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Radiocarbon Dating, Sea-Level Change and the Peopling of Belau

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Abstract—The initial settlement of the Belau archipelago has been widely posited to have taken place by 1500 B.C., a time coincident with documented early occupation in the Mariana Islands. However, recent geological studies and data obtained by Southern Illinois University's Belau Archaeological Program now suggest that the initial successful colonization of Belau took place after A.D. 1. The absence of early radiocarbon dates from Yap suggests that Belau's northern neighbor likewise may have been colonized much later than the southern Marianas. This paper critically evaluates aspects of sea-level change, radiocarbon dating and the distribution of early cultural remains in Belau in order to discuss the nature and timing of colonization.

Archaeological Background

The first systematic study of Belauan culture history was undertaken by Douglas Osborne, who in the mid-1950's conducted an ambitious program of archaeological survey throughout the archipelago (Osborne 1966). Osborne (1958: 163) concluded that the archaeological material culture and certain ethnographic parallels demonstrate a clear link between Belau and the Indo-Malaysian archipelago: "The Palau Islands, then, are well located to have received early and continued influence and migrants from the various parts of Indonesia and from Melanesia. Their location is strategic; they might well have been the first islands occupied by voluntary or involuntary migrants from Malaysia. Here lies their greatest attraction for the archaeologist interested in Micronesian culture history and in the problem of the peopling of the Pacific." In fact, Osborne (1958) even termed the Belau Islands "stepping stones into the Pacific," a not unreasonable metaphor, given the proximity of Belau to insular Southeast Asia.

Osborne tentatively constructed a cultural sequence utilizing Belauan oral history, the archaeological survey evidence and raw intuition. A key aspect of Osborne's sequence was his acceptance of Spoehr's (1957) second millennium B.C. radiocarbon date from Saipan. Osborne (1966: 464) states: "If the radiocarbon date of 1527 B.C. from Saipan is valid, this early period of occupation in the Marianas must have been matched by an equally early, or even earlier, peopling of the Palaus, unless the group were by-passed. The latter is unlikely and the Archaic in the Palaus no doubt began at least as early as 1800 to 1500 B.C."

This stepping stone model of colonization and the hypthesized second millennium B.C. peopling of Belau have become thoroughly embedded in subsequent thinking and literature (e.g., Osborne 1979, 1980, Takayama 1979, 1982, Gumerman *et al.* 1981, Craib 1983). For example, when Osborne returned to Belau to conduct test excavations in the late 1960's (Osborne 1979), although he failed to find clear evidence of sites dating to his "Archaic period" (ca. 1800 B.C. to A.D. 200), he nevertheless adhered to his original sequencing, even using a series of poorly understood and poorly controlled ceramic radiocarbon dates to support his model (Masse unpub., 1989).

Another example of the general acceptance of the early colonization model is that of Takayama's work in Belau's limestone islands (Takayama 1979, 1982, Takayama *et al.* 1980) and on Yap (Takayama 1981). Takayama (1979), who had the search for early sites as one of his major goals for his Belauan studies, obtained 17 radiocarbon dates from various locations throughout the Belau archipelago (1979 and personal communication, Takayama *et al.* 1980). The earliest of these dates was from a midden located on Ngcheangel Atoll, which yielded a date within the first century A.D. (A.D. 170 ± 83, an "adjusted" date derived in a manner to be discussed later). In order to explain the absence of earlier dates, Takayama (1979, 1982) hypothesized that an eustatic rise in sea level during the past 2000 years had submerged presumably earlier coastal settlements. This theme, which I here refer to as the "Ngibtal hypothesis" in honor of a legendary Belauan village destroyed by a typhoon (Krämer 1919: 45), was subsequently adopted by other researchers (e.g., Intoh 1981, Gumerman *et al.* 1981).

There has been at least one dissenter to the Ngibtal hypothesis and the stepping stone model of western Micronesian colonization. Peter Bellwood (1979: 295) noted, "In terms of culture history, the only extensive prehistoric sequence in Micronesia . . . is known from the southern Marianas group. The sequences of Yap and the Palaus seem to represent local and later developments, which probably do not extend back much beyond 2000 years." To show this idea is essentially correct this paper will (1) discuss the errancy of the Ngibtal hypothesis; (2) critically review the radiocarbon dates obtained thus far from the Belau Islands; (3) provide an assessment of the nature of the early occupation of Belau (ca. A.D. 1–900); and (4) conclude with the attempt to place the Belauan data into the broader context of general Micronesian settlement. A more detailed discussion of late prehistoric and historic period Belauan occupations has been presented elsewhere (Masse *et al.* 1984).

Sea-level Change

Changes in sea level for western Pacific islands are the result of two principal mechanisms, one "eustatic" or global change (such as would be caused by the melting of the polar ice caps), and the other change due to localized tectonic processes. There has been much debate about the directionality and magnitude of global sea-level change during the Holocene period; however, the consensus of recent research (e.g., Curry *et al.* 1970, Easton & Ku 1980; Gornitz *et al.* 1982) is that after a rapid rise in the early portion of the Holocene, there has been relatively little change in global sea level during the past 4000–5000 years. The average rise in sea level during the past 4000 years has been around 2–3 cm per century. Holding all other factors constant, archaeological materials deposited at the 1500 B.C. shoreline would now be under water to a maximum depth of about one meter, thus consistent with Takayama's notion of submerged coastal archaeological sites.

