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OBSIDIAN POINT DISCOVERED ON KAPINGAMARANGI ATOLL, MICRONESIA: IMPLICATIONS FOR POST-SETTLEMENT REGIONAL INTERACTIONS

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ABSTRACT: An obsidian point was discovered by chance by local people on Kapingamarangi Atoll, a Polynesian Outlier in Micronesia. In addition to use-wear and residue analysis to identify its use, pXRF analysis conducted on it demonstrated that it was brought from the Admiralty Islands in Papua New Guinea over about 900 km. The information on other Admiralty obsidian artefacts found in western Oceania and other associated phenomena suggest that those artefacts were brought from the source through an interaction network between Micronesia and Melanesia during the first half of the second millennium AD. They had significant social value as prestige goods in the peripheral areas of the Admiralty obsidian circulation, serving as chiefly heirlooms and grave goods. In addition to skilful Caroline Islands seafarers, Polynesian Outlier populations had an important role in the interregional interactions during this dynamic period in the western Pacific, which was possibly activated by Polynesian intrusion into the region related to a larger Polynesian expansion into eastern Polynesia circa AD 1000. Further, we argue that the Saudeleur dynasty of Pohnpei, which achieved the development of a famous megalithic politico-religious centre, Nan Madol, was influential in the interaction sphere during its height in AD 1000–1500. Thus, by using archaeological, linguistic, historical, ethnological, oral traditional and DNA data, the interdisciplinary analysis of this rare obsidian artefact has deepened our understanding of post-settlement interaction in the region.

Keywords: obsidian point, interdisciplinary analysis, Kapingamarangi Atoll, Admiralty Islands, prestige goods, Polynesian Outliers, Saudeleur dynasty, post-settlement interaction

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Recent advances in archaeological sourcing studies have enabled us to identify prehistoric long-distance interactions in the Pacific, by demonstrating movements of artefacts and materials (Kirch and Weisler 1994: 297–301; McAlister 2019; Reepmeyer 2021; Weisler 1993, 1997). However, archaeologically recoverable evidence of past contacts is limited to non-perishable items, despite an array of ethnographically documented exchange commodities (e.g., foodstuffs, feather products, barkcloth, mats, cordage, wooden items (Green and Kirch 1997: 26; Sheppard 2020; Thomas 1991; Weisler 1997: 10)). In addition, other information contextualising the movements of archaeological artefacts is often limited. Thus, it is difficult to draw a complete picture of past interactions and identify motivations behind them, especially for long-distance movements, except for cases associated with such phenomena as climate change (Anderson *et al.* 2006) and the Tongan expansion (Clark *et al*. 2014, 2020).

In this study, we present the results of pXRF analysis and use-wear and residue analysis on a rare obsidian point discovered by chance on Kapingamarangi Atoll, a Polynesian Outlier in Micronesia (Fig. 1A). This is a significant finding to help us understand past interaction patterns in the region, as only coral limestone and beachrock (cemented sand) exist on the atoll. Due to the nature of the discovery, this artefact lacks contextual information. However, by combining the information on this artefact with archaeological, linguistic, historical and ethnological data on other obsidian artefacts and other relevant phenomena in western Oceania, we can delineate intriguing characteristics of obsidian exchange and significantly enhance our understanding of an aspect of post-settlement interregional interactions between Micronesia and Melanesia, which have been often described as "influence" or "connection" in such aspects as material culture (e.g., Bayliss-Smith 1978: 43) and biological characteristics (e.g., Hogbin 1940: 216–18) in the past.

THE KAPINGAMARANGI OBSIDIAN POINT

Discovery

The obsidian point[1] (Figs 2 and 6A) was discovered by local people during an expansion of a taro patch at the Haime section on Welua Islet, the bigger of the two currently inhabited islets, in 1986 (Figs 1B and 1C). It was found with many human bones, shell adzes and possible ornaments (i.e., perforated "fish teeth", perforated cone shells) 1.5–2.5 metres deep in a large excavation, although all items except for the obsidian point were subsequently broken and lost. Since the bones probably included those of a number of bodies, according to locals, the area was most probably an ancient cemetery. The location at the northern end of a large islet may have had a pre-Christian

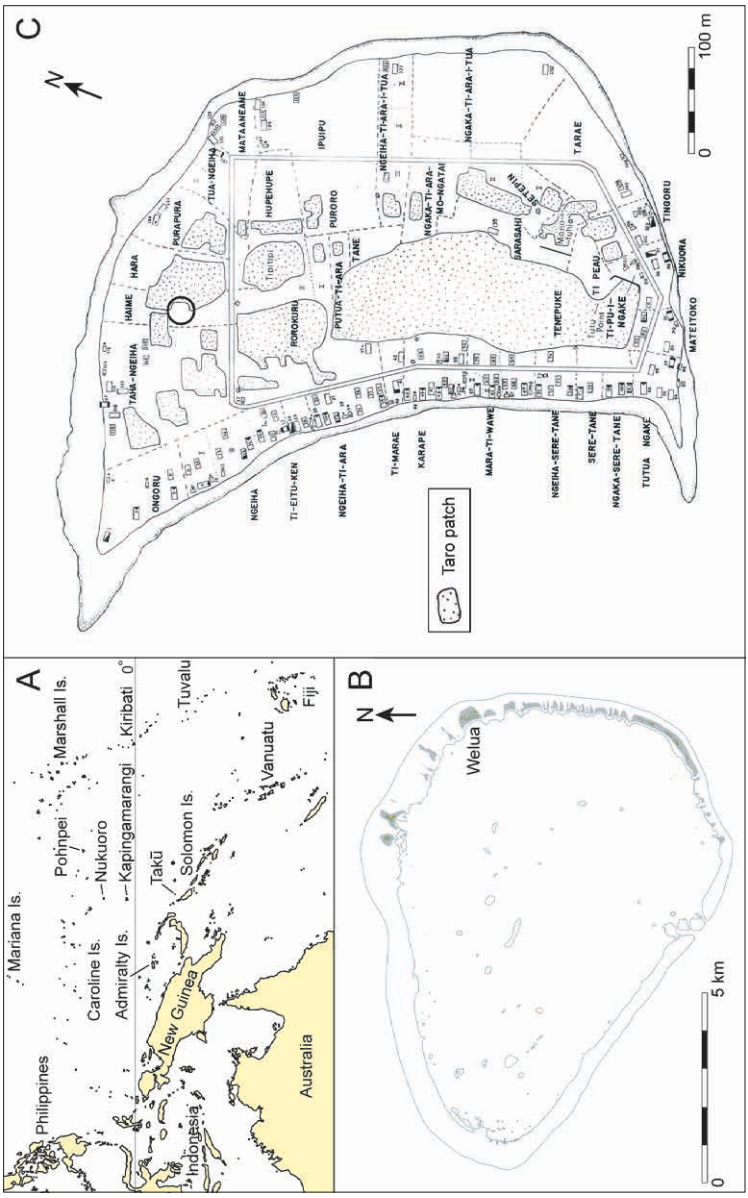

Figure 1. (A) The western Pacific; (B) Kapingamarangi Atoll; (C) the find spot of the obsidian point on Welua Islet (in circle) (after Emory 1965: 84, fig. 7).

Figure 2. The obsidian point from Kapingamarangi.

ideological significance. There is no tradition of a burial at the location nor knowledge of the age of the taro patch, which may suggest that the obsidian point could have some antiquity.

More recently, this obsidian point, which has been kept at a souvenir shop in a Kapingamarangi settlement on Pohnpei, came to the senior author's attention and was loaned to him for pXRF analysis at the University of Auckland and use-wear and residue analyses at the Australian Museum in 2012 (Kononenko 2012).

