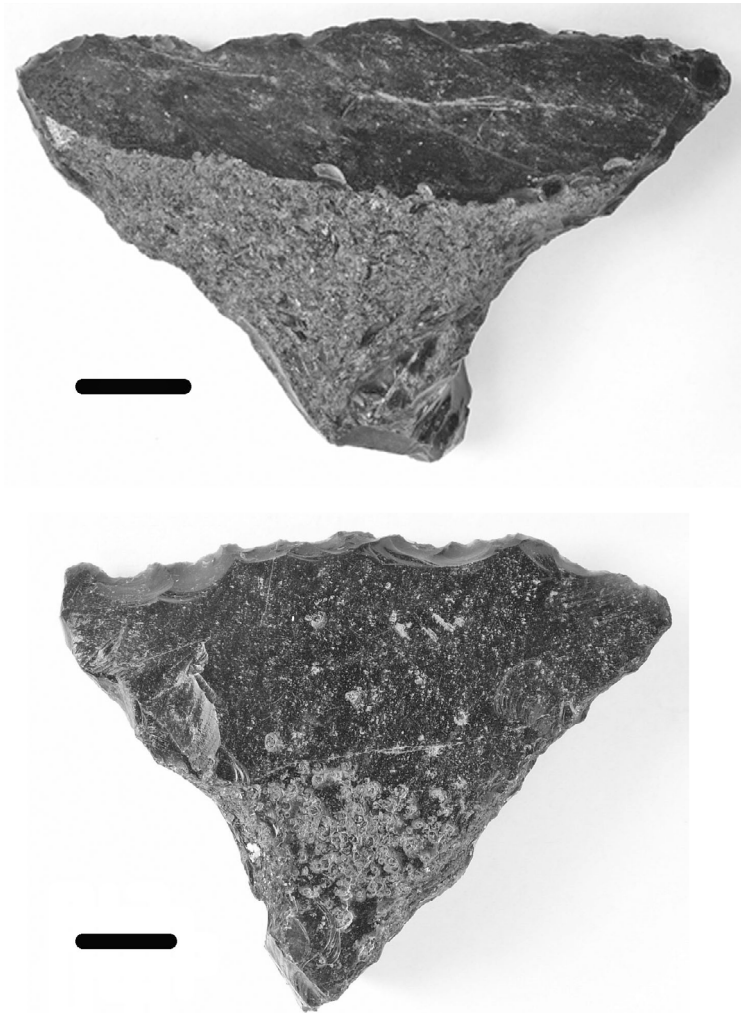


Fig. 5. Obsidian stemmed tools from Garua Island: upper, FAP M409; lower, FAP M408. Scale bar is 3 cm. (Photos by R. Torrence)

Sanaroa Island, and Lamoni; the Southwest Manus obsidians are surface finds clearly distinct from any other group; the West Fergusson group includes obsidians from Igwageta and Iaupolo but Fagalulu is chemically differentiated; and, finally, the Talasea (Kutau-Bao) and Voganakai (Gulu) groups both comprise several exposures that can be differentiated, but are clustered in this analysis.

Moving to a finer level of discrimination, the correspondence plot of ICPMS results in Figure 9 demonstrates that the Biak artifact is most closely aligned with the obsidian sources found in deposits within the Umleang-Umrei region on Lou Island (Ambrose et al. 1981). All the samples are from Lou Island, except those

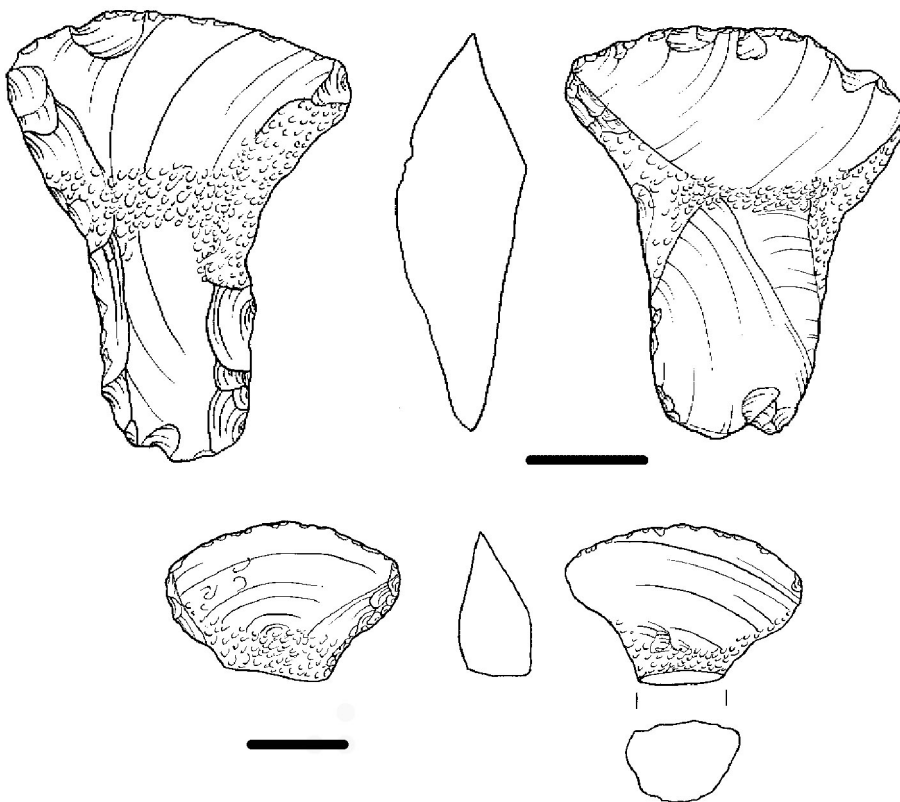


Fig. 6. Obsidian stemmed tools from Garua Island: upper, FAP M200; lower FAP M702. Scale bar is 3 cm. (Drawing by N. Kononenko)

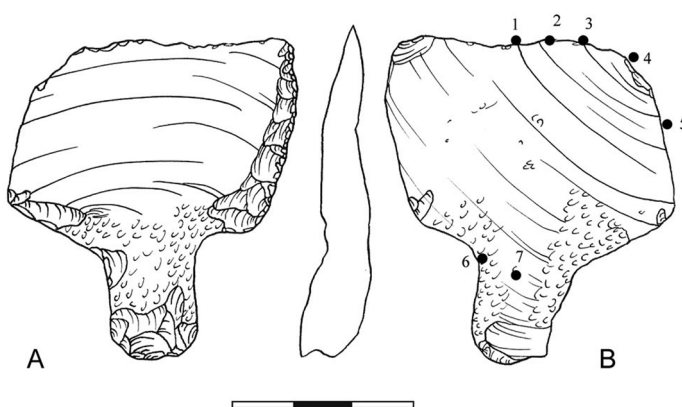


Fig. 7. Obsidian stemmed tool from Garua Island, FAP M267, showing location of points where use-wear is illustrated in Figures 10 and 11: A. ?ventral side of the Kombewa flake; B. ?dorsal side of the Kombewa flake. Scale bar is 3 cm. (Drawing by N. Kononenko)