However, not all other factors can be presumed to have been constant; tectonic processes have had a critical impact in Belau. The Palau Ridge, upon which the archipelago is situated, is the boundary between two active crustal plates (Easton & Ku 1980). Between 1910 and 1980 approximately 20 earthquakes of a magnitude of at least 6 on the Richter scale occurred on the Palau Ridge and in adjacent submarine trenches. The net effect of such tectonic activity has been to elevate the land mass of the Belau archipelago at a slightly higher rate than the eustatic rise in sea level.

Easton & Ku (1980) have seemingly demonstrated that land at mean sea level 3500 years ago is now generally at least 2 m above mean sea level. These figures were derived by the radiocarbon dating of shoreface terraces between Oreor and Babeldaob Islands, along with the dating of preserved fossil colonies of corals and mollusks found well above the present intertidal zone on two rock islands.

Three other compelling lines of evidence also support the uplift inferences of Easton & Ku (1980). The first is the presence of prominent notches that occur around the edges of the rock islands, the tops of which average 2–3 m above mean sea level. These notches are probably erosional features (presumably formed by wave action and chemical weathering of the limestone) and were perhaps created sometime between 3000 and 2000 years ago during a lengthy period when the rates of eustatic sea level rise and tectonic uplift were in approximate balance. Rates of uplift have exceeded eustatic sea level rise since that time, resulting in the present position of these notches.

The second indicator of uplift is the presence of the previously mentioned raised Shioya sand beaches. A single radiocarbon date (to be discussed later), suggests that these relict beaches were formed between 2500 and 2000 years ago, perhaps in conjunction with the cutting of the sea-level notches. The fact that the top of the Shioya sand deposits is characteristically 2–3 m above mean sea level throughout the archipelago indicates that tectonic uplift has been relatively uniform. This interpretation differs from that of Easton & Ku (1980), who base their conclusion on the respective heights above sea level of the two dated coral and mollusk fossil colonies. However, the radiocarbon dates of 5133 ± 80 and 2900 ± 85 years B.P. for these two colonies do not necessarily contradict the wave notch and Shioya sand data. It is possible that the character and rates of uplift were different before and after 500 B.C., and that uplift has indeed become more uniform during the past two millennia.

The third indicator of tectonic uplift is the presence in several rock islands of outcrops of beach rock, now situated about 25–75 cm above the modern intertidal zone (U.S. Department of Army, Office of Chief of Engineers 1956: 63). This type of beach rock is thought to form within the intertidal zone from calcium carbonate present in the seawater (Bird 1969, Bathurst 1971, King 1972). This durable material can form in a remarkably short period of time, in some cases over the course of just a few years.

The Belau beach rock is notable for the presence of pottery sherds and food shell remains firmly imbedded in its matrix. Lengthy patches of this material were observed at Ngemelis and Ngeanges Islands. Given our present understanding of the dates of occupation in these particular rock islands, the imbedded artifacts probably were deposited between A.D. 650–1450, most likely between A.D. 1200–1450 based on locational contexts and the nature of the ceramic assemblage (Masse 1989). These artifacts were apparently cemented into beach rock shortly after deposition and were subsequently uplifted to their present elevation. This is a hypothesis consonant with the tentative rates of uplift established by Easton & Ku (1980).

The Belau sea-level data do not support Osborne's Ngibtal hypothesis. We simply cannot explain away the lack of early archaeological materials by presuming their submergence. Therefore the absence of early sites must be due to other factors.

Radiocarbon Dating

It is when we consider the radiocarbon dates from Belau, many of which are only recently available, that we can begin to appreciate the general nature of the Belauan cultural sequence. As of late 1987, a total of 81 radiocarbon samples had been processed. Nine of these dates are the product of Osborne's (1979) innovative attempt to utilize the organic carbon residue in archaeological pottery. Unfortunately, this study was flawed by several poorly controlled variables (Masse 1984), and none of these dates can be considered meaningful. Nevertheless, this still leaves 72 usable dates, one of the largest sets of radiocarbon dates thus far obtained from any single island group in Micronesia.

The original general locations of the 72 dated Belau radiocarbon samples are depicted in Fig. 1, illustrating their broad geographic distribution. Figure 2 schematically organizes the resultant radiocarbon date midpoints by geographic location and feature type. The use of midpoints rather than calibrated date ranges (although the latter has also been done for the Belau samples—see Masse unpub., 1989) is simply for illustration and does not appreciably alter our interpretation of the radiocarbon dating.