Description

The obsidian point has a very long lozenge shape in plan view with a relatively flat ventral surface. The distal half is used to form a blade which is minimally retouched on the right edge, while the proximal half is bifacially flaked to create a tang. One-third of the dorsal surface of the tang is extensively retouched toward the dorsal ridge, while only the distal end is retouched on the ventral surface. The cross-section is roughly triangular at the blade and forms a semi-cylindrical shape at the retouched tang. It measures 234.8 mm long, 57.4 mm wide and 14.3 mm thick and weighs 180.5 g.

pXRF Analysis

In order to identify the geochemical source of the blade it was submitted to pXRF (portable X-ray fluorescence spectrometry) analysis at the University of Auckland's Anthropology Laboratory. The instrument used was an Innov-X Delta Series analyser (Rh anode, Si drift detector, 8–40 keV, 5–200 μA). The blade was analysed using the instrument's soil mode, which has the capability of detecting 29 elements. Analysis time was set at 180 seconds and the analysis was performed on the flattest surface available to minimise surface effects. The sample was also analysed three times in three separate loci and the results averaged to account for possible heterogeneity. Twelve elements were detected and measured, and these are reported in Table 1. The elemental composition was compared with the results of analyses (using the same instrument and settings) of archived samples from source locations in Near and Remote Oceania (Sheppard *et al*. 2010). Accuracy and precision were assessed using periodic analysis of the international standards ANU 2000 Wekwok and NIST SRM 278 (powdered obsidian from Clear Lake, Newbury Crater, Oregon) as well as the internal standard Mayor Island 9.3. The results of the NIST SRM 278 analyses are reported in Table 2. All elemental concentrations were subsequently calibrated by linear regression using these three standards. The results for the external standard are reported in Table 2. These show reasonable accuracy and good precision for all elements reported, with the exception of Pb in the ANU 2000 Wekwok sample. This is likely due to the concentration of Pb in this source being close to the detection level of the instrument.

While often multivariate methods are required in geochemical analysis, in this case bivariate plots are sufficient to identify the source location of the blade. A bivariate plot of Rb Log10 and Y Log10 for the blade and all previously measured source-region samples shows a clear relationship between the blade and the Admiralty Islands source region (Figs 3 and 4). A bivariate plot of Zr Log10 and Sr Log10 with the samples restricted to individual sources of the Bismarck Archipelago shows a clear grouping within the Admiralties and tentatively, given the single reference sample, to the Wekwok locality (and this relationship is consistent with the concentration of Rb or Sr substituted for that of Fe, Ti or Y). Although not described here, discriminant analysis and principal component analysis using K, Zn, Ca, Ti, Mn, Fe, Rb, Sr, Zr, Pb, Y and Nb confirm this relationship. Thus, this analysis identifies its source as most probably Wekwok on the northwestern side of Lou Island in the Admiralties, which was a major obsidian source in the Bismarcks in the past two millennia (Fredericksen 1997: 380–83; Torrence *et al*. 2014), and shows that it was transported from the source over about 900 km.

Table 1. Elemental concentration results (ppm) for sample.

Element	Analysis 1	Analysis 2	Analysis 3
K	29,816	31,446	30,189
Zn	32.3	36.9	34.7
Ca	6,122	6,608	6,217
Ti	1,549	1,681	1,581
Mn	426	438	430
Fe	11,137	12,189	11,521
Rb	146.2	152.3	148.1
Sr	66.4	69.2	67.5
Zr	219	225	220
Pb	6.4	6.1	5.9
Th	18	15	15
Y	37.6	38.5	37.5
Nb	28.4	31	29.1

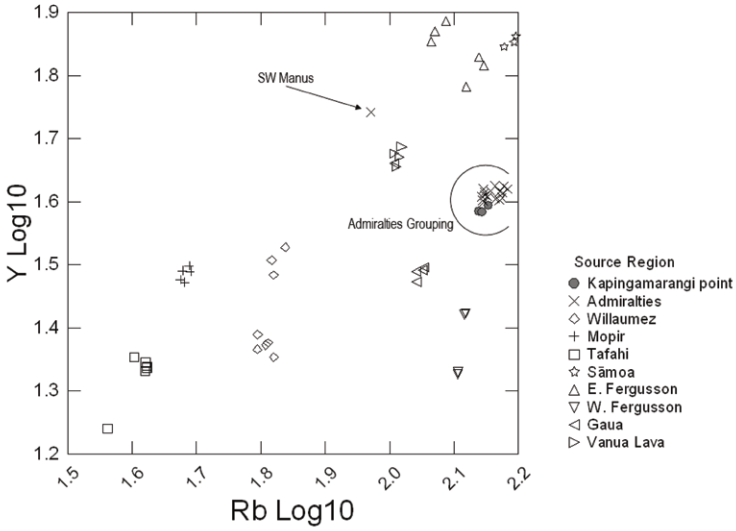

Figure 3. Source region.

Table 2. Elemental concentration results (ppm) for standard reference material. NIST 278 N = 15.

	pXRF			NIST	
Element	Mean	SD	CV	Mean	Error
K	33,337.3	1,069.9	0.032	34,534.3	166.0
Zn	50.6	1.3	0.025	55.0	Recommended
Ca	6,623.0	558.8	0.084	7,025.5	14.3
Ti	1,332.2	98.3	0.074	1,468.7	42.0
Mn	405.5	5.1	0.012	402.0	15.5
Fe	14,119.5	316.2	0.022	14,278.7	140.0
Rb	125.3	2.2	0.017	127.5	0.3
Sr	62.3	1.9	0.031	63.5	0.0
Zr	272.3	4.9	0.018	*290.0	30.0
Pb	17.4	0.7	0.041	16.4	0.2
Y	40.9	0.7	0.018	*39.0	5.0
Nb	16.5	0.7	0.041	*18.0	5.0

*Consensus values from Hollocher *et al*. (1995).

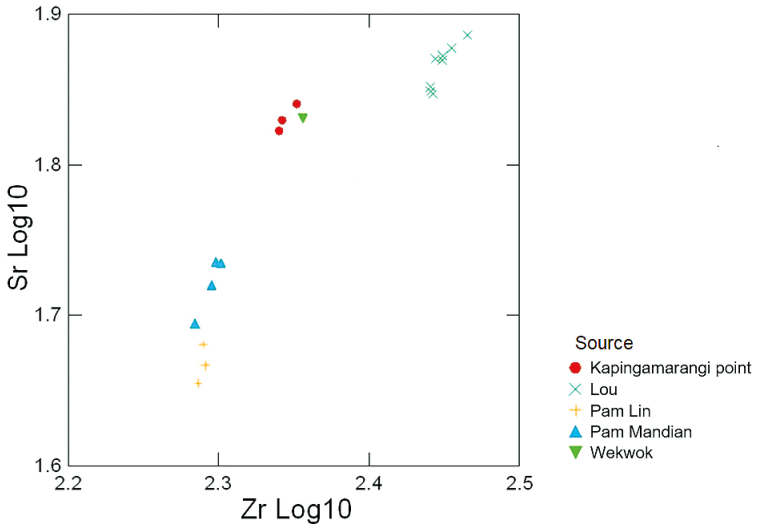

Figure 4. Source.

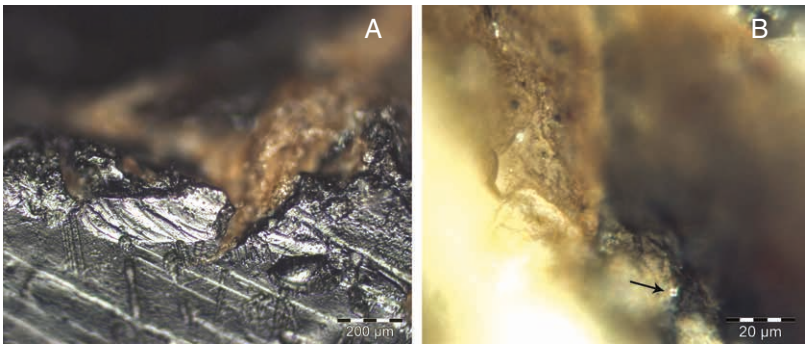

Figure 5. Use-wear and residue: (A) hafting wear and residues on dorsal side of the stem (×100); (B) residues and starch grain on ventral side of the stem (×1000). From Kononenko (2012: 4–5).

Use-wear and Residue Analysis

Microscopic use-wear and residue analysis identifies some spots on the dorsal and ventral sides of the stem that preserved rough abrasion, striations and plant residues (Fig. 5A). The residues are embedded into scratches and striations and include starch grains (Fig. 5B). Patterned wear attributes on the stem in association with plant residue and starch suggest that the tool was probably wrapped or hafted using organic plant materials (Kononenko 2012). This is in keeping with the specimen having had a haft made up of a loose bundle of sago fibres, covered by a kind of paste or putty made from the *Atuna* nut (Torrence 2002: 74), as ethnographically known for this island group. This would have enabled it to be used as a spear for hunting wild pigs or as a dagger or knife (Nevermann [1934] 2013: 296–310; Parkinson [1907] 2010: 274). Use-wear analysis shows no signs of edge rounding or polish on the edge of the point, suggesting that the point did not have a utilitarian function (Kononenko 2012).

