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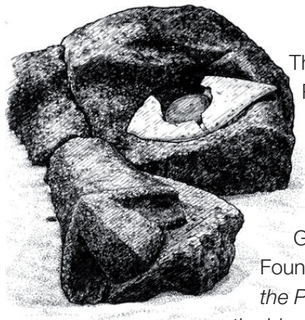
The Gotland Papers

Selected Papers from the VII International Conference on Easter Island and the Pacific: Migration, Identity, and Cultural Heritage

Gotland University in collaboration with Easter Island Foundation, Sweden, August 20–25, 2007



The conference at Gotland University assembled over 200 Pacific Islands scholars, scientists, students and enthusiasts in the island city of Visby in the middle of the Baltic Sea. Like its predecessors, this conference stimulated to new discussions on the Pacific past, present and future. The conference was co-chaired by Paul Wallin and Helene Martinsson-Wallin, Gotland University and Christopher Stevenson, The Easter Island Foundation. The *VII International Conference on Easter Island and the Pacific* was the first of its kind to be held in Europe and therefore the ideas of the world of the Pacific expands to a global scale.

This volume contains 6 chapters with 40 papers on updated Pacific research in the fields of archaeology and anthropology. Chapter 1-3 focus on Easter Island (Rapa Nui) research, Chapter 4 on Eastern Polynesia and the question on Pacific-American contacts, Chapter 5 on the Western Pacific and Chapter 6 include Miscellaneous Papers. The main themes at the conference were *migration, identity, and cultural heritage.* The keynote speech by Professor John Flenley at the Geography Department of Massey University, New Zealand focused on these issues from a paleobotanical perspective that clearly showed how man changes the environment when arriving into untouched Island landscapes. With this as a starting point and background, the discussion continued into cultural complexity and questions on identity... We hope this collection of papers prove to be a unique and useful contribution to future research in the Pacific area.

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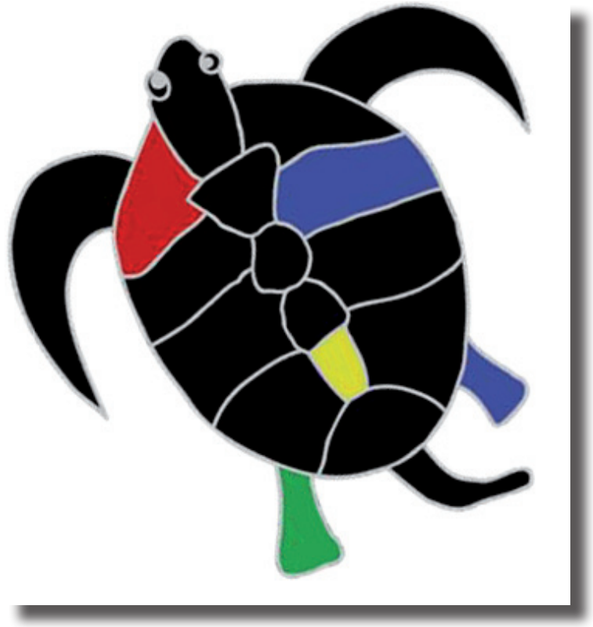

Editors:
Paul Wallin and Helene Martinsson-Wallin

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The Tutuila Basalt Export Industry and the 5600 km Distribution of Samoan Adzes at ~700-600 BP

David J. Addison
American Samoa Community College

Abstract *- This paper reviews the evidence for large-scale basalt tool manufacturing on Tutuila and the geographical and temporal spread of those tools in the southwest Pacific. Since the first anthropological work in Samoa in the 1920s, Tutuila has been known as a center of basalt tool manufacture. The last decade has seen a doubling of the number of documented lithic manufacture and quarry sites (50), with several now securely dated to ~700-600 cal BP. A later period of 500-300 cal BP may also be indicated. Regional distribution is greatest in the earlier period, but some evidence suggests movement of Tutuila basalt tools in the later period, at least to nearby archipelagoes. Tutuila adzes are documented over a 5600 km distribution from Pohnpei in the northwest to Ma'uke in the southeast. Tutuila has been long recognized as a major production and distribution center for high-quality basalt[1] tools in the southwest Pacific (e.g., Best et al. 1992, Clark 2002, Clark 1993, Clark et al. 1997, Di Piazza and Pearthree 2001, Leach and Witter 1990, Weisler and Kirch 1996, Winterhoff 2003). This has elsewhere been termed the Tutuila Basalt Export Industry (Addison and Asaua 2006). This paper first reviews the evidence for tool production on Tutuila, then examines where Tutuila products have been found.*

