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Mike T. Carson

First Settlement of Remote Oceania

Earliest Sites in the Mariana Islands

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*This book is dedicated to Alexander Spoehr,
Richard Shutler Jr., and Roger C. Green
whose work made this book possible,
although they did not live to see it*

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Contents

Chapter 1
Defining Early-Period Marianas Settlement

Until now, very little has been known about how people first crossed the engrossing enormity of the Pacific Ocean and colonized the world's most remote and small islands, heralding mankind's conquest of the most isolated parts of our habitable world. Starting about 1500 B.C., the Mariana Islands were the home of the first people ever to live permanently in this region known today as Remote Oceania (Figs. 1.1, 1.2). This event marked the longest-distance ocean-crossing migration of its time, more than 2,000 km from any other contemporary inhabited area. The evidence of this journey is found in deeply buried and long forgotten archaeological sites, telling the tale of a bygone era only just now reaching our consciousness in the present. It is the tale of first contact between humanity and the last inhabitable part of the earth, Remote Oceania.

In the humid tropical Mariana Islands of the western Pacific, people first made their homes here about the same time when Greek myths tell us that Jason and his companions aboard the *Argo* explored the farthest reaches of their known world, completely unaware of a quite different voyage that occurred on the opposite side of the globe. The adventure of finding and colonizing the Marianas was a real-life event, unlike the concoction of historical facts and legendary fiction infused in Jason's heroic quest for the Golden Fleece. Although lacking epic heroes and mythic grandeur, the Marianas adventure achieved a breakthrough in human history, for the first time crossing the barrier of truly long-distance voyaging into an entirely foreign territory of remote islands amidst the awesome expanse of a seemingly boundless ocean.

This breakthrough into colonizing Remote Oceania opened a world of new possibilities. This new world of a "sea of islands" was explored by people whose names and individual stories are unknown to us today, but the results of their actions forever changed the course of human history, setting the stage for others to conquer the farthest livable reaches of the globe. The storytellers in this case are not poets or bards, but they are broken bits of pottery and debris from the lives of real people who resided in the Mariana Islands more than three millennia ago. Dating from an era without written script or historical documents, the material evidence slowly is telling its ancient story, literally piece by piece, in a way that modern-day archaeologists struggle to understand.

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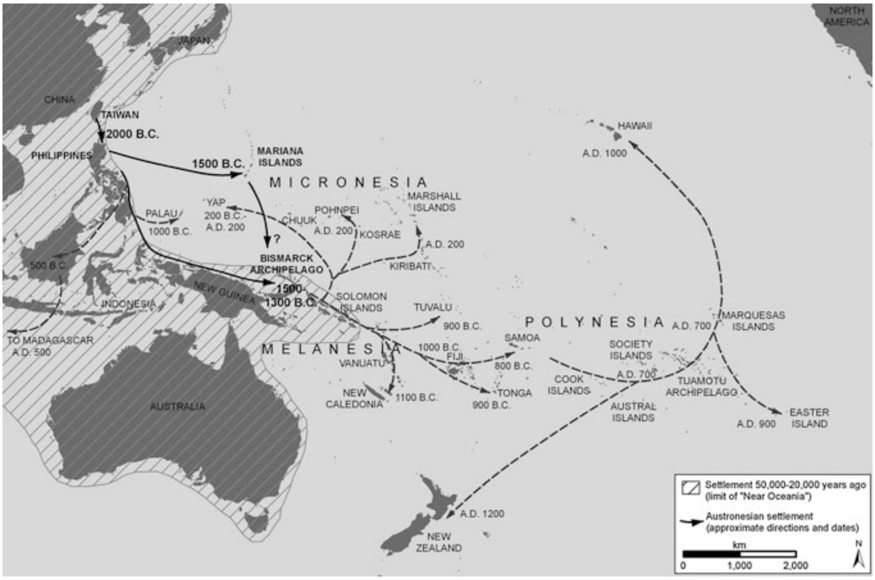

Fig. 1.1 Mariana Islands in relation to other major areas within the Asia–Pacific region, noting approximate dates of first settlement

The small and distant islands of Remote Oceania, including the Mariana Islands and many others, were first populated during an expansion of Austronesian-speaking people, eventually spreading more than halfway around the world (Bellwood 2007; Blust 2009a). This impressive diaspora began in Taiwan and southern coastal China about 3000 B.C. or earlier, incrementally growing over 75 degrees of latitude and 210 degrees of longitude (Bellwood et al. 1995). The Austronesian diaspora is visible in the archaeological record as a horizon of pottery styles, agricultural productivity, maritime technologies, and other traditions that swept across the Asia–Pacific (Bellwood et al. 2011). It also is detectable in the language histories of the Austronesian people living in the Asia–Pacific region today (Blust 1995, 2009a), known as one of the world's best examples of a linguistic phylogeny that mirrors a material culture history (Bellwood 1991).

One critical juncture in the Austronesian expansion was crossing into the remote islands of the Pacific. With mastering this barrier, people overcame the challenges of making long-distance migrations and learning to live in isolated and often impoverished island environments (Green 1991; Irwin 1998). This threshold opened the way into populating a remarkable expanse of the globe. The first such event is attested in archaeological sites of the Marianas at 1500 B.C., but this dating at first glance seems unexpectedly old in this remote location. Given this potential significance, the early Marianas sites deserve close attention that has been awkwardly lacking for many decades until now.

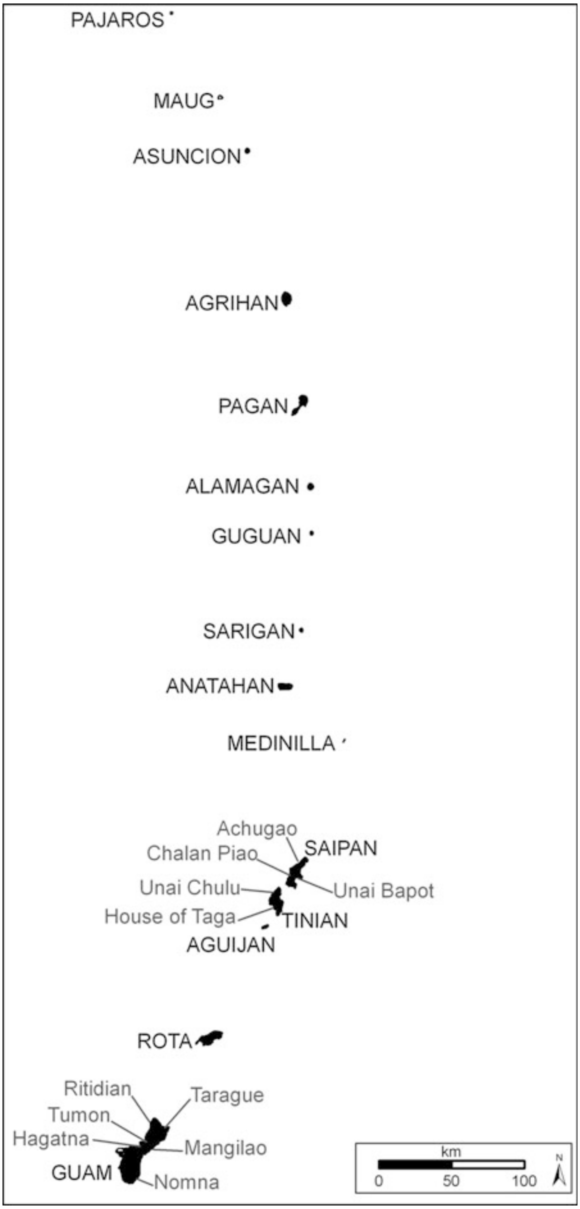

Fig. 1.2 Mariana Islands, showing sites mentioned in the text. Dating information for each site is depicted in Fig. 4.1. Closer geographic details are shown for Guam in Fig. 3.2, for Tinian in Fig. 3.3, and for Saipan in Fig. 3.4

If people settled in the Mariana Islands about 1500 B.C., then they were the very first to inhabit the region now known as Remote Oceania. Several important questions emerge. What were the motivations and circumstances of this unprecedented adventure? The first colonists must have come from somewhere, so where was it? How did these people choose where to live, which resources to use, and how to adapt to this new environment where as yet no human being ever had lived? These questions inspired years of research, leading to the results presented in this book.

This book about early Marianas settlement could not have been written some years ago. On a practical level, the most conclusive archaeological data simply did not exist until within this last decade. Meanwhile, in the absence of supporting data, the notion of early Marianas settlement could not enter into larger theoretical concepts and grand synthesis models of Oceanic archaeology. This debilitating cycle now has been broken, and the present book can contribute to a new scientific understanding, grounded in hard data from intensive field investigations.

