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Burial Artifacts from the Marshall Islands: Description, Dating and Evidence for Extra-archipelago Contacts

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Abstract—Salvage excavations had been conducted by D. Spennemann and associates in 1989 at a prehistoric cemetery at Laura village, Majuro islet, Majuro Atoll, Republic of the Marshall Islands. These excavations are summarized and the 631 artifacts associated with 12 of 29 human burials are described. Radiocarbon age determinations of three interments associated with the most numerous and diverse artifacts provide ages ranging from the 1st to 11th centuries AD—encompassing the first half of Marshallese prehistory. Artifacts described include *Spondylus* and *Conus* shell beads, Golden cowrie (*Cypraea aurantium*) pendants, a *Spondylus* nose ring, ground bivalves (*Cardium orbitum*), possibly used as charms, several styles of *Conus* shell rings, a *Porites* coral abrader, pearl shell lures, and a *Tridacna maxima* adze. The possible charms, pendants, and nose ring artifact types have not been reported previously for the Marshall Islands. *Conus* shell beads may be an early period artifact class with *Spondylus* disks more common in late prehistory. Contact with the Solomon Islands and several islands within eastern Micronesia is suggested by shared stylistic attributes of pearl shell trolling lure shanks and this evidence adds temporal details to the generalized colonization routes based on linguistic evidence.

Introduction

Artifacts associated with human burials from a prehistoric cemetery excavated in 1989 at the modern village of Laura, Majuro islet[1], Majuro Atoll, Republic of the Marshall Islands (RMI) are described from collections loaned to the author from the Historic Preservation Office, RMI. Because few human burials have been archaeologically excavated in the Marshall Islands, the Laura grave goods—many from dated contexts—provide an important addition to the material culture of the archipelago and, in the example of a pearl shell lure shank, contacts with the Solomon Islands and several islands in eastern Micronesia are suggested. Documenting extra-archipelago contacts in the eastern Carolines helps to

[1]Laura is the commonly used name of Majuro islet and the modern village. It was named by the occupying forces of the U. S. military immediately after World War II. The two names are used interchangeably in this paper.

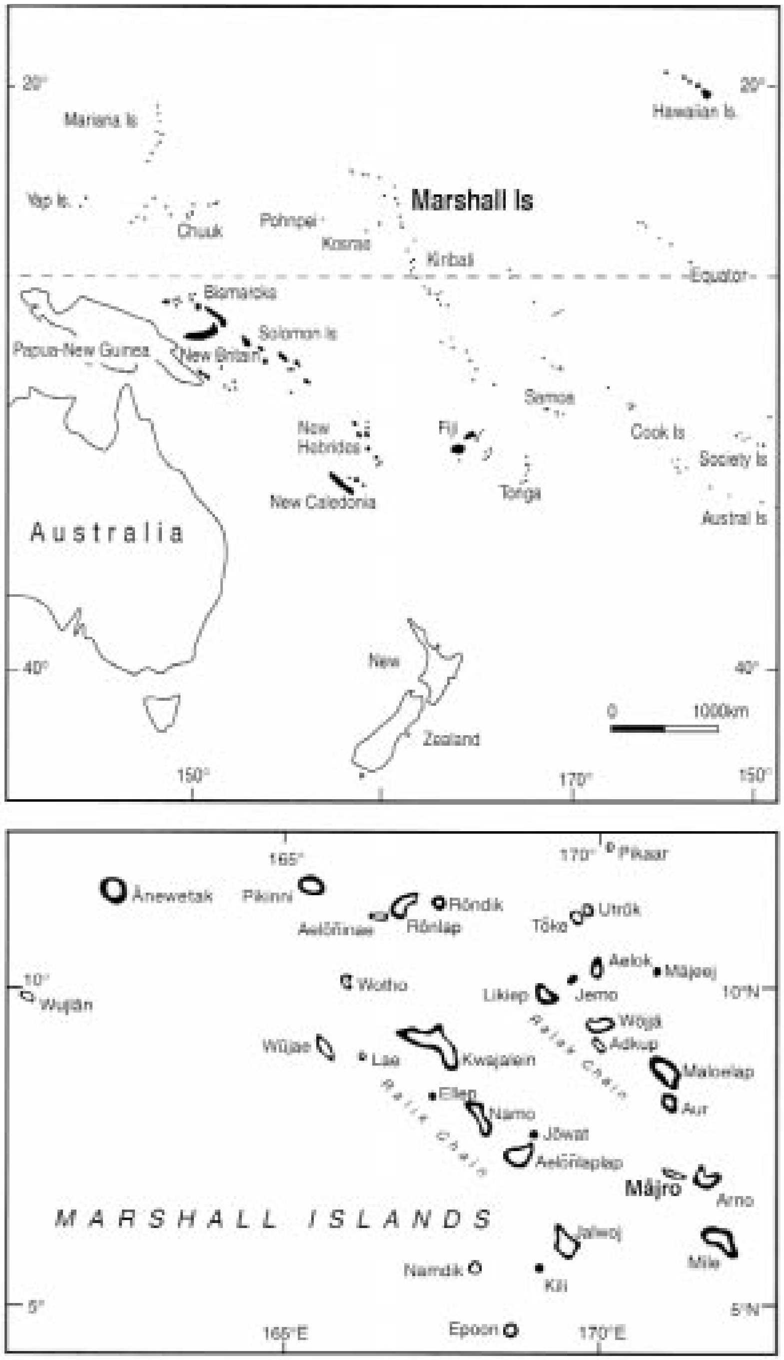

Figure 1. Map of Pacific showing location of the Marshall Islands 4-12˚ north of the equator. Majuro Atoll (lower map) is located towards the southern end of the Ratak Chain.

unravel the complicated colonization and post-settlement history only hinted at by models formulated with linguistic data (Blust 1984, Davidson 1988:91–94, Intoh 1997, 1999, Jackson 1986, Pawley & Green 1984). Excavation of the 29 burials was, in a classic sense, a salvage-rescue archaeological project where “most of the bones were badly broken due to construction vehicle traffic” (Spennemann 1994:32) as part of a groundwater development project. The artifacts, although stored at the Historic Preservation Office, RMI since 1989, have never been described. The excavations at the Laura cemetery are summarized, artifacts associated with these burials are described, and three interments with the most numerous and diverse artifacts were radiocarbon dated. A detailed study of the human remains is in progress and will be reported elsewhere.

Background and Archaeological Context

Located about 4,000 km southwest of Hawai‘i at the extreme margin of eastern Micronesia, the Marshall Islands consist of 29 low coral atolls and five small coral islands trending roughly northwest-southeast in two parallel island chains spread over nearly 2 million km^2 of ocean (Fig. 1). The islands (a total of 181 km^2) are situated between 4˚ to 12˚ N, in a zone with an annual rainfall gradient from 3,000 mm in the wet south to 500 mm in the dry north—a situation reflected in prehistoric settlement patterns and subsistence practices. For example, giant swamp taro (*Cyrtosperma*) and breadfruit is prevalent in the wet atolls, while pandanus and coconut are the staples in the dry north. Consequently, larger human populations were supported in the south.

The Marshalls were settled by about the first century AD as indicated by 2000 BP dates from habitation sites on several atolls (Shun & Athens 1990, Streck 1990, Weisler 1999a). Linguistic distributions (Marck 1975) and simulation studies of canoe voyages (Irwin 1992) point to the Solomon Islands as a likely origin for Marshall Islands settlement. As will be seen below, stylistic comparisons between a Marshall Islands trolling lure shank and those from the Solomon Islands give credence to this suggestion. For recent archaeological research in the Marshall Islands see Beardsley (1994), Dye (1987), Weisler (1999b), and Weisler et al. (2000).

