Prehistoric Melanesian Exchange and Interaction: Recent Evidence from the Northern Solomon Islands

STEPHEN WICKLER

RECONSTRUCTION OF PREHISTORIC exchange systems in Island Melanesia is becoming increasingly possible as archaeological activity continues to expand our knowledge of areas formerly labeled *terra incognita*. The Solomon Islands represent such an area, although much of the archipelago remains little known or unknown archaeologically. The objective of this paper is to examine recent evidence for past exchange and interaction within the Solomon Islands and between the Solomon Islands and Bismarck Archipelago to the north from the perspective of Buka Island, located at the northern end of the Solomon Islands (Fig. 1). Buka is presently part of the North Solomons Province of Papua New Guinea, which also includes the large island of Bougainville and a number of smaller islands.

At the time of European contact, Buka was the southern terminus of an exchange network that moved goods through the Green (Nissan, Pinipel) and Feni Islands to New Ireland in the Bismarck Archipelago. The archaeological evidence from Buka for prehistoric exchange reveals a dynamic, shifting configuration with considerable variation over the more than twenty-eight thousand years of Buka prehistory. Following a brief summary of past archaeological research in the Solomon Islands, evidence from Buka for exchange and interaction will be discussed within a temporal framework subdivided into three consecutive periods: Preceramic, Lapita, and Post-Lapita. These periods are examined in relation to one another.

SOLOMON ISLANDS ARCHAEOLOGY

Archaeological research within the main islands of the Solomons remains minimal, and the majority of investigations have centered on the northern region. Initial

Stephen Wickler is a graduate student in the Department of Anthropology, University of Hawaii, 2424 Maile Way, Honolulu, HI 96822.

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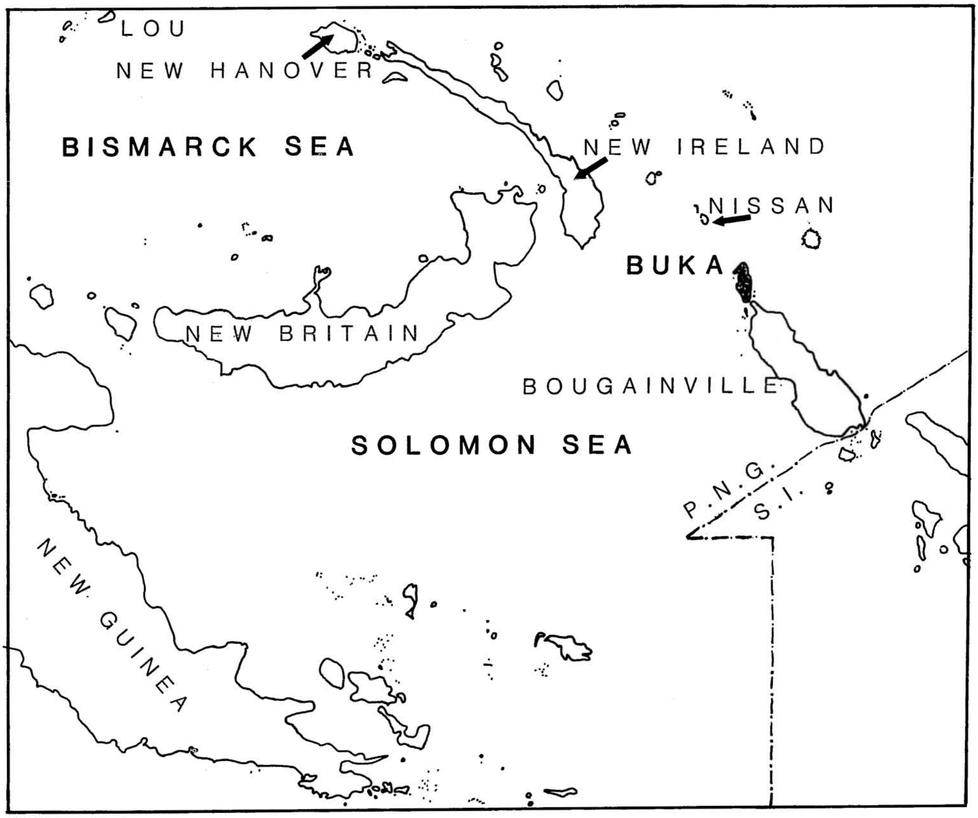

Fig. 1. Bismarck Archipelago and Northern Solomon Islands. Buka Island (see Fig. 2) is shaded.

work on Buka and nearby Sohano Island was carried out by Lampert in 1966 and followed up by more extensive field work on Buka and adjacent islands by Specht in 1967 (Specht 1969). Specht concentrated his efforts in the vicinity of Buka Passage, a narrow channel that separates Buka from Bougainville to the south, locating 73 sites and conducting excavations on Sohano Island and along the southeast coast of Buka at Hangan and Malasang. Specht established a ceramic sequence for Buka on the basis of changes in decoration and paste attributes. Six phases based on pottery styles were recognized by Specht, as listed in Table 1. Modern pottery production on Buka, which is restricted to the village of Malasang, was also described by Specht. Work by Terrell on Bougainville in 1969–1970 (Terrell 1976) established the presence of a prehistoric pottery industry in the Kieta area and documented settlement in the Paubake area of Buin over the past thousand years. Irwin's 1970 research in the Shortland Islands (Irwin 1972) resulted in the construction of a three-period ceramic sequence dating back to around A.D. 500.

The most recent field work in the northern Solomons has been conducted by Spriggs (in press *a,b,c*) on Nissan and Bougainville from 1985 to 1987 and by the author on Buka in 1987 (Wickler n.d.; Wickler and Spriggs 1988). Spriggs's sequence for Nissan extends back to the preceramic period and has been partitioned

TABLE 1. PREHISTORIC SEQUENCES FROM NISSAN AND BUKA

SPRIGGS'S NISSAN SEQUENCE		SPECHT'S BUKA SEQUENCE		REVISED BUKA SEQUENCE	
PHASE	DATES (B.P.)	PHASE	DATES (B.P.)	PHASE	DATES (B.P.)
Takoroi	4850–?			Preceramic	ca. 29,000–ca. 3200
Halika	ca. 3650–ca. 3200				
Lapita	ca. 3200–2500			Lapita	ca. 3200–ca. 2500
Yomining	2500–1150	Buka	2500–2200	Buka	ca. 2500–ca. 2200
		Sohano	2200–1500	Sohano	ca. 2200–ca. 1400
Late Hangan	ca. 750	Hangan	1500–1300	Hangan	ca. 1400–ca. 700
Malasang	ca. 700–ca. 300	Malasang	1300–800	Malasang	ca. 700–ca. 500
Mararing/	ca. 300–50	Mararing	800–300	Mararing	ca. 500–ca. 100
Recent		Recent	300–100	Recent	

into seven phases (Table 1). The first two phases are aceramic and the final three are linked to the Buka sequence due to the presence of imported Buka ceramics, with some revision of Specht's original dates. Excavations by Spriggs (in press *c*) during 1987 in the Kieta area produced a sequence of three pottery styles dating to 1600 B.P., which are related to Terrell's Kieta ceramics.