Note that the date midpoints are "adjusted" values, and in many cases, do not represent the midpoints originally reported by the six radiocarbon laboratories which dated these 72 samples. Radiocarbon laboratories differ considerably in the manner in which they calculate and report radiocarbon dates, especially with the dating of material other than charcoal; 39 of the Belau radiocarbon samples were marine shell. In order to standardize the Belau radiocarbon dates and to eliminate (as much as possible) the calculation and reporting "noise" present in these 72 samples, I obtained the actual radiocarbon activity counts (both sample and standard) from the four laboratories which dated the Belau marine shell samples (New Zealand Institute of Nuclear Sciences, Japan Radioisotope, Dicarb Radioisotope and Beta Analytic). I did not request this information from UCLA and Teledyne Isotopes since their calculation and reporting methods for charcoal dating closely follow those suggested by Stuiver & Polach (1977) and correspond to those used in my study. Five separate adjustments were made on the data from the four laboratories including (1) standardizing the mean life value of radiocarbon atoms; (2) standardizing the rounding-off of radiocarbon age values; (3) the assigning of species-specific "fictive" delta C-13 values of certain shell samples not originally analyzed for carbon isotopic fractionation (fictive values were established based on the carbon isotopic fractionation results obtained for other Belauan samples); (4) the assessment of a reservoir effect correction value for marine shell samples; and (5) adjustments to standard error terms. The rationale for each adjustment is given elsewhere (Masse 1984). All calibrated date ranges discussed in this paper utilize the calibration tables of Klein *et al.* (1982).

The radiocarbon data presented in Fig. 2 are remarkable in two aspects: first, the tight clustering and consistency of the dates within three of the feature type categories (volcanic island village, limestone island village, limestone island midden) and second, the near absence of dates before the first millennium A.D. The tight clustering of dates reflects patterns of the occurrence of important processes in Belauan culture history. The volcanic

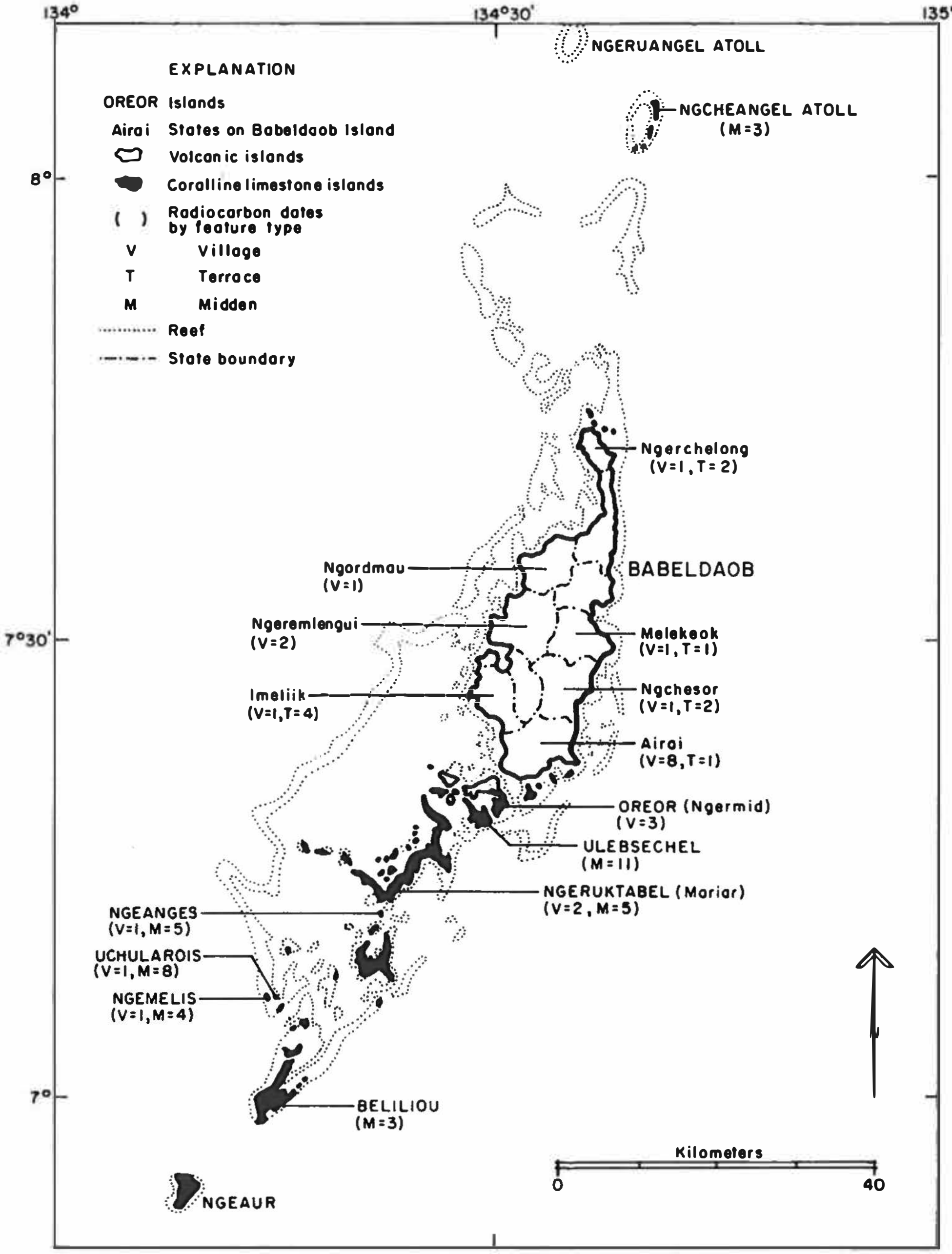

Figure 1. Map of the Belau archipelago depicting the approximate locations of dated radiocarbon samples.