For many reasons, archaeologists have not given much attention to early-period Marianas research, despite more than 100 years of regional archaeological inquiry (Carson 2012). Impressive megalithic house-post ruins, locally called *latte*, are readily viewed on the surface, and they have attracted most attention. A deeply buried ancient habitation horizon was known since the 1950s (Spoehr 1957; see also Pellett and Spoehr 1961), but its details were frustratingly vague. Rather than follow this tantalizing lead, most studies continued to examine the magnificent *latte* ruins, dated since A.D. 900–1000. Others have concentrated on Spanish colonial contexts since Ferdinand Magellan's landing in 1521. More efforts have focused on the events of World War II. For these later periods, information is overflowing in archaeological material, historical documents, and old stories remembered by community elders. The impressive monuments, profound historical events, and close feelings of these later periods all have become facts of life for the native Chamorro people of the Marianas reconnecting with their cultural heritage after centuries of foreign rule. By comparison, the earliest Marianas settlement 1500–1000 B.C. has been known only through fragile archaeological traces at just very few sites, and the full story effectively has remained hidden underground until now.

Early-period Marianas settlement has posed an enigma that cannot be understood in easily accessible terms. Given the unprecedented nature of such a remote-distance colonization at such an early date, nothing else in the world can serve as an example to help us understand it, but rather the unusual Marianas case may help us to understand more about human migrations and human-environment histories in the rest of the world. Marianas settlement around 1500 B.C. was more isolated than anything else in human experience of its time, more than 2,000 km from any other contemporary inhabited area. It could not realistically have related to very much else happening in other places. No other islands of Remote Oceania were populated until some centuries later. Archaeological knowledge of these separate areas and later periods has grown remarkably extensive since the 1950s (Kirch 2000), yet this impressive knowledge base has advanced without knowing about the earliest Marianas sites as the actual beginnings of Remote Oceanic settlement.

The oldest sites in the Marianas, like elsewhere in Remote Oceania, were made by Neolithic ("new stone age") people. They made fine pottery and other artifacts found today in deeply buried layers of habitation debris and middens. They did not, however, create long-lasting architecture or monuments that endured in the landscape as seen in the sprawling complexes of crumbling ruins in other parts of the world. They also did not keep a formal writing system for recording their history. As a result, the only proof of their existence has been found within ancient sedimentary layers, now completely hidden some meters beneath more recent deposits and an entirely new landscape with its own important history.

The first Mariana Islanders of course did not emerge spontaneously in situ. They must have come from a pre-existing community somewhere across the ocean, however distant that was. This hypothetical homeland community must have been established prior to 1500 B.C., and its people must have possessed long-distance seafaring skills. Most importantly for archaeologists today, these ancient people made a style of red-slipped pottery that eventually was brought to the Marianas.

The most likely candidates for a Marianas homeland are in Island Southeast Asia, where red-slipped pottery (often called "redware") has been found in sites dating to 1500 B.C. or earlier (Bellwood 1997, 2007). The oldest Marianas pottery has been very poorly known until now, but it appears most similar to redware traditions known in the Philippines (Hung et al. 2011). Likewise, linguistic studies point most likely to the Philippines as the immediate source of the Chamorro language spoken in the Marianas (Blust 2000, 2009b; Reid 2002; Zobel 2002). The proposed Philippines-Marianas link can encourage further research, but it is meaningless without first demonstrating the fundamental baseline knowledge of the oldest archaeological sites in the Marianas.

During its own time, the first Marianas settlement was indeed isolated, and still today it is isolated from scientific attempts to find its surviving material traces, reaching from the present through layers of time into the distant past. Today, the more recent time periods are quite well known archaeologically and historically, but they offer little if any useful information about the bygone era of 1500–1000 B.C. The descendants of the first colonists eventually would build extensive villages of pillar-raised *latte* houses, but these durable sites date no earlier than A.D. 900–1000, separated by a staggering two millennia from the original settlement period. Later still, the Mariana Islanders became the first inhabitants of Remote Oceania to make contact with voyagers from the other side of the world, when Magellan and his crew wandered through the region in 1521. These later events of course could not have occurred without an initial founding colonization, but how did this first settlement actually occur?

First Marianas settlement took place in a context very different from today's conditions, both culturally and environmentally. Modern and historical observations offer virtually no useful clues about Marianas settlement around 1500 B.C., but conversely the oldest archaeological sites may hold clues about how these settings developed into the landscapes we can experience today. The earliest sites have yielded pottery, stone tools, shell ornaments, and other artifacts bearing almost no resemblance to their functional counterparts known so thoroughly in the more recent periods of *latte* sites and Spanish colonial occupation. Moreover, the discard-middens of seashells and animal bones depict a much different set of natural resources available to the first Mariana Islanders. The early sites themselves are found only in deeply buried layers, hidden beneath a series of more recent sediments of a changing landscape.

Earliest Marianas settlement logically must be understood in its own terms, but the constant road-block has been the extreme paucity of relevant scientific data. If the existing evidence was so vague and puzzling, then how could anyone hope to obtain more useful information? If so few early sites were known, then how could anyone realistically discover additional sites? In particular, archaeologists have called for better dating and definition of the associated material culture (Bellwood 1975; Butler 1994; Carson 2008; Craib 1999; Hung 2008; Intoh 1997; Kurashina et al. 1981; Rainbird 1994, 2004; Russell 1998; Shutler 1999; Spoehr 1957; Spriggs 1999, 2007). The present work answers this call, with a clarification of ancient site contexts, critical evaluation of potential early-dated sites, and review of earliest pottery and other artifacts.

This book at last breaches the decades-long barricade that was holding back the evidence of a lost age of first Marianas settlement. The quest for archaeological knowledge in some ways has mirrored the break through of the first people who successfully lived in the remote Mariana Islands approximately 3,500 years ago, opening a way into truly uncharted lands and waters. The archaeological version of this adventure was brewing for many decades, with sporadic glimpses of fascinating yet inconclusive insights along the way, eventually opening a whole world full of scientific information and a new framework for understanding it all.

The 11 chapters of this book about earliest Marianas settlement breathe new life into one of mankind's long-forgotten but history-changing adventures of first contact between human society and the last inhabitable specks of land on earth, now known as Remote Oceania. While Jason and the Argonauts sought a magical treasure in a far-away kingdom, the Marianas colonists brought the treasure of human life itself for the first time ever into the small and remote islands of the Pacific. We follow this epic but real adventure through the chapters of this book.

This book is organized into three parts. Chapters 1–7 outline the body of archaeological evidence now available about early-period Marianas settlement, larger regional context, environmental setting, precise dating, material site contents, and other considerations. The second part continues with site-specific studies to highlight themes of environmental relations, early chronology, and material culture in Chaps. 8–10. Chapter 8 defines earliest site context and how it changed over the last 3,500 years at Ritidian in Guam. Chapter 9 examines the details of earliest known site-dating at Unai Bapot in Saipan. Chapter 10 discloses the wealth of material culture unearthed from what so far was the most productive early-period site excavation at House of Taga in Tinian. The third and final part of this book, Chap. 11, brings the archaeological evidence to bear on the topic of long-distance human colonization of the Asia–Pacific region.

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Chapter 2
Position of the Marianas in Oceanic Prehistory

How did an early Marianas settlement relate to the larger picture of Asia–Pacific archaeology? How did people manage to colonize these remote and small islands in the first place? From where did the colonists embark and for what reasons? This book will work toward answering these questions in its conclusion (Chap. 11), but first we must consider what else was happening in the Asia–Pacific around 1500–1000 B.C. and earlier. Such consideration inevitably involves discussion of how the first groups of sedentary people, known as the Austronesians, came to inhabit Island Southeast Asia and eventually spread to other areas.

In a large-scale view of the Asia–Pacific, the Mariana Islands are isolated in the far Northwest Pacific Ocean (see Fig. 1.1). The setting is part of Remote Oceania, referring to islands outside the range of inter-visibility or beyond 350 km (Green 1991). In addition to practical limitations of a long-distance colonizing voyage, Remote Oceanic islands tend to be biotically disadvantaged and challenging for human colonists. For instance, the kinds of foods most important for human life in the tropical islands, like bananas and taro, did not exist there naturally, and people needed to import these and other resources for their survival. Although coastal and marine resources were plentiful, the necessarily limited range of terrestrial resources provided insufficient or unreliable nutrition for long-term or large-scale settlement, unless satisfactory crops could be imported and managed.

Remote Oceania posed a barrier for colonization, while the islands of the so-called Near Oceania were settled perhaps 20,000 years ago by hunter-gatherers and low-intensity horticulturalists (Spriggs 1997). Related populations were established nearly 50,000 years ago in Australia, New Guinea, and Island Southeast Asia (Bellwood and Hiscock 2005). The longest ocean voyages at that time were about 200 km, but most were less than 90 km.