Tutuila Lithic Manufacture Sites

Tutuila sits in the middle of the Samoa Archipelago roughly halfway between the temporal power center of Savai'i and 'Upolu to the west and the seat of the sacred Tui Manu'a title at Ta'u in the east (Figure 1). Tutuila was built in two distinct volcanic phases. The newest phase, the Leone Volcanic Series, was actively erupting as recently as 1400 years ago (Addison and Asaua 2006, Addison *et al.* 2006). However, the main part of the island is Pliocene in age – some 1.0-1.5 million years old (McDougall 1985) – and divided into three major volcanic provinces. It is from these older volcanics that the high-quality Tutuila basalt comes. For reasons that are unclear, unusually hard, dense, fine-grained basalt was laid down among softer volcanic rock. During the intervening million years, the softer rock decomposed to a clay or lateritic matrix surrounding chucks or layers of the high-quality basalt. Ancient Samoans either found the high-quality basalt where it was exposed at the surface, or dug into the surrounding matrix to find it.

The first written record of basalt tools (Figure 2) being manufactured on Tutuila is from a *palagi* resident of Manono who wrote in 1840: "At Tutuila, however, is found the hard stone (Trap.) of which the Polynesian adzes and other tools were made previously to the introduction of iron" (Heath 1840). More than a half century later, Te Rangi Hiroa Sir Peter Buck recorded the name of the Tataga Matau basalt quarry when doing field research for his monograph on Samoan material culture (Buck 1930:330). Tataga Matau is located on the ridges behind Leone Village and is the largest documented basalt quarry site on Tutuila. A team of archaeologists from New Zealand investigated Tataga Matau in the late 1980s (Best *et al.* 1989, Leach and Witter 1987, Leach and Witter 1990). The etymology of this quarry's name seems straightforward: *tataga* refers to the striking action that flakes pieces from rocks in the process of shaping them into tools, and *matau* is an archaic word referring to a stone adze that is fully shaped but not yet ground, polished and sharpened. Shawn Barnes (pers. comm. 2006) has suggested that the name may be more descriptive than specific, and that many villages may have referred to their own quarries as "tataga matau."

To date, 50 lithic sites have been found in 28 different villages or locations on Tutuila (Table 1). This number can be taken as a mere indication of the number of the sites that actually exist, as only a relatively small area of Tutuila has been systematically searched (e.g., Clark 1989; Clark and Herdrich 1988). To date, archaeologists have used the term "quarry" with variable meaning in reference to Tutuila lithic sites. Ideally, sites where basalt