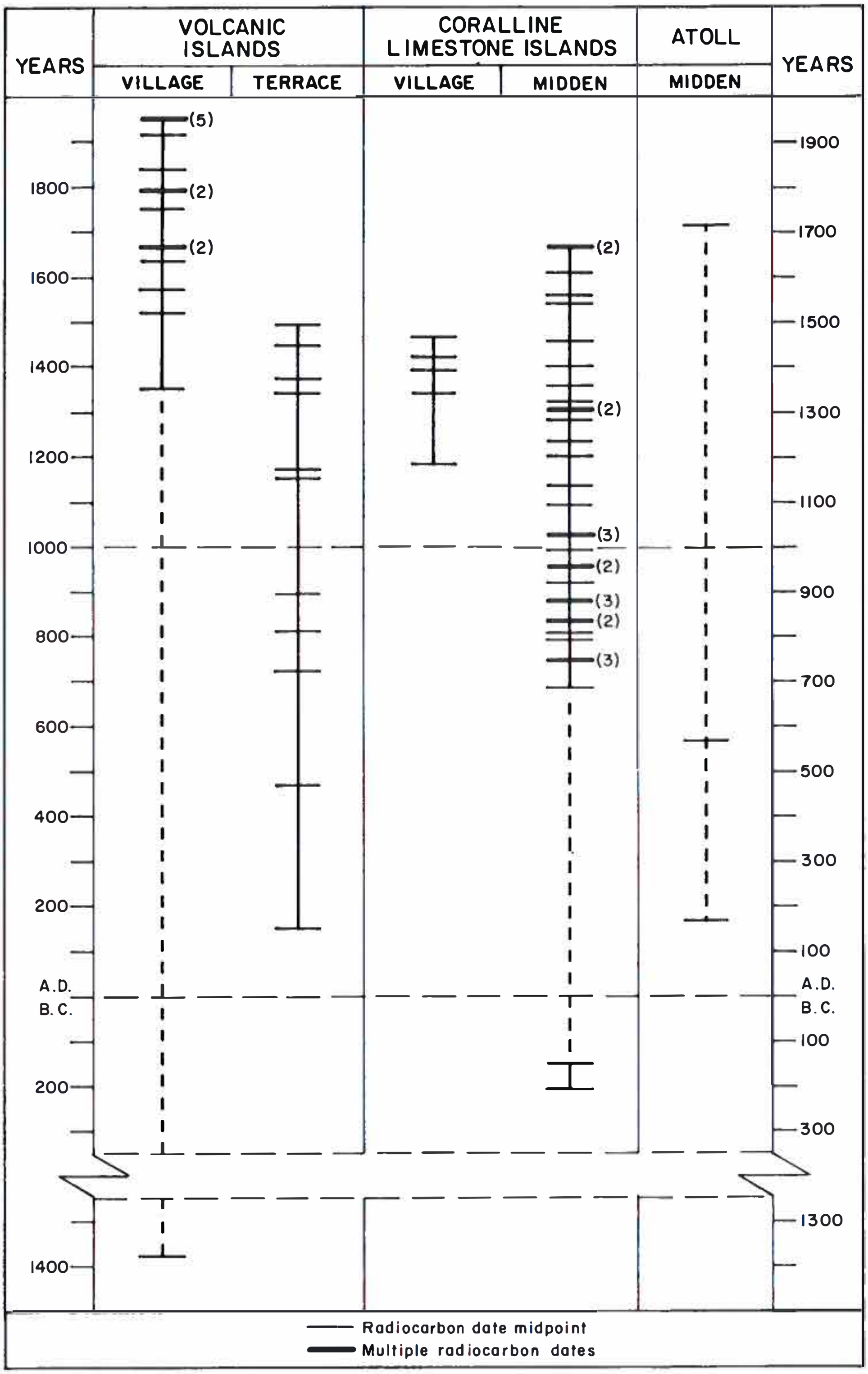

Figure 2. Schematic representation of Belau archaeological radiocarbon date midpoints by geographical unit and feature type. Midpoints are "adjusted" values as discussed in text.

island village dates represent samples obtained from villages that were likely extant at historic contact in A.D. 1783 (Keate 1788) and which were recorded by Krämer (1919) during the course of the German Südsee-Expedition at the beginning of this century. These dates are in good accord with oral traditions that appear to place the establishment of the villages in the 16th and 17th centuries (see Osborne 1966, 1979, Parmentier 1981, Lucking 1984, Masse *et al.* 1984). I refer to this 17th through early 20th century pattern of settlement as the "Traditional period," due to the rich documentary, ethnographic and oral history data especially relating to Oreor and Babeldaob Islands.