Archaeological research elsewhere in the main Solomon Islands is restricted to limited survey and testing within the Western Province (Miller 1979; Reeve 1989) and reconnaissance survey of the other principal islands—with the exception of Guadalcanal and Makira Province, where more extensive work has been done. Radiocarbon dating results from excavations at Fotoruma Cave on Guadalcanal between 1966 and 1968 suggest aceramic occupation at around 3000 B.P. (Black and Green 1975). Recent additional work at Fotoruma and elsewhere on Guadalcanal has been conducted by David Roe as a part of his Ph.D. research at the Australian National University (Roe in prep.). As a result of the Southeast Solomons Cultural History Programme carried out during the 1970s (Green and Creswell 1976; Yen 1982), extensive archaeological investigations of the outer islands within Temotu Province were carried out, and a lesser amount of field work was done on San Cristobal, Ulawa, and Santa Ana in Makira Province. The earliest evidence for settlement from this region is Lapita assemblages from the Reef and Santa Cruz Islands.

PRECERAMIC PERIOD

Archaeological Evidence

The first evidence for Pleistocene occupation of the Solomon Islands was recovered in 1987 by the author from Kilu Cave (Site DJA) situated along the southeast coast of Buka Island (Fig. 2). A discussion of this site is provided in Wickler and Spriggs (1988). Kilu is located at the base of a limestone cliff over 30 m high at about 8 m above sea level and 65 m interior of the present shoreline. The cave consists of a large, dry shelter with a smaller, inner wet solution chamber. The shelter portion is 33 m in width at its mouth and extends 17 m into the cliff face with a ceiling height ranging from 4 m at the dripline to 1.5 m at the rear. A 3 × 1 m trench excavated in the central portion of the shelter revealed 2.2 m of stratified fine silt deposits containing bone and marine shell refuse, flaked stone tools, and a few other artifacts.

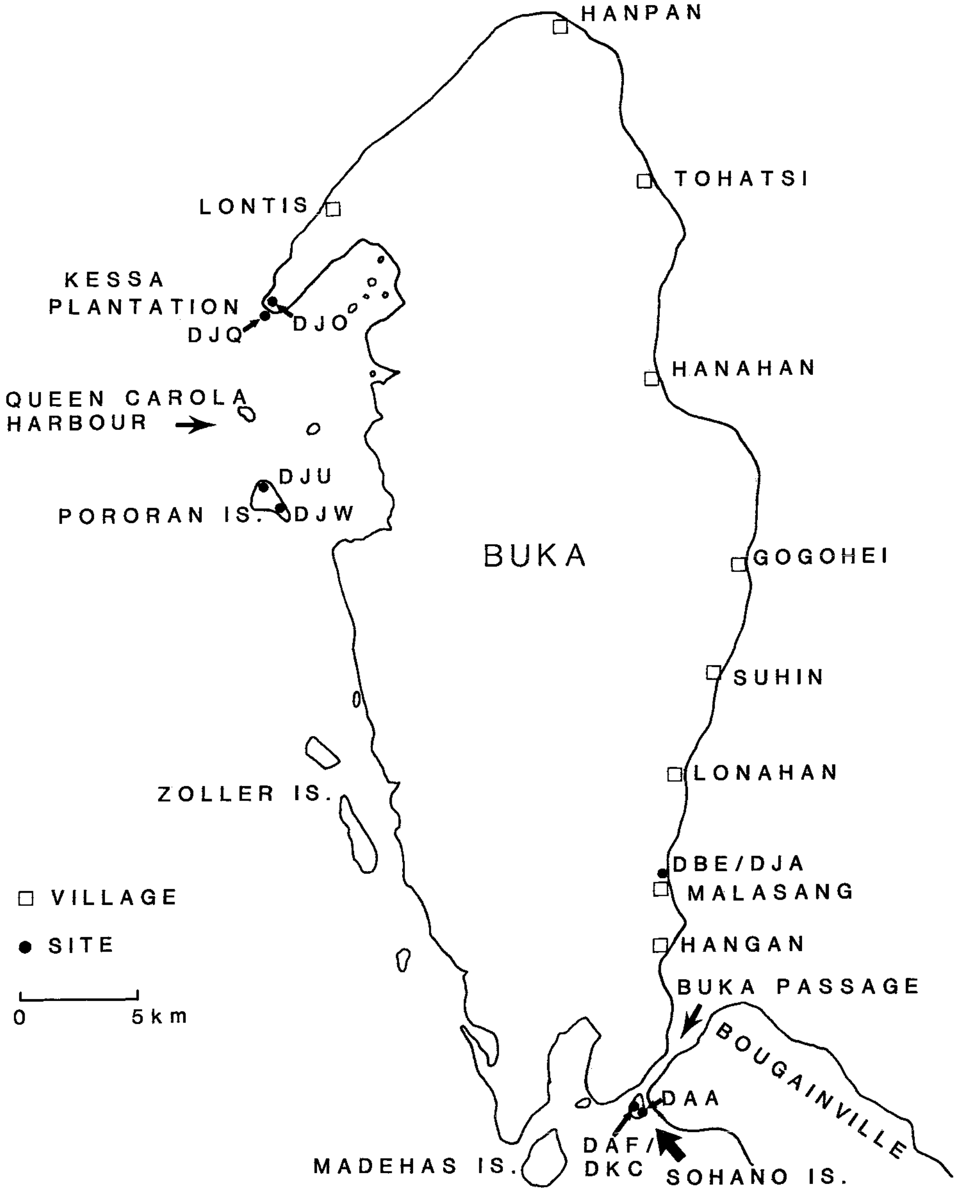

Fig. 2. Buka Island with archaeological sites mentioned in text.

TABLE 2. PRECERAMIC PERIOD RADIOCARBON DATES FROM BUKA

SITE	PROVENIENCE	MATERIAL	LABORATORY NUMBER	$^{14}C^{a}$ AGE B.P.	CALIBRATED AGE[b] RANGE B.P. (1 SD)
DJA	Sq. 1, Level 21	Nerita	ANU-5990	28740 ± 280	
DJA	Sq. 3, Level 18	Turbo	Beta-26150	23820 ± 290	
DJA	Sq. 3, Level 15	Nerita	Beta-26149	20140 ± 300	
DJA	Sq. 1, Level 15	Charcoal	ANU-6178	8950 ± 230	
DJA	Sq. 1, Level 13	Charcoal	Beta-25619	9430 ± 150	
DJA	Sq. 1, Level 9	Charcoal	Beta-25618	7900 ± 110	8989 (8652) 8549
DJA	Sq. 1, Level 4	Charcoal	Beta-25617	6670 ± 80	7586 (7509) 7436
DJA	Sq. 1, Level 2	Charcoal	ANU-6757	4680 ± 140	5589(5447,5368,5329)5149
DBE	Sq. 1, Level 13	Turbo	ANU-6110	4740 ± 80	5059 (4971) 4856
DBE	Sq. 1, Level 8	Turbo	Beta-25824	4850 ± 90	

[a] All dates except Beta marine shell corrected for $^{12}C/^{13}C$ ratios.
[b] Dates calibrated using *Calib* computer program (Stuiver and Reimer 1986); the intercept is bracketed. Marine shell dates calibrated with Delta R = 0.