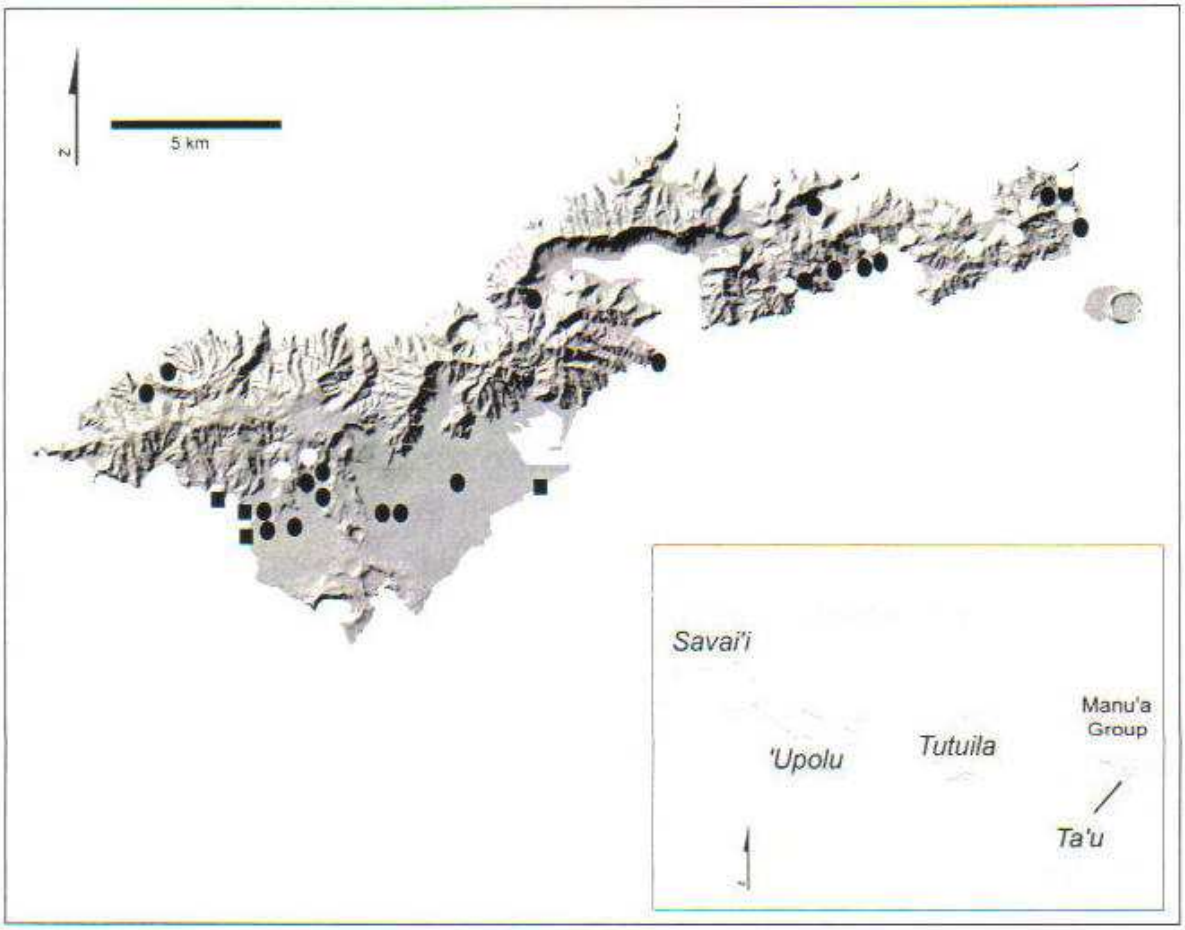

Figure 1. Distribution of lithic sites on Tutuila. Multiple sites at one location are represented by a single dot. White dots = extraction sites; black dots = flaking sites; black squares = major grinding sites; inset not to scale.

Figure 2. Examples of basalt tools from Tutuila. The three objects at the extreme right are interpreted as scrapers or graters. The others are adzes or pieces of adzes.

raw-material was removed from the ground or exposed outcrops (properly "quarries") would be clearly distinguished from sites where tool manufacture took place (as indicated by large amounts of flakes). Although this may seem an irrelevant distinction, it has important implications for how the production of basalt tools was done, who did it, who controlled it, and how the tools moved off-island (e.g., Winterhoff *et al.* 2007).

Table 1. Known lithic sites on Tutuila (n.d. = no date; ? = date unclear).