The limestone island village dates represent radiocarbon samples obtained from direct association with architectural features in prehistoric villages located in the rock islands. The dating and apparently short-lived nature of the rock island village phenomenon (circa A.D. 1200–1450) also seems to be supported by oral traditions (Osborne 1966, Masse *et al.* 1984). The limestone island midden dates are from radiocarbon samples obtained from a variety of midden deposits throughout the rock islands and on Beliliou Island. Some of these deposits may be associated with the previously mentioned villages but the majority of dated deposits seemingly represent pre- or post-abandonment usage of the rock islands. The midden deposits are bracketed by beginning and ending dates of A.D. 650 and 1650, respectively.

The volcanic island terrace dates and the dates from Ngcheangel Atoll are more widely distributed in time than those of the three previously described data sets, due both to the small number of samples obtained and to the nature of the samples themselves. For example, the four 14th and 15th century A.D. terrace dates were obtained by Butler (1985) from a terrace complex adjacent to historic Medorm Village in Imeliik State; these dates may relate to the founding of Medorm Village or to other non-agricultural activities rather than to actual terrace construction and usage. In a somewhat different vein, the early first millennium A.D. date from Ngcheangel Atoll (Takayama *et al.* 1980) may represent a pre-cultural horizon, given the depth of the marine shell sample and the meager amount of cultural material found in association (Masse 1984, 1989).

This then brings us to a discussion of the earliest radiocarbon dates obtained thus far from Belau. As seen in Fig. 2, only three samples have yielded dates earlier than the beginning of the Christian era. The earliest of these is that of a charcoal sample collected from Ngeburch, a historic village in Melekeok State on Babeldaob Island. The resultant radiocarbon age of 3330 ± 85 years B.P., with its calibrated date range of 1885–1415 B.C., would at first glance appear to be a vindication of Osborne's stepping stone model. Unfortunately, the sample consisted of unidentified "burned seeds or nuts" (Irene Stehli, personal communication) which were present in a midden deposit only 15 cm below the ground surface; recent-looking sherds and a small Belauan glass money bead were found in seeming direct association (Masse & Snyder unpub.). In addition, this sample was not subjected to an analysis of $^{13}C/^{12}C$ isotopic fractionation. Therefore, despite the earliness of the date, this sample must be considered anomolous and presently uninterpretable.

The other two pre-Christian era Belauan dates are from marine shells collected in the rock islands. One sample, collected by myself from Shioya sand deposits at prehistoric Mariar Village on Ngeruktabel Island, was that of a valve from a young complete specimen of *Tridacna squamosa*. This sample was collected from pre-cultural deposits for the specific purpose of attempting to date the formation of the Shioya sand beach deposit and was placed in the contextual category of limestone island "midden" (Fig. 2) for expediency of presentation. The resultant calibrated date range of 395–20 B.C. is thus precultural. The second sample, collected by Takayama (personal communication) from the PAAT-1 site on Ulebsechel Island, is likewise suspect. The sample, a burned *Tridacna* specimen, was collected from the highest level of an excavation unit in Shioya sand deposits. The radiocarbon age of this specimen and its calibrated date range of 395 B.C. to A.D. 185 is considerably earlier than that for two shell samples collected from lower levels of the same test pit. These two samples fall into a cluster of dates that have been calibrated at A.D. 915–1225 (Masse 1984, 1989). It appears that the burned *Tridacna* specimen was a fossil beach shell, perhaps dating to the original formation of the Shioya sand beach, which was collected and used by the more recent occupants of the PAAT-1 site. The use of fossil (or at least long-dead) *Tridacna* specimens, as well as the re-use of earlier manufactured tools, was probably a common practice throughout prehistoric Micronesia, especially during periods, or in places, of resource scarcity (see Fujimura & Alkire 1984: 120).

The Belauan cultural chronology appears to begin not much earlier than A.D. 200. Table 1 presents a suggested cultural sequence for the Belau Islands, based on current understanding of the available radiocarbon dates and their archaeological contexts, and on ethnohistorical and ethnographic data collected since initial historic contact in A.D. 1783. The prehistoric sequence is admittedly "rock island-centric" and is sure to be modified as further archaeological work is conducted. However, at the very least it provides us with a new perspective on the timing of colonization, and upon the apparent rapidity by which agricultural intensification and other cultural processes took place.

Colonization and Early Cultural Adaptation in Belau

With this background, it is now possible to present a brief scenario of early Belauan culture history between approximately A.D. 1 and 900. This scenario is admittedly speculative, largely based on material recovered from a single archaeological site, Uchularois Cave on Uchularois Island in the Ngemelis Island group (Fig. 1). However, the sheer quantity of material from this cave provides much useful information about the period of A.D. 650–900 (the "Early Resource Intensification period"). Extrapolations from more recent Belauan archaeological sites and from ethnographic and documentary sources, along with archaeological data from other western Pacific island groups, are also pertinent to this discussion.