Initial occupation of Kilu is dated to before 28,000 B.P. (Table 2) with sporadic use until ca. 20,000 B.P. when the site was abandoned. Reoccupation and more intensive use of Kilu took place during the early to mid-Holocene period, between ca. 9000 B.P. and ca. 5000 B.P. Minimal use of the site during the late Lapita-age Buka phase is indicated by the presence of calcareous tempered potsherds with incised decoration in the upper 30 cm of the deposit. Several Mararing and Recent-style potsherds were found with the Buka-style sherds at one end of the excavation trench.

A second site with preceramic occupation, Palandraku Cave (Site DBE), is located about 200 m north of the Kilu site at the base of a 10 m high limestone cliff about 5 m above sea level and 50 m from the shoreline. Palandraku is a wet solution cave consisting of multiple chambers that extend for an undetermined distance inward from the entrance. Specht (1969) initiated excavations within Palandraku, which were left uncompleted due to illness. A 3 × 1 m trench was excavated adjacent to Specht's excavation unit at the rear of the central chamber. Deposits reached a maximum depth of 165 cm with a preceramic component in the bottom 70 cm. The two radiocarbon dates obtained from the preceramic levels at Palandraku (Table 2) establish occupation of the site by ca. 5000 B.P., not long after abandonment of Kilu. The length of preceramic occupation at Palandraku remains uncertain, as the date from the upper portion of the deposit is earlier than the basal date, suggesting either brief use or mixing of the deposit. A limited Buka-phase occupation of Palandraku follows the preceramic component, as in Kilu Cave. The upper 60 cm of the site deposit represents occupation during the Mararing to Recent phase.

The artifactual assemblages from the two preceramic site deposits on Buka are dominated by small, unretouched flakes of sedimentary and igneous rock (Table 3). The majority of the Pleistocene lithic assemblage comprises coarse-grained crystalline igneous rock with lesser amounts of siliceous and fine-grained igneous rock. This ratio is reversed in the Holocene deposits, with a higher percentage of siliceous material and a decline in the amount of crystalline igneous rock at Kilu and a total absence at Palandraku. Lithics from mixed Pleistocene/Holocene levels at Kilu that are most likely from the early Holocene component display a more balanced ratio of

TABLE 3. FLAKED STONE FROM PRECERAMIC SITES ON BUKA

	KILU (PLEISTOCENE)	KILU (MIXED)	KILU (HOLOCENE)	PALANDRAKU (HOLOCENE)
Siliceous	25	5	11	19
Limestone	9	0	1	0
Fine igneous	11	2	1	5
Coarse igneous	155	7	9	0
TOTALS	200	14	22	24

crystalline igneous to siliceous raw material. The flaked stone assemblages from both cave sites were probably obtained locally, although further petrographic analysis is required to source the material. The crystalline igneous material was apparently obtained in the form of river cobbles, as indicated by the high frequency of flakes with cobble cortex. Use of vein quartz and nodules of siliceous rock is also evident. Starch grains and crystalline raphides typical of the taro genus *Colocasia* have been found on flaked stone tools from both Pleistocene and Holocene preceramic deposits at Kilu and preceramic levels at Palandraku, demonstrating early use of root vegetables (Loy, Spriggs and Wickler n.d.). Further evidence for plant utilization at Kilu by 9000 B.P. is present in the form of endocarp fragments of *Canarium* spp. like those of *C. indicum* and *C. solomonense* (Douglas Yen, pers. comm.) which are important arboricultural species in the region today. Whether these species are endemic to the northern Solomon Islands or were introduced by humans, it is probable that *C. indicum* was transported from farther west by prehistoric populations.

Nonlithic artifacts from the preceramic and Buka-phase levels at Kilu and Palandraku are listed in Table 4. The paucity of material from the preceramic levels at Kilu is striking in light of the lengthy time span of occupation represented. Artifacts from the Pleistocene component include only small fragments of *Turbo marmoratus* shell that have evidence of chipping along the margins. The range of artifacts does expand somewhat during the Holocene at Kilu to include shark teeth with drilled suspension holes and apex fragments of the marine gastropod *Terebralia palustris* with a single surface or two opposing surfaces ground, suggesting use as abraders. Both of these artifact types are present throughout the Holocene deposit. Additional artifacts include a fragment of *Tridacna* shell that has been ground along one margin and a fragment of worked *Turbo marmoratus* shell. Artifacts from mixed Pleistocene/ Holocene levels appear to originate within the Holocene component, considering their absence in the Pleistocene deposit. Of the range of artifacts at Kilu, only worked *Turbo marmoratus* shell is represented in the preceramic component at Palandraku. The shell ornaments located within the preceramic deposit at Palandraku are thought to have infiltrated from the upper ceramic levels as the result of crab burrowing activity. The shell beads were located within 10 cm below the Buka phase deposit, and the *Trochus* ring fragments were excavated from a level with a visible crab hole and two intrusive Recent-style sherds.

Analysis of a sample of the large quantities of mammal and reptile bone from Kilu by Peter White (White n.d. *a*) shows that rodents, bats, and a range of reptiles (including a prominent large skink and rarer varanid, agamid, and snake remains) form almost the entire collection. Several factors indicate that nearly all of the bone is derived from human meals, and the presence of all body parts establishes that animals were being brought whole to the site and eaten. Bone density figures suggest most intensive use of the site during the early Holocene. A decline in quantity and increase in breakage of bone within the upper 60 cm of the site is interpreted by White as representing both a decrease in intensity of site use and a change in the nature of this use. Perhaps the most significant of White's findings is a phalanger (*Phalanger orientalis*) zygomatic bone from the base of the Holocene deposit dated to ca. 9000 B.P. No other phalanger remains have been found within the site. Human introduction of phalanger from the north (Nissan, New Ireland) is likely, as discussed below. Two species of endemic rats that are now extinct, *Solomys spriggsarum* and *Melomys spechti*, are present throughout the Kilu preceramic sequence with extinction occurring sometime after 5500 B.P. (Flannery and Wickler 1990). Analysis of bird bone from Kilu is currently under way (Williams n.d.), and despite a small sample size, preliminary findings suggest that species extinction may have taken place within some families. The range of faunal remains from preceramic levels at Palandraku is similar to that of Kilu, although the amount of bone is much smaller and extremely fragmentary. White (n.d. *b*) has identified the remains of small to large bats, rats, and reptiles including skink and snake, although neither of the extinct rat species from Kilu is present. Phalanger is absent in the preceramic levels but appears in the Buka and Mararing/Recent component along with pig.