Site No.	Name or location	Visibility	Activity	Size	Date (cal)	References
AS-34-1	Fagamalo	Buried	Flaking	Small	post-1200 BP[2]	(Addison and Asaua 2006)
AS-34-34	Maloata	Surface	Flaking	Large	?	(Ayres and Eisler 1987)
AS-34-16	Afao/Atauloma	Surface	Grinding	Large	n.d.	(Addison 2004)
AS-34-10	Tataga Matau	Surface	Extraction	Large	~600BP?	(Best *et al.* 1989, Leach and Witter 1987, Leach and Witter 1990)
AS-34-39	Leone	Surface	Flaking	small	n.d.	ASHPO site files
AS-34-40	Leone	Surface	Flaking	small	n.d.	ASHPO site files
AS-34-41	Leone	Surface	Flaking	small	n.d.	ASHPO site files
AS-34-46	Leone	Surface	Flaking	small	n.d.	ASHPO site files
AS-34-47	Ologa To'i, Leone	Surface	Grinding	large	n.d.	ASHPO site files
AS-34-49	Leone	Surface	Flaking	small	n.d.	ASHPO site files
Not yet assigned	Leone (Puapua)	Buried	Flaking	?	n.d.	(Addison 2007b)
AS-34-18	Fagalele	Surface	Grinding	Large	n.d.	(Addison 2004)
Not yet assigned	Malaloto Ridge crater	Surface	Flaking	Large	n.d.	(Best *et al.* 1989, Clark 1980)[3]
AS-32-6-F4	Malaeloa[4]			Small	n.d	(Ayres *et al.* 2001)
AS-32-7	Malaeloa	Surface	Flaking	Large	800-300 BP	(Winterhoff 2003)
AS-32-13b	Malaeloa	Surface	Flaking	Large	post-500 BP	(Winterhoff *et al.* 2006)
AS-32-17	Malaeloa	Surface	Flaking	Small	n.d.	(Winterhoff 2003)
AS-31-170	Liko's House/Pava'ia'i	Mixed	Flaking	Small	n.d.	(Ishimura and Addison 2005, Ishimura and Addison 2007)
AS-31-174	Pulu Tree/Pava'ia'i	Surface	Flaking	Small	n.d.	(Winterhoff and Addison in prep)
AS-31-150	Fale O'o/Tafuna	Buried	Flaking	Small	n.d.	(Ishimura and Addison 2005, Ishimura and Addison 2007)
Not yet assigned	Airport Foaga Beds/Tafuna	Surface	Grinding	Large	n.d.	(Addison 2004)
AS-25-55	Fatu-ma-Futi	Buried	Flaking	Small	post-700 BP	(Walter and Addison 2005)
AS-25-72	Vai's Quarry/Pago Pago	Surface	Extraction	Small	n.d	(Currey *et al.* 2004)
AS-25-71	Masui's Quarry/Pago Pago	Surface	Extraction	Small	n.d.	(Currey *et al.* 2004)
AS-25-65	Vaipito	Buried	Flaking	Large	post-700 BP	(Addison and Asaua 2006)
AS-26-10	Fagasa	Surface	Extraction	Large	n.d.	(Best 1993)
AS-26-11	Fagasa	Surface	Extraction	Large	n.d.	(Best 1993)
AS-23-21	Alega	Surface	Flaking	Large	post-700 BP	(Clark 1992, Clark 1993)
AS-23-22	Alega	Surface	Extraction	Large	post-700 BP?	(Clark 1992, Clark 1993)
AS-23-23	Alega	Surface	Extraction	Large	post-700 BP?	(Clark 1992, Clark 1993)

Site No.	Name or location	Visibility	Activity	Size	Date (cal)	References
AS-23-24	Alega	Surface	Flaking	Large	post-700 BP?	(Clark 1992, Clark 1993)
AS-23-29	Alega	Surface	Extraction	Large	post-700 BP?	(Clark 1992, Clark 1993)
AS-23-36	Auto	Buried	Flaking	Large	post-700 BP	(Taomia 2005)
AS-23-11	Sa'ilele Quarry					(Best *et al.* 1992)
AS-23-12	Usi	Surface	Extraction	Small	n.d.	(Clark 1989)
AS-23-14	Usi	Surface	Extraction	Small	n.d.	(Clark 1989)
AS-23-41	Faga'itua	Surface	Extraction	Large	n.d.	ASHPO site files
Not yet assigned	Utusi'a 1	Surface	Extraction	Large	n.d.	(Addison 2007e)
Not yet assigned	Utusi'a 2	Surface	Flaking	Large	n.d.	(Addison 2007e)
Not yet assigned	Amaua	Surface	Flaking	Small?	n.d.	(Addison 2007c)
Not yet assigned	Masefau 1	Surface	Flaking	Large	n.d.	Site recently found by ASPA; no written documentation available
Not yet assigned	Masefau 2	Surface	Flaking	Small?	n.d.	(Addison 2007a)
AS-22-31	Asiapa	Surface	Extraction	Small	n.d.	(Clark 1989)
AS-21-100	Lau'agae	Surface	Extraction	Small	n.d.	(Clark 1989)
AS-21-110	Le'aeno	Surface	Extraction	Small	n.d.	(Clark 1989)
AS-21-1	Tulauta	Surface	Flaking	Large?	post-700 BP?	(Brophy 1986, Frost 1978)
Not yet assigned	Tula	Surface	Flaking	Large	n.d.	Site recently found by ASPA; no written documentation available
Not yet assigned	Alao 1	Surface	Extraction	Small	n.d.	(Addison 2007d)
Not yet assigned	Alao 2	Surface	Flaking	Large	n.d.	(Addison 2007d)
Not yet assigned	Alao 2	Surface	Flaking	Large	n.d.	(Addison 2007d)