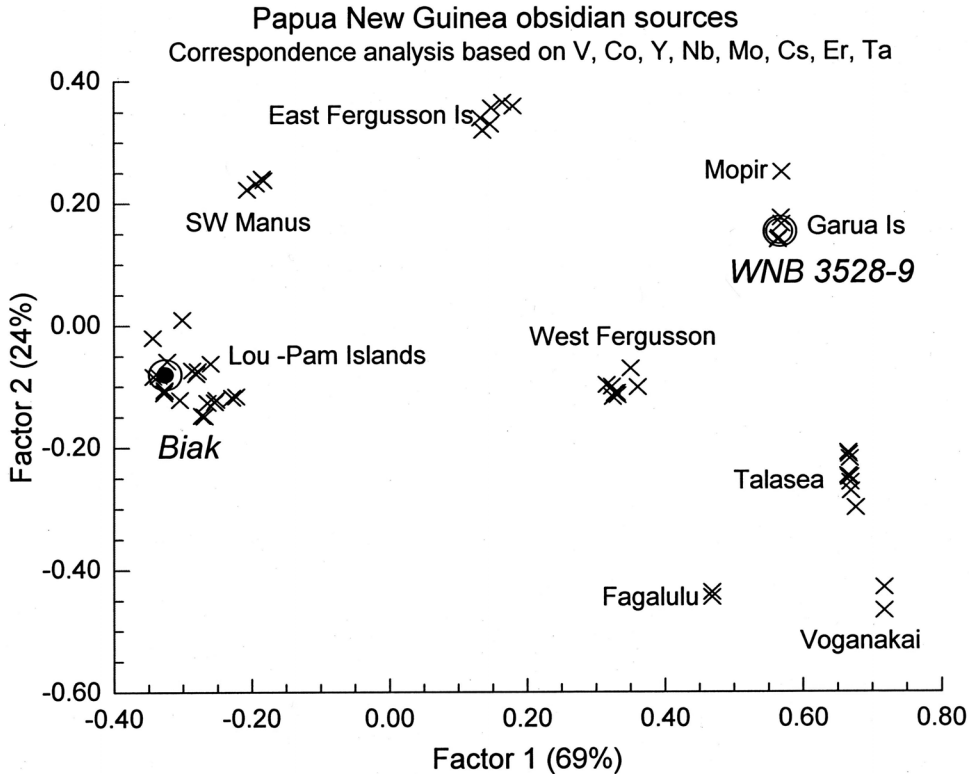


Fig. 8. Correspondence analysis of obsidian sources from Papua New Guinea using measurements of V, Co, Y, Nb, Mo, Cs, Er, and Ta obtained from LA/ICPMS. The plot compares results from the first two factors in the analysis.

TABLE 3. SUMMARY OF RESULTS OF CHARACTERIZATION STUDIES OF HAMMER-DRESSED ARTIFACTS

STEMMED TOOL	LA/ICPMS	PIXE-PIGME	INAA
Biak tool	Umleang, Lou Island	Umleang, Lou Island	
FAP M200		Baki	
FAP M408	Baki	Baki	
FAP M409	Baki	Baki	
FAP M228		Kutau	
FAO 1000/1010 5.1			Baki

Note: For location of obsidian sources see Figure 4.

from the Pam Lin and Pam Mandian Islands nearby. The Wekwok results represent a standard taken from a single block of obsidian. They provide an indication of the degree of variation within the current LA/ICPMS system.

To substantiate and expand on these results, the same samples used in the LA/ICPMS study, together with samples taken from two additional hammer-dressed

TABLE 4. ELEMENT CONCENTRATIONS FOR BAKI (GARALA) AND LOU ISLAND/UMLEANG OBSIDIAN SOURCES (*) AND FOR STEMMED TOOLS USING LA/ICPMS ANALYSIS

SAMPLE	V	Co	Y	Zr	Nb	Mo	Cs	Er	Ta
Biak tool	4.19	1.73	33.10	345	47.6	3.85	2.00	3.67	3.27
*Lou Mine 4									
ANU1131	4.44	1.79	33.00	344	47.4	3.87	1.93	3.72	3.25
*Lou Mine 22									
ANU5232	4.43	1.86	33.20	346	47.7	3.89	1.96	5.69	3.26
FAP M408									
WNB 3529	2.93	0.48	22.11	120	2.21	3.03	1.42	2.52	0.14
FAP M409									
WNB 3528	2.72	0.45	20.68	112	2.06	2.87	1.34	2.33	0.13
*Baki ANU2365	2.97	0.49	23.12	124	2.16	3.02	1.45	2.57	0.13
*Baki ANU2367	2.95	0.48	23.51	125	2.15	2.97	1.45	2.60	0.14

Note: ANU and WNB designate samples taken from artifacts.

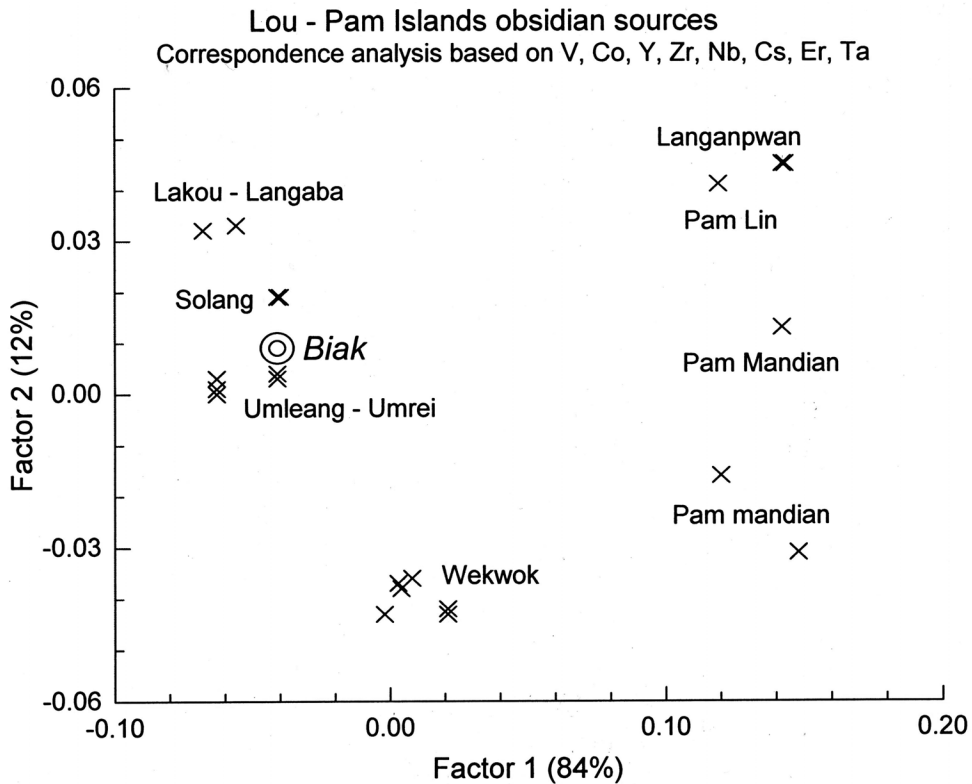


Fig. 9. Correspondence analysis of obsidian sources from the Lou-Pam Islands cluster in Figure 7 based on measurements of V, Co, Y, Nb, Mo, Cs, Er, and Ta obtained from LA/ICPMS. The plot compares results from the first two factors in the analysis.

TABLE 5. ELEMENT CONCENTRATIONS OF STEMMED TOOLS USING PIXE-PIGME ANALYSIS. WNB DESIGNATES SAMPLES TAKEN FROM ARTIFACTS

SAMPLE	F PPM	Na %	Al %	Si PPM	K %	Ca %	Ti PPM	Mn PPM	Fe %	Rb PPM	Sr PPM	Y PPM	Zr PPM	Nb PPM
WNB 3527 Biak tool	1264	3.33	7.07	34	3.61	1.03	2164	553	2.16	159	78	47	427	45
WNB 3528 FAP M409	647	2.63	6.34	38	3.65	0.83	1511	505	1.25	65	164	33	179	4
WNB 3529 FAP M408	615	2.63	6.32	37	3.66	0.83	1529	522	1.27	72	164	33	181	0
WNB 1819 FAP M200	625	2.64	6.19	35	3.45	0.77	1418	492	1.21	60	149	29	187	2
WNB 2260 FAP M228	555	2.65	6.43	40	3.60	0.97	1642	533	1.08	58	212	17	152	0

Note: WNB designates samples taken from artifacts.