Exchange and Interaction

Colonization of Buka would have required an open-sea crossing of 50–60 km from New Ireland via the Feni and Green Islands. If Nissan, a raised atoll that likely emerged during the Pleistocene, was not in existence or not yet suitable for human habitation, the crossing would have been 130 km via Feni or 180 km direct from New Ireland. Although traveling these distances would have required some degree of sophistication in navigational technology, much greater skill was required to venture beyond the southern end of the main Solomon Islands out of near Oceania and into remote Oceania (Green in press *a*), where the open-sea gap between islands increases to over 300 km, the size of target islands generally decreases, and the range of natural resources is reduced. Irwin (1989) refers to the region of near Oceania north of this boundary as a "voyaging nursery" where sailing skills were developed in relative safety, which then allowed the colonization of the remote Pacific. Here islands are large and intervisible, and winds and currents seasonally reverse themselves, making outgoing and return voyages equally feasible in most areas. This would presently apply to crossing the gap between the Bismarck Archipelago and the northern Solomon Islands where Buka can be seen before Nissan disappears below the horizon.

Despite Buka's location in a "voyaging nursery," the collective evidence from the preceramic phase of settlement on Buka (ca. 28,000–5000 B.P.) suggests that its inhabitants were relatively isolated following initial settlement. The only existing evidence from Buka for outside contact during this period is the possible introduction of phalanger and *Canarium indicum*. Evidence from early cave and shelter sites on New Ireland documents the appearance of *Phalanger orientalis* by 19,000 B.P. and the later appearance of a large rat (*Rattus praetor*) at 8000 B.P., a wallaby (*Thylogale brunii*) at 7000 B.P., and the Pacific rat (*R. exulans*) by 3000 B.P. (Allen, Gosden, and White

1989). It is argued that all of these species represent human introductions that were most likely accidental (Ibid.: 557). A review of mammal faunas from archaeological sites on Nissan and Buka (Flannery et al. 1988) notes the presence of *Phalanger orientalis* on Nissan during the earliest phase of settlement at ca. 4900 B.P. Although the species is no longer present on Nissan, a single fragment of *Rattus praetor* bone associated with Malasang-style pottery imported from Buka after ca. 800 B.P. has also been recovered. *R. praetor* is first documented on Buka at ca. 1850 B.P. at Specht's DAI site, and a single bone of *Thylogale brunii* from a slightly later date at DAI has also been identified. If the single phalanger bone from Kilu is in situ, as White (n.d. *a*) suggests, then human transport of phalanger to Buka by 9000 B.P. from New Ireland or possibly Nissan is likely. The occurrence of a single phalanger bone at Kilu and the absence of phalanger at Palandraku until the Buka phase suggests that wild-living populations did not flourish until the Lapita period. Unlike phalanger, *T. brunii* and *R. praetor* appear to have been introduced relatively late in the Buka sequence. The occurrence of only one specimen of *T. brunii* on Buka and the modern absence of the species on both Nissan and Buka argue for its introduction as an item of exchange (Flannery et al. 1988:91).

Artifactual evidence from Buka for preceramic-period exchange and/or interaction is limited to what Green (1982:15) refers to as direct access or local reciprocity, with no suggestion of long-distance transport of material at present. This situation contrasts with sites of similar age on New Ireland where Talasea obsidian from New Britain is present by 19,000 B.P. (Allen, Gosden, and White 1989). Talasea obsidian is also found on Nissan from the earliest phase of settlement at about 4900 B.P. (Spriggs in press *a*). The absence of obsidian at Kilu and in the preceramic levels at Palandraku suggests that Nissan may have represented the southern limit for exchange of obsidian before the Lapita period.

Discussion of archaeological evidence for exchange during the preceramic period on Buka must take into account the limitations of the present sample, which consists of only two sites and considerable temporal gaps in the sequence. Despite these limitations, the available data suggest minimal contact between the northern Solomon Islands and the Bismarck Archipelago until sometime after 5000 B.P. However, excavation of additional preceramic sites may reveal evidence for movement of materials that do not occur in the Kilu or Palandraku sites. If the present evidence does accurately reflect the degree of interaction during the preceramic period, this would suggest insufficient development of voyaging technology to allow regular crossings of the water gap separating the Bismarck Archipelago and northern Solomon Islands. As discussed earlier, an open-sea crossing of up to 180 km would have been necessary between the two regions before sufficient emergence of Nissan to permit human settlement. I would argue that a distance of this magnitude without the intervisibility provided by Nissan would have presented a considerable obstacle to regular two-way voyaging—significantly limiting, though not eliminating, contact between the Bismarck Archipelago and Solomon Islands.

LAPITA PERIOD

Although archaeological recognition of distinctively decorated Lapita pottery and its associations spans three decades and has resulted in a wealth of data concerning the Lapita Cultural Complex, there is still disagreement on such basic issues as what Lapita represents (Terrell 1989). Lapita research has focused for the most part on culture historical concerns, resulting in general under-theorization of the "complex" (cf. Gosden 1989). Sites with Lapita pottery are present from the Bismarck Archipelago to Samoa between 3600 B.P. and 2000 B.P. Lapita represents the initial settlement of Fiji–West Polynesia and most likely Island Melanesia south of the main Solomon Islands. The origins of the Lapita Complex and its spread remain a topic of debate. A "homeland" model, which views Lapita as developing within the Bismarck Archipelago region (Allen 1984; Spriggs 1984), has been put forward as an alternative to the "fast train to Polynesia" model, which traces Lapita origins to a rapid movement of Austronesian-speaking populations out of Island Southeast Asia into the Pacific (Bellwood 1978; Kirch 1988*a*; Spriggs 1989).

An increasingly large data base has enabled Lapita research to extend beyond broad culture historical reconstructions to more detailed regional analyses, including the modeling of local social systems (Gosden 1989) and investigations of exchange. The early emphasis on excavation of Lapita sites in remote Oceania and lack of data on pre-Lapita and Lapita settlement in western Melanesia have contributed to the construction of models that emphasize the colonizing aspect of Lapita (Green 1982). There is a need for models that view Lapita in relation to preexisting populations in the Bismarcks-Solomons region, and evidence from Buka provides an opportunity to explore the development of interactive models of Lapita, which are necessary in western Melanesia.