Prior to 2000 B.C., Island Southeast Asia and Near Oceania supported low-density populations that relied almost entirely on available native resources. The surviving artifacts primarily are stone tools, mostly found in cave sites but occasionally in other open settings. People apparently accessed almost every environmental zone in their known world. They did not, however, cross the ocean to inhabit the islands of Remote Oceania, nor did they necessarily have any reason to do so.

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Their luxurious tropical forests provided an endless supply of food and resources, but such was not the case in the more distant islands of Remote Oceania.

Coming from any potential source-area in Southeast Asia or Near Oceania, crossing the frontier into Remote Oceania required two equally important cultural traits. One was a set of remote-range navigation skills and seaworthy vessels (Irwin 1992). Another was the ability to transport and manage essential subsistence crops (Bellwood 2005). These developments are attributed to large-scale migrations by land-dependent farming populations that began when groups of people first spread from Taiwan to the Philippines about 2000 B.C. or earlier (Bellwood et al. 2011). Whatever was their motivation for settling in new and distant lands, these people created the first instances of pottery, farming, and sedentary lifestyles in the region.

Beginning about 2000 B.C., sedentary farming groups intruded through the humid tropical zones of Island Southeast Asia, specifically in the Philippines and parts of Indonesia, where they met with the long-established populations of hunter-gatherers and low-intensity horticulturalists in these areas. The archaeological evidence includes a sudden appearance of pottery and other artifacts that can be linked to origins in Taiwan (Hung 2008). Most important was a red-slipped pottery tradition, which in the Philippines developed to include fine dentate-stamped and circle-stamped designs by 1800 B.C. (Hung et al. 2011). By 1500 B.C., the telltale redware pottery appeared in increasingly more sites throughout Island Southeast Asia, namely in the Philippines and parts of Indonesia (Bellwood 1997; Simanjuntak 2008).

The intrusive sedentary farmers in Island Southeast Asia are recognized as ancestors of today's Austronesian-speaking populations (Bellwood et al. 1995). Their language histories point to a shared Austronesian origin (Fig. 2.1), with a series of splits and divergences as groups and subgroups separated into dispersed populations throughout the Asia–Pacific region (Blust 2009a). A first-order split is noted between the Austronesian languages in Taiwan versus all others known as Malayo-Polynesian. The native Chamorro language of the Mariana Islands is situated at a high phylogenetic level within Malayo-Polynesian, most likely derived from an early stage of the language history in the Philippines (Blust 2000, 2009b; Reid 2002).

According to the linguistic evidence, all Remote Oceanic settlements can be attributed to Austronesian-speaking groups, but the particular founding population in the Mariana Islands differed significantly from all others elsewhere in Remote Oceania. Remote Oceania is virtually synonymous with the Oceanic grouping in the Austronesian family, with curious exceptions in the Marianas and Palau. These two languages are not directly related to each other, but both came from an Island Southeast Asian source that was different from the Oceanic language group. Corroborating this story, the oldest known sites in Palau are not older than 1100 B.C. (Liston 2005), some centuries post-dating the first Marianas settlement. Likewise, all other Remote Oceanic settlements post-dated that of the Marianas by at least a few centuries (Carson and Kurashina 2012).

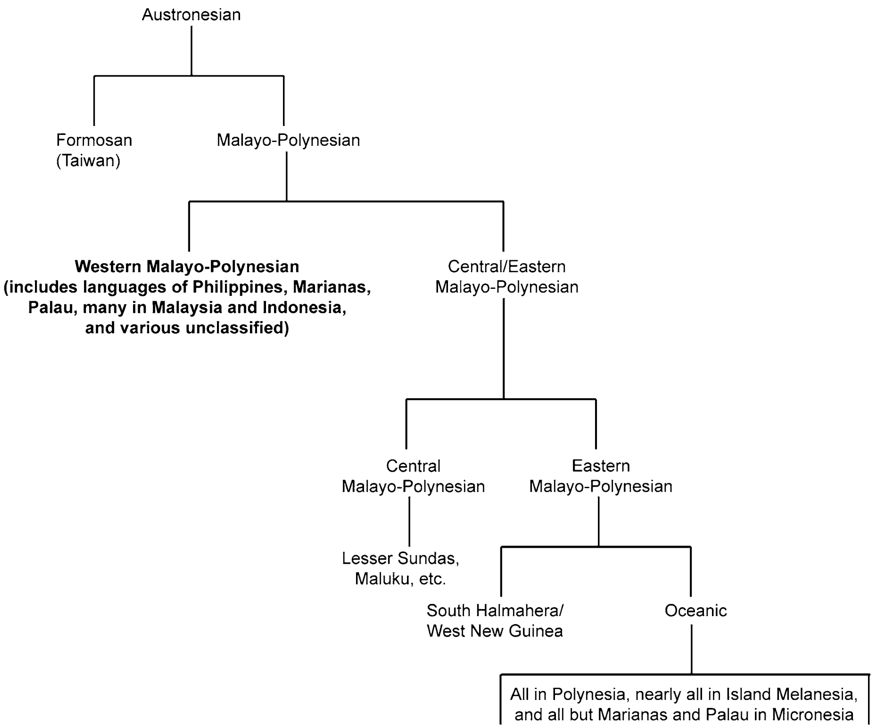

Fig. 2.1 Position of Chamorro, native language of the Mariana Islands, within the Austronesian language family. Information is based on data by Blust (2009a)

After Austronesians settled in parts of Island Southeast Asian, the migration into Remote Oceania most often is described as the legacy of the Lapita Cultural Complex (Kirch 1997). Around 1500–1350 B.C., a new group of people arrived in the previously occupied Near Oceanic islands of the Bismarcks and Solomons, where they made elaborately dentate-stamped Lapita pottery (Summerhayes 2007). The earliest Lapita designs in the Bismarcks display many of the same dentate-stamped and circle-stamped motifs that were found in slightly earlier dated pottery of the Philippines (Carson et al. 2013). Very soon, though, the Near Oceanic Lapita designs became significantly more extravagant, perhaps due to signaling of cultural identity in this area long-inhabited prior to the arrival of the pottery making groups (Summerhayes 2000a, b).

Around 1100–800 B.C., Lapita groups expanded into the previously unpopulated islands of Remote Oceania in Southern Melanesia and West Polynesia (Burley and Dickinson 2001; Nunn 2007; Sand 1997). The first settlement in this Melanesian-Polynesian part of Remote Oceania, however, post-dated the earliest sites in the Mariana Islands. Moreover, the signature of Lapita pottery decoration by this time had developed into a distinctive style of its own (Chiu 2012; Sand 2007, 2010). Links with a homeland in Island Southeast Asia by then were just vaguely noticeable in the pottery designs, after some centuries of development in a separate context. Similarly, the distribution of Laptia pottery was exclusively within the Oceanic language grouping of the Austronesian family.

Compared to the case for Lapita settlement of Remote Oceania, Marianas settlement in 1500 B.C. would require a separate language group, a different direction of overseas voyage, an equal or earlier date, and more isolation. Accordingly, Rainbird (2004: 85) identified this event as “the longest sea-crossing undertaken by that time in human history.” The longest Lapita voyage was about 900 km between Vanuatu and Fiji about 1000 B.C. (Irwin 1989), as compared to an earlier crossing in excess of 2,000 km between the Marianas and any other contemporary populated area.

Looking at a modern map of the western Pacific, other Micronesian islands appear potentially within practical reach of the voyagers who settled in the Marianas (see Fig. 1.1). However, these islands bear no evidence of human habitation as early as the sites in the Marianas (Carson 2013). For instance, Palau was settled apparently no earlier than 1100 B.C. (Fitzpatrick 2003; Liston 2005). The many small atolls of Micronesia were not yet emerged above sea level until about 1,000 years later (Dickinson 2003), and accordingly their first settlements dated approximately 200 B.C.–A.D. 200 (Intoh 1997; Rainbird 1994, 2004).

As outlined here, Marianas settlement occurred earlier and separately from all other parts of Remote Oceania, and moreover it must have remained isolated from other parts of Remote Oceania that were not populated until some centuries later. Long-distance contacts certainly occurred periodically throughout Marianas culture history, but the sheer distance alone would suggest that such voyages were few and infrequent. Prior to 1100 B.C., the only reachable inhabited areas outside the Marianas were in Island Southeast Asia and Near Oceania. The Mariana Islanders must have known about their own homeland and other populated areas, but repeated two-way contacts probably were rare. They may even have known about a number of unpopulated areas, such as Palau in far Western Micronesia, as well as about remote shoals and emergent atolls, but no existing material evidence can confirm or deny these musings.

Unlike for Lapita with its Near Oceanic roots, the Marianas case exemplifies a direct colonization of an exceptionally isolated part of Remote Oceania. Lapita origins in Near Oceania have been debated as owing to immigrant Southeast Asian (Austronesian) influence, in situ indigenous Papuan developments, or combinations of the two before expanding into Remote Oceania (Green 2000). The circumstances in the Marianas do not involve these complications, described by Spriggs (1999: 20) as the “smoking gun” of an Island Southeast Asian origin of ancient population movements in the Western Pacific (see also Spriggs 2007: 113–114).