TABLE 6. ELEMENT CONCENTRATIONS FOR OBSIDIAN SOURCE GROUPS USING PIXE-PIGME ANALYSES

SOURCE	NO.	F PPM	Na %	Al %	Si PPM	K %	Ca %	Ti PPM	Mn PPM	Fe %	Rb PPM	Sr PPM	Y PPM	Zr PPM	Nb PPM
Umrei/Umleang (Lou Island)	32	1329	3.39	6.96	32	3.54	1.02	2183	626	2.14	159	77	37	448	50
	s.d.	48	0.15	0.24	2	0.2	0.05	121	30	0.1	8	5	5	18	6
Baki	55	637	2.59	6.29	36	3.71	0.82	1500	509	0.82	60	146	29	179	2
	s.d.	16	0.12	0.1	2	0.29	0.04	87	21	0.06	3	4	3	27	2
Baki (Garala C)	10	620	2.56	6.15	32	3.36	0.74	1390	455	1.07	55	129	26	153	1
	s.d.	29	0.18	0.08	3	0.39	0.05	100	31	0.06	4	0	3	10	2
Kutau-Bao	47	559	2.67	6.34	37	3.46	.95	1600	523	1.05	55	206	20	151	1
	s.d.	12	.08	.09	2	.20	.05	95	22	0.05	4	9	2	7	2

Note: All data based on Bird et al. (1997) except for Umrei/Umleang (Lou Island), which is derived from Bird (1996).

artifacts from Garua Island were submitted to PIXE-PIGME analysis at ANSTO using the basic protocol described in Summerhayes et al. (1998). The PIXE-PIGME determinations confirm the LA/ICPMS results (Tables 3, 5, 6). Based on extensive studies of obsidian sources (Bird 1996; Bird et al. 1997), the Biak tool can be assigned to the Umleang/Umrei source on Lou Island, whereas all of the hammer-dressed stemmed tools from Garua Island are associated with the Baki chemical group, some of which outcrops in the same streambed where the tools were found. FAP M200 was assigned to the GaralaC subgroup of the Baki chemical group, which outcrops both on Garua Island near the site of FAP and on nearby Garala Island. Interestingly, the non-cortical flake FAP M228 groups with the Kutau-Bao obsidian source located on the New Britain mainland, c. 1 km away (Fig. 4). Finally, instrumental neutron activation analysis (INAA) at the

TABLE 7. INAA ANALYSIS OF NINE SOURCE SAMPLES AND ONE CORTICAL FLAKE WITH HAMMER-DRESSING FROM THE FAO SITE (NAA 14)

SAMPLE	Dy (PPM)	Mn (PPM)
NAA 14	4.39	475
Baki source mean	4.59	482
Baki source s.d.	0.34	5.77

University of Missouri Research Reactor (MURR), using methods described in Glascock et al. (1998), found that a further cortical flake with hammer-dressing matched the composition of the Baki source (Tables 3, 7).

The characterization studies provide the first evidence that stemmed tools were manufactured using obsidian from Manus as well as from New Britain. Before considering the profound social implications of Manus as a second source for stemmed tools (cf. Specht 2005:385), we turn to the second unique attribute of the Biak tool.

AN UNUSUAL TECHNIQUE

The use of hammer-dressing on the stem and blade of the Biak tool is not recorded for flaked obsidian artifacts in any other areas of the world. Grinding, another technique that does not involve flaking, is found on the platforms of obsidian blade cores from Mesoamerica (e.g., Sheets 1978), but hammer-dressing has not been reported previously on flaked obsidian tools, although it is common on artifacts made from less isotropic stone. In contrast, this highly unusual technique for flaked artifacts is found on rare stemmed tools from Garua Island (Fig. 1), but is absent on the neighboring New Britain mainland, even from large assemblages at sites FRL and FCH (Araho 1996; Araho et al. 2002; Fullagar 1992; Specht 1973, 1974; Specht et al. 1988), or at the Mopir obsidian outcrops (Fullagar et al. 1991). Outside New Britain, hammer-dressing occurs on a broken retouched flake from Lihir, New Ireland (Casey 1939:149–150, fig 7b; Specht 2005:384), which may part of a Type 2 stemmed tool made on a ‘secondary series’ Kombewa flake, as defined by Araho et al. (2002:66, figs. 7, 12; Fig. 1).

Among the tens of thousands of artifacts examined from Garua Island, only eight bear hammer-dressing (Tables 1 and 2): four complete and one broken Type 2 stemmed tools; one bifacially retouched stem that might derive from a broken Type 2 form; and two flakes (Figs. 5–7). All the artifacts are derived from the FAP obsidian quarry and workshop site, which is located adjacent to the Baki obsidian source (e.g., Torrence et al. 1990:461) or were excavated from site FAO situated on a hilltop directly above the obsidian outcrops. Since the Garua hammer-dressed tools are in association with debris from tool manufacture, they may be rejects rather than finished examples. This might explain why the Garua artifacts are smaller than the Biak tool, although the proportions of the stem and blade are similar (Table 1). On the other hand, the Garua examples could be tools that had been used, but were thrown away once replacements had been made at the quarry, or tools used in activities within this general location.

The two waste flakes demonstrate that hammer-dressed tools were manufactured on Garua Island (Table 3). Given the type of force applied during hammer-dressing, breakages obviously occurred during manufacture. For example, only a small pecked area is present on the FAP M224 broken stem, which implies that during manufacture the tool snapped cleanly at the weakest point: the junction of the stem and the rest of the flake.

Like the Biak tool, the Garua hammer-dressed stemmed tools have a robust, sturdy feel to them. Firstly, the stems are quite thick compared to others reported (Table 1; Torrence 2004a:167). Secondly, the notches forming the stem are relatively shallow and any corners created by them are quite thick. Thirdly, although several have a slightly convex working edge viewed in plan, in most cases the edges are relatively straight and differ from the highly rounded, crescent shape of other more elaborate types (Araho et al. 2002; Torrence 2003). FAP M267 (Fig. 7) varies from the others because of the presence of retouch along one edge. This was applied to the core before the Kombewa flake that forms FAP M267 was struck (cf. Araho et al. 2002: fig. 8).

The Garua hammer-dressed tools are dated by a combination of tephrostratigraphy and AMS dating. FAP M267 (Fig. 7) was found in a stream section immediately under a layer of redeposited W-K1 tephra. The unit is dated by an AMS determination of 5204 ± 85 (NZA 1570; 5740–6210 B.P.) on charcoal from the same stratigraphic level in a test pit c. 100 m upstream (Torrence et al. 1990:461). Secondly, a cortical flake with hammer-dressing was recovered from a level dated by AMS to 3532 ± 66 (NZA 2901; 3640–3990 B.P.) at site FAO. These dates place hammer-dressed stemmed tools on Garua Island firmly within the mid-Holocene and prior to the local appearance of Lapita pottery (Torrence and Stevenson 2000).

The presence of hammer-dressing on the Biak and Garua artifacts is intriguing. Obsidian is notable for its shininess, a characteristic often associated with aesthetic and symbolic meanings typical of valuables (cf. Torrence 2005). It therefore seems strange that the tool's reflective surface was deliberately destroyed. To understand why hammer-dressing was applied, we consider its potential role for tool-use and the wider social implications of this unusual technique.