Long-distance exchange is one of the most distinctive features of the Lapita cultural complex, and transport of obsidian, chert, metavolcanic rock, pottery, and other materials between Lapita settlements has been documented. The geographical extent of the Lapita exchange network was far greater than any ethnographically recorded system in Oceania, covering distances of over 3000 km. If the recently reported Talasea obsidian from the Bukit Tengkorak site on Sabah dating to around 300 B.C. is viewed as an extension of Lapita exchange, the distances involved increase to around 6500 km (Bellwood and Koon 1989). The most extensive evidence for Lapita exchange is from sites in the Reef–Santa Cruz Islands of the southeastern Solomon Islands where local to long-distance movement of material is documented (Green 1979). Archaeological investigations at a number of locations in the Bismarck Archipelago, initiated as part of the Lapita Homeland Project, have provided an abundance of new data on Lapita exchange in this region (Gosden et al. 1989). Lapita sites in the northern Solomon Islands include artifact scatters on intertidal reef flats and excavated deposits on Buka and nearby Sohano island investigated by the author, together with three Lapita sites on Nissan reported by Spriggs (Gosden et al. 1989; Spriggs in press *a*). Evidence for Lapita exchange from these sites is presented below and compared with evidence from the pre-Lapita period in order to evaluate changes in the nature of exchange and interaction that took place following Lapita settlement.

Excavated Sites

A number of significant changes in the archaeological record on Buka appear to coincide with Lapita settlement. Excavated Lapita-related material from 1987 is

TABLE 4. NONLITHIC ARTIFACTS FROM THE KILU AND PALANDRAKU SITES

	KILU (PLEISTOCENE)	KILU (MIXED)	KILU PALANDRAKU (HOLOCENE)		KILU PALANDRAKU (BUKA PHASE)	
Drilled shark tooth	0	2	9	0	0	0
Terebralia "abrader"	0	6	8	0	0	0
Worked *T. marmoratus*	3	0	1	4	4	7
Worked *Tridacna*	0	0	1	0	0	0
Trochus ring	0	0	0	2	1	2
Shell bead	0	0	0	2	1	2
Oliva ornament	0	0	0	1	0	1
Conus disk	0	0	0	0	2	0
TOTALS	3	8	19	9	8	12

limited to the two cave sites with pre-Lapita occupation and single 1 × 1 m test units at a shelter site (DKC) and open beach site (DAF) on Sohano island. Attempts to date these deposits have been problematic due to disturbance and limited occupation, although ceramic attributes indicate use during the late Lapita period, Buka phase (2500–2200 B.P.).

The most visible contrast between preceramic and Buka-phase levels at the cave sites is the appearance of shell ornaments including beads, *Conus* disks, *Trochus* rings, and *Oliva* shells with the spires removed in levels containing Buka-style pottery (Table 4). The presence of shell ornaments in the pre-Lapita levels of Palandraku is most likely due to infiltration from the upper ceramic layers due to crab activity, as discussed earlier. Although they are not abundant numerically, the relative amount of shell artifacts increases significantly during the Buka-phase occupation considering the short duration of occupation compared to the preceramic period. The only pre-Lapita cultural remains that appear to continue into the Buka phase are worked fragments of *Turbo marmoratus* representing artifact-manufacturing debris. Obsidian appears for the first time in the Buka-phase levels at Palandraku but is absent at Kilu. The two flakes of obsidian from Palandraku have not yet been sourced but are likely to originate on Lou, based on obsidian sourcing results from Buka-phase occupation at the DAF site on Sohano Island.

The faunal record at Palandraku documents the initial appearance of pig and phalanger during the Buka-phase occupation (White n.d. *b*). The appearance of domesticates in Island Melanesia has not been documented before the Lapita period. Pig first appears on Nissan during the Halika phase (3660–3200 B.P.), which Spriggs (in press *a*) describes as "Lapita without pots," and is present at the Balof 2 site on New Ireland at 3000 B.P. (Allen, Gosden, and White 1989). The extinction of two endemic rat species present throughout the preceramic sequence at Kilu but absent in later deposits on Buka may be the result of competition with domesticates such as pig and dog introduced during the Lapita period (Flannery and Wickler 1990). A similar situation may exist on New Ireland where the extintion of an endemic rat species (*R. mordax*) is attributed to the human introduction of a competitor, *R. praetor*, with replacement taking place by ca. 3000 B.P. at the Balof 2 site (Allen, Gosden, and White 1989:556).

Reef Sites

The principal evidence for Lapita settlement on Buka has been recovered from three sites consisting of artifact scatters on intertidal reef flats. A fourth reef site from Nissan investigated by Spriggs (in press *a*) contains pottery and lithic artifacts similar to the other reef assemblages, suggesting importation from Buka.

The Kessa Plantation (DJQ) site is located on the northwest coast of Buka at the southern tip of Cape Dunganon, a large sand spit forming the northern boundary of Queen Carola Harbor. The site consists of a scatter of pottery, lithic artifacts, and volcanic oven stones located in shallow sand or on reef limestone exposed at low tide and extending for a distance of about 300 m west from the Kessa wharf. This material was located in a 20–60 m zone along the central portion of the reef flat, which ranges from 100 to 200 m in width. Intensive collection of artifacts was carried out over the site along transects at 5 m intervals. In addition to Lapita ceramics, Malaring and Recent-style sherds were present over most of the site, along with several late Hangan and Malasang-style sherds. These styles date to the last 800 years and can be distinguished from Lapita ceramics on the basis of temper (mineral sand vs. calcareous) as well as decoration and vessel form. Over 80 percent of the Lapita pottery was concentrated in a 5250 m^2 zone at the eastern end of the site.

Two reef sites are located on Sohano, a small island situated within Buka Passage, the narrow channel separating Buka from Bougainville to the south. Lapita pottery and associated lithic artifacts and volcanic oven stones were found on the sandy reef flat and beach along the west (Site DAF) and east coasts (Site DAA) of the island. Discussion here is limited to site DAF, where a much wider range and higher density of material was recovered than at DAA. The DAF site includes a relatively narrow beach zone of actively eroding Buka and Sohano-style pottery, obsidian, and other artifacts as well as the associated reef flat extending for over 400 m along the coast. The width of the reef flat at the site location ranges from 15–30 m in the north to over 150 m in the south end, with the site boundaries extending to the outer edge of the reef flat in the north and about 100 m out from the beach at the southern end. The inner portion of the reef flat consists of exposed reef limestone with pockets of sand, while the outer portion is covered with silty sand in most areas. Although the site area exceeds 30,000 m^2 most of the material is situated in spatially distinct concentrations of pottery and volcanic oven stones in which all visible artifactual material was collected. Over 60 percent of the Lapita pottery was collected from a 400 m^2 area with a density of nearly 20 sherds per square meter. A small number of Malaring and Recent-style sherds were present along the inner reef and beach portion of the site along with a higher density of Sohano-style pottery, which extended farther out onto the reef flat.