Majuro Atoll Archaeology

Stretching nearly 40 km east-west, the 64 islets of Majuro Atoll—surrounding a lagoon nearly 300 km^2—have a total land area of 9.2 km^2. The atoll is situated near the southern end of the eastern archipelago (Ratak Chain) at 7˚ N latitude and ample rainfall has supported extensive aroid pit cultivation on the largest islet, Majuro. Riley (1981, 1987) conducted an extensive survey of the atoll and recorded 122 sites which he grouped into midden areas (sites with surface food remains), coral-faced structures, house platforms, fishtraps, and wells. From comparisons with other atoll settlement patterns (Weisler 1999b), Majuro islet—with the largest land mass and most substantial groundwater resources—should have the earliest habitation dates. This was borne out even by limited test excavations on Majuro and Calalin islets. Riley tested a large habitation site at Laura village which produced, on unidentified wood charcoal, a radiocarbon age determination of 1970 ± 110 BP (Riley 1987:243), still one of the earliest acceptable dates in the archipelago. Majuro islet has a central cultivation zone with dense aroid pit concentrations, breadfruit trees and bananas. Coconut and pandanus are found throughout the islet. The habitation sites, for the most part, are situated along the lagoon half of the islet and the two burial sites, whose associated artifacts are described below, are found there (Fig. 2). Shellfish scatters, consisting mainly of conch (*Strombus luhuanus*), and remnant coral pavements were observed throughout the area.

The Marshall Islands government initiated a groundwater development project on Majuro islet which consisted of mechanically excavating six approximately 3 by 3 m holes for well pads and several trenches for connecting pipelines. More controlled archaeological excavations in a dense burial area were made at well pad 2, while human remains were removed from trench profiles for well pads 4 and 6, located north of well pad 4 (Fig. 2).

A 4.5 by 5.5 m archaeological excavation was conducted at well pad 2 but few stratigraphic details were reported such as Munsell color, texture, structure, consistence and specific post-depositonal alterations such as the ubiquitous coconut tree roots found in the upper 50 cm of most sites in the Marshall Islands (e.g., Weisler 1999b:49–51; see also Hanson 1988:385 for a similar situation in Rota, northern Mariana Islands). As described by Spennemann (1994:22–33, 1999:42), excavations proceeded in a series of spits ("plana" in Spennemann's terms) 10± cm thick. Well pad 2 excavations encountered a dark layer that contained burials to a depth of 2 m, yet only four spits are described (Spennemann 1994:34). Some sediments were sieved with 1/4" (6.4 mm) screens (Spennemann 1994:24), but in the Figure 13 photo caption (Spennemann 1994, volume 2:9) 5 mm sieves were used for all excavated material around burials which is suggested by the recovery of *Conus* beads less than 6.4 mm in diameter at two burials. Spennemann reported (1994:32–33), spit 1 as "a light grey topsoil layer, with a few darker patches." Spit 2 revealed "a patch of clean unadulterated coral sand as well as a few scattered human bones...." Burials 7-15, not all of which were complete, were encountered in spit 3, but no sediment characteristics were given. The lowest spit 4 contained "an increasing amount of clean and unadulterated coral sand" [sterile subsoil] and burial pits were clearly visible. Spit 4 contained burials 4, 4a, and 16–29. The interments were densely spaced (dated burials 16 and 21 were about 1 m apart) and burial 21 showed prehistoric, post-depositional disturbance. From these spit descriptions, then, spits 3 and 4 contained all the in situ interments. Human burials were contained within a somewhat dark layer up to 2 m thick (Spennemann 1994:Fig. 4.9); the base of only some pits (contained in spit 4) intruded into the sterile sand subsoil. Spennemann (1999:40, 45) illustrates the burials encountered within layer 3 at well pad 2. The bones from the individual burials are stylised, computer-generated images, while only photos show the true condition of the bones (Spennemann 1999:Fig. 5).

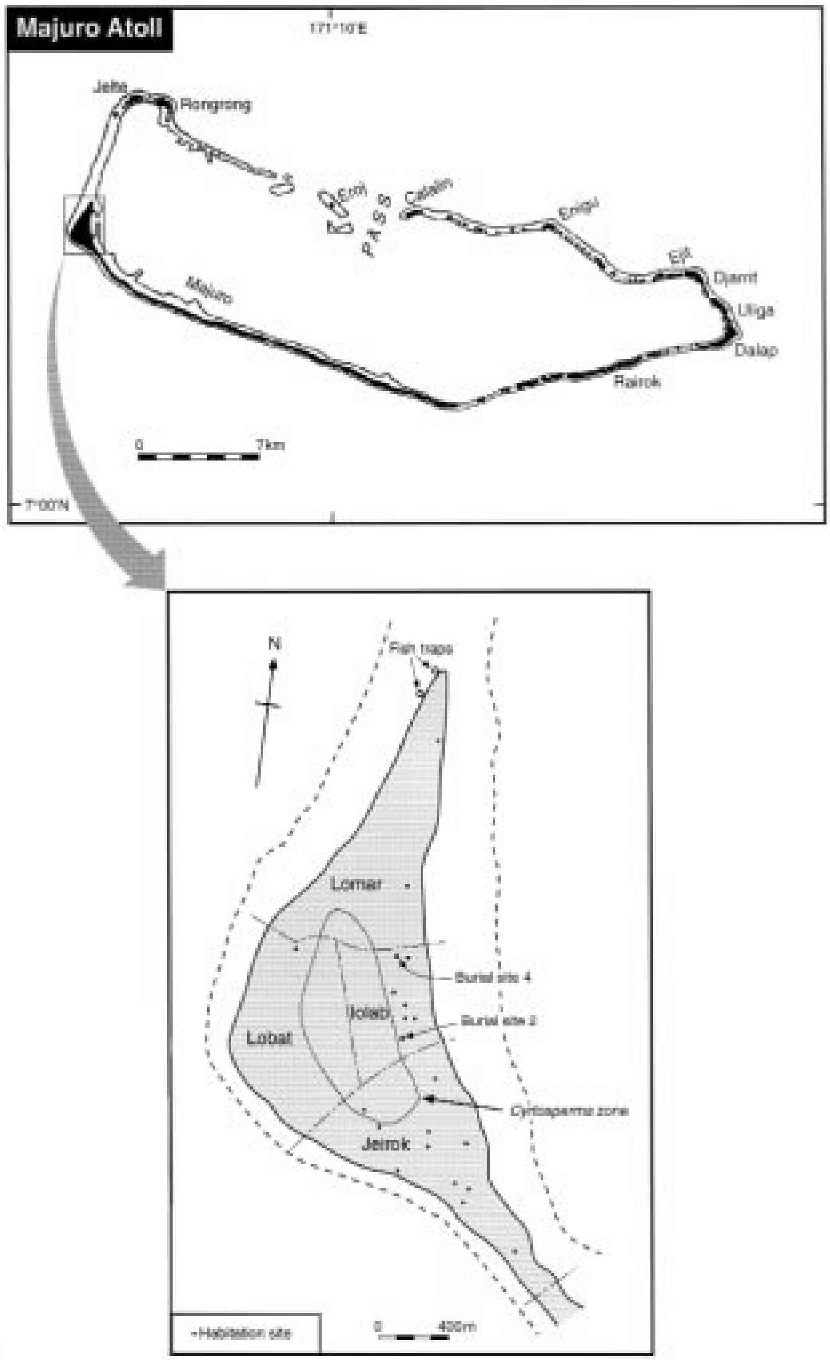

Figure 2. Map of Majuro Atoll and Majuro islet showing habitation sites, inland *Cyrtosperma* zone, and burial sites 2 and 4.

No complete burials were recovered due to their disturbed condition, missing bones, or partial exposure of several interments. However, it was possible to record the body orientation for 22 burials: 12 were positioned 50-55˚, while 10 were aligned 65-90˚; that is, all individuals were in a northeast to east direction (Spennemann 1994:47, 1999:42). Some 27 (93%) were in a supine position, two covered with large beachrock (?) slabs and, in one instance, a *Tridacna gigas* valve had been laid over the body. Only eight (28%) had grave goods, which included 6 *Cardium* and *Cypraea* shell charms on 3 individuals, 13 *Conus* arm rings from 5 burials, *Conus* beads (3 interments), bird bone needles with one individual and an additional burial with a single nose ring, 2 *Pinctada* trolling lures and 2 single-piece fishhooks with 2 burials, and a whale tooth pendant with a single interment. After excavation, the human remains, artifacts, and most field notes were stored in a walk-in shipping container in Majuro. Project photographs were stored in a file cabinet in the Historic Preservation Office, Marshall Islands (Spennemann, personal communication, 1995), but, in 1995, they could not be located and are presumed missing. Unfortunately, a termite infestation destroyed "a large part of the laboratory logbook and field notes" (Spennemann 1994:2); some of the bones were mixed as a result. This report analyses the artifacts as well as dating three of the individuals that have reliable provenance data.