TOOL-USE

Since they are so rare, one might predict that the hammer-dressed tools were special in some way. The plans of stemmed tools with hammer-dressing can be grouped into two broad shapes. Only one tool from Garua (FAP M267) has the same rectangular-shaped blade as the Biak tool (in its current reworked form), whereas the majority has a trapezoidal shape with expanding sides that maximize the length of the working edge. The Lihir tool may represent a third oval, blade shape. The rectangular blades have deeper notches than the expanding blade group. The longitudinal sections of the two groups also differ. The Biak and FAP M267 tools have a relatively straight, flat longitudinal profile with a relatively consistent thickness along the whole length of the tool (Figs. 2, 7). Those in the second group have a very thick stem in comparison to the working edge so the profile either tapers smoothly toward the edge (e.g., FAP M702, Fig. 6) or there is a prominent angle along one of the faces (e.g., FAP M200, Fig. 6). In both cases

the result is a relatively thick and long working edge that is controlled from a much narrower stem that could fit nicely within a handle or straight into the hand.

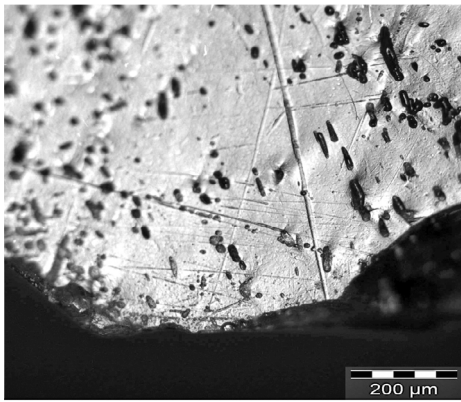
The hammer-dressed tools were designed on different principles than the more elaborate and fragile Type 2 stemmed tools previously proposed as valuables (e.g., Araho et al. 2002; Torrence 2004a). Firstly, the latter usually have a crescent-shaped blade with the rounded edge profile forming an arc. Secondly, there are deep notches leading to fragile protrusions or tips (Araho et al. 2002: figs. 2, 3, 12; Torrence 2003: fig. 18.3, 2004a: figs. 3, 4). Thirdly, the stem of the elaborate type is not located at the proximal end of the Kombewa flake. Instead, the bulb of percussion has been removed by the notch which forms the stem. This means that the distal end of the stem is the original sharp, thin edge of the flake (Torrence 2004a: Figs. 5, 6). Such thin, fragile stemmed tools would have broken under minimal stress. In comparison, stemmed tools proposed by Torrence (2003, 2004a) to have had utilitarian or mixed uses were made with the thick, bulbar part of the flake forming the distal end of the stem as in the case of the hammer-dressed tools.

Use-Wear Analysis

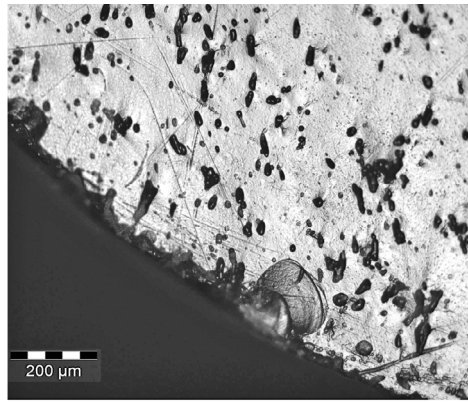
Although the hammer-dressed tools appear to be quite robust and functional, it is still possible that they were used in activities that had special significance. Unfortunately, the original edges of almost all have been removed, as in the case of the Biak tool, or extensively damaged by movement within the streambed where they were found. Kononenko found that only FAP M267, which was found in situ under a thick layer of redeposited W-K1 tephra within a steep bank of Malaiol Stream (Torrence et al. 1990:461), was well enough preserved for use-wear analysis. Fortunately, of all the hammer-dressed tools from Garua, FAP M267 most closely resembles the Biak tool in terms of the shape of the blade and the distribution of hammer-dressing. After cleaning, Kononenko examined the artifact under both low- and high-power magnification following the basic methodology outlined by Fullagar (2005). A combination of edge morphology, striations, polish, and residues was used to interpret past tool use.

The working edge of FAP M267 is slightly rounded in plan view and is still relatively sharp. Under low-power magnification feathered and isolated microscars were observed on both faces along the distal edge (i.e., opposite the stem). More intensive damage, in the form of continuous feathered microscars, is located on the right-hand side of the face in Figure 7B. Comparison of the use-wear microscars with fresh scarring and unused surfaces together with the presence of striations within the microscars indicate that they were formed as a result of tool use.

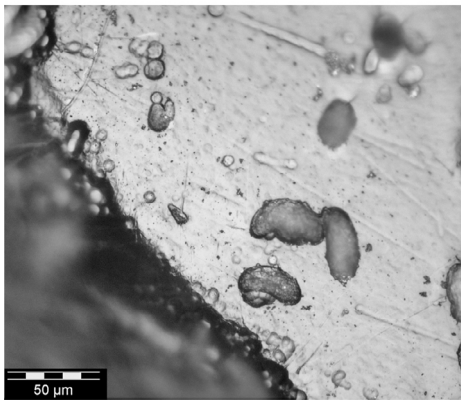
Two forms of striations, (1) narrow and (2) deep and intermittent (Hurcombe 1992:37), were observed mainly on the right-hand side of the face shown in Figure 7B. They run parallel or in a slightly diagonal direction to the edge and sometimes cross each other. The striations called “sleeks” located along the edge are primarily observed in association with isolated microscars (Fig. 7, points 1, 2, 3, 5; Fig. 10 A, B, D, F). This pattern of striations was also observed on experimental tools used for processing soft, elastic materials such as skin, meat or fish (Fig.



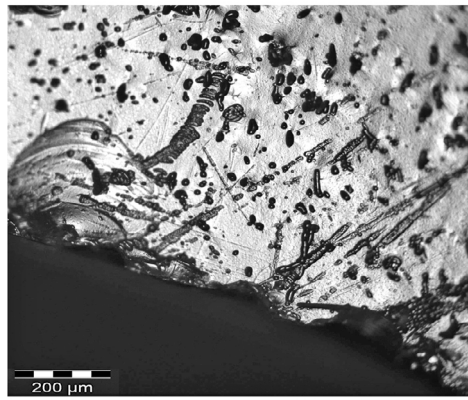
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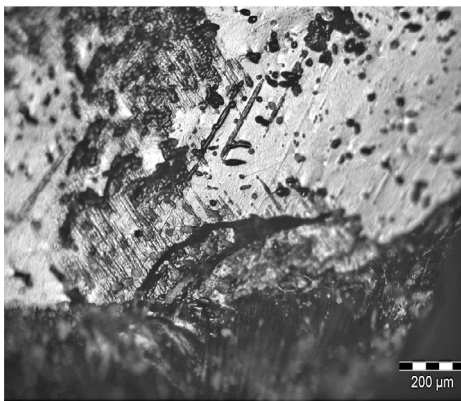
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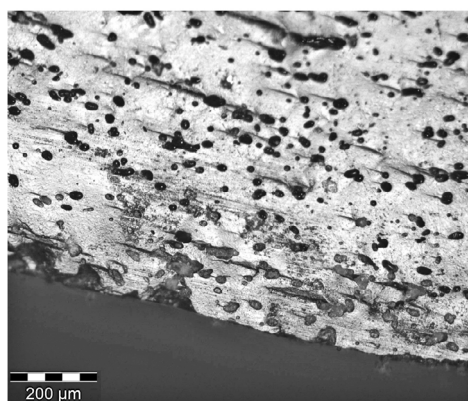
C



D



E



F

Fig. 10. Use-wear on hammer-dressed stemmed tool FAP M267. For location of points see Figure 7. A, point 1: slightly rounded edge; light polish; discontinuous bending and feather scars; diagonal, deep, isolated striations of sleek and rarely intermittent types (100×). B, point 2: feather and bending scars; parallel, isolated, long, and deep striations with a few diagonal striations (100×). C, point 2: intensive edge rounding and developed polish with some diagonal, isolated striations (500×). D, point 3: feather and bending scars; isolated, deep, parallel, and diagonal striations of intermittent and sleek types. Note that striations spread into scars (100×). E, point 4: intensive edge rounding; patches of dense, deep, isolated sleek and intermittent striations and a few flaked striations on the edge; developed polish (100×). F, point 5: intensive edge rounding; discontinuous feather scars; light to developed polish; isolated shallow and deep, parallel striations (100×). (Photos by N. Kono-nenko)

11E, F). In addition, numerous and more obvious intermittent striations are associated with an area of intensive scarring at point 4 in Figure 7. These wear forms suggest that this part of the edge had more intensive contact with a harder material such as bone.