Investigation of the Tutuila Basalt Export Industry is only in its beginning stages, but several things can be said at this point. For areal coverage, only a small portion of Tutuila has been systematically searched for lithic sites. The majority of currently known sites on Tutuila are visible on the surface. Only six of the known sites are not visible on the surface. This is not coincidental. Archaeological surface survey will *only* find sites visible on the surface. Each of the buried sites was found during archaeological monitoring of construction activity. This

highlights the importance of careful attention to this activity. This is especially true if we want greater understanding of the timing of the development of the Tutuila Basalt Export Industry. Table 1 indicates that our understanding of lithic chronology on Tutuila comes largely from these subsurface sites found during construction monitoring.

The currently available evidence suggests that there was major basalt tool manufacturing on Tutuila in the post-700 cal BP period. It should be emphasized that this is only the very beginning of a chronological understanding of tool manufacture on the island. It remains unknown if there was major production before this period, if there were cycles of decline and resurgence in tool production, or if there was a steady increase through time. The Puapua and Malaeloa AS-32-13b sites document a later period of tool manufacture after ~500 cal BP.

The occurrence of a variety of sizes of lithic sites all over the island suggests that the tool manufacture on Tutuila was complex and widespread. This is not a situation with one quarry exploited during a discrete period and under one kind of production management. The fact that there are flaking areas at some distance from possible quarry sources raises questions about access to and control of quarries, intra-island exchange relationships, and the social, economic and political aspects of basalt tool production on the island. That finished tools were used, reworked, and reused repeatedly – often down to a mere stub of stone – suggests that high quality basalt was not universally available, or at minimum, had significant costs associated with its acquisition (Ishimura and Addison 2005, Ishimura and Addison 2007). The Airport Foaga Beds indicate large-scale adze finish-grinding at a location at least 5 km from any possible quarry source and some 15 km from any known quarry. This situation begs questions about how and why large numbers of tools were being finished so far from quarries. Geochemical sourcing offers a technique for generating data to begin addressing such questions.

Johnson (Johnson *et al.* 2007) has succeeded in geochemically distinguishing quarry material from the three major Pliocene volcanic provinces on Tutuila, laying the groundwork for future studies to assign artifacts from archaeological sites on Tutuila and beyond to particular quarries. Recent geochemical work by Winterhoff (Winterhoff 2003, Winterhoff *et al.* 2007) has succeeded in distinguishing different basalt source material from three different valleys (Tataga Matau, Maloata, and Malaeloa) *within* a single volcanic province. The Malaeloa sources can further be divided into three distinct groups. Winterhoff documents intra-island movement of source material between the source areas as well as to areas with no known quarries (e.g., Afao workshop sites obtained rock from sources in both Tataga Matau and Malaeloa). These initial studies suggest the rich possibilities for improving the understanding of the social, political, and economic aspects of the Tutuila Basalt Export Industry on Tutuila itself.

Regional Distribution of Tutuila Basalt Tools

The previous section has demonstrated the scale of basalt tool manufacture on Tutuila. But where were the tools used? Evidence from the region suggests widespread distribution of these Tutuila products (Table 2).

Table 2. Inter-island exchange of Tutuila basalt tools, arranged by distance from Tutuila (includes data from tables in (Clark 2002) and (Di Piazza and Pearthree 2001).

Location where lithics were found	Distance from Tutuila (km)	Quarry source	Date of context where found	Reference
‘Upolu	70	Tataga Matau, Malaeloa, Maloata, Eastern Tutuila, and Tutuila unknown	~1800 cal BP?	(Best *et al.* 1992, Winterhoff *et al.* 2007)
Manu’a, Ta’u	120	Tataga Matau	~2000 cal BP	(Best *et al.* 1992)
Savai’i	160	Tataga Matau	Surface	
‘Uvea	500	Samoan looking	Surface	(Sand 2006, Sand and Llau 2000)
Tokelau (general)	~600	Tataga Matau, Maloata, Malaeloa		(Winterhoff *et al.* 2007)
Tokelau, Fakaofo	560	Eastern Tutuila and Tutuila unknown	Pre-600 cal BP?	(Best *et al.* 1992)