DATING

Three burials were selected by the author for direct dating of human bone based on the diversity of associated artifacts and quality of the bone for dating. The profiles show that all burials from well pad 2 were from the same stratum which measures up to 1.10 m thick (Spennemann 1994:41). Because this is a relatively homogeneous deposit with no internal variation demarcating finer stratigraphic layers, the dates for each of the three burials reported here cannot be used to provide a chronological period for other spatially associated interments. This is because burial pits that have the same bottom depth, may have been originally excavated from different surfaces. Consequently, the dates presented here only establish clearly the temporal period for the associated grave goods and provide date ranges of when the three burials could have been interred. Identifying the stratigraphic origins of interments in sandy sediments is a difficult problem that has been noted, for example, by Hanlon (1988:377) working along the north coast of Rota where, "one of the more difficult problems associated with the excavation of burials in the project area was trying to define the mortuary features in the sandy soils."

As a dating material, bone is a distant second after identified carbonized wood. However, in some situations, such as that presented by the Laura cemetery remains, bone is the only material available for dating. Density, strength, and color can be used to quickly estimate the suitability of bone for radiocarbon analysis (Petchey 1998:44). Samples of dense, well-preserved bone were selected to reduce the amount of observable alteration and, obvious contaminants—such as rootlets—were removed prior to submission. At Beta Analytic Inc., collagen was

Table 1. Radiocarbon age determinations for Laura cemetery burials.

Beta No.	Provenience	^{14}C	$^{13}C/^{12}C$	Conventional	Weight	Calibrated 2 σ Range(a)	Calibrated 2 σ Range(b)
80176	burial 8	1740 ± 70	-18.1	1850 ± 70	280 g	AD 4 (133) 376	AD 256 (432) 616
80177	burial 16	1590 ± 70	-18.6	1690 ± 70	225 g	AD 143 (362, 366, 383) 537	AD 439 (623) 713
80178	burial 21	1300 ± 80	-18.1	1410 ± 80	190 g	AD 440 (646) 775	AD 680 (883) 1028

a = calibrations after Stuiver and Reimer (1993) for terrestrial samples.
b = calibrations after Stuiver and Reimer (1993) for mixed atmospheric and marine samples. Samples calibrated as 50% marine and 50% terrestrial.
A Δ R of 115±50 was used (Stuiver and Braziuna 1993:156).

extracted from long bone fragments by repeated applications of cold hydrochloric acid and samples Beta-80176 (burial 8, spit 3; 280 g sample) and -80177 (burial 16, spit 4; 225 g sample) were pretreated with alkali (NaOH) to remove secondary organic acids. These procedures are essential for removing acid- and base-soluble contaminants and particulate matter to help insure compatibility between laboratories (Ambrose 1990:431; Petchey 1998:33–34). However, there are no failsafe procedures for eliminating contaminated samples (van Klinken 1999:692). In tropical zones, bone collagen is typically low (van Klinken 1999:688), but calcareous soils—such as those found at the Laura cemetery—can stop or retard dissolution of the bone (White & Hannus 1983:322). However, large sample weights—two to three times that recommended by the lab which performed the analyses—were submitted for radiocarbon age assessment to increase the amount of dateable collagen. Sample Beta-80178 (burial 21, spit 4; 190 g sample) was not pretreated for humic acids due to small sample size and there is a possibility that the date is somewhat too young (personal communication, Darden Hood, 1995). However, it does overlap at 2 σ with Beta-80177. Table 1 presents the data for each sample calibrated using Stuiver & Reimer (1993) version 3.0 for terrestrial samples. At 2 σ, burials 8 and 16 from well pad 2, and burials 16 and 21 overlap one another in time, with date ranges suggesting the interments took place between the 1st and 8th centuries AD.

It is acknowledged that atoll dwellers depend significantly on marine foods for protein. However, Majuro islet has an extensive aroid pit and breadfruit cultivation zone (Riley 1987:172) and coconut and pandanus—important components of the subsistence regime—are plentiful in the modern Laura village. Pigs are not known from the Marshall Islands (Intoh 1986) and dogs were the only sizeable terrestrial mammals. The latter, however, are not common in archaeological deposits. Consequently, the dominant sources of protein in prehistory were fish and shellfish. Not knowing the percent contribution of marine foods to prehistoric diets, it is uncertain what effect they may have on the age calibrations. However, calibrating the three samples as 50% marine and 50% terrestrial using Stuiver & Reimer (1993) for mixed atmospheric and marine samples provides a range of AD 256 to 1028 (Table 1), thus shifting the calibrated range 250 more recent. A 50% marine diet seems reasonable in light of isotopic studies of prehistoric diet for Saipan (McGovern-Wilson & Quinn 1996:64) and the Caribbean (Keegan & DeNiro 1988). Considering the differences between the terrestrial- and marine-based radiocarbon age calibrations, portions of the Laura cemetery were used sometime between the 1st and 11th centuries; that is, during the first half of the culture-historical sequence known for the Marshall Islands.

Artifacts

A total of 631 artifacts was associated with 12 human burials, consisting mainly of ornaments, but also a few tools (Table 2). These are described below under broad categories.

Table 2. Burial artifacts from the Laura cemetery.

	Well pad/burial number												
Artifact class	2/8	2/11	2/13	2/16	2/19	2/21	2/24	2/28	4/1	6/1	"pit-3"*	"loose bones"*	Total
Ornaments:													
Bead	yes(25)	---	---	yes	(45)	yes(539)	---	---	---	---	---	---	?(609)
Cardium, ground	---	(1)	---	1	---	---	---	---	---	---	---	---	1(1)
Cypraea, whole	---	---	---	2	---	---	---	---	---	---	---	---	2
"charm"	---	---	---	---	---	---	---	---	---	3	---	---	3
Pendant, whale tooth	---	---	---	---	---	---	---	---	---	1	---	---	1
Ring, arm	5(5)	---	(1)	2(2)	1	4(4)	1	(1)	---	---	(1)	(1)	13(15)
Ring, nose	---	---	---	---	---	1(1)	---	---	---	---	---	---	1
Tools:													
Abrader, coral	---	---	---	---	---	(1)	---	---	---	---	---	---	(1)
Adze, shell	---	---	---	(1)	---	---	---	---	---	---	---	---	(1)
"Fishhook"	---	---	---	---	---	---	---	---	2	2	---	---	4
"Needles," bird bone	---	---	---	---	---	3	---	---	---	---	---	---	3
Trolling lure	(2)	---	---	---	---	---	---	---	---	---	---	---	(2)
Total	5(32)	(1)	(1)	5(3)	1(45)	8(545)	(1)	(1)	2	6	(1)	(1)	27(631)

Entries in parentheses, this report. Other values from Spennemann (1994:table 5.2).
Artifact classes in quotes are as reported by Spennemann (1994).
* = as labeled on artifact bags.