As compelling as this brave new tale may be, it nonetheless needs scientific support from real archaeological sites, or else it risks dissolving into a fog of fairy tales and unproven knowledge claims. At the very least, early Marianas settlement reveals more complexity in Oceanic settlement than has been evident in Lapita, and possibly it exposes a radically different prehistory narrative. These daring and possibly disturbing notions now can be addressed properly by robust new field data from the Marianas, as presented in the chapters of this book.

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Chapter 3
Ancient Site Contexts

The early-period Marianas sites occur in settings that today have become significantly different from their original conditions 1500–1000 B.C., due to change in sea level, reshaping of coastlines, and deep burial of sites beneath more recent sedimentary layers. The landscape of first Marianas settlement thus has been obscured from modern view. What kind of environmental zones did the first settlers inhabit, and what kind of resources did they access or create? How did they affect their environments, and how did their environments affect them? Why were some locales preferred over others? Chapter eight of this book will answer these questions through a detailed case study at Ritidian in Guam, but here we can review the general environmental setting of the Marianas region during the time-range of our interest.

The oldest sites were established when the sea level was about 1.8 m higher than today (Fig. 3.1). This magnitude of sea-level change may seem negligible compared to more than 100 m of post-glacial sea-level rise following 10,000 B.C., but the effects of even the slightest sea-level change can create large impacts in small islands. The consequences are especially concerning for communities living close to the sea, as must have been the case for the first colonists reaching the extremely remote Mariana Islands. A detailed sea-level history has been possible due to a unique combination of emerged coral reefs and tidal notches along certain coastlines, where elevations and dates could be coordinated (Dickinson 2000, 2001, 2003).

The ancient sea-level history formed one essential part of an island-wide palaeoterrain model of Guam (Fig. 3.2). Site-specific findings throughout the island provided measured depths and dates of sedimentary layers, so the terrain model was refined to account for elevations of the former land surface at specific time intervals (Carson 2011). The resulting ground surface then could be depicted in relation to the former sea level during any arbitrary time period. In some cases, deep excavations reached ancient coral reefs, where dates and elevations verified the regional sea-level history.

Focusing just on the earliest settlement period about 1500–1000 B.C., the ancient coastline did not incorporate any of the broad sandy beaches and coastal plains seen today. A number of narrow beach fringes and berms existed around the

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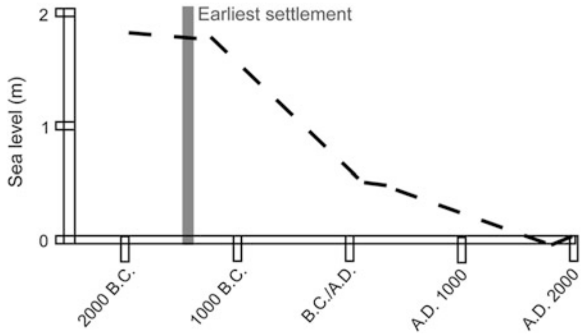

Fig. 3.1 Chronology of sea level in the Marianas region. Data are modified from Dickinson (2000, 2001, 2003)

island of Guam, but only very few of them so far have disclosed early site deposits. In precisely the modeled palaeoshoreline context, an early site was confirmed at Ritidian in northern Guam, buried more than 2 m deep and more than 100 m from the modern shoreline (Carson 2010, 2012a). Other early-period sites previously were reported at Mangilao (Dilli et al. 1998) and Tarague (Kurashina et al. 1981). Using the palaeoterrain model as a guide, additional sites may yet to be found.

Similar palaeoterrain models for Tinian and Saipan confirm that the known early sites were situated on a few narrow beaches and unstable berms (Figs. 3.3 and 3.4). Some caution is advised, because these models are not yet refined to the level of detail as achieved for Guam. Further exploratory efforts will be necessary, but for now the known sites can be situated in their approximate original contexts.

The apparent absence of early sites in Rota and Aguijan may be due to the ancient coastal landform configurations. Steep limestone cliffs surrounded both islands, and sandy beaches may not have existed at all. The coastal terrain instead offered shallow or sometimes no soils over rocky limestone terraces.

For the islands north of Saipan, collectively called the Gani, the ancient sea level touched against rocky coastal slopes, and opportunities for preserved sandy beach deposits are virtually non-existent. These settings could not offer the same habitat niches that were targeted by earliest colonists in the larger southern islands. The oldest known sites in the Gani relate to ruins of *latte* stone columns and capstones, no earlier than A.D. 900–1000 (Carson 2012b).

The known early site records in Guam, Tinian, and Saipan all depict a similar natural habitat niche, in unstable sandy terrain near former shallow lagoons. This land-sea interface provided abundant nearshore resources and some degree of access to land-based zones. Shellfish and vertebrate faunal records reflect a reliance on productive reef ecosystems and mangroves (Amebsury 2007; Carson 2012a). Concurrently, intentional forest-clearing occurred for the first time but in limited scale, in support of growing essential tree and root crops (Athens and Ward 2004).

Inland terrain likely was accessed during the earliest settlement period for various native forest resources and new farmland, but early-period inland sites have not been found. Preservation quality is quite poor in the acidic clays,

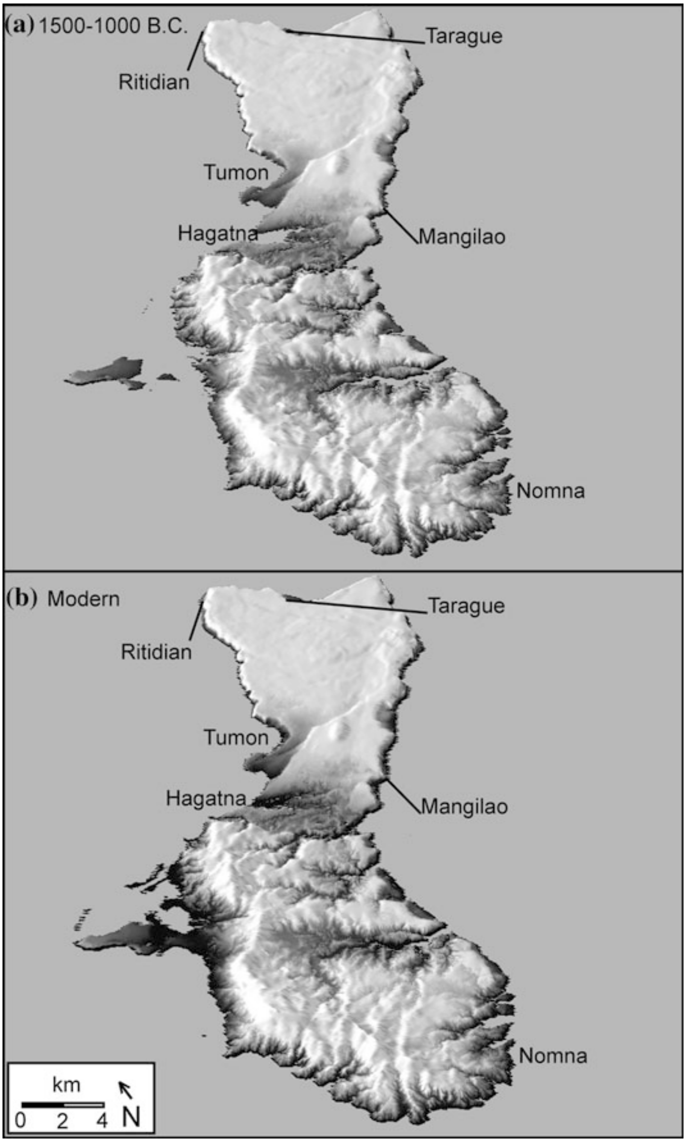

Fig. 3.2 Guam palaeoterrain model

typically in very shallow (20 cm or less) rocky deposits over bedrock. Later occupations may have disturbed or removed earlier site remnants, or perhaps earliest inland activities did not generate durable site records at all.