The Kapingamarangi Point's Position in the Admiralty Obsidian Sequence

In this section, we will examine the Kapingamarangi point's position in the Admiralty obsidian sequence to determine its age based on its morphological traits, although that chronological sequence is rather coarse-grained (Ambrose 2002; Fredericksen 2000). Obsidian sources in the Admiralties began to be used possibly around 12,000 years ago, but more certainly around 7,000–8,000 years ago. During the Lapita horizon, the Admiralty obsidians, mainly in form of flakes, appear outside the island group for the first time not only in the Bismarck Archipelago but also in the northern Solomons, the Santa Cruz Islands and Vanuatu in the east as well as northern New Guinea and Borneo in

the west. But their distribution contracted to the Bismarcks by around 2,500 years ago at the end of the Lapita period (Ambrose 2002; Summerhayes 2009).

A new formal point type appeared by 2,100 years ago on Lou, and around 2,500–2,100 years ago it was found in association with Lapita ceramics on Buka in the northern Solomons (Wickler 1990: 147). The new point form is highly retouched, having a triangular or trapezoidal cross-section. This complex technology was lost at some poorly resolved point between 1,600 and 700 years ago, and stemmed blades, which are only minimally retouched for functional reasons to produce a haft or a pointed tip (Fredericksen 2000: 104), appear. This minimally retouched form continued to be used as spear and dagger points into the early historic period.

The Kapingamarangi point shows characteristics of those with minimal retouch during the last period of the Admiralty obsidian point sequence. However, it is somewhat unique as similar points do not have such careful retouch around the haft. Although the shape and size are very similar to those that were hafted as ethnographic spears and daggers from the Admiralty Islands, the systematic, rather flat retouch on the proximal (bulbar) end of the dorsal side of this point is unusual (Robin Torrence, pers. comm., 21 November 2012). Substantial flaking skill was required to make this point. Since there is no stone-working tradition on Kapingamarangi, a coral atoll, it was almost certainly transported there as a finished product.

ADMIRALTY OBSIDIAN ARTEFACTS IN THE WESTERN PACIFIC

Distribution of the Admiralty Obsidian Blades Outside the Bismarck Archipelago During the Second Millennium AD

Past studies indicate that Admiralty obsidian blades were rather narrowly traded in the Bismarck Archipelago, as far as Buka in the east, and the New Guinea mainland during the second millennium AD before European contact (Ambrose 1978: 330; Key 1969: 49; Summerhayes 2009: 118–19; Torrence 2000: 133). The regional distribution of the large obsidian blades may be partially obscured by limitations in museum documentation, which often lists Admiralty Island obsidian spears and daggers in the collection as derived from the Admiralty Islands, rather than noting the specific place where they were collected, which may be unknown (Robin Torrence, pers. comm., 15 October 2012). The only examples documented outside the region during that period are intriguingly from Polynesian Outliers (Nukuoro, Kapingamarangi and Takū) and Pohnpei in Micronesia (Fig. 1A).

On the Polynesian Outlier atoll of Nukuoro, a close neighbour of Kapingamarangi, a long obsidian blade (Fig. 6B) was reported to be in the possession of Chief Leka in 1910 (Eilers 1934: 179). According to a local legend recorded by a German visitor, Carl Jeschke (2013: 229), a large outrigger canoe crewed by people from "Hiti" stood off Nukuoro and was

seized by Nukuoroan men after brief fighting. The strangers were spared, and their weapon, the obsidian blade, giva,[2] and the fossilised *Tridacna* shell object called papa[3] were seized along with coloured stones. *Hiti* is a reflex of Proto-Polynesian **Fiti* 'traditional place name', which generally refers to 'Fiji' in many Polynesian languages, while in Outlier languages, its reflexes refer to neighbouring Melanesians (e.g., Nukuria, Takū, Tikopia) or legendary indigenous (pre-Polynesian) populations (e.g., Rennell) (Greenhill and Clark 2011). Hiti people appear in a few Nukuoroan legends, in which they visited Nukuoro and had a hostile relationship with Nukuoroan people (Jeschke 2013: 228–29). It seems that this Nukuoroan word currently means 'mythical foreign land', but originally it referred to Melanesians in the south, as it still does in some North Central Outlier[4] languages. The reference to Hiti as the source of the obsidian point suggests its Melanesian origin. According to Jeschke's drawing (Fig. 6B), the obsidian artefact was a prismatic blade, which has no retouch. It measures 16.5 cm long, 3.1–4.3 cm wide and 1.3 cm thick. Both ends are broken, and it was said to have been originally an arm's length long, although this is likely an exaggeration.

On Takū Atoll, a German ethnologist, Richard Parkinson (1986: 10), observed several obsidian spear tips in the late nineteenth century, which he assumed, probably based on their morphology, had their origin in the Admiralty Islands. Although present islanders do not have any memory of them (Moyle 1997), a local legend provides further information. According to this story, the magical "diamond" called *kiva*, a cognate of *giva*, the Nukuoroan word for an obsidian point, was transported from somewhere by a founding canoe, *Taoa*, which is said to have migrated to Takū and subsequently travelled to "Samoa" as well as visiting several islands, including "Rotuma", "Tikopia", "Sikeiana" (Sikaiana) and "Liuaniua" (Ontong Java), to bring back dances for the entertainment of the sacred chief, Ariki. This stone was used by an ancestral spirit, Rapi, one of *Taoa*'s crew, to create a well (Moyle 2007: 259–60; 2018). Although the legend does not specify the origin and rock type of kiva, a local informant's description of it as a shiny stone and Parkinson's report suggest that it is most likely an obsidian object transported from the Bismarck Archipelago, most probably the Admiralties, according to the late prehistoric obsidian circulation pattern (Summerhayes 2009: 118–19).

In Pohnpei, four obsidian artefacts were discovered in the famous megalithic ruin of Nan Madol. In the early colonial period, two obsidian points were recovered from the (probably single) stone tomb on the most sacred and architecturally elaborate islet, Nandouwas (Ayres and Mauricio 1987: 29), which served as the resting place of Saudeleur rulers and subsequently early paramount chiefs (Nahnmwarki) of the Madolenihmw chiefdom according to oral tradition (Hadley 2014). One was excavated with human bones and a large number of shell valuables, such as shell ornaments

(e.g., beads, bracelets, pendants), pearl-shell lure shanks and large shell adzes (probably of *Tridacna* shells), at the central tomb by an English scholar, Fredrick W. Christian (1897: 103; 1899: 89–91), in 1896. The other was excavated in the (probably same) "royal grave" with a reddish potsherd and stone blades by the missionary Weise during the German colonial period (Schurig 1930: 7). Although it was subsequently lost, a drawing (Fig. 6C) shows that it was a retouched flake broken in the middle (Ayres and Mauricio 1987: 29–30). Some archaeologists (Ambrose 1978: 330; Spriggs 1997: 128) believe that this blade was from the Admiralties. Two very small obsidian flakes were excavated from two layers in a test pit on Usendau Islet, next to Nandouwas, in a modern archaeological excavation (Ayres *et al*. 1983: 165–66). One was subsequently lost. Instrumental neutron activation analysis (INAA) was conducted on the other piece. Although the data is not directly comparable to that used in current Bismarcks sourcing, the authors suggest a Solomon Island source (Ayres *et al*. 1997).

Ages of the Obsidian Blades Found Outside the Admiralties

Among the obsidian artefacts discussed above, the most archaeologically well-dated ones are those found at Nan Madol in Pohnpei. They date from the height of the Saudeleur dynasty in the first half of the second millennium AD. The two obsidian flakes found on Usendau, for example, are younger than 1190 BP in a dated level (Ayres *et al*. 1983: 128, 165–66). The dates of the two obsidian points found on Nandouwas are unknown due to the nature of the discovery. Although some European artefacts are known to have been found on that islet (Athens 1981), we are not aware of any historical accounts that record Europeans using Admiralty Island obsidian artefacts to exchange with other islanders (Torrence 2000; Robin Torrence, pers. comm., 20 August 2022). Thus, those two obsidian points also likely fall in a similar time range, as the artificial islet was constructed around AD 1180–1200, according to recent high-precision Th/U coral dating (McCoy *et al*. 2016). Therefore, those obsidian artefacts found at Nan Madol are presumably dated between AD 1000 and AD 1500 before the fall of the Saudeleur dynasty (Ayres 1990: 202), when Nan Madol lost its position as the religious-political centre of Pohnpei and its influence supposedly diminished in the region. This accords with the morphological features of the point (Fig. 6C), which are like those known from the last period of the Admiralty point chronological sequence (Fredericksen 2000).