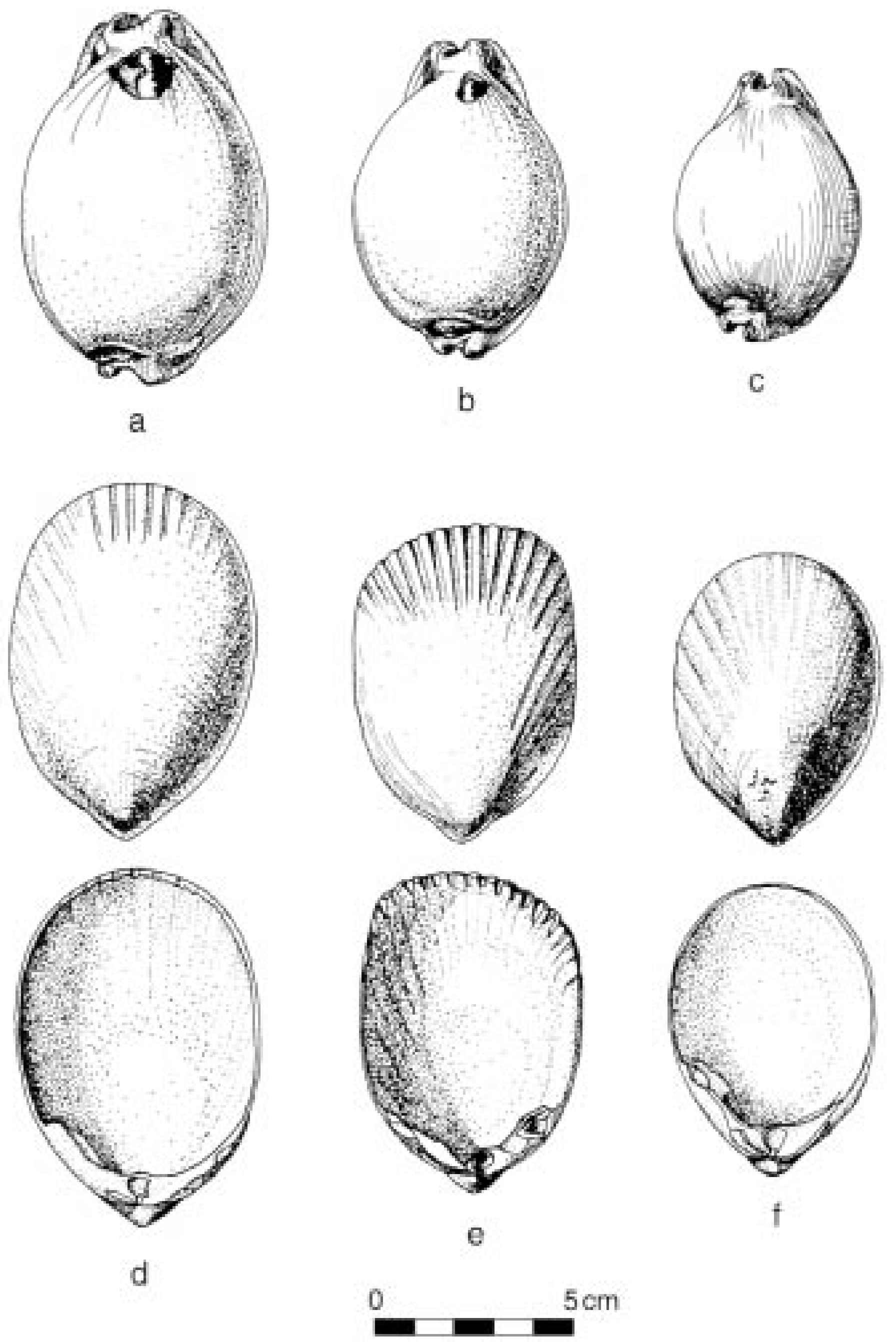

Figure 3. Shell ornaments: a-c Golden cowrie (*Cypraea* cf. *aurantium*), with two specimens showing holes chipped to facilitate suspension; d-f the bivalve, *Cardium orbitum*, ground on the exterior surface and along the interior rim.

Shell Ornaments

Ground bivalves. Three ground shell ornaments were made from the Orbit Cockle bivalve (*Cardium orbitum*) which inhabits shallow reef waters. The shell is violet on its exterior surface and around the interior perimeter which undoubtedly made an attractive ornament. In general, the radial grooves on the exterior surface and along the interior perimeter of the valves were almost completely ground smooth, the edges were rounded, and the hinge area was also ground flat. There is no facility for suspension and perhaps the artifacts were placed with the burials as charms. Described here are the first artifacts of this kind reported for the Marshall Islands. Specimen 14 (Fig. 3d) weighs 36.3 g and was 88.19 mm long, 60.73 mm wide, and 27.85 mm in height. Specimen 21 (Fig. 3e), weighing 39.8 g, with a length of 78.51 mm, width of 55.85 mm, and height of 25.05 mm, was the least ground of the three artifacts. Radial grooves are prominent on the interior and exterior distal end which is not as rounded as the other two specimens. The smallest of the ground shell ornaments is also the most completely ground (Fig. 3f). It weighs 27.7 g and is 71.65 mm long, 51.59 mm wide, and 24.81 mm in height.

Cowrie ornaments. Three large molluscs were identified as Golden Cowries (*Cypraea aurantium*) from their size, shape, and spacing and size of teeth along the aperture. Two of the largest specimens have chipped holes above the tapering end which provided a means for suspension as pendants. These are the only known artifacts of this kind from the Marshall Islands. Artifact 18, the largest specimen (Fig. 3a) weighs 95.0 g and is 93.44 mm long, 62.85 mm wide, and 51.01 mm in height. The perimeter of the suspension hole is slightly offset from the medial line and is uneven and rough measuring 18.59 by 18.00 mm in diameter. The second specimen (number 17) weighs 79.3 g, is 79.51 mm long, 53.52 mm wide, and 45.14 mm in height (Fig. 3b). Similar to specimen 18, the chipped hole is offset, uneven and rough measuring 10.80 by 7.80 mm in diameter. The smallest of the cowries does not have a suspension hole. It weighs 43.3 g and is 66.81 mm long, 45.17 mm wide, and 38.47 mm in height (Fig. 3c).

Nose ring. A half ring of *Spondylus* has a diameter of 78 mm and was found immediately above the maxilla of burial 21 suggesting it was worn through the nose. The specimen was completely ground into a circular cross-section with a thickness of 2.85 to 4.59 mm (Fig. 4f). No other specimens are known from the Marshall Islands.

Shell rings. Shell rings were worn on the upper and lower arms and occasionally within greatly distended ear lobes. In specimens where the species of shell is known, the Leopard Cone (*Conus leopardus*) was favored as it obtains lengths up to 140 mm and has the largest diameter of any Conidae. Examination of partially worked cones and unfinished rings in the Alele Museum (National Museum of the Republic of the Marshall Islands) suggests a manufacturing sequence that probably included the following steps, but not necessarily in this order: (1) using a fire