In terms of polishes, there are a few spots with thin lines or patches that have smoothed bright polish that extends from the higher peaks into low areas of the obsidian surface (Fig. 10C). The distribution of the polish, its association with edge rounding, and the pattern of the striations provide additional support for the hypothesis that the tool was used for cutting a soft, elastic material, but also occasionally made contact with a harder substance.

It is important to note that the degree of use-wear on FAP M267 is relatively intensive. Based on experiments, it was used in excess of 30 minutes. The size and shape of the working edge of FAP M267 indicate its appropriateness for use on large-size animals. The use-wear traces are entirely consistent with cutting the carcass or working the flesh and bones of large-bodied animals such as crocodiles, turtles, tuna, dolphins, or even humans. At this stage the use-wear analysis neither supports nor challenges the possible ceremonial or ritual use of FAP M267.

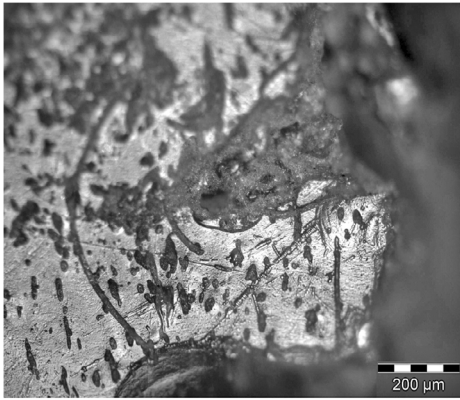
Hafting

The use-wear results suggest that the extra care and attention directed to the handle in the form of hammer-dressing may have been necessary for tool function, because a precision grip may have been required to effectively complete the task. Certainly, if much force was applied, e.g., in butchery or warfare, a secure hold would have been highly beneficial. Araho et al. (2002:70–71) noted that hammer-dressing converted smooth obsidian into a rough and irregular surface that would better support a strong grip when held directly in the hand or aid in the attachment of a wrapped or wooden handle.

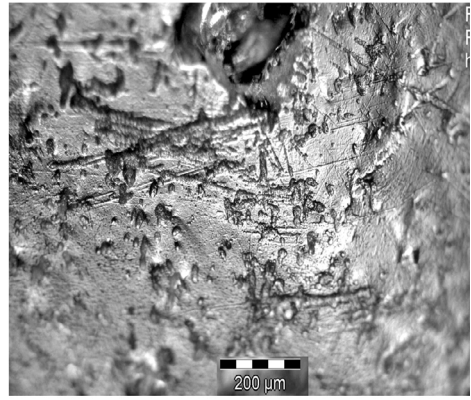
The use-wear study found microscopic evidence for hafting on the stem of FAP M267. Along the left edge of the stem in Figure 7B, there are a few areas with scars that are associated with a net of intermittent and sleek striations (Fig. 10A). These are further accompanied by light polish and some plant tissue (Fig. 7, point 20). A similar constellation of abrasion, polish, striations and plant tissue was observed at some elevated areas of the stem (e.g., Fig. 7, point 7; Fig. 11B). These use-wear traces indicate that the haft had come in contact with wood or perhaps from string made from a woody plant, such as rattan. A similar wear pattern was observed on an experimental tool that was placed inside a wooden handle (Fig. 11C, D).

The role of hammer-dressing in improving the grip seems particularly apt for tools FAP M267, FAP M200, and FAP M408 since much of the percussion damage occurs on flat, unflaked surfaces (Figs. 5–7). FAP M702 is hammer-dressed on both the flaked surface that forms the notches and on the smooth surface of the flake between them (Fig. 6). It is plausible that the effective application of force on the long working edge on these tools demanded a sturdy handle and this was assisted by the simultaneous smoothing of the bifacially flaked stem and the roughening of the glassy flake surface.

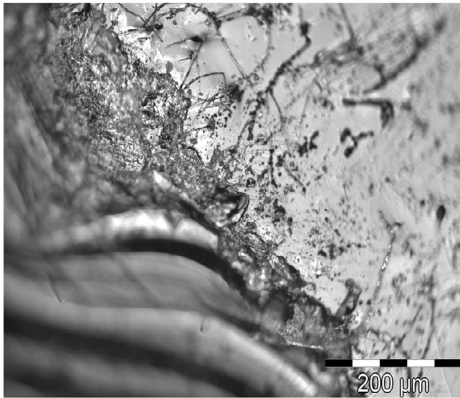
The Biak tool may incorporate elements of both these functions because the bifacially flaked stem is extensively covered with hammer-dressing and where this



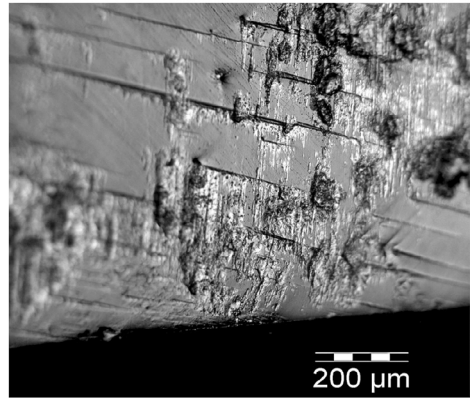
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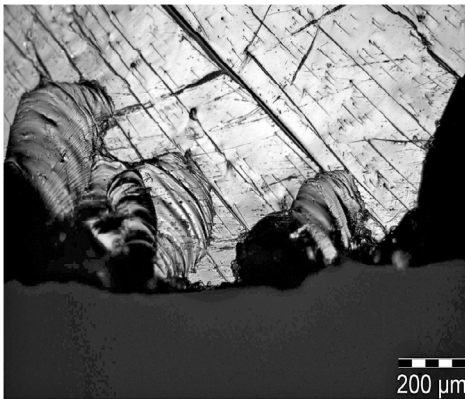
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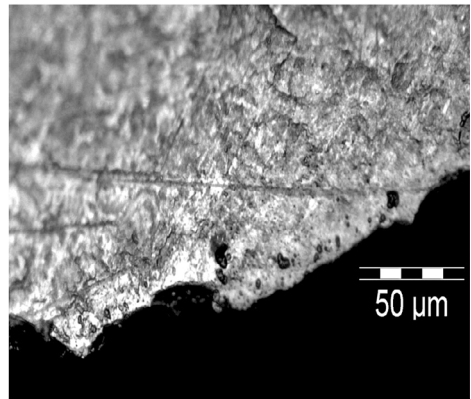
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Fig. 11. Hafting wear on hammer-dressed stemmed tool FAP M267 (A, B); hafting wear on experimental tools 178 and 247 (C, D); and use-wear on working edges of experimental tools 263 and 308 (E, F): A. FAP 267 point 6: rounded edge; rare isolated and random oriented deep striations; light polish; few scars covered by plant tissue (100×); B. FAP M267 point 7: spot of light polish with randomly oriented, isolated striations, and plant tissue (100×). C. experimental tool 178, cutting banana leaves and stem for 30 minutes: hafting wear, rounded edge with developed polish; few isolated striations and plant tissue (200×). D. experimental tool 247, sawing frond, Nipa palm for 15 minutes, hafting wear: patches of dense, deep striations oriented perpendicularly to the edge and white-colored residues (100×). E. experimental tool 263, gutting/cutting fish for 25 minutes: light edge rounding; feather and bending scars; light to developed polish; diagonal and parallel, isolated striations (100×). F. experimental tool 308, gutting/cutting fish for 30 minutes: intensive edge rounding and developed polish; few diagonal, deep striations (500×). (Photos by N. Kononenko)

is absent, the flake scars are very flat. The impact cones from percussion, however, also extend quite far onto the smooth, shiny, flat flake surface above the notching on both faces of the tool (Fig. 2), suggesting that the roughening of the smooth surfaces may have been applied to secure wrapping or a haft for a handle. The hypothetical use of wrapping is very similar to the way long obsidian blades were recently attached to spears in Manus (Moseley 1877: pl. xx; Torrence 1993:472), although there is no evidence of hammer-dressing on these tools.