The other obsidian artefacts found on the Polynesian Outliers lack archaeological contextual data, although their morphological traits and traditional information indicate their antiquity, probably placing them in a similar time range to the Nan Madol artefacts. First, the Nukuoro point (Fig. 6B) shows characteristics of the final period in the Admiralty sequence, as do those from Nan Madol and Kapingamarangi.

Second, both Nukuoroan and Takū legends discussed above place their relative chronological position in the early settlement phase or immediately after in individual islands' oral histories. Among Jeschke's (2013) chronologically ordered 15 Nukuoroan legendary accounts and 103 recorded high priests from colonisation to the late nineteenth century, the myth of the obsidian artefact is in the fifth story, immediately after a series of stories related to the founder (the first high priest) of the island Vave and before the

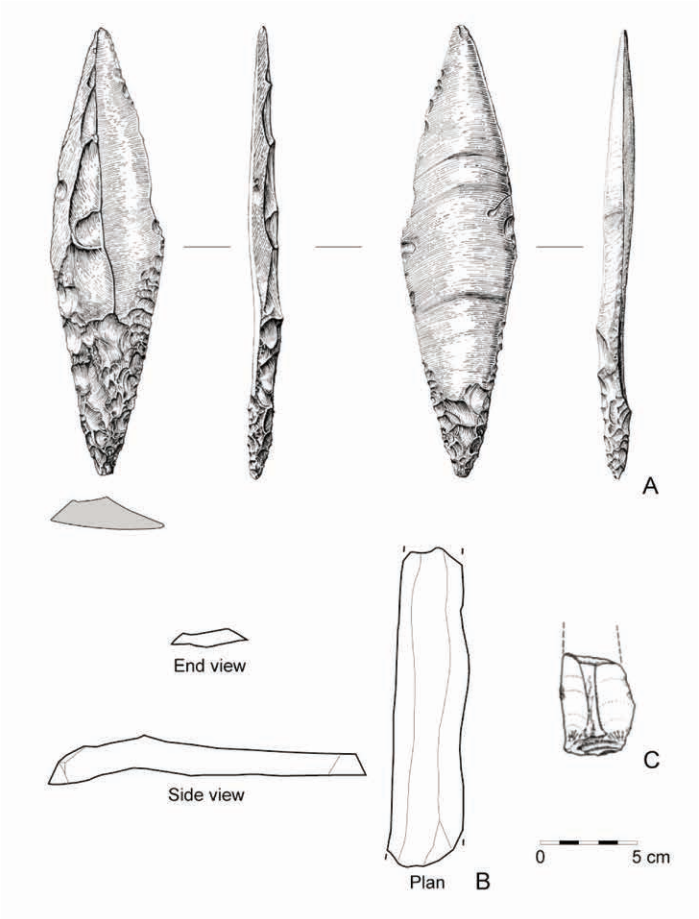

Figure 6. (A) The obsidian point from Kapingamarangi; (B) the obsidian flake from Nukuoro (drafted based on Jeschke 2013: 231, fig. 94); (C) the obsidian flake from Nan Madol, Pohnpei (after Ayres and Mauricio 1987: 30, fig. 4, left).

seventh story during the eighteenth high priest's reign (p. 229). Although the Nukuoroan oral history is rather sketchy, this seems to indicate a deep time depth for the event, placing it immediately after the initial Polynesian settlement. The Takū legend is about one of the founding canoes, which also places it at a very early stage of the island's history (Moyle 2007: 259–60).

Third, those obsidian artefacts found on Polynesian Outliers are dated during or after the Polynesian settlement in the first half of the second millennium AD, according to the archaeological data on the Northern Outliers (Nukuoro (Davidson 1971, 1992) and Kapingamarangi (Leach and Ward 1981)) and the documentation of Northern and North Central Outliers' names (Kapingamarangi, Nukuria, Takū, Nukumanu, Sikaiana and Nukuoro) in 1664 (Lévesque 1993: 251–52), as discussed below. Thus, these lines of archaeological and oral historical information can be interpreted to suggest that obsidian artefacts from Pohnpei and the Polynesian Outliers date to within the same period.

Linguistic Evidence of Obsidian Blades

Two sets of linguistic data related to obsidian in western Oceania offer important information to enhance understanding of prehistoric interaction in the region. First, Nukuoroan *giva*[5] and Takū *kiva* are reflexes of Proto-Central Pacific **qiwa* 'fire-lighting stone' (Paul Geraghty, pers. comm., 8 November 2022; cf. Greenhill and Clark 2011).

Proto-Central Pacific *qiwa 'fire-lighting stone'

Fij†: Fiji *qiwa* 'a flint stone: properly a thunderbolt, or stone that falls in a tempest well known by the natives' (Hazlewood 1850)

Pn: East Futunan *kiva* 'flake/splinter of glass, stone' (Moyse-Faurie 1993)

Pn: East Uvean *kiva* 'sharp piece, sharp fragment' (Rensch 1984)

Pn: Marquesas *kévá* 'a stone for slinging, likewise shot or ball' (Crook *et al*. 1998)

Pn: Marquesas (Nukuhiva) *kiwa* 'stone' (Hale 1848)

Pn: Marquesas (Nukuhiva) *kiva* 'plomb, balle de fusil' (lead, bullet) (Zewen 1987)

Pn: Nukuoro *giva* 'legendary obsidian weapon, which is said to be brought by foreigners from Hiti' (Jeschke 2013: 229)

Pn: Rennellese *kiba* 'knife, sharp stick' (Elbert 1975)

Pn: Takū *kiva* 'mythical "diamond" with which the spirit ancestor Rapi created the well on Takū island named after him' (Moyle 2011)

Pn: Tuvalu *kiva* 'superincise, circumcise' (Ranby 1980)

Pn: Vaeakau-Taumako *kiva*, *kive* 'former old word for adze' (Green n.d.)

Pn: West Uvean *giwa* 'hache pour couper le bois' (axe for cutting wood) (Hollyman 1987)

†Fij: Fijian; Pn: Polynesian.

It seems reasonable to assume that imported obsidian objects (most likely from the Admiralties) were commonly referred to using these cognate words in the Northern and North Central Outliers, which probably circulated them among them and beyond. This indicates that the Polynesian communities of those Outliers had close interactions among them, as shown by oral traditions (Moyle 2007: 22–28; Parkinson [1907] 2010: 394–400) and other lines of evidence discussed below.

Second, another set of linguistic borrowings related to obsidian in the region indicates the importance of Caroline islanders/Northern Outlier populations in Admiralty obsidian transfer in the region. The words for 'obsidian' in the Admiralties (the eastern Admiralty languages) are reflexes of Proto-Admiralty **patu i Lou* 'stone of Lou (Island)' (e.g., Loniu *piciluw*, Bipi *patilow*, Titan *pataniw*, Nauna *periliw*) (Blust 2021: 17), named after the major obsidian source in this island group, while it is called *palanga* in the Mussau-Emira languages of the neighbouring Mussau Islands.[6] The Mussau-Emira word appears to be a borrowing from one of the Nuclear Micronesian or Northern Outlier words for 'iron, foreign disease, foreign', most of which were in turn borrowed from Malay *paraŋ* or Malay-derived loanwords for 'machete, bush knife' (Blust and Trussel 2020) spread among Western Malayo-Polynesian/Central Malayo-Polynesian languages in the Philippines, Malaysia and Indonesia, possibly from plural sources at different times (cf. Tent and Geraghty 2001[7]), as iron tools were in use at least by the beginning of the first millennium AD in Island Southeast Asia (Bellwood 2007: chap. 9) and western Caroline islanders visited there to obtain iron tools even before western contact (e.g., Fitzpatrick 2008).