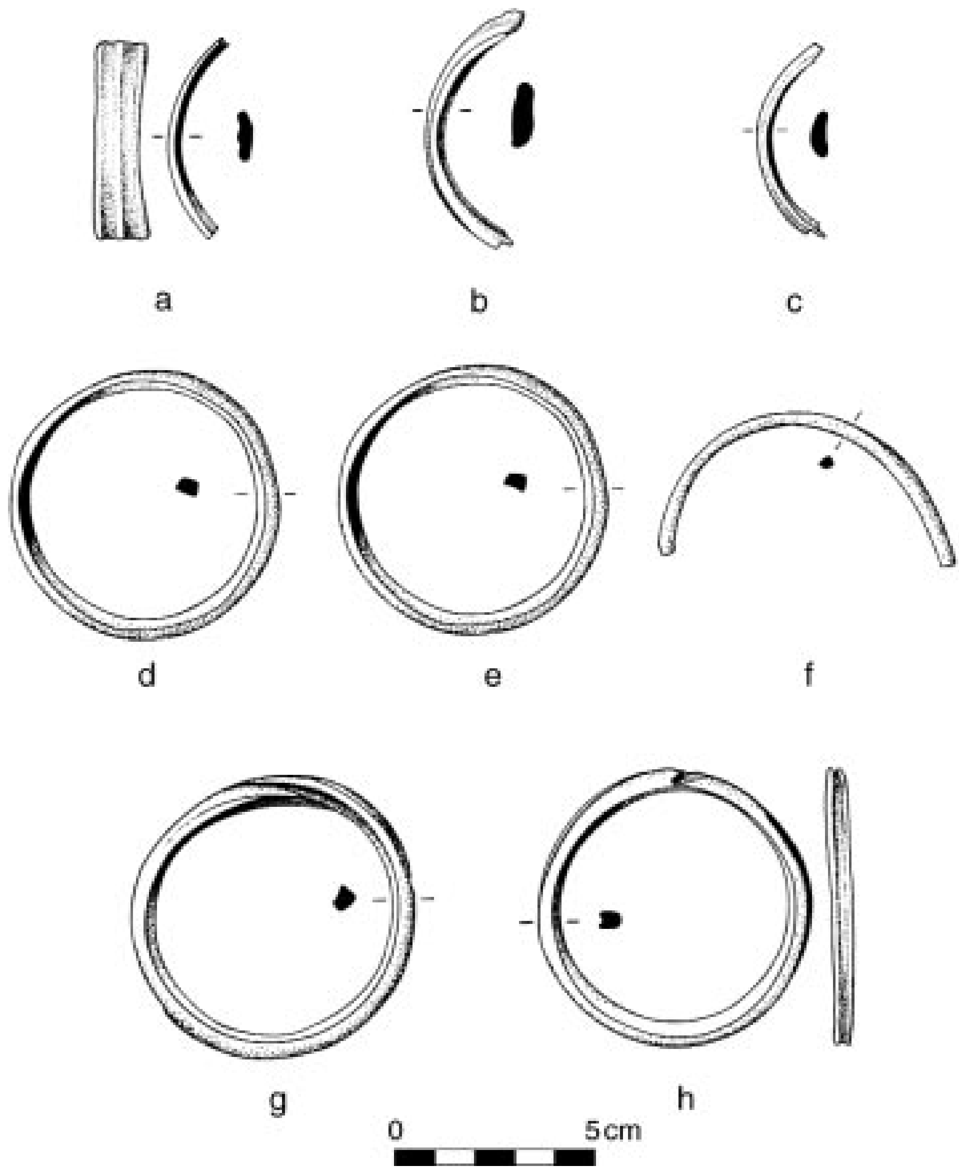

Figure 4. Nose ornament (f) and *Conus* shell rings showing variation in cross-section and design: a quadrangular cross-section with wide grooves and center ridge; b and d are quadrangular in cross-section; c is plano-convex in cross-section; e and g are subtriangular in cross-section without perimeter design; and h is square in cross-section with a deep center groove.

stick, a line of shell was removed about 25 mm below the spire and around the circumference of the cone, thus removing the top (Rosendahl 1987:Fig. 1.73d); (2) the spire was then removed possibly by using the fire stick and the resulting

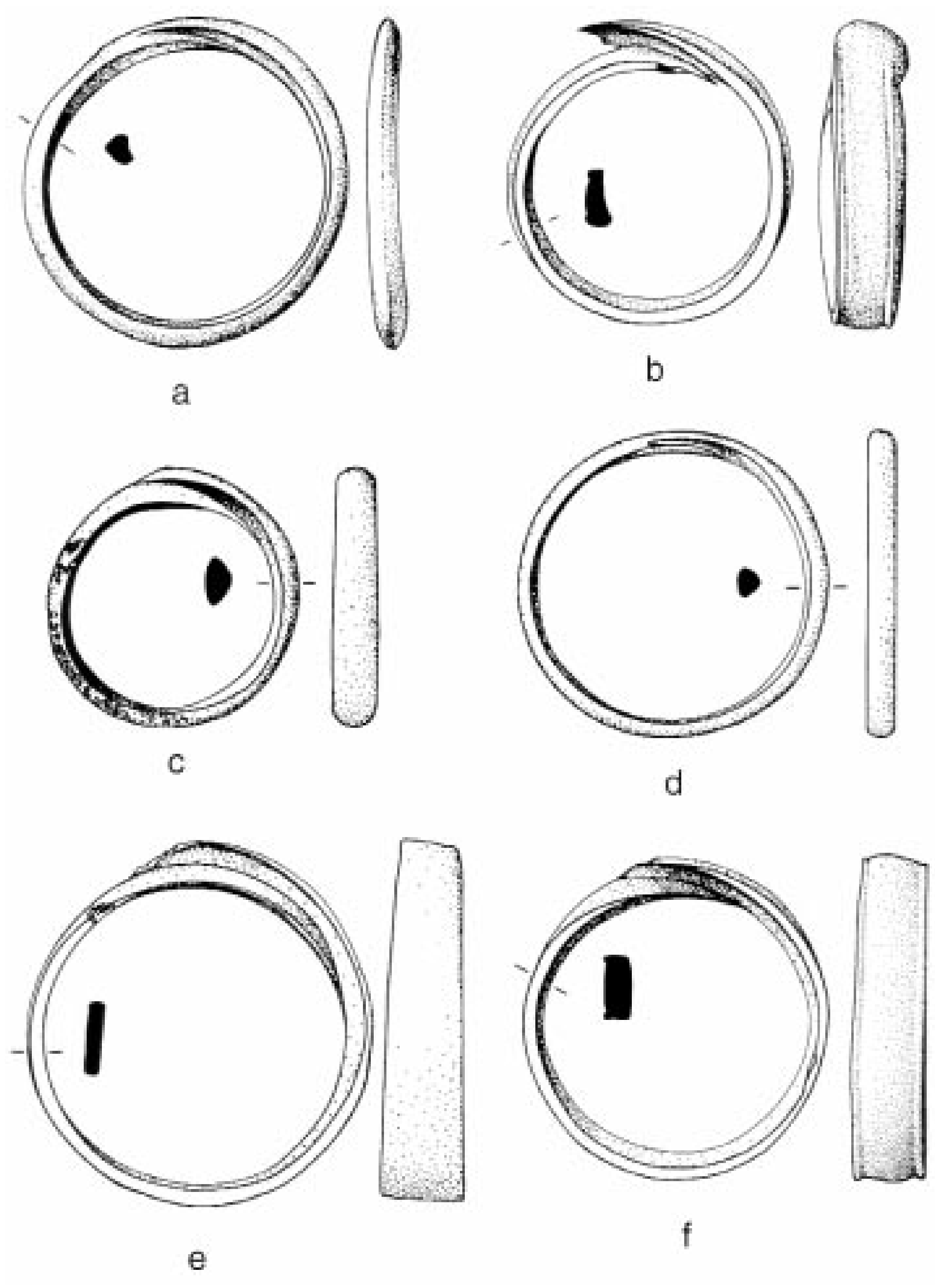

Figure 5. *Conus* shell rings showing variation in cross-section and perimeter design; a has a subtriangular cross-section; b and f are quadrangular in cross-section with marginal, fine parallel grooves; c and d are plano-convex in cross-section; and e is quadrangular in cross-section without design.

hole was gradually widened (e.g., artifact no. MiMl-WjSA-2); (3) the top and bottom of the roughed-out ring could then be ground on a slab of coral smoothing the sides of the ring; (4) fine design could be applied to the exterior ring surface by incising with a shark tooth or other sharp object (e.g., Fig. 5b and f) or grinding wider grooves with a *Porites* coral abrader (e.g., Fig. 4a). In some examples, the spire is removed by incising a groove around the perimeter of the shell, perhaps 25 mm below the spire (e.g., artifact no. MiMl-Ar5-13); the bevel of the groove also shapes one side of the sub-triangular cross-sectioned forms. In another example, the spire is removed either by grinding or a combination of using a fire stick, then grinding, thus finishing one side of the ring before removal from the whole shell (Rosendahl 1987:1.73e).

Design was applied to shell rings by shaping the specimen in cross-section: plano-convex (e.g., Fig. 5c and d); sub-triangular (e.g., Fig. 5a), and quadrangular (e.g., Fig. 5e) shapes. On the exterior perimeter of the ring, multiple, parallel thin lines could be incised around the circumference (Fig. 5b and f; Rosendahl 1987:Fig. 1.76l), while wider grooves produced an internal ridge (Fig. 4a). Table 3 lists the metric and discrete attributes of the shell rings from the Laura burials. Interior diameters ranged from 48.01 to 71.68 mm and, if worn on the upper arms, suggests that the owners of these ornaments were of slender build. Comparison of the discrete attributes reveals that rings that are plano-convex and sub-triangular in cross section do not have external design, while only quadrangular and square cross sections are incised or grooved. While it is easier to incise a flat surface, there is no functional reason why the plano-convex forms could not display incising or grooves. Perhaps the makers of the shell rings adhered to stylistic conventions or culturally-mediated design rules.

Conus beads. The spacing of the whorls near the apex of the *Conus* beads suggests that small cone shells (e.g., *Conus flavidus* or *C. ebraeus*) were used to manufacture these ornaments. Bead "blanks" of naturally worn cone spires could have been collected along the beaches and then ground flat on both sides. The bead holes were probably made by grinding, and were not drilled, since the perforation is often irregular in plan and internally uneven and rough. Consequently, these were the easiest shell beads to manufacture and their consistently smaller size, in reference to other shell beads, probably reflects the nature of the raw material (i.e. naturally occurring small bead "blanks") and not the skill of the artisan. *Conus* beads, found in three burials, consisted of 78% of all beads (Fig. 6). Aside from two much larger *Conus* beads recovered from burial 19, the mean diameter of these artifacts from burials 8 (n = 12) and 21 (n = 464) is nearly identical at 4.25 and 4.24 mm, respectively (Table 4).