The isolated patch of hammer-dressing on the blade may have had an entirely different function and history (Fig. 2, left). One possible explanation is that the tool was used as an anvil, perhaps for bipolar working of stone tools, as has been hypothesized for similar patterns on ground edge axes in Australia (McCarthy et al. 1946:44, Figs. 257, 279), although the Australian examples often have a definite pitted area which is not present on the Biak tool.

NON-UTILITARIAN ROLES

Although preparing the obsidian surface so that it can be comfortably and safely held or securely hafted makes good functional sense, hammer-dressing is so rare in Melanesian obsidian assemblages, even among stemmed tools, that we question whether its application on the mid-Holocene obsidian tools described here was purely or even primarily utilitarian. An alternative hypothesis is that the roughened surface was aesthetic or had ideological significance. Since obsidian is naturally shiny, a dull surface could have carried symbolic meaning. Another possibility is that creating a rough exterior made it resemble some other type of stone not found locally and perhaps therefore significant. Along these lines, the presence of artifacts in the New Guinea Highlands that resemble stemmed tools, but made from different raw materials (e.g., Bulmer 2005:432 type 3c), is provocative, although in the absence of good chronology for the New Guinea examples, one might well ask who was imitating whom.

Rath and Torrence (2003) have suggested that the numerous stages of production necessary for the manufacture of stemmed tools might have contributed to their social significance in several ways. Firstly, the additional care and effort invested in their manufacture may have added to their "value." Secondly, their production may have required special skills that were not widely shared in the population, therefore requiring the creation of social relationships with one or more knowledgeable knappers. Thirdly, the staged reduction sequence provided opportunities for moving the tool between several producers or craft specialists located in different places. Possession of the final tool would therefore provide concrete proof that a series of social relations had been successfully negotiated. Hammer-dressing might then represent an extra step in production that required additional skills or persons and therefore further enhanced the value of these objects.

A final suggestion is that this stage of stemmed tool production offered opportunities for "craft-as-performance" as described by Carter (2007:94). The making of a tool could have been a ritualized act, especially since hammering a fragile obsidian tool without breaking it was a very risky business. One could imagine that the rhythm of the hammering and the associated sounds were conducive to a public performance of skills incorporated into a ceremony.

Replication Experiment

To evaluate the Rath and Torrence hypotheses, Nina Kononenko conducted a replication experiment aimed at assessing the time and skill requirements and functional advantages of hammer-dressing. In the first stage of manufacture, a roughly circular, thick flake with a large bulb of percussion was struck from a core of New Britain obsidian using direct percussion. Although not strictly a Kombewa flake, the blank resembled many stemmed tools in terms of its bilateral symmetry and longitudinal cross section. The ventral and dorsal surfaces of the flake intersected to form a relatively thick and sturdy distal edge. Next, a combination of invasive and steep bifacial percussion was applied to the bulbar end of the flake to create the two notches that delineate the stem and create its roughly triangular cross section. Four heavy river cobbles of relatively soft material were used as hammerstones to make the stemmed tool.

The presence of a prominent ridge creating the thick, triangular cross section of the stem and the sharp, fresh flake scars made the stem difficult to grasp. Additionally, any movement of the tool within a haft would have torn it and eventually destroyed a wooden collar or wrapping. One way to avoid this problem would be to smooth the surface of the stem and at the same time convert the cross section into a round or oval shape more easily hafted. To achieve these goals, hard hammer blows were applied directly to the surface of the stem and the notches.

During the hammer-dressing, as much as possible of the tool rested on a soft wood anvil to prevent unequal stress that could cause breakage at the junction of the stem and the body of the flake. During much of the experiment the sharp distal edge of the flake was covered by a soft animal skin to protect the hand holding the tool. Of eight hammerstones tested, two were preferable. Both of these river cobbles had a narrow edge and one had a relatively pointed shape. It was found that limiting the amount of surface that came in contact with the obsidian surface increased the accuracy of the hammering.

Hammer-dressing was restricted to the area of the stem with deep flake scars. The blows were positioned carefully and not applied too forcefully so as to avoid breakage. During this process, the sharp edges of the stem were replaced by small round impact cones created by the hammering (Fig. 12). Although on the small scale these create an irregular surface, it is relatively level and smooth to the touch. During this process microflakes were also removed, although these were not intended. Despite care taken to anchor the tool, a section of the weakest part of the edge, representing the corner just above the notch on one side, suffered vibrations and broke off due to end shock (Fig. 12).

After 40 minutes, the cross section of the stem had been rounded and the sharp edges removed. At this stage the stem could be held comfortably in the hand. The conical impact fractures created on the experimental tool and the hammer-dressed surfaces of the archaeological artifacts are roughly similar, although those created on the experimental surface are less distinct and more highly fractured and crushed, possibly due to the use of softer hammerstones with a more rounded surface and/or the application of a higher density of blows (Fig. 13).

The experiment demonstrated that hammer-dressing is an effective way to smooth contours and reshape a flaked stem, but also that the procedure is

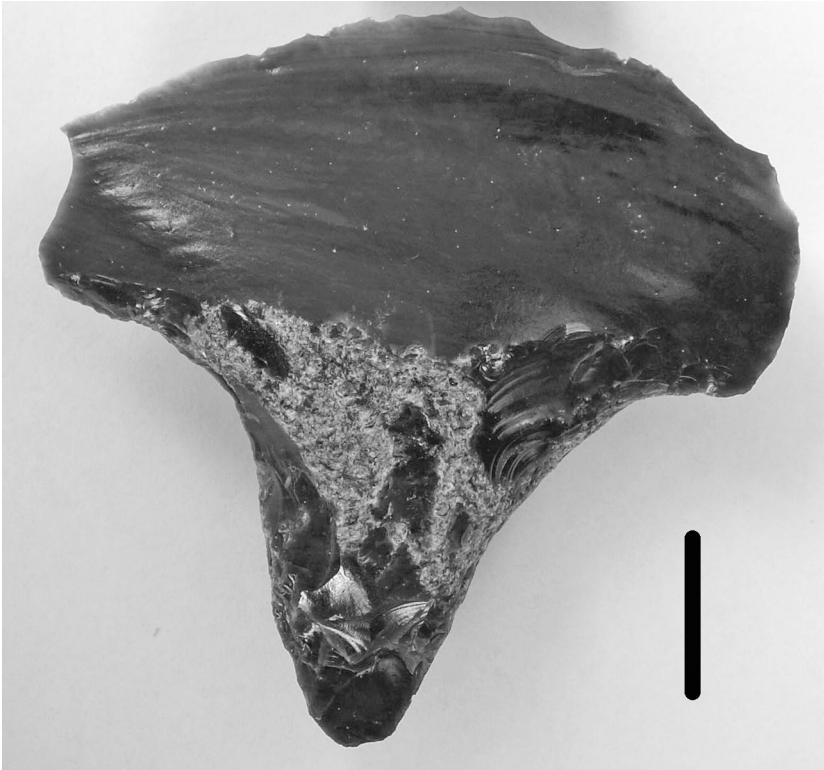


Fig. 12. Final form of hammer-dressed obsidian stemmed tool from replication experiment. Note breakage on the left-hand tip due to end shock during manufacture. Scale bar is 2 cm. (Photo by N. Kononenko)

relatively time-consuming and demands appropriate equipment (hammerstones, anvil, hand protection) that must be used with relative precision. An experienced person using a better hammerstone might complete the task more quickly, but pecking still takes more time than flaking. It is also clear from the replication experiment that care is needed to create the desired surface without damaging the tool. The likelihood of breakage explains why all the hammer-dressed stemmed tools are robust. Hammering is a very risky strategy when there are protruding edges or tips and favors stems formed from the thickest (bulbar) end of the flake blank.