In most regions of the world, caves and rockshelters provide the best starting-point for finding earliest preserved site records, but they so far have been

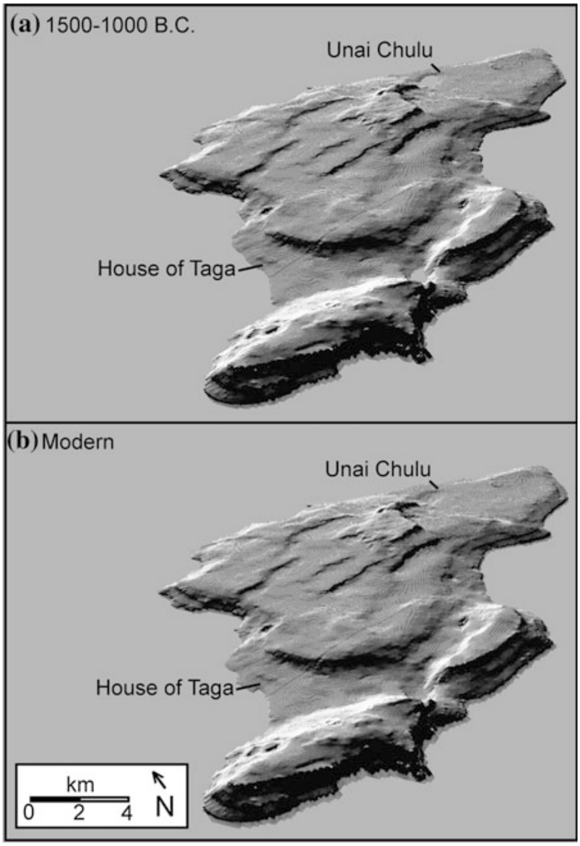

Fig. 3.3 Tinian palaeoterrain model

disappointing in the Mariana Islands. Most caves were transformed into defensive positions and then intensively scoured during and after WW II. Many were modified by artificial tunneling. In one rare case in Saipan, potentially early-redware pottery was found in Laulau Rockshelter, disturbed by later burial pits (Spoehr 1957). In a set of surprisingly well-preserved caves at Ritidian in Guam, limited cave-use began perhaps as early as A.D. 200, and intensive use followed A.D. 1000 (Carson 2012a).

Early cave-use may have been somehow avoided or restricted in the Marianas. In the few cases of intact natural sediment sequences, no evidence of early- period cultural activity has been found. However, intensive habitation sites were situated directly outside these same caves as early as 700–500 B.C. (Carson 2012a). Several spectacular deep karst caves in northern Guam escaped WW II activities, but they have yielded absolutely no signs of early-human presence. Many of these caves connect into the subterranean aquifer of northern Guam (Fig. 3.5), certainly a precious resource for human survival even today.

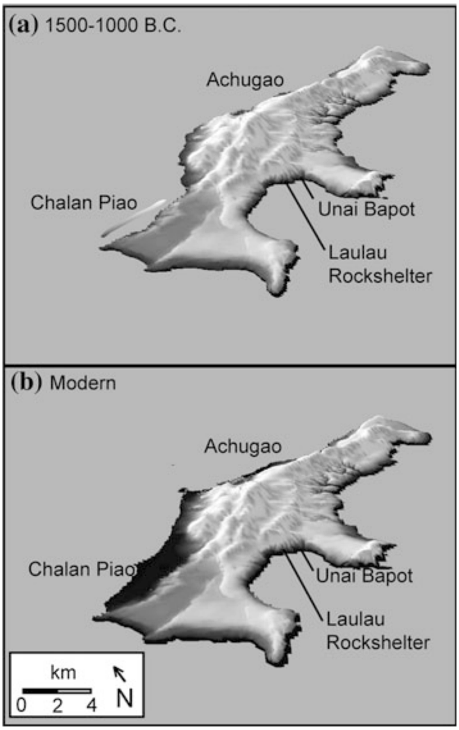

Fig. 3.4 Saipan palaeoterrain model

Fig. 3.5 Photograph of pool of fresh water in deep karst cave in Ritidian, connected to the natural subterranean aquifer of Guam

The earliest Marianas sites now can be understood as distantly separated communities, scattered around the larger southern islands in ideal locales where coral reefs, mangroves, and terrestrial resources all could be accessed. These habitation sites apparently were chosen for strategic catchment of primary resources. Other locations and probably other entire islands likely provided important supplemental resource bases.

The preferred first-settlement niches did not last forever, and in fact they began to change significantly by 1000 B.C., due to falling sea level, reshaping of coastlines, and further effects in the ecosystem compounded with human-caused impacts. We thus can depict a palaeohabitat during the centuries 1500–1000 B.C., directly relevant for defining the context of earliest Marianas settlement. We can begin to address questions about what attracted people to these particular locales, how they eventually transformed, and how people adjusted to these new conditions.

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Chapter 4
Earliest Site Inventory

Much of this book is predicated on early Marianas site dating, but the dating itself needs clarification. How old exactly were these sites? How much confidence can we place in the radiocarbon dating results? How many early sites can be confirmed, and where are they? So far, the oldest verified radiocarbon dating has been at Unai Bapot in Saipan, in the range of cal. 1612–1558 B.C., discussed in detail in Chap. 9. Several other sites, however, have yielded early dates or other evidence worthy of serious examination.

A critical review considers 12 sites where early redware pottery, radiocarbon dating, or both have been reported or suspected (Table 4.1). The individual sites are presented from south to north, as shown in Fig. 1.2. Seven are verified early, one more is convincingly probable, another one is questionable, and three cannot yet be accepted (Fig. 4.1). This review builds on an abbreviated version published separately (Carson and Kurashina 2012).

Radiocarbon date-rages are noted in calibrated calendar years, designated as "cal." This notation serves to distinguish the calibrated probability-range from exact known dates of historic reference. For example, Ferdinand Magellan landed in the Mariana Islands in A.D. 1521, but an archaeological site of this same age could produce a radiocarbon date of cal. A.D. 1440–1655.

Nomna

Possible early dating of the Nomna site in Guam cannot be verified. The site produced an early radiocarbon date of cal. 2017–1123 B.C. (GaK-1364), incongruent with the associated pottery and violating the law of stratigraphic superposition when compared to 12 other dating samples (Reinman 1977). The single early date incorporates an awkwardly broad error range, and it was not corrected for isotope ratios. The sample was processed at the Gakushuin Laboratory that produced a number of abnormal early dates at that time.

The dating results from the Nomna site overall match the expectations of a *latte*-associated habitation. The site consists of megalithic stone-pillar ruins called

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Table 4.1 List of radiocarbon dating samples from potential early-period archaeological sites in the Mariana Islands. Site locations are shown in Fig 1.2

Site and reference	Radiocarbon sample	Comments	Sample material[1]	Measured radiocarbon age (years B. P.)	13C/12C ratio (‰)	Conventional radiocarbon age (years B. P.)	Marine reservoir correction (ΔR)	Calibrated radiocarbon date range (calendar years)
Nomna, Guam (Reinman 1977: 32–42)	UCLA-1232G	Unit 4-4-18, 6–12 inches	Charcoal	320 ± 80	Not measured	Not available	Not applicable	A.D. 1431–1683 (87.3 %); A.D. 1736–1804 (6.4 %); A.D. 1936–1953 (1.7 %)
	UCLA-1232H	Unit 4-4-18, 6–12 inches	Pottery sherd	275 ± 80	Not measured	Not available	Not applicable	A.D. 1445–1687 (71.5 %); A.D. 1726–1815 (16 %); 1836–1877 (2.3 %); A.D. 1917–1954 (5.6 %)
	GaK-1364	Unit 6-1-1, 6–12 inches; possibly 12–18 inches	Charcoal	3,270 ± 170	Not measured	Not available	Not applicable	2017–1966 B.C. (0.5 %); 1961–1123 B.C. (94.9 %)
	GaK-1696	Unit 6-1-1, 6–12 inches	Charcoal	1,110 ± 80	Not measured	Not available	Not applicable	A.D. 690–1146 (95.4 %)
	GaK-1366	Unit 6-2-1, 6–12 inches	Charcoal	590 ± 90	Not measured	Not available	Not applicable	A.D. 1252–1488 (95.4 %)
	GaK-1697	Unit 6-1-1, 12–18 inches; possibly 6–12 inches	Charcoal	1,070 ± 70	Not measured	Not available	Not applicable	A.D. 777–1153 (95.4 %)
	GaK-1362	Unit 3-1-1, 18–24 inches	Charcoal	770 ± 80	Not measured	Not available	Not applicable	A.D.1043–1391 (95.4 %)
	UCLA-1232I	Unit 4-4-18, 18–24 inches	Charcoal	805 ± 80	Not measured	Not available	Not applicable	A.D. 1032–1380 (95.4 %)
	UCLA-1232 J	Unit 4-4-18, 18–24 inches	Pottery sherd	670 ± 100	Not measured	Not available	Not applicable	A.D. 1161–1441 (95.4 %)
	GaK-1698	Unit 6-1-1, 18–24 inches	Charcoal	1,460 ± 80	Not measured	Not available	Not applicable	A.D. 414–760 (95.4 %)
	GaK-1365	Unit 6-1-1, 18–24 inches	Charcoal	280 ± 70	Not measured	Not available	Not applicable	A.D.1447–1954 (95.4 %)
	GaK-1363	Unit 4-1-3, 24–30 inches	Charcoal	2,050 ± 110	Not measured	Not available	Not applicable	382 B.C. –A.D. 208 (95.4 %)
	GaK-1367	Unit 6-2-1, 24–30 inches	Charcoal	980 ± 90	Not measured	Not available	Not applicable	A.D. 886–1253 (95.4 %)
Hagatna, Guam (Cordy and Allen 1986: 34)	Not reported	Plaza de Espana, base of cultural deposit	Charcoal	2,580 ± 100	Not measured	Not available	Not applicable	906–411 B.C. (95.4 %)
	Not reported	Plaza de Espana, predates cultural layer	Marine bivalve shell	2,970 ± 100	Not measured	Not available	0	1049–499 B.C. (95.4 %)
Tumon, Guam (Olmo and Goodman 1994: 38)	CAMS-7868	Ypao Beach Park, Unit 74.204, post mold, 70 cm	Charcoal	2,700 ± 70	Not measured	Not available	Not applicable	1023–768 B.C.(95.4 %)
(DeFant 2008)	Beta-238482	Feature 2	Bulk sediment	1,700 ± 40	Not reported	1,680 ± 40	Not applicable	A.D. 246–420 (95.4 %)