Spondylus beads. These light orange to red-colored beads were made from the bivalve, *Spondylus* cf. *rubicundus* (Fig. 6). Live individuals were probably collected on the reef flat, valves broken into small fragments, then ground to the desired thickness. Of the 131 beads recovered from three burials, only 15% were

Table 3. Attributes of shell rings from Laura burials.

Burial No.	Artifact No.	Weight	Diameter	Width	Thickness	Figure No.	Exterior Surface	Cross-section	Edges	Classification
28	24	5.0	50.00*	11.98	3.14	4c	plain	plano-convex	rounded	I3C
13	23	12.8	55.00*	16.31	5.02	4b	fine, faint edge ridges	quadrangular	slightly rounded	III1B
pit-3	25	13.8	64.98	6.81	4.71	5d	plain	sub-triangular	rounded	I4C
16	12	16.9	66.88	8.12	4.82	5a	plain	sub-triangular	rounded	I4C
16	11	31.2	58.59	15.85	5.18	5b	fine edge ridges	quadrangular	square	III1A
8	10	33.4	63.72	17.02	4.08	5f	fine edge ridges	quadrangular	square	III1A
8	9	41.8	71.68	19.78	4.12	5e	plain	quadrangular	square	I1A
8	7	39.1	59.85	21.86	4.48	none	plain	quadrangular	square	I1A
8	6	18.3	50.60	11.71	4.10	5c	plain	plano-convex	rounded	I3C
"loose bones"	27	5.2	60.00*	12.62	3.81	4a	wide edge ridges, center ridge	quadrangular	rounded	II1C
8	8**	21.0	59.11	14.30	4.39	none	plain	plano-convex	rounded	I3C
21	5	12.2	61.68	6.42	4.29	4g	plain	sub-triangular	rounded	I4C
21	4	10.2	58.59	5.41	4.90	4h	deep, center groove	square	slightly rounded	IV2B
21	3	8.2	58.95	5.18	4.18	4e	plain	sub-triangular	rounded	I4C
21	2	12.3	48.01	7.22	4.20	4d	plain	quadrangular	square	I1A

* = estimated from fragment. ** = 90% complete circumference

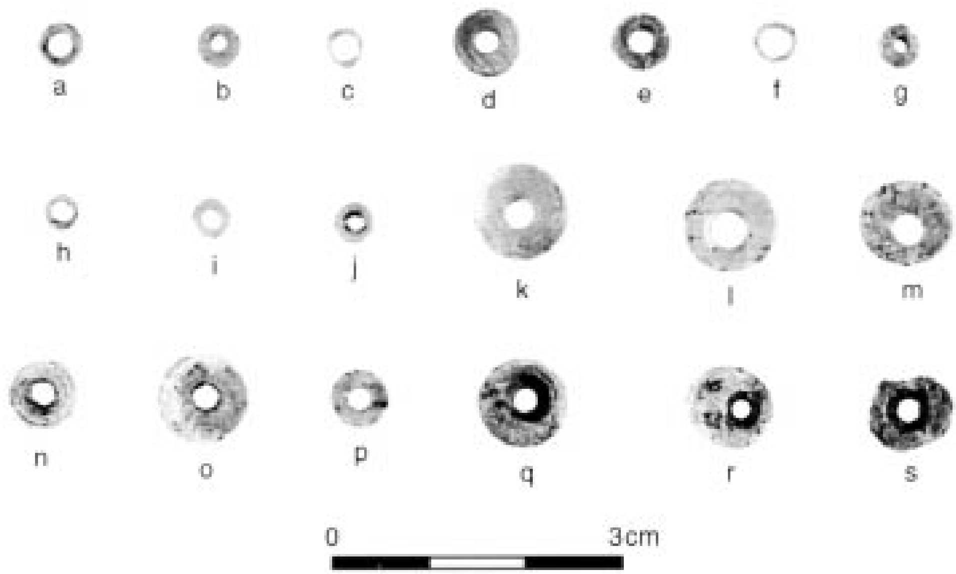

Figure 6. Examples of shell beads from Laura burials. a-c, h-j, and n-p are *Conus* beads; d-g, k-m, and q-s are *Spondylus* beads.

biconically drilled, the rest perforated from one side. Centering the drill hole was, perhaps, the most difficult aspect of bead manufacture since 24% of all holes were off center. From the finished shape in plan (from perfectly circular to oblong), orientation of profile (parallel or converging), and definition of the drill hole (funnel-shaped or straight sides), there is a variation in the quality of the beads. Ten percent were not round, with overall bead shapes varying from perfectly round to slightly oblong in plan. Some 13% had wedge-shaped profiles, although this may have been intentional for the beads that were positioned in lower bend in necklaces so they fit closer. However, converging profiles was a function of uneven grinding.

Since it was more difficult and time consuming to manufacture the smallest *Spondylus* artifacts, it is interesting to note that burial 21 not only had the most numerous beads, but had significantly smaller specimens than burials 8 and 19. This is clearly seen by comparing the mean weight of *Spondylus* beads between burials (cf. Table 4).

Coral Abrader

A well-shaped, nearly completely ground *Porites* sp. coral abrader was found with burial 21. Angular and blocky forms of *Porites* coral abraders are the most common in the Marshall Islands and were used for working pearl shell (*Pinctada margaritifera*) into fishhooks and possibly incising the perimeters of large cones (*Conus* spp.) for ring manufacture. Weighing 50.0 g, specimen 19 measures 68.50 mm long, 43.07 mm wide, and 21.18 mm thick. The working edge is 68.18 mm long and was ground to a 55˚ angle (Fig. 7c).