Location where lithics were found	Distance from Tutuila (km)	Quarry source	Date of context where found	Reference
Tokelau, Nukunonu	590	Tataga Matau	Pre-600 cal BP?	(Best *et al.* 1992)
Cook Islands, Pukapuka	630	Tataga Matau	Pre-600 cal BP?	(Best *et al.* 1992)
Futuna	645	Samoan looking	Surface	(Sand 2006)
Tokelau, Atafu	670	Tataga Matau and Eastern Tutuila	post-1000 cal BP	(Best *et al.* 1992)
Tongatapu	910	Tataga Matau	"late" (post 300 cal BP)	(Best *et al.* 1992)
Fiji (general)	~1000	Maloata, Malaeloa	Surface	(Winterhoff *et al.* 2007)
Fiji, Cikobia	~1000	Morphology and mineralogy suggest Samoa	~500 BP	(Sand pers. comm. cited in Clark 2002, Sand *et al.* 2000, Sand *et al.* 1999)
Fiji, Vanuabalavu (Lau)	~1000	Tataga Matau	790-480 cal BP	(Best *et al.* 1992, Clark 2002)
Fiji, Yacata (Lau)	~1000	Morphology and mineralogy suggest Samoa	Surface	(Clark and Hope 2001)
Fiji, Taveuni	~1000	Tataga Matau	Surface	(Best *et al.* 1992)
Fiji, Lakeba (Lau)	~1000	Tataga Matau	900 BP?, 700-200 cal BP	(Best *et al.* 1992, Clark 2002)
Fiji, Moce (Lau)	~1000	Tataga Matau	Surface	(Best *et al.* 1992)
Fiji, Namuka (Lau)	~1000	Tataga Matau	Surface	(Best *et al.* 1992)
Fiji, Komo (Lau)	~1000	Mineralogy suggests Samoa	Surface	(Best 1984)
Fiji, Ogea (Lau)	~1000	Petrology suggests Samoa	Surface	(Best 1984)
Fiji, Karaba (Lau)	~1000	Tataga Matau	Surface	(Best *et al.* 1992)
Fiji, Fulaga (Lau)	~1000	Tataga Matau	Surface	(Best *et al.* 1992)
Fiji, Vatoa (Lau)	~1000	Morphology suggests Samoa	Surface	(Thompson 1938)
Fiji, Totoya (Lau)	~1000	Tutuila	Surface	(Clark and Cole 1987)
Fiji, Gau	~1200	Morphology suggests Samoa	Surface	(Clark 2002, Moce 1972)
Phoenix Islands, Manra	1070	Tataga Matau	550-750 cal BP	(Di Piazza and Pearthree 2001)
Tuvalu	1300	Eastern Tutuila and Tutuila unknown	Surface	(Best *et al.* 1992)
Cook Islands, Aitutaki	1300	Tataga Matau, Eastern Tutuila, and Tutuila unknown	600-800 cal BP	(Allen and Johnson 1997)
Cook Islands, Rarotonga	1450	Tataga Matau, Tutuila unknown	500-700 cal BP	(Sheppard *et al.* 1997)
Cook Islands, Ma'uke	1630	Tataga Matau, Asiapa	600-700 cal BP	(Best *et al.* 1992, Sheppard *et al.* 1997)
Reef/Santa Cruz Islands, Taumako	2300	Tataga Matau and Eastern Tutuila	Surface	(Best *et al.* 1992)
Reef/Santa Cruz Islands, Nupani	2300	Asiapa	Surface	(Best *et al.* 1992)
Reef/Santa Cruz Islands, Tikopia	2300	"Samoan looking"	post-750 cal BP	(Kirch and Yen 1982)
Solomon Islands, San Cristobal	2800	Tataga Matau	Surface	(Best *et al.* 1992)
Pohnpei	~4000	Tutuila	Surface	(Ayres and Mauricio 1987)

More than a decade ago, Best and colleagues (Best *et al.* 1992) conceptualized the temporal distribution of Tutuila tools in the region as concentric rings emanating from Tutuila. According to this scenario, in the earliest period Tutuila tools are found on the other islands in Samoa, with later distribution to Fiji and around the region (Best *et al.* 1992:68-69).