The deposits from Uchularois Cave will serve as our starting point, as they have produced the largest and best documented early assemblage studied to date in Belau. Uchularois Cave is an unpretentious-looking limestone shelter near the top of tiny Uchularois Island at an elevation of about 30 m above sea level. Uchularois Island was part of the prehistoric Ngemelis Village system during the 13th through 15th centuries A.D. (Masse 1989) It contains several house platforms, trails, and a canoe landing dock, all of which are presumed to have been a part of that system. The upper deposits of Uchularois Cave also date to this late prehistoric period but deposits between approximately 80 and 175 cm below the present cave floor are securely placed within the cali-

Table 1. Suggested cultural sequence for the Belau Islands.

Calendrical Date	Period	Sub-Period	Heuristic Designation
A.D. 1–650	I		Colonial
650–1200	II		Resource Intensification
(650–900)		*(IIa)*	*(Early)*
(900–1200)		*(IIb)*	*(Late)*
1200–1450	III		Rock Island Village
1450–1600	IV		Transition
1600–1914	V		Traditional
(1600–1783)		*(Va)*	*(Protohistoric)*
(1783–1802)		*(Vb)*	*(Initial Contact)*
(1802–1914)		*(Vc)*	*(Historic)*
1914–Present	VI		Modern

brated date range of A.D. 675–910. This date range is based on six associated charcoal and marine shell radiocarbon samples obtained from various depths within the early horizon. Since the resultant dates of the six samples were judged to be statistically contemporaneous, the deposit apparently was created over a relatively short time, with perhaps some mixing of the materials within this early horizon (Masse 1984, 1989).

The volume of excavated soil from the early horizon of Uchularois Cave is estimated at only 1.5 cubic meters; nevertheless the deposit yielded a staggering amount of cultural material (Masse & Snyder unpub., 1986, Smith unpub., Carucci unpub., Masse 1986, 1989). The items recovered include some 900 sherds, several dozen specimens of worked shell and stone (e.g., shell and stone adzes, shell scrapers, a shell ring), and the remains of more than 17,000 individual shellfish (representing at least 39 different species), 200 individual fish (representing at least 16 families), a probable dolphin, a turtle, and the scattered remains of three or four young pigs. Also present were the remains of several lobsters and crabs, at least one bird, sea urchin spines, and frequent elements from at least two species of rats.

Several aspects of this assemblage bear upon questions of colonization and early cultural adaptation in Belau. First, it is obvious that at least the marine resources of the Ngemelis Island group were being utilized intensively at this time. It seems unlikely, however, that there was permanent occupation of the rock islands during A.D. 650–900; rather, the early Uchularois Cave deposits and other small contemporaneous middens on Ngeanges and Ngeruktabel Islands could have been created during intermittent extended fishing expeditions by people living on the volcanic islands. The large amount of pottery and the presence of the pig remains are indicative of close contact with the volcanic islands, especially given the lack of usable clay for pottery making in the rock islands.

Pigs may have been brought live to the Ngemelis Island group, based on the variety and distribution of recovered skeletal elements (Smith 1983). The pigs represented at Uchularois Cave ranged in age at death between approximately six months and two years; perhaps they had been culled from a substantial breeding population. If large numbers of pigs were indeed present in Belau by A.D. 900, such a situation implies a robust agricultural economy; the maintenance of sizable pig herds usually goes hand-in-hand with agricultural production. This is not to suggest that pigs in Belau ever assumed the importance accorded these animals elsewhere in Oceania such as New Guinea (Rappaport 1984, Morren 1977). In fact, pigs seemingly were extirpated from Belau, probably at the end of the Rock Island Village period or during the Transition period between the abandonment of the rock island villages and the establishment of the Traditional period volcanic island villages. Such extirpation of pigs is seemingly unique in prehistoric Oceania for any island group so large and environmentally diverse as Belau. The presence of the pig bones in the A.D. 650–900 period, along with a few contemporaneous radiocarbon dates from apparent terrace construction activities on Babeldaob Island, suggests that agricultural intensification was occurring by at least A.D. 900. Unfortunately, we have no data from this period regarding volcanic island settlement patterns, population size, or other forms of intensification such as the development of irrigated agricultural systems.

Another notable aspect of the Uchularois Cave pre-A.D. 900 assemblage is its overall distinctiveness from later Belauan archaeological assemblages. For example, a well-constructed and heavily slipped and polished redware type forms a small but significant portion of the early Uchularois Cave ceramic assemblage; this pottery is missing from later Belauan assemblages. The use of sherd temper in these specimens, however, places the earlier pottery within the general Belauan ceramic tradition (Osborne 1979, Snyder 1984, Masse & Snyder unpub.). Also of interest is the virtual absence of decorated sherds from this early period, with the exception of a single sherd, technologically similar to the redwares, which displays a rectilinear red-painted design. Apparently, decorated ceramics were never more than a minor component of the Belauan ceramic tradition.

Analysis of fish remains from Uchularois Cave and other Belauan archaeological sites (Masse 1986) indicates a modest decline in the capture of pelagic fishes (e.g., skipjack tuna, jacks, needlefishes) between the early period and later periods, along with a dramatic increase in the taking of sharks and/or rays. These data suggest an increasing emphasis on the exploitation of lagoonal resources, an intensification that culminated during the Rock Island Village period, at which time there is evidence for overharvesting and the depletion of certain fish stocks (Masse 1989). It is probably no coincidence that pigs were extirpated at about this time.