In summary, the replication experiment provides support for hypotheses that consider the role of the handle, energy and skill inputs, and multiple stages of production, since all are required. Freshly flaked obsidian is sharp, so dulling a potential handle reduces risks of injury and damage to a haft or handle. The procedure also requires extra time, care, skill, and perhaps practice. Although discrimination among the potential reasons for the use of hammer-dressing on stemmed tools will require further research and more data about how the tools were used and exchanged in the past, the use-wear analysis and replication experiment are helpful in suggesting future directions.

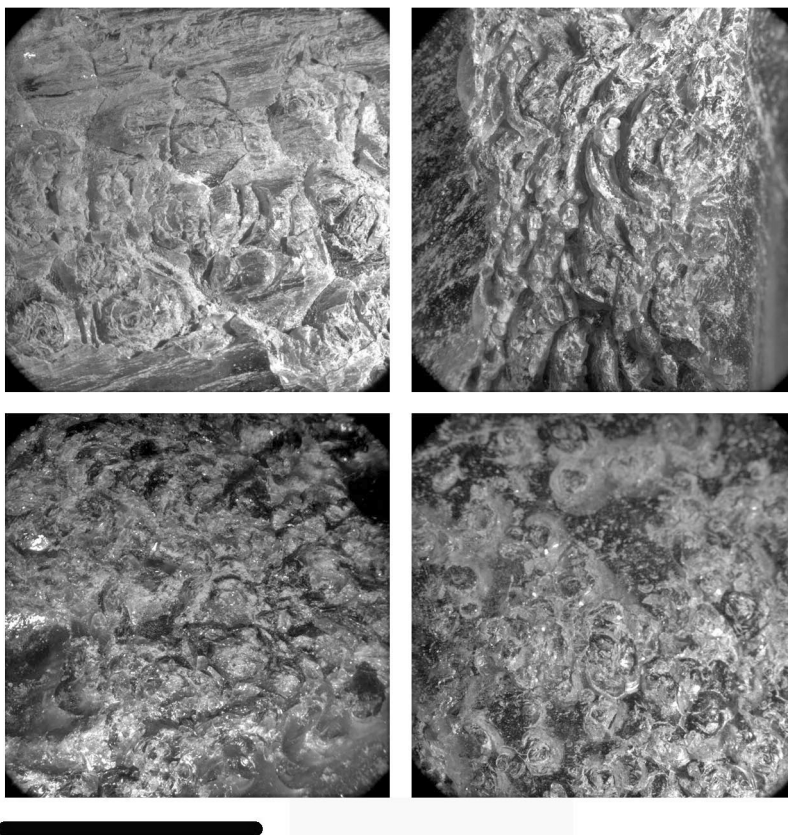


Fig. 13. Close-up views of impact fractures on hammer-dressed obsidian stemmed tools. Clockwise from top left: FAP M200; FAP M702; FAP M408; experimental tool. Scale bar is 1 cm. (Photos by R. Torrence)

INNOVATION, IMITATION, AND INTERACTION

Although it is possible that the combination of the two unusual and highly demanding techniques, hammer-dressing and Kombewa flakes, was invented independently at the two widely separated obsidian source areas on Garua and Lou Islands (in New Britain and Manus, respectively; Figs. 1, 4), in our view such a coincidence is highly unlikely. The more plausible scenario is that the similarities are the result of significant contact between people living on two distant islands. Perhaps the precise form of the artifact was copied by knappers from one area after viewing it, either at the other production center or at any of the widely distributed places where stemmed tools may have been exchanged, as represented by the current find spots (Fig. 1). The Kombewa technique is so complex and difficult that we feel imitation is also highly unlikely. It is most plausible that the replication of identical technologies in two different places was the outcome of prolonged interaction. We suggest that the use of similar methods to make obsidian stemmed tools was either because (1) people shared ideologies about the role and meaning of the tools, or that (2) competing groups on Garua and Lou used the same forms to gain access to exchange with third parties.

Although limited, there is some archaeological evidence that obsidian stemmed tools may have been made on Lou Island. Two Type 2 stemmed tools and a curved stem from an unknown type have been reported from the nearby mainland of Manus (cf. Araho et al. 2002: Table 1; Bühler 1935:21, 1946–1949:230; Casey 1939:147, Fig. 6; Nevermann 1934:341, Fig. 193; Ohnemus 1996:363, Fig. 433.10), but none has been found near the obsidian sources on Lou Island. Another problem is that Lou Island obsidian is rare in the mid-Holocene archaeological record (e.g., White 1996) and none has been previously found outside Manus province. In addition, only four artifacts from mid-Holocene levels at the Pamwak site on Manus have been characterized to Lou Island sources and one of these is not from the Umleang source (Fredericksen 1997:72).

Since artifacts with stems or tangs (but not made on Kombewa flakes) were made on Lou Island beginning in the late Holocene and continuing up to the recent period (Fredericksen 1994, 2000), Type 2 stemmed tools might represent their mid-Holocene precursors. Furthermore, the current lack of evidence for stemmed tools on Lou Island during the mid-Holocene could be explained by the paucity of contemporary contexts (Kennedy 2002). For example, excavations at the site of Umleang, where obsidian outcrops match the chemical composition of the obsidian used in the Biak tool, have not reached the mid-Holocene landscape, which is buried by deep layers of recent volcanic ash that overlie most of the island (e.g., Ambrose 1988, 1998; Ambrose et al. 1981; Fredericksen 2000).

Although perhaps unlikely because of the large distances involved, it is not impossible that people from Lou Island took obsidian to Garua Island where only certain people had the skills, knowledge, and right to make hammer-dressed tools. We already know that Kutau-Bao obsidian from mainland New Britain was transported to Garua Island and converted into Type 1 stemmed tools (Rath and Torrence 2003), and a flake (FAP M228) found on Garua and sourced to Kutau-Bao has been hammer-dressed (Table 3). In addition, since hammer-dressing is absent from the relatively large collections of stemmed tools from mainland New Britain sites at FRL and FCH (e.g., Araho 1996), it is possible that the technique was restricted to Garua Island. In this regard, Nevermann's (1934) report that in historic times access to the recent obsidian quarries at Umleang and knowledge of blade production was tightly controlled is relevant. The geographical location of the highly skilled knappers in historic Manus, however, was not restricted to the obsidian sources themselves, so this provides a precedent for raw material moving to producers located elsewhere (Fullagar and Torrence 1991:116).

Alternately, craft specialists from Garua may have been brought to Lou Island to make stemmed tools by sponsors seeking to enhance their prestige, possibly as part of the performance within a ceremony (cf. Carter 2004, 2007). If so, then these tools may have had a very special value either in social or utilitarian terms. The use-wear results indicate that at least one hammer-dressed tool was used for cutting a large animal, which could include its use in warfare. Perhaps this tool type had special ideological significance within a ceremonial or warfare context. In addition, control over knowledge and skills suggests intense social interaction and possible competition for status, since individuals must have successfully negotiated and manipulated social relationships to obtain raw materials and finished goods (Rath and Torrence 2003).