In the intervening 15 years, only the southern Cook Islands (Allen and Johnson 1997, Sheppard *et al.* 1997) and the Phoenix Islands (Di Piazza and Pearthree 2001) have been added. Allen and Johnson found that two adze fragments found on Aitutaki came from Tutuila, and other specimens are likely from eastern Tutuila or unknown Tutuila quarries (Allen and Johnson 1997:126). Two adze fragments from Manra in the Phoenix Islands closely match samples from the Tataga Matau quarry on Tutuila (Di Piazza and Pearthree 2001:147).

The Tutuila Basalt Export Industry - Summary

Tutuila was a major source of stone tools in the southwest Pacific. The fifty known quarry and tool manufacturing sites on Tutuila are only a small sample of such sites that are likely to exist on the island. Not only is the geography of lithic sites on Tutuila incomplete, there are major gaps in our understanding of most aspects of tool manufacture. Questions remain about: where tools were produced; the management of their production; the possibility of craft specialization and the timing of its emergence; the social, political, and economic relationships between communities where quarries were located and the (sometimes) distant communities where tools were produced. Finally, questions remain unanswered about how all of these changed throughout the more than two millennia of Tutuila's history.

Current evidence on the regional distribution of Tutuila basalt tools is fragmentary and has been largely dependent on the initiative of individual archaeologists to do geochemical analyses on lithics they have found on islands outside Tutuila. Even this partial evidence suggests how widespread Tutuila basalt was in ancient times. Surely there are many more islands within a 2000 km radius of Tutuila where such evidence remains hidden in the ground.

The timing of the manufacture and off-island distribution of Tutuila basalt tools remains to be well defined. Evidence from Tutuila is ambiguous, but there are growing indications of large-scale production at ~600-700 cal BP (Table 1). Sites with components earlier than this period are poorly dated and/or the association between dates and lithics is problematic. The late-prehistory extent of large-scale manufacture is also poorly dated, but two sites postdate ~500 cal BP. Interestingly, one of these may have specialized in tools interpreted as coconut graters (Addison 2007b).

Evidence from off-island shows Tutuila basalt spread throughout the Samoan Archipelago in the early periods of settlement (Table 2). It is unknown how extensive tool manufacture was on Tutuila at this time. Recently excavated sites at Aganoa[5], and Ulu Tree II (Addison and Winterhoff in prep) date to this period. Although lithic manufacture was not a significant component of either site, sourcing of the few lithics at these sites may provide information on which quarries were used in this earliest period of Tutuila history.

Outside of Samoa, the evidence mostly corresponds with the ~600-700 cal BP dates for large-scale tool manufacture from Tutuila sites (Table 2). Best initially dated Samoan adzes in Fiji to ~900 cal BP (Best 1984, Best *et al.* 1992). In an extensive review of the evidence for Samoan lithics in Fiji, Geoff Clark suggests that 650-450 cal BP is more likely (Clark 2002). More lithic samples from well dated stratigraphic contexts are needed. Currently all samples but two are from the Lau Group; wider geographic sampling in Fiji would be helpful. With 22 Samoan tools or flakes, Fiji currently has most of any archipelago with known Samoan stone imports.

Tutuila tools in Tokelau and Tonga are unexpectedly late given the proximity of these islands to Tutuila, but sites with lithics clearly dating to earlier periods remain to be found. Proximity and oral history suggest strong links between Samoa and Futuna/'Uvea (Sand 2006). Geochemical characterization needs to be done on the "Samoan-looking" tools that have been found on these islands. Nearby Niuatoputapu and Niuafo'ou are also likely candidates for having Samoan adzes (Figure 3). Regional weather patterns and parameters surrounding traditional voyaging technology suggest that Tutuila was ideally located for contact with a variety of islands in the region and this needs to be accounted for in discussions of tool distribution (e.g., Di Piazza and Pearthree 2001).