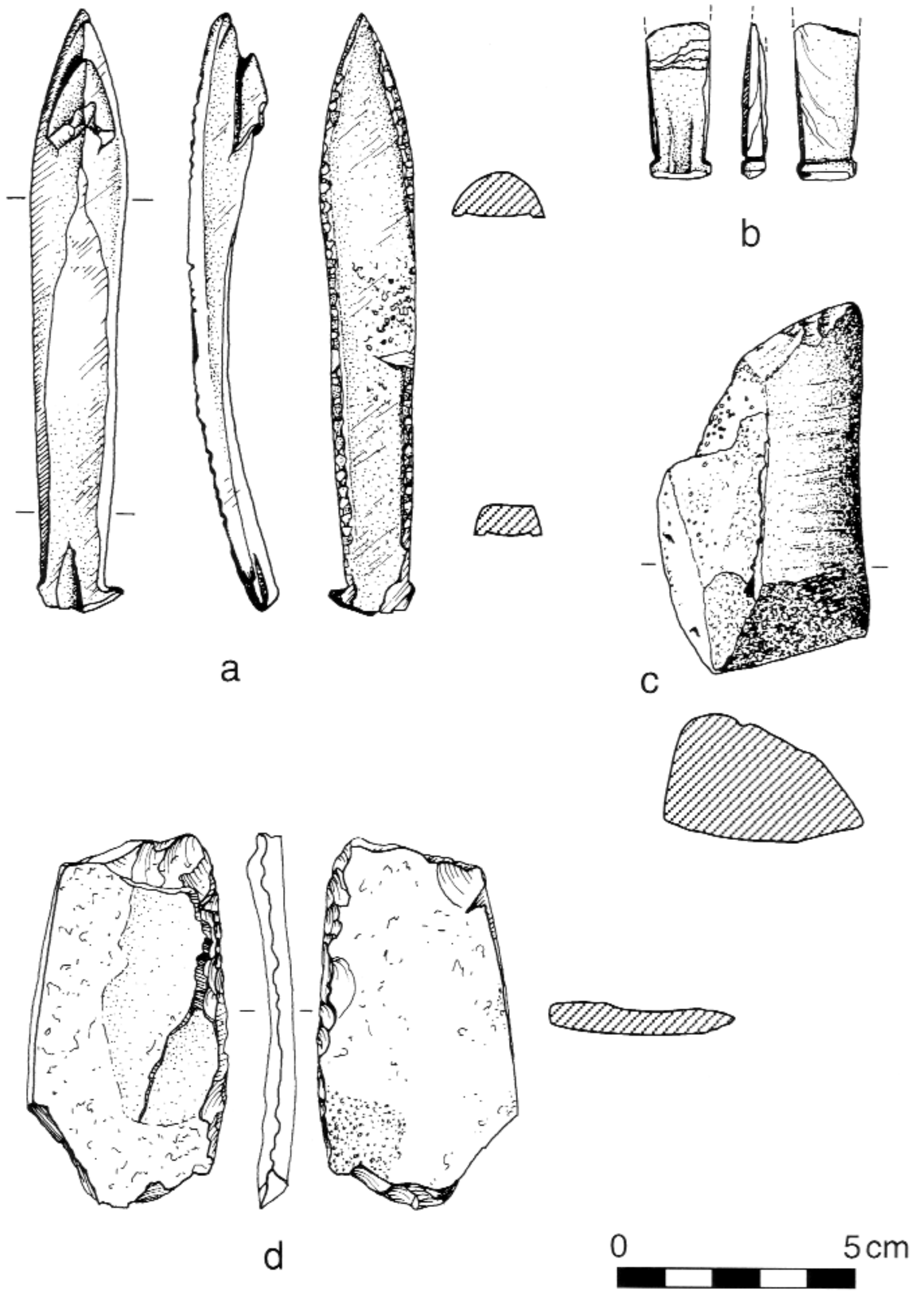

Figure 7. Other grave goods: a is a Black-lipped pearl shell (*Pinctada margaritifera*) trolling lure showing edge design and knobbed line attachment with basal grooves; b distal fragment of a trolling lure of Black-lipped pearl shell; c *Porites* coral abrader; d *Tridacna maxima* shell adze midsection.

Table 4. Metric attributes of shell beads from Laura burials.

	Bead Diameter	Hole Diameter	Thickness	Weight
Burial 8 (n = 25)				
Conus (n = 12)	4.25 ± 0.91	2.13 ± 0.57	1.14 ± 0.16	0.03 ± 0.02
Spondylus (n = 13)	8.87 ± 1.07	2.83 ± 0.43	2.73 ± 0.65	0.33 ± 0.10
Burial 19 (n = 45)				
Conus (n = 2)	7.46-9.25	2.40-2.69	2.78-3.18	0.23-0.41
Spondylus (n = 43)	8.62 ± 0.83	2.75 ± 0.40	3.08 ± 0.59	0.34 ± 0.11
Burial 21 (n = 539)				
Conus (n = 464)	4.24 ± 0.32	2.20 ± 0.37	1.08 ± 0.17	0.05 ± 0.03
Spondylus (n = 75)	5.39 ± 1.21	2.47 ± 0.42	1.54 ± 0.30	0.08 ± 0.05
All Beads (n = 609)				
Conus (n = 478)	4.21 ± 0.61	2.17 ± 0.32	1.09 ± 0.30	0.05 ± 0.04
Spondylus (n = 131)	6.77 ± 1.96	2.60 ± 0.44	2.16 ± 0.85	0.19 ± 0.15

The range is reported for burial 19 *Conus* beads due to small sample size.

Shell Adze

A *Tridacna maxima* adze midsection was found with burial 16. Completely ground on the dorsal surface, the sides are subparallel, converging towards the poll. One side is ground smooth, while the other margin is flaked and unfinished (Fig. 7d). At the midpoint, the specimen measures 41.00 mm wide and 6.33 mm thick. It is classified as TRI-EXT (Rosendahl 1987) and type 3 according to Kirch & Yen (1982).

Trolling Lures

Manufactured from the Black-lipped pearl shell (*Pinctada margaritifera*), a nearly complete and one distal fragment of two trolling lures were recovered as grave goods. Spennemann lists "fish hooks" from two burials (1994:Table 5.3), but the artifacts are not mentioned under his burial descriptions (1994:49). Both artifacts were found in a bag marked burial 8. The largest lure weighs 32.0 g and is 125.59 mm long and, at the midpoint, it measures 16.92 mm wide and 7.02 mm thick. The proximal and thickest end has an elaborate, knob-like lashing device which has similarities to Solomon Islands lures (Anell 1955: Fig.12b, Beasley 1928: Plate CVI, Bell et al. 1986:Fig. 4.2, item 4, Green 1976: Fig. 40, item l) and a lure from Fais whose style may have also originated from the Solomons (Intoh 1996:114–115). Lures with similar line attachments have been recovered from Ebon Atoll (Marshall Islands) and at another site on Majuro islet, Majuro Atoll (Rosendahl 1987:Fig. 1.50b, i-l) which are from later prehistoric contexts. The distal end had two short points or lugs—the intact one is 4.16 mm long—that is perpendicular to the long axis of the lure. The projections and a narrow, V-shaped groove facilitated lashing of the lure point. The back of the lure (exterior portion of the shell valve) has an intricate incised and grooved pattern that parallels the sides (Fig. 7a). A distal lure fragment weighs 3.5 g and, at the intact end, is 11.88 mm wide and 4.98 mm thick. Like the other specimen, it has a groove to facilitate lashing of the lure point (Fig. 7b; see also Rosendahl 1987:Fig.1.49k).

Discussion

The artifacts associated with the Laura burials compose the largest collection of grave goods yet recovered from archaeological contexts in the Marshall Islands. Unfortunately, there are no other published burial reports from the Marshall Islands aside from an adult interment from Kwajalein Atoll (Weisler et al. 2000). The Laura and Kwajalein burials, then, are the only basis for examining patterns of associated grave goods throughout the archipelago. With these limitations in mind, it is interesting that one similarity in the grave goods between the two atolls is the presence of a single *Porites* coral abrader from burial 21 and the Kwajalein interment. This tool could have been used for sawing and shaping shell for fishhook and shell ring manufacture. It is not temporally or stylistically unique.

It is somewhat difficult to make accurate comparisons of *Conus* shell rings from other sites both within and outside the Marshall Islands since the attributes of these artifacts are not reported in a standard way. For example, Rosendahl described his shell ring assemblage—the most extensive collection to date from the Marshall Islands—by grouping the specimens first by the presence or absence of the "natural shell exterior" (1987:138). Within these groups, *Tridacna, Conus,* and possibly *Trochus* were identified. However, upon my examination of the actual specimens, several of his unidentified shell taxa and at least one of his *Tridacna* artifacts are clearly *Conus*. His "exterior" group was separated further by the characteristics of the exterior shell surface (e.g., flat, ridges) and cross-section form (e.g., rectangular, lenticular). The "natural" ridges he describes for several shell rings (Rosendahl 1987: Fig. 176k, l), upon my examination of the specimens, are actually artificial grooves, probably incised with a sharp cutting tool. The "interior" shell rings, defined by Rosendahl (1987:138) as "exhibit[ing] little or none of the natural shell surface or configuration", were separated into seven groups based on exterior surface (e.g., shallow groove, parallel side ridges, "peak") and cross-section form (e.g., triangular, rectangular, oval). His descriptive grouping scheme does not have mutually-exclusive features making its use difficult. Furthermore, he lists the results of his scheme in a table that uses letters for groups, while his discussion refers to numbers (Rosendahl 1987:138, Table 1.22), thus further confusing use of his results.

A paradigmatic classification was formulated here for the Laura shell rings with each dimension consisting of explicitly-defined and mutually-exclusive features. Ideally, features of each dimension should be exhaustive of all possibilities. For example, for the dimension of cross-section—quadrangular, square, planoconvex, and sub-triangular were used. The intersection of these features, from the three dimensions, results in artifact classes. The characteristics of the paradigmatic classification are presented in Table 5.

Table 5. Paradigmatic classification of *Conus* sp. shell rings.

Dimension 1: Exterior Surface

Feature I: plain (Fig. 5e)
Feature II: single center ridge around circumference (Fig. 4a; Rosendahl 1987:Fig.1.76m)
Feature III: two fine ridges, one parallel to each edge around the circumference (Fig. 5b, f; Rosendahl 1987:Fig.1.76k)
Feature IV: one deep center groove around the circumference (Fig. 4h)
Feature V: two fine grooves around the circumference
Feature VI: three fine grooves around the circumference
Feature VII: four fine grooves around the circumference
Feature VIII: five fine grooves around the circumference
Feature IX: six fine grooves around the circumference (Rosendahl 1987:Fig.1.76l)

Dimension 2: Cross-section

Feature 1: quadrangular (Fig. 5e, f)
Feature 2: square (Fig. 4h)
Feature 3: plano-convex (Fig. 4c)
Feature 4: sub-triangular (Fig. 4g, 5a)

Dimension 3: Edge Modification

Feature A: square (Fig. 5b, e, f)
Feature B: slightly rounded (Fig. 4b, h)
Feature C: rounded (Fig. 4a, c, 5a, c, d)

Example: I1A = plain exterior surface, quadrangular cross-section, square edges.