(continued)

Table 4.1 (continued)

Site and reference	Radiocarbon sample	Comments	Sample material[1]	Measured radiocarbon age (years B. P.)	13C/12C ratio (‰)	Conventional radiocarbon age (years B. P.)	Marine reservoir correction (ΔR)	Calibrated radiocarbon date range (calendar years)
	Beta-238484	Burial 156	*Conus* sp. shell beads	2,330 ± 40	Not reported	2,790 ± 40	0	730–422 B.C. (95.4 %)
	Beta-238485	Burial 273	*Conus* sp. shell beads	2,490 ± 40	Not reported	2,860 ± 40	0	781–532 B.C. (95.4 %)
	Beta-238483	Burial 173	*Conus* sp. shell beads	2,490 ± 40	Not reported	2,940 ± 40	0	872–661 B.C. (95.4 %)
	Beta-238486	Burial 286	*Conus* sp. shell beads	2,640 ± 40	Not reported	2,970 ± 40	0	891–731 B.C. (95.4 %)
(Bath 1986: 25–100)	Beta-14704	Matapang Area B, Unit 127, hearth feature	Charcoal	3,170 ± 70	Not measured	Not available	Not applicable	1614–1271 B.C. (95.4 %)
	Beta-14705	Matapang Area A, Backhoe Trench 1, hearth feature	Charcoal	3,880 ± 90	Not measured	Not available	Not applicable	2580–2043 B.C. (95.4 %)
Mangilao Golf Course, Guam (Dilli et al. 1998)	Beta-67876	Site 25, EU-241, Layer IIIg2, level 10	Charcoal	3,090 ± 90	−28.7	3,030 ± 90	Not applicable	1491–1015 B.C. (95.4 %)
	Beta-67870	Site 25, EU-248, Layer IIIg2, level 11	Charcoal	3,010 ± 70	−28.5	2,950 ± 70	Not applicable	1386–978 B.C. (95.4 %)
	Beta-67869	Site 25, EU-243, Layer IIIg2, level 12	Charcoal	3,020 ± 70	−27.7	2,980 ± 70	Not applicable	1400–1014 B.C. (95.4 %)
	Beta-67875	Site 25, EU-243, Layer IIIg2, level 12	Charcoal	3,020 ± 60	−28.1	2,970 ± 60	Not applicable	1385–1016 B.C. (95.4 %)
	Beta-67874	Site 25, EU-245, Layer IIIg2, level 12	Charcoal	2,840 ± 60	−28.9	2,780 ± 60	Not applicable	1111–811 B.C. (95.4 %)
	Beta-46502	Site 25, EU-246, Layer IIIg2, level 12	Charcoal	3,000 ± 60	−28.1	2,950 ± 60	Not applicable	1379–1001 B.C. (95.4 %)
	Beta-67871	Site 25, EU-248, Layer IIIg2, level 12	Charcoal	3,280 ± 90	−29.8	3,200 ± 90	Not applicable	1690–1265 B.C. (95.4 %)
	Beta-53472	Site 25, EU-243, Layer IIIg2, level 13	Charcoal	3,190 ± 60	−27.5	3,150 ± 60	Not applicable	1601–1266 B.C. (95.4 %)
Ritidian, Guam (Carson 2010, 2012a; see also Chap. 8 this volume)	Beta-239577	98-105 cm; upper cultural layer	Charcoal	2820 ± 40	−25.4	2810 ± 40	Not applicable	1110–1104 B.C. (0.5 %); 1082–1065 B.C. (1.5 %); 1056–843 B.C. (93.5 %)
	Beta-239576	98–105 cm; upper cultural layer	*Cellana* sp. (limpet) shell	5,340 ± 40	+3.9	5,810 ± 40	2,810 ± 40	1161–796 B.C. (95.4 %)
	Beta-239578	105–115 cm; upper cultural layer	*Anadara* sp. shell	2,710 ± 40	+1.5	3,140 ± 40	13 ± 58	1161–796 B.C. (95.4 %)
	Beta-303808	110–120 cm; natural surge layer	*Acropora* sp. branch coral	2,870 ± 30	−1.1	3,260 ± 30	−44 ± 41	1360–1042 B.C. (95.4 %)
	Beta-253681	250–260 cm; deepest cultural layer	*Anadara* sp. shell	3,030 ± 40	−0.7	3,430 ± 40	−44 ± 41	1550–1256 B.C. (95.4 %)
	Beta-253682	255−260 cm; deepest cultural layer	*Halimeda* sp. bioclastic sand	2,980 ± 40	+5.3	3,480 ± 40	−44 ± 41	1609–1322 B.C. (95.4 %)
	Beta-303807	262,263 cm; predates cultural layer	*Acropora* sp. branch coral	3,390 ± 30	−3.0	3,750 ± 30	−44 ± 41	1929–1644 B.C. (95.4 %)
	Beta-253683	260–265 cm, predates cultural layer	*Heliopora* sp. coral limestone	3,610 ± 50	+4.4	4,100 ± 50	−44 ± 41	2455–2068 B.C. (95.4 %)
Tarague, Guam (Kurashina et al. 1981)	Beta-4897	Layer VIII	Marine shells (limpets)	3,435 ± 70	Not measured	Not available	0	1528–1167B.C. (95.4 %)

(continued)

Table 4.1 (continued)

Site and reference	Radiocarbon sample	Comments	Sample material[1]	Measured radiocarbon age (years B. P.)	13C/12C ratio (‰)	Conventional radiocarbon age (years B. P.)	Marine reservoir correction (ΔR)	Calibrated radiocarbon date range (calendar years)
House of Taga, Tinian (Chap. 10, this volume)	Beta-313865	*Latte*-associated cultural deposit; rubbish pit feature	Charcoal (narrow twigs)	740 ± 30	−23.5	760 ± 30	Not applicable	A.D. 1220–1284 (95.4 %)
	Beta-316285	Upper cultural deposit, thick-coarse redware; small hearth feature	Charcoal (narrow twigs)	2,920 ± 30	−23.7	2,940 ± 30	Not applicable	1264–1045 B.C. (95.4 %)
	Beta-313867	Lowest cultural deposit; rubbish pit feature D	Charcoal (narrow twigs)	3,150 ± 30	−30.1	3,070 ± 30	Not applicable	1413–1266 B.C. (95.4 %)
	Beta-313866	Lowest cultural deposit; hearth feature A	Charcoal (narrow twigs)	3,080 ± 30	−30.1	3,070 ± 30	Not applicable	1413–1266 B.C. (95.4 %)
	Beta-316283	Lowest cultural deposit; hearth feature A	*Anadara* sp. shell	2,980 ± 30	0	3,390 ± 30	−44 ± 41	1488–1232B.C. (95.4 %)
	Beta-316282	Lowest cultural deposit; hearth feature C	*Anadara* sp. shell	3,010 ± 30	−1.3	3,400 ± 30	−44 ± 41	1496–1242 B.C. (95.4 %)
	Beta-313869	Lowest cultural deposit; rubbish pit feature E	*Anadara* sp. shell	3,030 ± 30	−0.3	3,440 ± 30	−44 ± 41	1547–1283 B.C. (95.4 %)
	Beta-313868	Lowest cultural deposit; small hearth feature I	*Anadara* sp. shell	3,080 ± 30	−0.7	3,480 ± 30	−44 ± 41	1604–1347 B.C. (95.4 %)
	Beta-316284	Lowest cultural deposit; hearth feature B	*Anadara* sp. shell	3,090 ± 30	+0.3	3,500 ± 30	−44 ± 41	1616–1371 B.C. (95.4 %)
	Beta-313870	Natural beach deposit, predated cultural activity	*Acropora* sp. branch coral	4,160 ± 30	−2.9	4,570 ± 30	−44 ± 41	3031–2731 B.C. (95.4 %)
Unai Chulu, Tinian (Craib 1993)	Beta-62603	Unit 2, Layer III, 40–50 cm; base of cultural deposit, possibly predating this layer	*Anadara* sp. shell	3,300 ± 90	−0.9	3,690 ± 100	−44 ± 41	1996–1447 B.C. (95.4 %)
	Beta-62604	Unit 3, Layer III, 45-55 cm	*Anadara* sp. shell	2,820 ± 50	−2.6	3,190 ± 50	−44 ± 41	1291–916 B.C. (95.4 %)
	Beta-62607	Unit 3, Layer III, 55-67 cm	Bulk sediment	Not reported	Not reported	2,530 ± 60	Not applicable	805–417 B.C. (95.4 %)
	Beta-62605	Unit 3, Layer III, 55-65 cm	*Anadara* sp. shell	2,890 ± 50	−0.5	3,290 ± 50	−44 ± 41	1402–1049 B.C. (95.4 %)
	Beta-62606	Unit 3, Layer III, 70-80 cm; at base of cultural deposit, possibly predating this layer	*Anadara* sp. shell	2,990 ± 50	−0.2	3400 ± 70	−44 ± 41	1581–1156 B.C. (95.4 %)