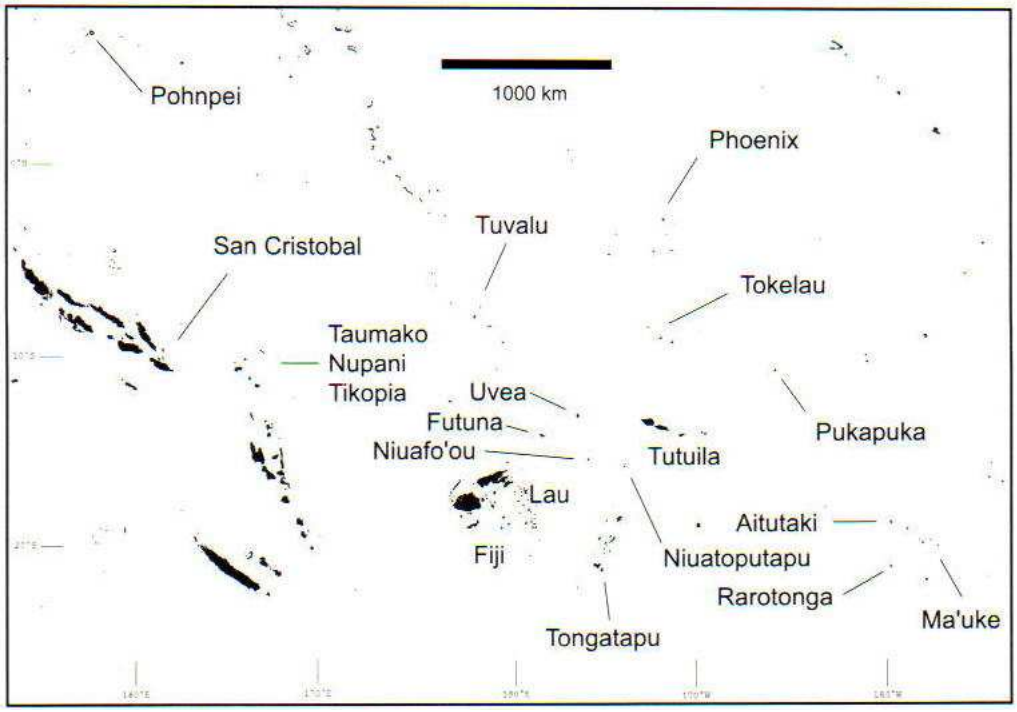

Figure 1. Regional locations mentioned in the text. Base map courtesy of Peter Minton (http://www.evs-islands.blogspot.com).

At 5600 km (from Pohnpei to Ma'uke), the geographic spread of Tutuila basalt is the largest known distribution of any material in Oceania. It surpasses the Oceanic spread of Bismarck Archipelago obsidian, although including the Indonesian spread of the latter makes its distribution some 6000 km (Summerhayes 2000). The recently published evidence for Hawai'i basalt in the Tuamotu Islands also involves a shorter distance (Collerson and Weisler 2007).

So far, lithics from the region geochemically sourced to Tutuila have been adzes or waste flakes. Bifacially modified flake tools interpreted as coconut graters (*tuai*) or vegetable peelers (*asi*) show a high degree of uniformity and occur in sites all over Tutuila. A recently discovered site in Puapua (Leone Village) may have specialized in these tools (Addison 2007b). Another site in the lagoon in front of 'Auma (Leone Village[6]) has a high number of these tools (Suafo'a-Taua'i pers. comm.) and may have also been a specialized manufacture site. These tools may have also been distributed in the region.

Much research awaits both in Samoa and in the region to develop a deeper and more comprehensive understanding of the Tutuila Basalt Export Industry.

Acknowledgements

Thanks to Christophe Sand for inviting me to present in the session "Past Interactions within the Western Pacific: the Archaeological Evidence", for comments on this paper, and for years of friendship and collegiality. Travel to Gotland would not have been possible without the generous assistance of the Easter Island Foundation, Mary Dell Lucas and Far Horizons Archaeological and Cultural Trips, Michael Coe, Jerome Glick, Ron Guttman, Pam Halfmann, Faith Hentschel, Wythe Holt, Sibyl Masquelier, Shawn McLaughlin, Joy Mundy, Jorge Navarette, Gary Rollefson, Jean Rusk, and Susan Silver.

Notes

[1] Although geologists make finer distinctions, I use basalt to refer to the range of basaltic rock found on Tutuila.

[2] Strata with abundant lithic-manufacture debris at Fagamalo were not directly dated, but are stratigraphically above a date of 1218±40 BP (WK11507).

[3]Clark apparently mistook this site for part of Tataga Matau, but Best *et al.* consider it a separate site.

[4] Winterhoff et al. (in press) indicate that "much of the [Malaeloa] valley and its hillsides were places of tool production."

[5] Excavated by Frederic Pearl and Suzanne Eckert in 2006.

[6]This site is exposed at low tide. I interpret it as having been deflated.

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