The distinctiveness of the early Uchularois Cave assemblage from that of later assemblages and the seeming absence of earlier dated sites in the rock islands combine to suggest that the early Uchularois Cave deposits represent a time early in the evolution of Belauan culture but not the earliest settlement of the archipelago. It would take a fair number of generations to develop a local pottery tradition and also to reach a population size that required the intensification of agricultural production through the construction of dryland terraces.

However, there is no need to invoke two millennia of population growth, as implied by the stepping stone model of colonization, to achieve the necessary population size for agricultural intensification. For example, if the original successful colonizing party had landed in Belau at the beginning of the Christian era, and included at least one potent male and one fertile female, an average annual growth rate of 0.7% would have produced a population of more than 32,000 by the middle of the Rock Island Village period. While an annual growth rate of 0.7% is higher than some demographers might prefer (e.g., Hassan

1981), this rate is nevertheless reasonable given the situation of expansion into an empty niche (see also Terrell 1986: Chapter 8). Belauan population growth was likely greater than 0.7% per year during several of the early generations given the richness of the available resources and was likely closer to zero or even declining during portions of the Rock Island Village and later periods when resources were scarce and the historic patterns of competition, warfare, and complex social structure had been formalized (see Gumerman 1986).

Thus the first successful colonists reached Belau probably no earlier than the beginning of the Christian era, and perhaps as late as A.D. 200–400. These colonists may have first settled on the volcanic islands of the archipelago and did not utilize Belau's rock islands in a sustained fashion until after A.D. 650. The nature and timing of early use of Beliliou and Ngeaur Islands and Ncheangel Atoll is less certain.

These colonists brought with them pigs and taro (and, presumably, rats), as well as coconuts and bananas. They may have had some knowledge of hillslope terrace agriculture (such as the irrigated rice terraces in the Philippines; see also Solheim's paper, this volume) but did not bring with them rice or any other cereal crop. The original colonists were pottery makers and seem to have come from a tradition which included red-slipped pottery while other types of decorative treatment were rare. The colonists likely utilized shell jewelry, such as rings and bracelets, and manufactured adzes from both shell and stone (the stone adzes have not yet been sourced, and it is possible that some or all of these came from outside the Belau archipelago). With the single exception of a bone fishhook from early period deposits in Uchularois Cave, and a few pearlshell trolling lure shanks and sherd and coral netsinkers from Rock Island Village period contexts, Belauan fishing gear from all time periods was seemingly manufactured from perishable materials, such as turtle shell, plant fibers and wood (Masse 1986, 1989). The colonists practiced open ocean fishing and perhaps had a cultural prohibition against the capture of sharks and rays.

More recent archaeological and ethnographic manifestations in Belau hint at other characteristics of the first settlers, although these items could have been introduced to Belau later in the cultural sequence. These traits include betel nut chewing (betel nut-stained teeth have been observed in the human remains recovered from presumed Rock Island Village period contexts at Mariar Village on Ngeruktabel Island (Houghton unpub.); slab-lined graves (which are present in association with Rock Island Village period remains on Ngemelis Island); the carving of small stone monoliths and human figures (dating prior to the Traditional period—see Osborne 1966, 1979) and perhaps the manufacture of stone sarcophagi (Osborne 1966: 206–208; 1979: 203); the construction of stone house platforms, sometimes in tiers (dating to the Rock Island Village period or earlier); the construction of elongate men's houses (dating at least to the Rock Island Village period and perhaps as early as A.D. 900–1200 on Ngemelis Island); and the manufacture of beaked adzes (dating to A.D. 900–1200 or earlier). Most of the historically important Belauan glass money beads and bracelet fragments (Ritzenthaler 1954, Osborne 1966) appear to date from before the Traditional period given the nature of the oral history surrounding these objects; it is not inconceivable that some or even most of these specimens were brought by the original colonists.

When viewed in aggregate, these traits clearly indicate that Osborne was correct in his belief that Belau was settled by immigrants from the Indo-Malaysian archipelago (see also Gregory & Osborne 1979); however, this colonization was achieved at about the transition between the Late Neolithic and Early Metal phases (Bellwood 1985), not at the end of the Early Neolithic phase as originally posited. It is not presently possible to identify the specific "homeland" of the original colonists, although Late Neolithic and Early Metal phase sites in Sulawesi, the Talaud Islands, Java, Bali, and Malaya (Bellwood 1985) have yielded materials which seem to bear the closest affinities to the early Belauan material. The Belauan assemblage also exhibits affinities with assemblages from the Philippines but they are not as pronounced as those with Indonesia and Malayasia. New Guinea and western Melanesia seem to be only distantly related and are not likely to have played a part in the colonization of Belau. However, the recent discovery of still poorly understood agricultural terraces in Papua New Guinea's Arona Valley (Sullivan *et al.* 1986, Matthew Spriggs personal communication), which seem to bear a striking resemblance to prehistoric Belauan terraces, may eventually force a reevaluation of the relationship between Belau and New Guinea.