Further archaeological research, particularly on Lou Island, is necessary to determine the precise social relationships implied by the Biak and Garua hammer-dressed obsidian artifacts. At this stage, however, we conclude that independent innovation in two different places or direct copying are unlikely. Instead, the alternatives—employing craft specialists, or replication following training in this relatively sophisticated technology—all demand significant interaction between individuals from Garua and Lou Islands.

INTERACTION SPHERES

Having considered the unusual geological source and technique of hammer-dressing, we now turn to the third important attribute of the Biak artifact: its geographical location. Given the information at hand, the most parsimonious conclusion is that the Biak tool was derived from archaeological deposits on Biak that were disturbed by Japanese building activities during the war. Another possibility is that the tool was taken to Biak from Manus by a Japanese soldier as a souvenir, but this scenario is quite unlikely given the history of Japanese troop movements during World War II. On February 29, 1943, the Allies attacked Japanese positions on Manus. Heavy fighting ensued and by May 18, 1943, the fighting was over and 3,317 of the original 4,600 Japanese stationed there had been buried (Dexter 1961:795–797). It is doubtful that any survivors played a further part in the war and therefore unlikely that a Japanese soldier fighting on Manus transported the stemmed tool to Biak.

If the hammer-dressed stemmed tool was indeed deposited in the Biak cave during prehistory, it had traveled c. 1200 km from the obsidian source on Lou Island. This new find could therefore markedly increase the geographic scale of social relations represented by obsidian stemmed tools to a region extending from West Papua to southern Bougainville, a distance of c. 2200 km (Fig. 1). The location of the Biak tool also means that we should seriously reconsider the possibility of social relations between Melanesia and regions to the west during the mid-Holocene.

Swadling (1996:15, 51–53) proposed wide-scale interaction beginning in the early Holocene between New Guinea and islands to the west, but until recently there has been very little concrete evidence to support her hypothesis. Drawing on previous work (Araho et al. 2002; Golson 2001, 2005; Swadling and Hide 2005; Torrence 2003, 2004*b*), Specht (2005:387) proposed that obsidian stemmed tools are “a highly visible archaeological indicator” “of long-standing social connections” during the mid-Holocene. The distance over which the tools traveled from the obsidian sources in New Britain and Manus is so considerable that it is difficult to imagine that everyone who possessed one was actively engaged within the same ceremonial system of exchange and status, although given our discussion of interaction between the obsidian sources of Garua and Lou, this suggestion requires serious research.

More important than the overall distribution of extant stemmed tools, the sharing of the Kombewa technology and hammer-dressing required contact between the people who made the Biak and Garua Island obsidian stemmed tools and these networks must have stretched over areas larger than those recorded by ethnography for recent Melanesian trading systems. The overall spatial pattern of

stemmed tools, however, may not necessarily have resulted from direct communication among all the areas where this tool type has been found. The artifacts may have circulated through a diffuse network of links rather than through a single, organized exchange system. For example, White (1996) has shown that the archaeological distribution of obsidian in the recent period is not restricted to the area encompassed by exchange systems described by ethnographers. Instead, recent obsidian artifacts are spread over a much larger region than self-defined exchange systems because social relationships rarely have tight boundaries, exchange systems often overlap, and objects frequently leak out into a wider social sphere (cf. Specht 2005:385–386). In this regard, the extensive amount of reworking around the blade of the Biak tools is relevant and may signify a long and complex history of use and meanings as it was exchanged and moved through space and time.

Stone mortars and pestles and shell artifacts dating to the mid-Holocene have also been used as evidence for wide-scale social interaction within mainland New Guinea and between the islands and the mainland (Golson 2005:484; Swadling 2005; Swadling and Hide 2005; Swadling et al. 2008). The translocation of various animals to Manus and New Britain is another indication of links between these islands and the New Guinea mainland (White 2004). Perhaps it was on the mainland that people from Manus and New Britain came into contact and then exchanged or borrowed knowledge and skills relevant to stemmed tools or competed for status. Whatever scenario is established by future research, it is clear that the mid-Holocene was a period in which ideas and possibly people were regularly moving over long distances.

IMPLICATIONS FOR PACIFIC PREHISTORY

In contrast to recent obsidian exchange systems through which unmodified blocks or small pieces of obsidian were distributed (e.g., Specht 1981), the mid-Holocene stemmed tools are a finely worked product with recognizable shapes. As they passed between hands across social and language boundaries, these distinctive artifacts had the potential to carry various meanings and information with them. The exchange of these tools therefore must have established routes along which a range of ideas, ceremonies, dances, etc., as well as concrete objects could have flowed, possibly as far as from Biak to Bougainville.

If people from Manus and New Britain were in regular communication, as implied by our analyses of the hammer-dressed tools, then the spread of goods and ideas might have been relatively rapid. Given the location of Biak, on the edge of Southeast Asia, it is also possible that Melanesia had extensive contacts to the west from at least the mid-Holocene. The existence of a large-scale mid-Holocene interaction sphere or even a loose network of social relations through which goods like stemmed tools, social practices, and ceremonies involved with the stone mortars and pestles were already circulating, created a mechanism for the borrowing and circulation of ideas from the west. If so, then the subsequent adoption and spread of Austronesian languages, Lapita style pottery, pigs, etc., did not necessarily require human migrations. As we have shown, by at least the mid-Holocene period, interaction networks distributing elaborate items of material culture had already set the stage for changes later signaled by Lapita style pottery.

Given the limited amount of archaeological research on the mid-Holocene, the small number of stemmed tools probably represents the tip of the iceberg. As yet the exact timing and motivation for the long-distance interaction represented by the spatial distribution of hammer-dressed obsidian stemmed tools is unknown and requires sustained research. Possibly rising sea levels destroyed homelands as well as created new opportunities that might have spurred on movements of people through and within the broader Southeast Asian/Melanesian region (e.g., Oppenheimer 1998; Terrell 2004:605–606). What is clear, however, is that further research on social interaction during the mid-Holocene period is likely to yield provocative alternative scenarios for Melanesian prehistory.

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ABSTRACT

The widespread distribution in Papua New Guinea of obsidian stemmed tools dated to the mid-Holocene has led scholars to postulate the existence of large interaction spheres. A newly reported artifact from Biak Island, West Papua provides the stimulus for reconsidering the role of this tool type in regional social interaction. The tool was hammer-dressed, a technique unknown for obsidian flaked tools elsewhere in the world and only rarely applied to obsidian artifacts in Melanesia. This new find closely resembles hammer-dressed obsidian stemmed tools from Garua Island, Papua New Guinea, but these are characterized by LA/ICPMS, PIXE-PGME, and INAA to the local Baki and Kutau-Bao obsidian sources in New Britain, Papua New Guinea, whereas the Biak tool is sourced to outcrops on Lou Island in Manus Province, Papua New Guinea. Hypotheses for functional, symbolic, and social roles of hammer-dressing are explored and evaluated on the basis of replication experiments and use-wear analyses. We argue that the complex and exceptionally rare technologies used for manufacturing hammer-dressed stemmed tools and applied to obsidian acquired from two widely separated obsidian sources substantially add to previous evidence for wide-scale social interaction during the mid-Holocene. The existence of these social networks might also have provided a mechanism for the rapid, extensive spread of innovations like Austronesian languages or Lapita pottery. **KEYWORDS:** Melanesia, Pacific archaeology, stone tools, obsidian, hammer-dressing, characterization, PIXE-PIGME, LA/ICPMS, instrumental neutron activation analysis.