The Tarmon site (DES) is located on a reef flat exposed at low tide along the western coast of Nissan adjacent to a reef passage into the atoll's inner lagoon. Lapita pottery, stone tools, and volcanic oven stones were present over an area of ca. 73 × 70 m immediately seaward of the present beachline, which was subject to intensive surface collection (Spriggs in press *a*). Two Sohano-style rim sherds and three late Hangan-style body sherds as well as more numerous sherds of later pottery styles from Buka were also found at the site.

Artifactual Evidence

The Lapita reef sites from Buka, Sohano, and Nissan can be dated relative to each other to some extent based on the percentage of decorated and stamped (dentate and/or untoothed) sherds. Decorated Lapita pottery has been shown to decline over time within other Lapita sites (Gosden et al. 1989; Green and Anson in press). Based on these criteria, the Kessa site may be earliest with decoration present on 29 percent of the 1050 sherds collected and at least 27 percent of the decorated sherds exhibiting stamped designs. If eroded sherds with probable stamped decoration are included, the number of stamped sherds increases to nearly 50 percent of the decorated assemblage. Of the 1660 sherds analyzed from the Tarmon site, 16 percent are decorated, and stamped designs are present on 10 percent of the decorated sherds. The Sohano site (DAF) has a large sample of over 15,650 sherds that has not been fully analyzed. Based on present estimates, approximately 20 percent of the sherds are decorated although less than 1 percent of the decorated sherds are stamped. The site is more complex than the other two; earlier settlement was apparently restricted to the outer reef zone where 90 percent of the dentate stamped sherds were found. Later Buka-phase settlement is confined to the beach and inner reef where the percentage of decorated sherds is much lower. The ratio of incised to stamped sherds is lowest at Kessa, where stamping is the dominant decorative technique, and highest at the Sohano site, while the two techniques each account for about 10 percent of the decorated sherds at the Tarmon site. A variety of decorative techniques, including applied relief nubbins and bands, finger and fingernail impressions, and low frequencies of perforation and punctation, are also present at each of the three sites.

A high degree of similarity in terms of decoration, vessel form, and fabric is evident between the Nissan and Sohano reef sites. This suggests the possibility of ceramic exchange from Buka to Nissan before the documented presence of Sohano-style pottery from Buka at the Tarmon site. An outside source for all ceramics on Nissan is necessary as no suitable clay source for pottery manufacture exists on the island. The Kessa ceramic assemblage is distinguished from the other two sites by the range of vessel forms present and a higher percentage of dentate-stamping and incised motifs similar to those produced by dentate-stamping.

Decorative analysis of the reef site ceramics has identified a high percentage of shared motifs between all three sites and Lapita sites in the Reef–Santa Cruz Islands of the southeastern Solomons (Donovan 1973; Anson 1983). These motifs are characteristic of the Western Lapita design province first defined by Green (1976), which also includes Watom and sites in eastern Melanesia. Western Lapita has been distinguished by Anson (1983, 1986) from a proposed earlier Far Western Lapita style present in the Bismarck Archipelago at the Eloaue, Ambitle, and Talasea sites. Green (in press *b*) suggests that an initial boundary between Far Western and Western Lapita styles may have occurred across the water gap between the Bismarck Archipelogo and northern Solomon Islands, with Watom representing a possible later movement of Western Lapita into a Far Western province. The geographical separation of Far Western and Western Lapita styles may relate to a pause in Lapita expansion within the Bismarck Archipelago or as far south as Nissan (see Spriggs in press *b*) before movement into the Solomon Islands.

The occurrence of applied relief and fingernail impression as decorative techniques at the three reef sites has parallels in the late (post-500 B.C.) Lapita-age assemblages on Watom (Specht 1968; Green and Anson 1987, in press) and the contemporary to later Lossu-Lasigi pottery assemblages from New Ireland (White and Downie 1980; Gosden et al. 1989). Reef sites similar to those in the northern Solomon Islands have recently been recorded at Panaivili village on the barrier island of Ndoro in the Roviana lagoon, western Solomons (Reeve 1989) and at Kreslo along the south coast of West New Britain (Specht n.d.; Gosden et al. 1989). The Kreslo site has obvious Lapita associations and contains pottery with dentate, incised, nail-impressed, and incised and applied designs. All of these techniques, with the exception of dentate-stamping, are also found at the Panaivili site, and Reeve (1989:53) suggests that the assemblage represents a tradition possibly derived or descended from Lapita. Based on the examination of illustrated sherds, the pottery from both Kreslo and Panaivili exhibits some similarities in vessel form and decoration to the reef site assemblages from the northern Solomon Islands. Analysis of temper from the Nissan, Buka, and Sohano reef sites indicates a dominance of calcareous inclusions in all three sites. Only a small percentage of sherds (under 10 percent) lack calcareous inclusions. Pottery vessel forms fall within the range of other Lapita sites with simple bowls among the most common. Several more unusual items appear, including a range of coil and strap handles and complex everted rims with one or more strips of clay attached above the original rim.

Stone artifacts from the Lapita reef sites on Buka and Nissan include obsidian from the Bismarck Archipelago and a range of adzes, grindstones, abraders, and flaked stone probably obtained from sources on Buka or Bougainville with a few possible exceptions. Nearly all of the obsidian found at the three reef sites is from DAF on Sohano, where over 350 pieces were recovered, 98 percent of which were collected from the inner reef and beach zone, indicating a probable Buka-phase association. Although almost all pieces of obsidian were small, unretouched flakes, several blades and a single triangular point were collected from the reef. The triangular point is very similar in appearance to points from Lou Island in the Admiralties, where their occurrence is dated to 2100 B.P. at the Sasi site (Ambrose 1988). Transport of the point and possibly the blades to Buka as finished products is suggested in light of the lack of evidence for point or blade manufacture in the northern Solomon Islands. A similar point was recovered from the Lossu site on New Ireland, dating to around 1700–1650 B.P. (White and Downie 1980: Fig. 7). Some indication of the obsidian density within the beach deposit at DAF is obtainable from the single 1 × 1 m test unit excavated in this area, which contained nearly 10 pieces of obsidian per cubic meter. Much less obsidian was present at the Tarmon site on Nissan (13 flakes) (Spriggs in press *a*) and Kessa site (11 flakes). All of the obsidian from the Tarmon and Kessa reef sites sourced by the density technique (Ambrose n.d.) are from Lou in the Admiralty Islands (W. Ambrose pers. comm.). Ten (6.8 percent) of the 162 flakes positively sourced from site DAF are from Talasea rather than Lou. The scarcity of Talasea obsidian is intriguing considering its early presence on Nissan and dominance in the Reef–Santa Cruz Lapita sites throughout the Lapita sequence between 1400 and 700 B.C. (Green 1987). The evidence from the southeastern Solomon Islands suggests two alternative hypotheses: (1) the Kessa and Sohano sites were not occupied before 700 B.C. when Talasea was the primary source of obsidian, or (2) Buka was bypassed in the movement of Talasea obsidian into the southeastern Solomon Islands. The initial hypothesis appears to fit the ceramic evidence from Kessa and Sohano, which indicates occupation during the middle to late Lapita period. The absence of Talasea obsidian at the Tarmon site on Nissan contrasts with a Lou-to-Talasea ratio of 1.4:1 at the two excavated Lapita sites on Nissan (Spriggs in press *a*). The potential significance of this observation remains uncertain due to the small sample sizes involved and lack of temporal control at the reef site.