WMP†: Palauan *balang* 'Yapese stone money' (McManus and Josephs 1977: 74)

Mic: Tobian *pahang* 'iron' (Black 2017: 162)

Mic: Ulithian *paarang* 'metal, bell' (Mellen and Hancock 2010)

Mic: Woleaian *paarang* 'iron, wire, bell, metal' (Sohn and Tawerilmang 1976: 267)

Mic: Satawalese *paarang* 'metal, iron; bell' (Sauchomal *et al*. 2018: 177)

Mic: Satawalese *kinipaarang* 'smallpox, chicken pox' (*kiin* 'skin; the bark of a tree; skin disease') (Sauchomal *et al*. 2018: 116, 117)

Mic: Puluwat *paarang* 'small pox' (Elbert 1972)

Mic: Chuukese *paarang* 'rust; small pox, measles' (Goodenough and Sugita 1980: 273)

Mic: Pohnpeian *pahrang* 'a type of pox (of before European-originated small pox)' (Hambruch 1932: 172; Lawrence *et al*. 1973: 63–64, 162–63)

Mic: Mwoakilloa *pahrang* 'metal' (Harrison and Albert 1977: 66)

Mic: Pingelap *pahraeng* 'metal' (Hattori 2012: 256)

Mic: Kosrae *paclahng* 'tumor, abscess; foreign, non-native, alien, strange' (Lee 1976: 241)

Pn: Nukuoro *baalanga* 'metal' (Carroll and Soulik 1973: 16)

Pn: Kapingamarangi *baalanga* 'metal' (Lieber and Dikepa 1974: 21)

Pn: Kapingamarangi *baalangi* 'European, American' (Lieber and Dikepa 1974: 22)

Adm: Mussau-Emira *palanga* 'obsidian'

†WMP: Western Malayo-Polynesian; Mic: Nuclear Micronesian; Pn: Polynesian; Adm: Admiralties.

Although it is difficult to identify the precise source of the Mussau-Emira word phonologically (Ken Rehg, pers. comm., 13 February 2022), we suggest a possibility that it was borrowed from a Northern Outlier source due to the Northern Outliers' involvement in Admiralty obsidian transfer based on other lines of archaeological and linguistic evidence discussed in this study.[8] This linguistic borrowing indicates that Northern Outliers participated in transporting Admiralty obsidian to the Mussau Islands at one time during the second millennium AD.

Overall, these two sets of linguistic evidence suggest that those Polynesian Outliers had a role in the transportation and exchange of Admiralty obsidian in western Oceania for some period in prehistory. This model is strengthened by other lines of evidence discussed below.

Significance of Obsidian Blades

We can suggest some characteristics of the role of obsidian artefacts in those Outliers. In the Admiralties, a chief's obsidian-tipped spears were property, along with land and canoes, that was passed down as patrilineal heirlooms (Parkinson [1907] 2010: 307; cf. Fullagar and Torrence 1991: 140). In the areas of peripheral circulation of the obsidian discussed here, the rareness, visual aspect and transportation costs of obsidian artefacts seem to have significantly increased their social value as prestige goods.

In the case of the Kapingamarangi obsidian point, as the use-wear analysis (Kononenko 2012) suggests, it did not have a practical function but more likely a social and symbolic one. The Nukuoroan and Takū legends discussed above relate to their mythical origins. Related to this, the latter legend attributes magical power to the obsidian object. The chiefly possession of the Nukuoroan blade and its associated legend suggest that it worked as the chiefly family's valuable and heirloom. The ones excavated from the most important stone tomb in Nan Madol and the Kapingamarangi example served

as burial goods. The former ones' association with other shell valuables, which are exclusively found in status and ritual contexts, suggests their social significance. They were probably treated as an exotic tribute to Saudeleur rulers, who used them to promote their chiefly authority in a similar way to the associated shell valuables.

POST-SETTLEMENT INTERREGIONAL INTERACTIONS

Polynesian Outliers as Mediators

As we have seen above, Polynesian Outliers, especially the Northern Outliers, may have had a role in transporting Admiralty obsidian in western Oceania during the first half of the second millennium AD. Intoh (1999) discusses archaeological (*Terebra*/*Mitra* shell adzes and pearl-shell trolling lure shanks) and ethnographic (backstrap looms and kite fishing) evidence of post-settlement contact between Micronesia and Melanesia. There had been a voyaging corridor between the two regions through the Northern Outliers for a long period. As soon as those atolls became inhabitable after 2000 BP (Dickinson 2009: 7), this route came into use and possibly facilitated eastern and central Micronesian colonisation. From then, this corridor was used for a long term throughout prehistory, which created the distribution of shared cultural traits mentioned above. Except for kite fishing and lesser-known pearl-shell trolling lure shanks, other traits (e.g., backstrap looms (Nagaoka 2004), *Terebra*/*Mitra* shell adzes, beaked *Tridacna* shell adzes (Craib n.d.), pulaka-like forms for *Cyrtosperma* taro (Kikusawa 2010: 84–88)) have characteristic widespread distributions in Micronesia and narrow distributions in Melanesia, suggesting the prevailing direction of diffusion from the former to the latter, in which skilful central Carolinian seafarers had an important role in the transmission.

To understand the Caroline islanders' interaction sphere during the first half of the second millennium AD, a valuable source is an historical account by four Ifalik islanders who drifted from their home island in the central Carolines to the Moluccas in 1664 (Lévesque 1993: 249–53). They could list island names for nearly the entire Carolines between Tobi and Kosrae, including Nukuoro and Kapingamarangi and some islands in the Marshalls and Kiribati (Fig. 7). Further, their geographical knowledge of the south extends from northeastern Indonesia to the Bismarck Archipelago along the northern New Guinea coast, enumerating unidentifiable islands, Pigiluil, Liselei, Luol, Gugotal, Tagaiofisir, Lurra, Faluerser and Namolosit. Intriguingly these island names recorded in Spanish show some correspondences with those in Woleaian (Krämer 1937: 274) and Mortlockese (Namoluk-Lukunor) (Krämer 1935: 106) lists of the southern islands documented in 1910, suggesting that this is shared knowledge among the central Caroline islanders (Table 3), although it is difficult to

identify them—except for two possibilities, Pigiluil as Pelleluhu in the Ninigo Group (Jacobs 1980: 406) and Faluelnudja/Nudja as Nusa on the northern tip of New Ireland (Krämer 1937: 274)—due to the use of old island names and language barriers between the Carolinians and Melanesians/foreign transcribers. This corresponds with contemporary central Carolinian navigators' knowledge, which includes sea-lanes of Sonsorol–Manus, Philippines–New Guinea and Kosrae–Solomons (Ali Haleyalur, pers. comm., 6 April 2022).

Table 3. Lists of the southern islands from the west to the east by Ifalikese, Woleaian and Mortlockese. Names in bold show sound correspondences among them and underlined ones indicate possible correspondences.

Ifalikese	Woleaian*	Mortlockese
Pigiluil		
Liselei	**Faluelidjel**	
	Faluelnugaraurau	Fanuane
	Faluelnumau	**Numul**
		Fanuan
	Faluelnudja	**Nudja**
	Faluelnuteten	Fanua Nuram
Luol	**Faluelluiol**	**Nuol**
Gugotal	Faluelnauporoi	Urur
Tagaiofisir	Faluelikelau	Leu
Lurra		Fituwai
Faluerser	Falueliep	Mokinpeito
	Jevesi	
Namolosit	**Namofizi**	
Tapeipei		
Moiao		

**Faliuwe-* (*falu* in this German orthography) in Woleaian names is the possessive classifier for islands (Sohn and Tawerilmang 1976: 64).

It is remarkable that the older Ifalikese list includes Polynesian Outliers in Melanesia, which are not found in the two other more recent lists nor in contemporary Carolinians' knowledge, suggesting the contraction of the Caroline islanders' interaction sphere in the latter half of the second millennium AD:

> East of them, 4 or 5 days away is Tapeipei and further east is Moiao, circular; Laguria [Nukuria] Tangun [Takū], and north of it Lugumanes [Nukumanu], Peilau[9] [Ontong Java], a big island, and 4 leagues away Segeial [Sikaiana].
>
> The latter six islands are often visited by Piguilapese [Ifalik people]. All six use the same language. They know about deep-sea fishing with a line. They make boats with very large trees and cover them with deck as the white people do. …
>
> East of Segecial [*sic*] [Sikaiana] at 16 or 20 days of sailing is Tugupia [Tikopia], whose king is named Fatia.[10] It is like Pigilap [Ifalik], big, somewhat elongated; it is a volcano, a lagoon and its own language. Three days further east is Lupali [Nupani], with an active volcano. Its natives are cannibals. Northwest of it is Pigirran[11] [Kapingamarangi]. In sight of the latter lies Tolufuri, big, with a volcano: they are cannibals. Within sight is Ytarao [Tarawa], bigger; they eat human flesh as on the two previous islands. (Lévesque 1993: 251–52)

Those six islands, whose people used the same language, are North Central Outliers, including five identifiable islands (Nukuria, Takū, Nukumanu, Ontong Java and Sikaiana), and one unidentifiable island, possibly the Carterets (Kilinailau), an atoll known to have been previously inhabited by Polynesians in this area according to oral traditions (Spriggs 1997: 198). Their account that they frequented those islands corresponds with a recent DNA study's interpretation of distinctive mitochondrial sequences from Ontong Java as a Micronesian introduction (Gentz 2005: 462). Further, their geographical knowledge extended to two Polynesian islands, Tikopia and Nupani, in the Santa Cruz group. This account clearly illustrates the communication network among the Caroline Islands, Northern Outliers and North Central Outliers, which contributed to the transmission of cultural traits between Micronesia and Melanesia discussed above.