(continued)

Table 4.1 (continued)

Site and reference	Radiocarbon sample	Comments	Sample material[1]	Measured radiocarbon age (years B. P.)	13C/12C ratio (‰)	Conventional radiocarbon age (years B. P.)	Marine reservoir correction (ΔR)	Calibrated radiocarbon date range (calendar years)
	Beta-62608	Unit 3, Layer IV, 90-100 cm; predates cultural layer; shell taxon may not be reliable for dating, subject to possible marine upwelling	*Turbo* sp. shell	3610 ± 50	+2.7	4060 ± 50	0	2301–1976 B.C. (95.4 %)
(Haun et al. 1999)	Beta-81946	Stratum VII, 210-220 cm	Charcoal	Not reported	−24	3120 ± 50	Not applicable	1497–1269 B.C. (95.4 %)
	Beta-81949	Stratum VII, 217-230 cm	Charcoal	Not reported	−26	2940 ± 70	Not applicable	1379–940 B.C. (95.4 %)
	Beta-81947	Stratum VII, 220 cm	Charcoal	Not reported	−26	3070 ± 100	Not applicable	1528–1020 B.C. (95.4 %)
	GX-20,795	Stratum VII, Feature 488, 220-230 cm	Bulk sediment	Not reported	−23	2215 ± 135	Not applicable	750 B.C.–A.D. 60 (95.4 %)
	Beta-83214	Stratum VII, 220-230 cm	Charcoal	Not reported	−26	3000 ± 40	Not applicable	1386–1123 B.C. (95.4 %)
	Beta-81948	Stratum VII, Feature 494, 227-249 cm	Charcoal	Not reported	−26	3100 ± 60	Not applicable	1500–1211 B.C. (95.4 %)
	Beta-83213	Stratum VII, 227-249 cm	Charcoal	Not reported	−27	3080 ± 40	Not applicable	1435–1233 B.C. (95.4 %)
	Beta-81950	Stratum VII, 230-244 cm	Charcoal	Not reported	−28	3020 ± 60	Not applicable	1421–1057 B.C. (95.4 %)
	Beta-81951	Stratum VII, 244 cm	Charcoal	Not reported	−28	3070 ± 60	Not applicable	1489–1130 B.C. (95.4 %)
	GX-20796	Stratum VII, Feature 500, 241-262 cm	Bulk sediment	Not reported	−25	2565 ± 70	Not applicable	837–416 B.C. (95.4 %)
	Beta-81952	Stratum VII, 244–250 cm	Charcoal	Not reported	−25	3,110 ± 60	Not applicable	1508–1213 B.C. (95.4 %)
	Beta-8953	Stratum VII, 250–260 cm	Charcoal	Not reported	−24	2,990 ± 50	Not applicable	1387–1056 B.C. (95.4 %)
	Beta-81954	Stratum VII, 250–260 cm	Charcoal	Not reported	−26	3,050 ± 60	Not applicable	1436–1127 B.C. (95.4 %)
	Beta-81955	Stratum VII, 258–273 cm	Charcoal	Not reported	−26	3,040 ± 60	Not applicable	1433–1122 B.C. (95.4 %)
	GX-20797	Stratum VII, Feature 520, 268–283 cm	Bulk sediment	Not reported	−26	2,035 ± 135	Not applicable	386 B.C. –A.D. 237 (95.4 %)
	Beta-83216	Stratum VII, Feature 520, 268–283 cm	Charcoal	Not reported	−25	2,920 ± 40	Not applicable	1261–1006 B.C. (95.4 %)
Chalan Piao, Saipan (Spoehr 1957: 60–67)	Chicago-669	Unclear context but probably post-dating earliest redware	Oyster shell	3,479 ± 200	Not measured	Not available	0	1910–902 B.C. (95.4 %)
(Moore et al. 1992)	Beta-33390	Charcoal combined from multiple locations, 36–61 cm	Charcoal	2,930 ± 90	Not measured	Not available	Not applicable	1390–916 B.C. (95.4 %)

(continued)

Table 4.1 (continued)

Site and reference	Radiocarbon sample	Comments	Sample material[1]	Measured radiocarbon age (years B. P.)	13C/12C ratio (‰)	Conventional radiocarbon age (years B. P.)	Marine reservoir correction (ΔR)	Calibrated radiocarbon date range (calendar years)
	Beta-33391	Charcoal combined from multiple locations, 61–100 cm	Charcoal	3,210 ± 100	Not measured	Not available	Not applicable	1741–1261 B.C. (95.4 %)
Unai Bapot, Saipan (Marck 1978)	UCR-649	Upper sample	Charcoal	2,980 ± 100	Not measured	Not available	Not applicable	1,433–932 B.C. (95.4 %)
	UCR-650	Lower sample	Charcoal	3,000 ± 100	Not measured	Not available	Not applicable	1452–939 B.C. (95.4 %)
Bonhomme and Craib (1987)	ANU-4771	40–50 cm	*Anadara* sp. shell	1,070 ± 110	Not reported	620 ± 120	–44 ± 41	A.D. 1450–1950 (95.4 %)
	ANU-4770	90–100 cm	*Anadara* sp. shell	2,970 ± 90	Not reported	2,520 ± 100	−44 ± 41	596 B.C.–A.D. 9 (95.4 %)
	ANU-4767	100–110 cm	*Anadara* sp. shell	3,130 ± 110	Not reported	2,680 ± 120	−44 ± 41	790–183 B.C. (95.4 %)
	ANU-4772	135–155 cm	*Anadara* sp. shell	3,140 ± 110	Not reported	2,690 ± 120	−44 ± 41	795–191 B.C. (95.4 %)
	ANU-4768	170–190 cm	*Anadara* sp. shell	3,310 ± 80	Not reported	2,860 ± 90	−44 ± 41	921–407 B.C. (95.4 %)
	ANU-4769	310–330 cm; beneath cultural layer	*Anadara* sp. shell	3,590 ± 110	Not reported	3,140 ± 120	−44 ± 41	1,366–782 B.C. (95.4 %)
(Carson 2008: see also Chap. 9, this volume)	Beta-214761	TU-2, Layer III-A, combustion feature; later cultural layer	Charcoal	2,850 ± 40	−25.8	2,840 ± 40	Not applicable	1127–903 B.C. (95.4 %)
	Beta-202722	TU-2, Layer IV-A, localized discard pile; earliest cultural layer	*Anadara* sp. shell	3,210 ± 40	−1.5	3,590 ± 40	−44 ± 41	1733–1440 B.C. (95.4 %)
	Beta-216616	TU-2, Layer IV-A, localized discard pile; earliest cultural layer	*Anadara* sp. shell	3,320 ± 50	−1.1	3,710 ± 50	−44 ± 41	1916–1558 B.C. (95.4 %)
(Clark et al. 2010)	Wk-23750	Unit 8, 30–40 cm	Nutshell charcoal	Not reported	−22.6 ± 0.2	1,386 ± 30	Not applicable	A.D. 604–675 (95.4 %)
	Wk-23751	Unit 4, 50–60 cm	Nutshell charcoal	Not reported	−23.4 ± 0.2	1,581 ± 35	Not applicable	A.D. 410–557 (95.4 %)
	Wk-23752	Unit 2, 70–80 cm	Charcoal	Not reported	−24.3 ± 0.2	2,043 ± 30	Not applicable	165 B.C. –A.D. 25 (95.4 %)
	Wk-23753	Unit 7, 100-110 cm	Charcoal	Not reported	−29 ± 0.2	2,386 ± 30	Not applicable	724–393 B.C. (95.4 %)
	Wk-23754	Unit 2, 100–110 cm	Charcoal	Not reported	−24.5 ± 0.2	2,189 ± 30	Not applicable	365–175 B.C. (95.4 %)
	Wk-23755	Unit 8, 130–140 cm	Charcoal	Not reported	−27.9 ± 0.2	2,168 ± 32	Not applicable	362–113 B.C. (95.4 %)
	Wk-23756	Unit 5, 130–140 cm	Charcoal	Not reported	−25.7 ± 0.2	2,175 ± 30	Not applicable	364–120 B.C. (95.4 %)
	Wk-23757	Unit 7, 150–160 cm	Charcoal	Not reported	−25.1 ± 0.2	2,907 ± 32	Not applicable	1251–1006 B.C. (95.4 %)
	Wk-23760	Unit 5, 180–190 cm	Charcoal	Not reported	−25.3 ± 0.2	2,866 ± 32	Not applicable	1130–926 B.C. (95.4 %)