Nonobsidian stone artifacts from the reef sites include small oval sectioned adzes of fine-grained basalt and andesite; grindstone fragments of andesite and felsic volcanics; small abraders with rectangular to rounded cross-sections of volcanics, andesite, sandstone, or tuffs, and possibly diorite; miscellaneous flakes of andesite and lithified mudstone; and a few greenstone and red and green chert flakes on Sohano (Sinton n.d.). All of these raw materials would have been available on Bougainville or Buka, although more distant sources are possible. Substantial quantities of volcanic oven stones were also present at all three sites. Similarities between the Kessa and Sohano lithic assemblages and that of the Tarmon site suggest transport of stone from Buka to Nissan, where all volcanic rock must be imported.

Lapita Exchange and Interaction

The location of Lapita reef sites in the northern Solomon Islands may indicate occupation in stilt dwellings built over the reef flat, although erosion of a previous beach settlement is possible at the Tarmon site, and material along the inner portion of the reef on Sohano is obviously derived from actively eroding beach deposits. Recent evidence for Lapita stilt house settlement from Mussau in the Bismarck Islands (Kirch 1988*a*) lends support to such an argument. Stilt house occupation has also been suggested for the reef sites at Kreslo (Gosden et al. 1989:585) and Panaivili (Reeve 1989:49), discussed earlier. The increasing evidence for stilt dwellings on intertidal reef flats may indicate a widespread settlement pattern within the Bismarcks-Solomons region during the Lapita period. Stilt house settlement can be viewed as an extension of the "small island" bias previously noted for Lapita sites, which emphasizes ready access to the sea (Green 1979). The three reef sites from the northern Solomon Islands and the Panaivili site in the western Solomons are also located in the vicinity of deepwater passages in the reef, a pattern common to a number of Lapita sites.

The absence of intact Lapita deposits on Buka before the Buka phase—despite fairly extensive survey by Specht (1969) and the author—is notable and may be explained by an early Lapita stilt house settlement pattern with later diversification of settlement during the Buka phase to include beach and shelter/cave sites. The present lack of Lapita sites beyond Buka in the main Solomon Islands chain may also be due in part to stilt house settlement on reef flats during the Lapita period. The reasons for early stilt house settlement may be related to the nature of Lapita interactions with earlier inhabitants. One possible scenario might involve initial peripheral settlement by Lapita people relative to existing populations, with more diversified Lapita settlement following increasing interaction between the two populations. This assumes that Lapita represents a population movement into the region, although some would argue that this is not necessarily the case (Terrell 1989). Although the location of Lapita settlements on reef flats may relate to the importance of marine subsistence or the role of maritime exchange, the possibility must be entertained that settlement in these locations by Lapita "colonists" was necessary due to the nature of interactions with existing populations. The importance of reef site locations obviously continued for some time after the Lapita period in the Solomons Islands as indicated by the Panaivili site. The substantial gaps in our current understanding of settlement in the Bismarcks-Solomons region before the advent of Lapita greatly limit discussion of this period.

The overall evidence from the northern Solomon Islands does not support the view that Lapita sites may be "simply one phase in an already expanding colonising or exchange system" (Allen and White 1989:141). Pre-Lapita exchange networks that may have existed in the Bismarcks do not appear to have operated south of Nissan, and evidence from Lapita sites in the northern Solomon Islands suggests more discontinuity than continuity with pre-Lapita settlement. On the basis of existing evidence, the initial appearance of pottery, domesticated animals, a variety of shell artifacts, and obsidian and other stone implements such as adzes all appear to coincide with Lapita settlement of Buka. Evidence for Lapita exchange in the northern Solomon Islands includes long-distance transport of obsidian from the Bismarck Archipelago and the probable movement of pottery and stone from Buka to Nissan. Procurement of stone from Bougainville or possibly farther is indicated from evidence at the Kessa and Sohano reef sites hinting at importation of material from the south.

POST-LAPITA PERIOD

Field work carried out by the author on Buka, together with work by Spriggs on Nissan, has provided considerable additional detail to the post-Lapita Buka cultural sequence proposed by Specht. This work has resulted in a revision of dates for four phases of the sequence. Sites with each of Specht's six ceramic style phases represented were excavated by the author in 1987 on Buka and the smaller offshore islands of Pororan and Sohano. Archaeological evidence from each of Specht's phases following the Lapita period is discussed in this section in order to trace patterns of contact and exchange up through the historic period.

Sohano Phase

Excavations at shelter (DKC) and beach (DAF) sites on Sohano Island recovered Buka-style pottery stratigraphically associated with pottery diagnostic of the following Sohano phase (2200–1400 B.P.). Specht also noted the presence of Buka and Sohano-style sherds in the same levels during his excavations. Although this may indicate stratigraphic mixing of Buka and Sohano phase deposits, the possibility that a transitional period in which both styles were in use is considered likely. Specht argued that Sohano ceramics represented an entirely new pottery tradition introduced by a population that replaced the producers of Buka-style pottery (Specht 1969:307). An evaluation of the present evidence suggests that a transition from Buka to Sohano pottery is more reasonable. The strongest evidence for such a transition has been obtained through compositional analysis of Buka ceramics by Summerhayes (1987) using the electron microprobe technique. Results demonstrate that the clay sources used in the manufacture of Buka-style ceramics were also used in the production of Sohano-style pottery, thus establishing continuity between the two styles. A change from calcareous temper in Buka-style pottery to mineral sand temper in Sohano and later pottery styles on Buka has been documented. The presence

TABLE 5. CERAMIC PERIOD RADIOCARBON DATES FROM BUKA

SITE	PROVENIENCE	MATERIAL	LABORATORY NUMBER	^{14}C[a] AGE B.P.	CALIBRATED AGE[b] RANGE B.P. (1 SD)	PHASE
DJW	Sq. 1, Level 8	Charcoal	Beta-25825	1520 ± 60	1510 (1402) 1345	late Sohano
DJU	Sq. 1, Level 9	Charcoal	Beta-25826	1310 ± 40	1287 (1273) 1191	Hangan
DJO	Sq. 4, Level 13	Charcoal	Beta-25828	1080 ± 50	1056 (976) 942	late Hangan
DJO	Sq. 4, Level 2	Charcoal	Beta-25827	710 ± 50	685 (673) 662	Malasang
DAF	Sq. 1, Level 9	Charcoal	ANU-6755	450 ± 110	550 (510) 334	Mararing/ Recent

[a] All dates corrected for $^{12}C/^{13}C$ ratios.
[b] Dates calibrated using *Calib* computer program (Stuiver and Reimer 1986); the intercept is bracketed.

of Sohano-style sherds with calcareous temper in sites excavated by Specht and the author provides additional evidence for a gradual transition from Buka to Sohano-style pottery.