In Micronesia, such prehistoric interactions are probably supported by the existence of masks called *tapuanu* on Satawan Atoll in the Mortlocks, which are common in Melanesia but not in Micronesia, and are thought to be derived from Melanesia (Feldman 1986: 29). Possible direct archaeological evidence is one quartz crystal found at a level tentatively dated between AD 500 and AD 1100 on an islet at Nan Madol (Athens 1990: 30), whose closest possible source is New Guinea. An exotic sherd collected on the

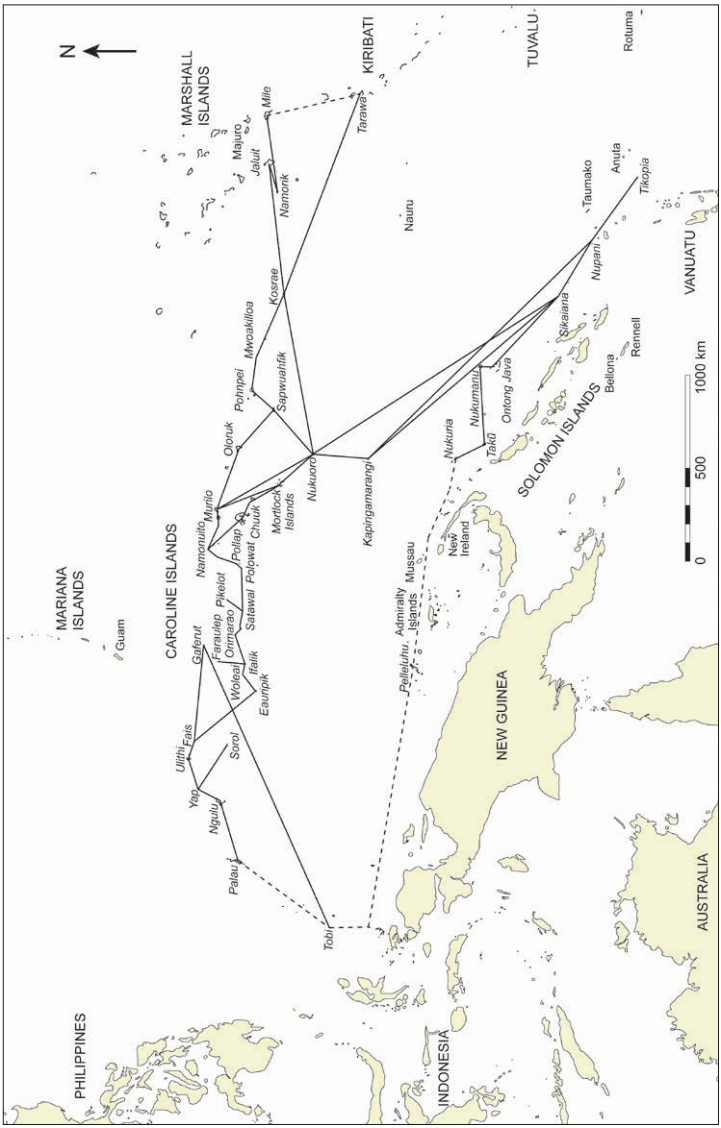

Figure 7. Islands known by Ifalik islanders in 1664. Names in italics indicate those that are identifiable or possibly identifiable. The lines and dotted lines indicate routes between identifiable islands and routes including unidentifiable islands in between, respectively.

surface on Kapingamarangi is also thought to be of Melanesian origin (Leach and Ward 1981: 75, 134–37). In Melanesia, as one can anticipate from geographical proximity, there are many pieces of evidence for post-settlement cultural contacts with the Carolines found predominantly in the Bismarck Archipelago and its vicinity. The use of grog-temper (adding crushed sherds or fired clay to unfired clay as a temper) in Type X pottery of the northwestern New Guinea coast is proposed to be the product of contacts with Palau about 1,000 years ago (Specht *et al*. 2006). The late appearance (ca. 500 BC–AD 1500) of *Trochus* shell arm rings and dorsal margin *Tridacna* shell adzes in the Mussau sequence is thought to be an indication of contacts with Micronesia (Kirch *et al*. 1991: 154, 160). The isolated distribution of kava (*Piper methysticum*) in Lou and Buluan in the Admiralty Islands is also thought to be a result of this line of interaction with Pohnpei based on linguistic comparison (Crowley 1994: 95; see also Ambrose 1991: 468 for a similar conclusion based on the use of a slab mortar for pounding kava; cf. Lebot 1991: 197; Lebot *et al*. 1992: 55–56; Lynch 2002: 511). Linguistic studies argue that pulaka-like forms for *Cyrtosperma* taro spread from the Carolines to the Bismarcks (Geraghty 2004: 88; Kikusawa 2003: 43–46). Similarly, the Pacific rat (*Rattus exulans*) was possibly introduced to Tench in the northern Bismarcks from Micronesia (Matisoo-Smith *et al*. 2009: 471). Loom weaving was brought to Mussau Islands (Mussau, Emira and Tench) directly by the central Carolinians, rather than through the Northern Outliers, based on the distribution of Carolinian traits (Nagaoka 2004). Similarity of hourglass drum names between eastern Micronesia and Wuvulu and Kaniet in the western part of the Bismarcks as well as the nearby New Guinea coast (Fischer 1983: 57) is notable. Contact with the Carolines is shown in the distribution of the shark noose around New Ireland (Anell 1955: 52, map 5, facing p. 56). Long-term Micronesian influence is manifested in material culture (e.g., shark-tooth inlaid clubs, turtle-bone cleavers), subsistence patterns and physical appearance of the people of Wuvulu and Aua (so-called "Micronesian Outliers") in the west of the Admiralties (Chowning 1977: 102n5; Hambruch 1908; von Luschan 1895).

Among impetuses from the Micronesian side, we propose here that the interregional interactions were activated by Polynesian Outliers in the first half of the second millennium AD when settlements are archaeologically known to have existed on some Outliers, such as Nukuoro (Davidson 1971, 1992), Kapingamarangi (Leach and Ward 1981), Taumako (Leach and Davidson 2008), Tikopia (Kirch and Yen 1982) and Anuta (Kirch 1982). The Polynesian Outliers' names recorded in 1664 (see above) suggest those islands had been inhabited by Polynesians by that time. This movement was probably related to a larger Polynesian expansion into eastern Polynesia after AD 1000 (Mulrooney *et al*. 2011; Sear *et al*. 2020; Wilmshurst *et al*. 2011),

which is archaeologically manifested by long-distance movements of lithic artefacts in Polynesia and beyond (e.g., Allen and Johnson 1997: 129–30; Best *et al*. 1992: 69; Clark *et al.* 2014; Cochrane and Rieth 2016: 4–6; Sheppard *et al*. 1997: 105; Weisler 2002; Weisler *et al*. 2016). The Polynesian Outliers' role is supported by several archaeological (*Terebra*/*Mitra* shell adzes and beaked *Tridacna* shell adzes (Craib n.d.)) and ethnographic traits (backstrap looms (Nagaoka 2004)), which are narrowly distributed in Micronesia, the Northern and North Central Outliers and the northeastern fringe of Melanesia. Although not all of them are dated, two archaeological phenomena in the two regions, the almost simultaneous appearance of *Terebra*/*Mitra* shell adzes (ca. AD 1000–1200 (Intoh 1999: 413–14)) and the prevalence of beaked *Tridacna* shell adzes (ca. AD 1200–1400 (Craib n.d.)), are dated within this time range.