Inter-island comparisons are limited, but all the *Conus* shell rings from the Kwajalein burial (Weisler et al. 2000: Fig. 5) are classified as III1A and are identical to one ring from burial 8 and one from burial 16 dating to AD 4-713 (Table 1). Since the Kwajalein burial is late prehistoric (no earlier than the 15th century AD; Weisler et al. 2000:197–198), it is likely, then, that this style of *Conus* ring is not temporally distinct, having been found in early as well as late contexts. A similar style of *Conus* ring was surface collected from Ebon Atoll (Rosendahl 1987:Fig. 1.76k), the furthest south in the archipelago, and Maloelap Atoll, located just north of the geographical center of the Marshall Islands[2]. Looking farther afield, it is noteworthy that the practice of incising *Conus*, *Tridacna*, and *Trochus* rings is greatly elaborated in Uki, southeast Solomon Islands (Newman 1975:17–26), precisely the region where stylistic affinities have been demonstrated for trolling lures found in one Laura burial.

[2]Similarities between the *Conus* rings surface collected by Rosendahl (1987) and the Laura grave goods were made by personally examining Rosendahl's collections held at the Alele Museum, National Museum of the Republic of the Marshall Islands, Majuro. These include Rosendahl's artifact numbers MiML-Eb5A-23, MiML-Eb-5-95 (Rosendahl 1987:Fig.1.76k), MiML-Eb-5-97, and MiML-Ml1-1. The actual specimens must be examined since cross-section form was not consistently reported by Rosendahl and is a necessary dimension for classification.

Spondylus beads were found in several Laura burials, while *Spondylus* disks were noted for Kwajalein. The Kwajalein artifacts are more disk-like (i.e. the hole is much smaller than the specimen diameter), while the Laura ornaments are more bead-like—the hole is much larger in relation to the bead diameter. Extra-Marshall Islands artifact comparisons are informative in that Butler & Harris (1995:249-250) found that *Conus* beads were generally early in the cultural-historical sequence of Saipan, with *Spondylus* disks more common in the later periods. Perhaps this change in bead material reflects increasing social complexity and status differentiation in the display, during later prehistory, of ornaments that were more time-consuming to make and were manufactured from raw materials there were increasingly more difficult to obtain—at least in the Marshall Islands where *Spondylus* cf. *varius* is known only from archaeological contexts (Weisler et al. 2000:198). There is some ethnographic evidence that *Spondylus* beads were specially valued and considered heirlooms of great value in Kiribati (Koch 1986: 159). At Laura, *Spondylus* and *Conus* beads were found together in three burials with calibrated age ranges, at 2 σ, of AD 4 to 1028 suggesting that bead material may not be indicative of a specific period within this time range. However, a single late prehistoric burial from Kwajalein (date range at 2 σ of AD 1429-1645; Weisler et al. 2000:198) contained only *Spondylus* disks alluding to the material change during later prehistory. It is also interesting to note that the *Spondylus* disks from the late prehistoric burial on Kwajalein are significantly larger with a mean diameter of 19.3 ± 2.02 mm (Weisler et al. 2000:199) compared to only 6.77 ± 1.96 mm for all the Laura *Spondylus* beads. Although the burial sample is small *Conus* beads appear only in early interments and *Spondylus* bead/disk size increases from the early to the late periods of the Marshall Islands cultural-historical sequence. In may also be that *Spondylus* disks are late, while *Spondylus* beads are early.

The large, intricately decorated trolling lure, with an associated age range, at 2 σ, of AD 4-376, has clear stylistic parallels with ones from the Solomon Islands. The material, line attachment and shank profile are similar to the New Georgia specimens (Anell 1955:149) and nearly identical line attachments are known from Uki, north of San Cristobal in the eastern Solomons (Green 1976: Fig. 40, item l; see also Beasley 1928; Plate CVI, Bell et al. 1986:Fig. 40.2, item 4). A similar, but undecorated, lure is known from nearly 3,000 km west of Majuro on Fais—ascribed to the Solomons by Intoh—which dates to the relatively early period of AD 400-800 (1996:114–115). This may well argue for independent introductions from the Solomons into western and eastern Micronesia during the first few centuries AD. Anell identifies the Marshall Islands "type" west to Mokil (Mwokil), Namoluk, and Nan Madol where, on the volcanic islands of Pohnpei and Kosrae, Marshall Islands lures seem to have been used as currency and ornaments where they are usually found in graves (Anell 1955:153–154). Although the distance is quite great (from Majuro it is 1,000 km to Kosrae), pearl shell lures may have been one of several commodities exchanged between the resource-rich high volcanic islands of Kosrae and Pohnpei and the low coral atolls of the Marshalls. Studies of ancient mtDNA from the Kwajalein burial (Weisler et al. 2000), dental comparisons of Marshall Islanders with other Pacific islanders (Swindler & Weisler 2000) and other physical anthropological studies (e.g., Pietrusewsky 1990) suggest much interaction during prehistory.

Measuring more than 125 mm long, the lure is larger than the average length of Solomon Islands lures at 50–70 mm (Anell 1955:149). The large size and detailed design on the perimeter of the convex surface (Fig. 7a) may suggest that this was an artifact made specifically for interment with a human burial. All lures from the Marshalls, recovered as surface finds or excavated from habitation contexts, are not decorated. If smaller, less ornate lures take about a week to make (Kaschko 1976:194), this Marshall Islands specimen is clearly an item of value, perhaps even a symbol of status.

Although the data presented here were derived from collections that were not properly curated, it was possible to associate some artifacts with particular burials, and three of these interments were radiocarbon dated to a calibrated range of AD 4 to 1028 suggesting that the Laura (Majuro islet) cemetery was used at some time during the first half of Marshallese prehistory.

In conclusion, dating and analysis of the Laura grave goods have provided insights into several areas. (1) Based on stylistic comparisons of Solomon Islands trolling lures and the elaborate practice of incising *Conus* shell rings there, contact with this group and the Marshall Islands may have taken place during the first few centuries AD thus providing some temporal depth to colonization models based on linguistic data. (2) Pearl shell lures may have been an exchange commodity between the resource-poor coral atolls of the Marshall Islands and the more diverse volcanic islands of Kosrae and Pohnpei attesting to long-distance interaction networks suggested by recent mtDNA results and other physical anthropological studies. (3) The differential distribution of grave goods in the Laura burials (Table 2) indicates some level of status hierarchy where, for example, burial 21 contained more than 500 shell beads and burial 8 was associated with an intricately carved pearl shell trolling lure, while a few interments had only a single *Conus* shell ring or no grave goods at all. The significance of these artifact distributions is a topic of future research when the age at death, sex, and general health is determined for individual burials. However, to date, western Micronesian cemeteries rarely provide indications of interment status with portable artifacts (e.g., Hanson 1988, Hunter-Anderson & Butler 1995:55–61) and few large cemeteries have been excavated elsewhere in the Carolines. Often, spatial organization of interments, size and configuration of grave monuments, or burial near high status residences (such as latte habitation sites in the Mariana Islands; Graves 1986) are the common data for inferring social status of the individual burials (Hanson & Gordon 1989). Because no convincing evidence has been provided to show that the few examples of Marshallese architecture are prehistoric (Rainbird 1994:328), the differential distribution of grave goods is currently the only way to infer social status. (4) Building a culture-history for the Marshall Islands can take several forms where portable artifacts, architecture, subsistence data, settlement patterns, population growth, environmental and socio-political transformation all contribute (Green 1993:224). The artifact descriptions and associated radiocarbon age determinations presented here are important steps towards eventually forming a regional culture-historical sequence for the Marshall Islands. Thus far artifacts from dated contexts have been few, and the Laura assemblage presented here goes some way towards documenting the spatial and temporal variability of artifact forms in the Marshalls, a necessary step in our understanding of island and regional prehistory.

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