It is probably no accident that those island groups noted above which most closely share their material culture with Belau also share their language. All are members of the Western Malayo-Polynesian subgroup of the Austronesian language family, which includes the Philippines, Vietnam, Madagascar, Malaya, Sumatra, Java, Borneo, Sulawesi, Bali, Lombok, western Sumbawa, Chamorro, and Belau (Bellwood 1985).

Prehistoric Belau and its External World

Regarding the relationship between Belau and the rest of early prehistoric Micronesia, it now seems clear that Belau was not a "stepping stone" to other Micronesian islands and was settled relatively late in the culture history of Micronesia. It appears that most of the suitable Micronesian islands were colonized at about the same time as Belau, or perhaps even earlier.

Recent research at the Tarague site in Guam (Kurashina *et al.* 1981) supports the general validity of the second millennium B.C. occupation of the southern Marianas, while more recent work near Guam's Tumon Bay has produced some evidence for fifth millennium, and seemingly strong evidence for late third millennium B.C. occupation (Joyce Bath personal communication). Some argue, however, that the earliest reliable dates are around 1000 B.C. (Athens 1986, Bonhomme & Craib 1987). Based on the apparently earlier colonization of the Marianas and the substantive material culture differences between the prehistoric assemblages in Guam and Belau, the relationship between Belau and the Marianas is likely not direct despite the fact that Chamorro and Belauan are related languages. The material culture differences can best be explained by assuming that while both the cultures of southern Marianas and Belau ultimately derive from the Philippines, the colonization of Belau was probably affected by the spatially and temporally discrete "filter" of migration through Indonesia, as opposed to a possibly direct migration from the Philippines to the southern Marianas.

Yap stands somewhat apart from the Marianas and Belau in both language and material culture, although early ceramics suggest a closer affinity to the Marianas (and ultimately the Philippines) than to Belau (Takayama 1982, Intoh & Leach 1985). Recently obtained radiocarbon dates indicate that Yap was colonized in the last half of the first millennium B.C. Sherds suspected to be of Belauan origin have been recovered by Intoh in contexts that may date as early as the beginning of the Christian era (Intoh & Leach 1985: 98); however, if these ceramics do prove to be from Belau, they should not date earlier than approximately A.D. 400–650.

Belauan pottery has been found in at least two other areas besides Yap. One location is in midden at Ngulu Atoll (Takayama 1982; Intoh 1981), not a surprising finding given that Ngulu lies between Yap and Belau. This particular context was dated to between A.D. 800–1400, the time period which the previously mentioned sherds on Yap may eventually be shown to belong.

Belauan ceramics have also been recovered from excavations on Lamotrek Atoll (Fujimura & Alkire 1984), a somewhat surprising situation given the atoll's distance some 1300 km east of Belau. However, Lamotrek was part of the Yapese *sawei* exchange system (e.g., Lessa 1966: 35–39), which could have brought these sherds (Dickinson 1984). The Belauan sherds on Lamotrek were found in a level with a calibrated date range of around A.D. 1250–1400. These specimens were thus deposited at a time when Belauan culture was seemingly undergoing maximum intensification of resource procurement. However, organized external trade does not appear to have been practiced by Belauans during the prehistoric period, perhaps due to the exigencies brought about by the intensity of local competition and warfare and the likely rapidly changing alliance structure within the archipelago. It is not necessary to invoke a Belauan trading "empire" (*sensu* Takayama 1982: 94) to explain the few Belauan sherds occurring outside the archipelago; neither Belauan oral traditions nor the archaeological assemblages studied to date in Belau itself support such a claim.

That apparently Belau did not serve as a stepping stone to other Micronesian islands, and the lack of evidence for Belau's involvement in organized long distance trade and exchange, does not mean that Belau flourished in total isolation. For example, the Rock Island Village period (A.D. 1200–1450) may seem at first glance to be the natural product of an evolving society, with steadily increasing population and accelerated resource exploitation. However, it is notable that this period in Belauan culture history occurred at about the same time that other equally impressive events and processes were sweeping the Pacific. We have tended to look in isolated fashion at such phenomena as the establishment and demise of Belau's rock island villages; the "ferment" present throughout the central and eastern Carolines (King & Parker 1984: 455); the establishment of the Yapese *sawei* trade and exchange system; the striking ritual sacrifice associated with elite burials in the New Hebrides (Garanger 1972: 59–79, Fig. 158); the establishment of the Classic Maori phase in New Zealand (Bellwood 1979, Davidson 1984); the establishment of the *ahupua'a* territorial system in Hawai'i (Kirch 1985, Hommon 1986 and personal communication); and many other significant cultural events and processes throughout the Pacific.

Perhaps we need to give more serious attention to broader issues such as the impact of major climatic perturbations or periods of stasis on aspects of cultural evolution and the development of social complexity (Saxe & Loughridge, unpub.) and the systemic impacts in Micronesia produced by contacts with the sea-going peoples of Melanesia, Indonesia and coastal China (Solheim, this volume). We still have much to learn about the micro- and macroevolutionary processes that shaped Belauan society and the rest of humankind in the prehistoric Pacific.

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