A phenomenon that may relate to the Polynesian Outliers' role as mediators is the transportation of obsidian artefacts and kava in western Oceania. The distribution of kava in this region, particularly Pohnpei and Kosrae in eastern Micronesia and Lou and Baluan in the Admiralty Islands, intriguingly overlaps to some extent with that of Admiralty obsidian artefacts. Two linguistic models of kava's diffusion routes have been proposed. Crowley (1994: 95) argues that kava was taken from Sāmoa to Kosrae/Pohnpei and then to the Admiralties from there. In contrast, Lynch (2002: 510–11) discusses a possibility that kava-bearing Polynesian settlers of Micronesian and Melanesian Outliers took kava (presumably from their homeland) to Pohnpei and Kosrae as well as the Admiralties. We do not fully agree with his proposal that those settlers took kava from their homeland due to their probable homeland being on atolls in Tuvalu (Kirch 2017: 161; Marck 2000; cf. Hudjashov *et al*. 2018; Wilson 2021), where kava does not grow well. However, his suggestion of the Polynesian Outliers' involvement in the transmission of kava seems to be plausible.

By combining archaeological data on the Admiralty obsidian network discussed above with the linguistic models on kava transfer, we can speculate that kava was taken from Pohnpei to the Admiralties as the Saudeleur elite's requital for exotic tributes (obsidian artefacts), as kava was associated with status and rituals in Pohnpei. This seems to explain the reason that kava is narrowly distributed within the Admiralties, only on two small islands, Lou, the prevailing obsidian source in the region in the last two millennia (Fredericksen 1997: 382–83) and the source of the Kapingamarangi point, and its neighbouring island, Baluan (cf. Lynch 2002: 511). In addition, as Lynch (2002: 510–11) proposes for the transmission of kava, Polynesian Outlier people probably transported both obsidian artefacts and kava between the two regions rather than through down-the-line exchange. It is reasonable to assume the direct transportation of kava, as only atolls exist between the two.

Northern and North Central Outliers could have acquired Admiralty obsidian in the following ways: (i) directly from the sources, (ii) through the Admiralty obsidian exchange network, extending to the Mussau Islands, northern New Ireland and its offshore islands as far as Buka (Summerhayes 2009: 118–19), whose inhabitants had contacts with neighbouring North Central Outliers (e.g., Cath-Garling 2017: 48–50), or (iii) through the Polynesian Outlier network. We need to wait for future investigations in the region, especially on the North Central Outliers, but the relative abundance of obsidian artefacts on Takū documented in the late nineteenth century (Parkinson 1986: 10) and ease of voyaging to the source through the island chain suggests Takū (and possibly neighbouring Polynesian Outlier Nukuria) mediated obsidian exchange from the Admiralties through the above exchange network along the northeastern fringe of the Bismarcks up to Buka for some period during the second millennium AD. However, partly due to the limited number of archaeological investigations on the islands relevant to this study, the known amount of Admiralty obsidian transported to Micronesia beyond its original circulation sphere around the Bismarcks is very small. This may indicate that this channel was a minor one operated through sporadic contacts for a relatively short period, probably a few hundred years.

The Saudeleur Dynasty's Influence

We also propose here that the Saudeleur dynasty of Pohnpei (ca. AD 1000–1500 (Ayres 1990: 202)), which was based at its politico-religious centre, Nan Madol, may have been influential in the interactions in the western Pacific during its height in the first half of the second millennium AD, although we need further evidence on the degree of the Saudeleur's control over long-distance interactions. In addition to Melanesia, several lines of archaeological, linguistic and ethnological evidence also show Pohnpei's prehistoric interaction with western Polynesians, although there is also evidence of Micronesian influence in Polynesia (e.g., breadfruit and *Cyrtosperma* taro names (Geraghty 2004: 87–89), canoe technology (Anderson 2000), commensal animals' DNA (Addison and Matisoo-Smith 2010)). For example, the development of monumental stone structures and hierarchical societies in the early second millennium AD, which occurred only on Pohnpei and Kosrae in Micronesia, may have been influenced by western Polynesia (Kirch 2017: 178). A large basalt adze of Samoan Type I/III adze form discovered in Nan Madol was possibly imported from western Polynesia (Ayres and Mauricio 1987: 28–29). Rehg (n.d.; see also Geraghty 1994: 244–45) also identifies more than 30 possible loans in the Pohnpeian language from western Polynesia, especially Sāmoa, which is parallel with Hage *et al.*'s (1996: 339) observation on striking similarities between

Pohnpei and Sāmoa in terms of a kava ritual, a chief's language and a chiefly diarchy. Linguistic studies (Crowley 1994: 95; Rehg n.d.) argue for kava's introduction from Sāmoa to Kosrae/Pohnpei. The Pohnpeian word *merei* 'place where people or spirits gather to sing, dance, wrestle, play and carry out reed throwing game' (Nagaoka n.d.) was also borrowed from western Polynesian *mala'e* 'public meeting place, with strong religious connotations' (Green 1993: 9). Those phenomena are the product of a long-term history in the past two millennia. However, since a few datable ones (i.e., the Samoan type stone adze found at Nan Madol, possible appearance of kava stones) are of the Saudeleur period, many others are probably also of this period, presumably Pohnpei's most influential time in western Pacific prehistory. As Geraghty (1994: 244–55) argues, based on linguistic evidence, for possible Polynesian expeditions to Pohnpei for procuring red feathers, we need to consider Polynesian impetuses, possibly Samoan early and Tongan (maritime chiefdom) later (after AD 1200 (Clark *et al*. 2014)), in this interregional interaction during the first half of the second millennium AD.

The Saudeleur elites may have been influential in the interactions with other islands. Obsidian artefacts found at Nan Madol, especially in the most important royal tomb, possibly suggest their involvement in the transportation. A similar example is some pearl-shell trolling lure shanks found at Nan Madol (Hambruch 1936: 51, fig. 34), which were valuables found in high-status tombs (pp. 51–52) and were evidently brought from the Marshall Islands due to their morphological similarities (see below). Polynesian borrowings, such as terms related to kava, a chiefly title, a god, stone structures, public space and high language (Geraghty 1994: 243–45; Rehg n.d.), also suggest their status and ritual contexts, which are parallel with the transportation of kava and obsidian artefacts on the Melanesian side. The significance of rare stone artefacts in Pohnpei, including stone adzes and obsidian artefacts, as argued by Ayres and Mauricio (1987: 30), is that "[t]he rarity of stone adzes and other shaped stone tools on Pohnpei, their occurrence in special areas (tomb crypts and at Nan Madol), and their large size suggests that they were curated and used in special status contexts". Pohnpeian legends of the Saudeleur period describe foreign tributes, such as a *derepeiso* feather and a *mahlipwur* shell of a legendary sea creature, which were procured overseas during punishment trips ordered by the Saudeleur rulers; the latter has been kept by a particular matrilineal clan as their heirloom (Bernart 1977: 38–41, 41–43). Hunt and Graves (1990: 111) discuss how "exchange may play an integral part in the differential access of some individuals to critical resources, thus promoting hierarchical sociopolitical relations". The obsidian artefacts were possibly transported via the Polynesian Outliers directly to the Saudeleur rulers as exotic tributes or religious offerings to their deities (see below) based on a reciprocal

relationship between Pohnpei and the Admiralties. The Pohnpeians needed such agents, as their canoes probably became ineffectual in oceangoing voyages earlier. The Polynesians' motivation may have been associated with the Saudeleur's prowess in the region, although they rather worked independently based on their different interests due to cultural differences and a language barrier with Pohnpeians. The political influence of the Saudeleur polity beyond the island is shown by the spread of Pohnpeian chiefly titles in neighbouring Pohnpeic-speaking islands—Pingelap (Damas 1983), Mwoakilloa (Weckler 1949: 44) and Sapwuahfik (Poyer 1993: 42)—which possibly legitimated local chiefs' authority.[12]