The presence of Lou obsidian at the DJW site on Pororan Island dating to the late Sohano phase (Table 5) demonstrates maintenance of obsidian exchange from the Buka phase, although the low number and small size of flakes recovered suggests more restricted access to this resource. The two Sohano-style sherds from the Tarmon site found together with Lapita pottery are the only evidence of exchange with Buka during the Sohano phase on Nissan. Sites on Nissan contain generally plain calcareous tempered pottery from the end of the Lapita period to around 1150 B.P. which Spriggs (in press *a*) assumes was brought from Ambitle or New Ireland. Obsidian from Lou predominates during this period on Nissan although Talasea obsidian is still present. Exchange of the wallaby *Thylogale brunii* from the Bismarck Archipelago is also likely, as previously discussed. Exchange from Buka to the south during the Sohano phase is attested by surface finds of Sohano-style pottery along the northeast coast of Bougainville as far south as the Teop Island area (Terrell 1976).

Hangan Phase

Specht's original dates for the Hangan phase (1500–1300 B.P.) have been revised to 1400–700 B.P. on the basis of recent archaeological work on Buka and Nissan. A gradual transition from Sohano to Hangan-style pottery occurs at the DJW site on Pororan Island situated off the west coast of Buka. A calibrated date of 1510 (1402) 1345 B.P. from the base of the DJW deposit associated with Sohano-style pottery supports the extension of Specht's Sohano phase an additional century (Table 5). Calibrated dates associated with Hangan-style pottery of 1287 (1273) 1191 B.P. from the DJU site on Pororan and 1056 (976) 942 B.P. from the DJO site at Kessa Plantation have also been obtained. Dates of ca. 750 B.P. from two sites on Nissan associated with late Hangan-style pottery (Spriggs in press *a*) provides a terminal date for the Hangan phase on Buka.

Low amounts of Lou obsidian found in Hangan-phase deposits on Buka attests to continued exchange with the Bismarck Archipelago either directly or via Nissan. Hangan-style pottery does not appear on Nissan until the late Hangan phase when rapidly increasing exchange of Buka-made pottery was reinitiated. Exchange between Buka and Bougainville during the Hangan phase apparently maintained patterns established during the Sohano phase.

Malasang–Mararing/Recent Phase

A gradual transition from Hangan to Malasang-style pottery is noted at the DJO site. A calibrated date of 685 (673) 662 B.P. associated with Malasang-style pottery from the upper portion of the DJO deposit, together with late Hangan dates from Nissan, indicates that the transition took place sometime between 800 and 700 B.P. Changes in pottery attributes from the Malasang to Mararing style were perceived by Specht (1969) as possibly representing the arrival of an intrusive culture. Subsequent analyses of Malasang, Mararing, and Recent-style pottery from surface collections on Nissan (Kaplan 1976) and excavations on Teop Island off the northeast coast of Bougainville (Black 1977) have concluded that attributes shared by all three styles indicate transitions from one style to the next. Mararing and Recent-style pottery cannot be separated stratigraphically in excavations where both styles are present on Buka and Nissan (Spriggs in press *a*), indicating a temporal overlap between the styles. Replacement of the Malasang style by Mararing/Recent style-pottery at ca. 500 B.P. is supported by a calibrated date of 550 (510) 334 B.P. from the test unit at the DAF site on Sohano that contained Mararing and Recent-style pottery mixed with Buka and Sohano-style sherds. The date is thought to be associated with the later pottery, as it is much too late for the Buka or Sohano phase. Recently obtained dates of similar age associated with Mararing and Recent pottery on Nissan support this interpretation (M. Spriggs: pers. comm.). The temporal overlap of Mararing and Recent styles makes it difficult to establish when the former was replaced by the latter, and the date of 300 B.P. proposed by Specht cannot be verified until additional evidence is available. The modern pottery industry on Buka is viewed as an extension of the Recent style.

Lou obsidian is still present in the Malasang levels at the DJO site on Buka, but no obsidian has been found in excavations or surface collections from later phases. Obsidian was transported to Nissan until the early 1900s, with a majority coming from the Lou source (Spriggs in press *b*). The abundance of Buka-made pottery on Nissan from the Malasang phase to the historic period indicates significant exchange between the two islands during the past eight hundred years. Selective transfer of goods is suggested by the apparent lack of obsidian following the Malasang phase on Buka, despite its continued presence on Nissan. Export of Buka ceramics beyond Nissan is evident from the Malasang period onward. Malasang and Mararing-style pottery has been reported from Ambitle in the Feni Islands and the southern coast of New Ireland (Kaplan 1976; Spriggs in press *b*), and Buka pottery appears as far south as Numa Numa on the east coast of Bougainville by the Mararing phase (Terrell 1976). Pottery collected from the atoll of Ontong Java located east of Bougainville (Davidson 1974; Miller 1979) includes a Buka-made sherd with Mararing-style decoration (M. Spriggs: pers. comm.). Pottery from the Kieta area is associated with Malasang and later style pottery at the Teobebe site on Teop (Black 1977) demonstrating an overlap in exchange from the south and north.

CONCLUSION

Archaeological evidence suggests that aspects of the historically recorded exchange network between the Bismarck Archipelago and northern Solomon Islands in which Nissan operated as a stepping stone have been in existence for at least eight hundred years. Although broad exchange links extend back to the Lapita period, as reflected by the movement of obsidian, significant changes in the pattern of exchange and the variety of items being transported have been documented since this time. The use of ethnographic models of maritime exchange in Melanesia to interpret prehistoric exchange have been justly criticized as both inadequate and inappropriate (Ambrose 1978). By providing more detailed reconstructions of prehistoric regional exchange networks for areas such as the northern Solomon Islands, our knowledge of external linkages is greatly improved. The recent discovery of evidence for Pleistocene settlement within the Bismarcks-Solomons region greatly increases the time frame for exchange, and the number of potential questions to be addressed has multiplied accordingly. Recent evidence from Buka and elsewhere in the northern Solomon Islands has begun to allow the investigation of such questions by opening a window into more than twenty-eight thousand years of prehistory.

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