Related to political power, the ideological factor had an important role in the *sawei* exchange of the Yapese "empire" over small atolls, in which atoll dwellers brought not only tributes to Yapese chiefs but also religious offerings to powerful Yapese spirits every two to three years to avoid the spirits' threat of epidemics, storms and famines over the low atolls (Lessa 1950). Similarly, the so-called "Kachaw ('sky world') cult", which spread from Pohnpei over eastern Micronesia between Chuuk and the Marshalls (Goodenough 1986), seems to be deeply related to the rise of the Saudeleur polity. Petersen (2006: 89) proposes that hybrid breadfruit varieties, developed during the so-called "breadfruit revolution" on Pohnpei and Kosrae during the first millennium AD, diffused into the region in association with matriclans widely named 'Under the Breadfruit Tree' (Marck 2009), who contributed to the transmission of the Kachaw ideology. Regarding the spread of this ideology, Goodenough (1986: 562) notes that "instead of thinking of high islands as having empires, we can think of them as centers of influence, their influence being spread by the atoll dwellers who came to them to trade and to seek refuge". Its religious influence is manifested in basalt stones transported to coral atolls, which were used as the material symbol of supernatural power. Such examples probably transported from Pohnpei are basalt stones at a religious site on neighbouring And (also known as Ahnd and Ant) Atoll (Ayres and Haun 1980: 116–22) and the "stone god" of a basalt block on Sapwuahfik Atoll (Goodenough 1986: 561).[13] This seems to be related to a semantic addition, 'basaltic rock, basalt peak' of the Chuukic reflexes, to Proto-Micronesian **kacawa* 'open space between' (Bender *et al*. 2003: 31), from which Kachaw-related words were derived, as this ideology diffused to the Chuukic-speaking area in the west. In return, from neighbouring atolls to Pohnpei, prestigious shell valuables or their material shells, such as lure shanks made of pearl-shell and extremely large shell adzes made of giant clams (*Tridacna gigas*), which were exclusively found on royal tombs at Nan Madol, could have been brought as tribute due to their lack or scarcity on Pohnpei (Anell 1955: 154; Heslinga *et al*. 1984: 197–98). We need further

investigations of the possibility of tribute exchange between Pohnpei and its neighbouring islands, but the Marshallese-type lure shanks (e.g., Krämer and Nevermann 1938: 117, fig. 14) found at Nan Madol (Hambruch 1936: 51, fig. 34) and Lelu, the megalithic politico-religious centre on Kosrae,[14] which are said to be traded from the Marshalls (Sarfert 1919: 102, 215–16), are examples of prehistoric interaction between volcanic islands and their neighbouring atolls.

CONCLUSION

Our study of the Kapingamarangi point and other Admiralty obsidian artefacts provides us with a deeper understanding of the prehistoric island interactions in the western Pacific during the first half of the second millennium AD, which has not been fully taken into consideration in relevant studies in the past. This interregional interaction contributed to the transmission of cultural traits between the two regions and potentially had a significant role in regional cultural history. Further, we argue that this was deeply related to two phenomena in the region, Northern and North Central Polynesian Outlier colonisation and the rise of the Saudeleur dynasty. It is possible to hypothesise that the Polynesian intrusion into the southwestern Pacific, which was related to the major Polynesian migration into eastern Polynesia, activated island interaction in Micronesia and Melanesia. We propose that Pohnpei also had political and ideological influence over eastern Micronesia and functioned as a focal point for island interactions in the wider region, expanding both into northern Melanesia and western Polynesia. Prehistoric interactions manifested in the transferred Admiralty obsidian artefacts were potentially politically motivated at a high level on the individual islands, as those obsidian artefacts worked as prestige goods in a peripheral area outside the Admiralty obsidian exchange sphere. We need further studies not only to examine the possible influence of climate change (e.g., Allen 2006; Anderson *et al.* 2006; Kumar *et al*. 2006; Masse *et al*. 2006) in this wider regional movement but also to fully understand how those two phenomena were interrelated, as a possibility of a Polynesian impact on sociopolitical development in Pohnpei is suggested (Kirch 2017: 178).[15]

Archaeological (e.g., Intoh 1999), linguistic (e.g., Kikusawa 2010: 84–88; Smythe 1970: 1221–28) and genetic evidence (e.g., Friedlaender *et al*. 2005: 711; Matisoo-Smith *et al*. 2009: 471) for post-settlement interregional interactions between Micronesia and Melanesia has been discussed. Although we need further research to understand the impact of this dynamic period in the regional culture history, this study provides a useful interpretive framework for such studies concerning past human movements in the region.

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NOTES

1. We use the term *point* to refer to this artefact solely based on its morphology, following previous studies (Ambrose 1991; Fredericksen 1994; Kennedy 1997), although it does not imply its function as a spear/dagger point.
2. Its local name was recorded as *giwa* by Jeschke (2013: 231, fig. 11, 238n11) but is *giva* according to the current orthography (Carroll and Soulik 1973) based on the cognate set discussed below.
3. In the Nukuoro language *baba* means "level (not bumpy); (any sort of) flat base (esp. the board on which mats are plaited); the consolidated reef under water or sand; the back of a human; the shell of a turtle, crab, etc.; to be ready" (Carroll and Soulik 1973).
4. In this article, I adopt Moir's (1989) terminology for the Polynesian Outliers subgrouping based on their geographical locations, the Northern Outliers (Nukuoro and Kapingamarangi) and the North Central Outliers (Nukuria, Takū, Nukumanu, Luangiua (Ontong Java) and Sikaiana), which correspond with proposed linguistic subgroupings (Pawley 1967; Wilson 2021), showing some degrees of historical relationship.
5. A Polynesian linguist, Ross Clark (pers. comm., 3 December 2008), failed to find anything like this word in either the Nukuoro/Kapingamarangi dictionaries (Carroll and Soulik 1973; Lieber and Dikepa 1974) from the 1970s or Elbert's (1946, 1948) 1940s materials.
6. This is based on *păláṅĕ*/*păláṅă* according to Nevermann ([1934] 2013: 96) (the dot above "n" symbol is consistently used for the velar nasal in the German South

Sea Expedition volumes) and *atu palapalanga* (*atu* means 'stone') according to contemporary informants (Jillian Kapty and Nedley Laban, pers. comm., 7 March 2022).

7. Tent and Geraghty (2001) claim that Mwoakilloa *pahrang* was derived from Malay *barang* 'goods', which was borrowed in Tonga during Dutch explorer Abel Tasman's visit in 1643. However, it seems more plausible that some of the loanwords in Micronesia were directly borrowed from Malay *parang* 'cleaver, machete; to chop' or its loanwords in Island Southeast Asia (Blust and Trussel 2020) through their occasional visits there and spread in the region, as Tent and Geraghty (2001: 198) also consider possible. For example, Palauans may have obtained glass money beads from Island Southeast Asia in the first millennium AD (Napolitano *et al*. 2022: 2). The only possible exception is Kapingamarangi *baalangi*, which was likely borrowed from Polynesian *palagi*, given the meaning and final vowel, possibly through Polynesian sailors in European vessels (Paul Geraghty, pers. comm., 8 November 2022).
8. Northern Outliers' close relationship with the Mussau Islands is also evidently shown by the borrowings of loom part terms from the former languages to the latter (Nagaoka 2004).
9. Peilau is added here based on the Spanish text (Lévesque 1993: 241).
10. He is possibly Fakaarofatia, the first chief of the Fangarere clan, as he was the only survivor from the massacre of the Nga Ravenga clan, which took place around the seventeenth century based on genealogical evidence (Firth 1961: 132–34; Kirch and Yen 1982: 367).
11. This name is phonologically similar to the central Carolinian names for Kapingamarangi (e.g., Pikiram in Satawalese (Sauchomal *et al*. 2018: 183)).
12. However, we should note that the titles documented ethnohistorically in these atolls are of a relatively new group of titles with the prefix *nahn-*, which were hypothetically developed after the fall of the Saudeleur polity (Riesenberg 1968: 43). It is possible to assume that Pohnpei continued to have had influence over the neighbouring atolls during the following Nahnmwarki period (ca. AD 1500– (Ayres 1990: 189)) in some degree, although active interactions were not documented in the late prehistoric/early historic period.
13. A similar case is two stone pillars, the personification of two female founders, at the origin places of chiefly clans on Namu and Aur Atolls in the Marshall Islands (Pollack 1977: 93–96; Tobin 2002: 54–55), which are said to have originated from the west, possibly neighbouring high volcanic islands (such as Pohnpei or Kosrae).
14. The current data suggests that the influence of Kosrae, which also developed a highly stratified society, seems to have been limited in the region, as concluded by Goodenough (1986: 561–62), although we need further research to validate this.
15. Intriguingly, in addition to other Polynesian loans in the Pohnpeian language, the Pohnpeian ruler's title, Saudeleur, which literally means 'ruler of Deleur' (a region surrounding Nan Madol), includes a Polynesian loanword, Proto-Polynesian **sau* 'ruler, rule' (Rehg n.d.). A recently discovered irrigation system near Nan Madol (Comer *et al*. 2019), which seems to have been the main agricultural base for the Saudeleur dynasty, was possibly developed by Polynesian influence, as its kind is known to be old there (e.g., the middle of the first millennium AD on Futuna (Kirch and Lepofsky 1993: 187)).

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