(continued)

Table 4.1 (continued)

Site and reference	Radiocarbon sample	Comments	Sample material[1]	Measured radiocarbon age (years B. P.)	13C/12C ratio (‰)	Conventional radiocarbon age (years B. P.)	Marine reservoir correction (ΔR)	Calibrated radiocarbon date range (calendar years)
	Wk-23761	Unit 8, 190–200 cm	Charcoal	Not reported	–24.6 ± 0.2	2,922 ± 30	Not applicable	1256–1016 B.C. (95.4 %)
	Wk-23763	Unit 3, 200–210 cm	Nutshell charcoal	Not reported	–21.8 ± 0.2	2,904 ± 30	Not applicable	1212–1004 B.C. (95.4 %)
	Wk-23764	Unit 2, 210–220 cm	Charcoal	Not reported	–25.1 ± 0.2	2,910 ± 30	Not applicable	1251–1008 B.C. (95.4 %)
	Wk-23765	Unit 2, 210–220 cm	Charcoal	Not reported	−25.5 ± 0.2	2,900 ± 30	Not applicable	1211–1001 B.C. (95.4 %)
	Wk-23769	Unit 1, 210–220 cm	*Cypraea* sp. shell artifact	Not reported	1.9 ± 0.2	3,355 ± 30	0	1378–1172 B.C. (95.4 %)
	Wk-23770	Unit 1, 210–220 cm	*Cypraea tigris*artifact	Not reported	2.1 ± 0.2	3,192 ± 30	0	1166–927 B.C. (95.4 %)
	Wk-23766	Unit 5, 220–230 cm	Charcoal	Not reported	−25.5 ± 0.2	3,013 ± 30	Not applicable	1386–1131 B.C. (95.4 %)
	Wk-23771	Unit 4, 220–230 cm	*Conus* sp. shell artifact	Not reported	0.6 ± 0.2	3,182 ± 30	0	1147–916 B.C. (95.4 %)
	Wk-23767	Unit 1, 230–240 cm	Charcoal	Not reported	−28.1 ± 0.2	3,010 ± 30	Not applicable	1384–1130 B.C. (95.4 %)
	Wk-23768	Unit 4, 230−240 cm	Charcoal	Not reported	−24.9 ± 0.2	2,908 ± 30	Not applicable	1251–1007 B.C. (95.4 %)
	Wk-25210	Unit 2, 230–240 cm	*Anadara* sp. shell	Not reported	−0.7 ± 0.2	3,484 ± 35	−44 ± 41	1612–1343 B.C. (95.4 %)
Achugao, Saipan (Butler 1994, 1995)	Beta-28086	Uppermost sample	Charcoal	2,790 ± 50	−25.6	2,780 ± 50	Not applicable	1051–816 B.C. (95.4 %)
	Beta-29087	Middle-upper sample	Charcoal	2,980 ± 80	−27.0	2,950 ± 80	Not applicable	1392–939 B.C. (95.4 %)
	Beta-28218	Lower-middle sample	Charcoal	2,530 ± 80	−26.7	2,500 ± 80	Not applicable	794–412 B.C. (95.4 %)
	Beta-36190	Lowest sample	Charcoal	3,490 ± 120	−25.9	3,470 ± 120	Not applicable	2133–1502 B.C. (95.4 %)
	Beta-36191	Lowest sample	Charcoal	3,120 ± 50	−26.3	3,120 ± 50	Not applicable	1497–1269 B.C. (95.4 %)

All calibrations are by the OxCal program (Bronk Ramsey 2009), reported at 2-sigma (95.4 %), using INTCAL09 for charcoal and sediments materials or MARINE09 for shells and bioclasts (Reimer et al. 2009). Marine reservoir correction (ΔR) follows calculations as reported by Carson (2010). Site locations are shown in Fig. 1.2 (see also Figs. 3.5, 3.6, and 3.7)

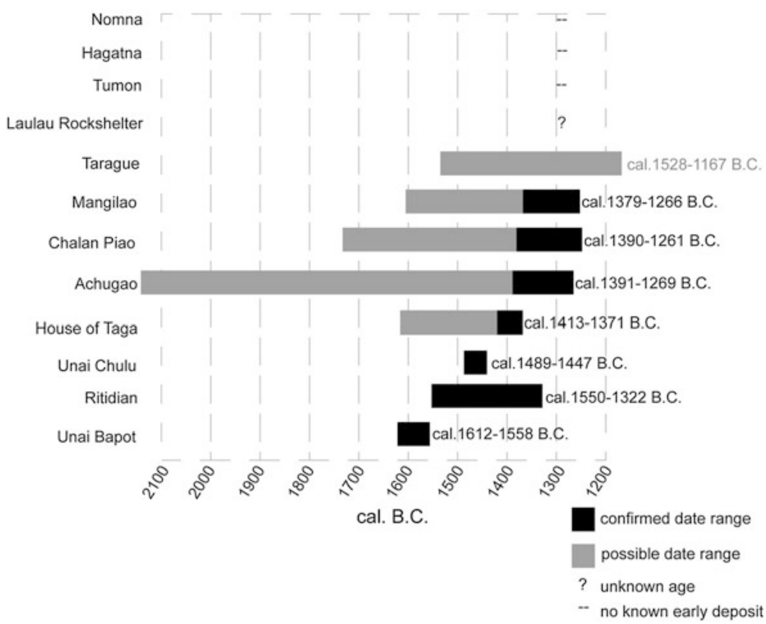

Fig. 4.1 Summary of potential early-period Marianas site dating. Site locations are depicted in Fig. 1.2

latte, known as house-supports during the early Spanish colonial period (Laguana et al. 2012). Diagnostic thickened-rim pottery of this period was reported on the surface and extending as deep as 75 cm. Generally in the Marianas region, the *latte* period dates within a liberal range of approximately A.D. 900 through 1700 (Carson 2012b).

The Nomna site contained a lower subsurface component that partly predated the surface-related *latte* habitation, but it did not disclose significantly older materials. The lower portion of the deposit at 60–75 cm contained coarsely made volcanic sand-tempered pottery typical of the *latte* period, but it was mixed with possibly older potsherds containing calcareous beach-sand temper. Dating results from this deeper component mostly were at the early range of the *latte* period, but two samples were a few centuries earlier. None of the dating results approached the singular much earlier date reported from the site.

The evidence so far does not indicate an early-period site occupation at Nomna. The anomalous early dated sample was from 30 to 45 cm, squarely within the *latte*-associated cultural deposit. If the dating accurately represents the age of charcoal cal. 2017–1123 B.C., then the material must have been re-deposited from a different context.

Mangilao

At the present-day Mangilao Golf Course in Guam, a coastal site was inhabited probably for an extended period of a few centuries, at least as early as cal. 1379–1266 B.C. A buried layer at 90–130 cm depth yielded thin red-slipped potsherds and several early radiocarbon dates (Dilli et al. 1998). Seven charcoal samples overlapped significantly cal. 1379–1266 B.C., and the earliest of these was cal. 1601–1266 B.C. (Beta-53472). One additional sample was later than the others, cal. 1111–811 B.C.

The lowest cultural layer was covered by dense branch coral debris, indicating impact of a high-sea event. Several redware potsherds, including a few pieces with rare finely decorated designs, were found in eroded condition and re-deposited in an upper layer post-dating A.D. 1000. An unknown amount of the original site deposit was disturbed or removed, but a 40 cm-thick remnant was documented intact in the lowest excavated levels.

People lived at Mangilao at least as early as cal. 1379–1266 B.C., but more realistically a few generations of people lived there during a span of perhaps a few centuries. If each of the eight dating samples represented a slightly different portion of an occupation that lasted a few centuries, then the first siteuse probably occurred earlier than the redundant overlap of seven samples at cal. 1379–1266 B.C. The full set of eight dates can be ordered in a slightly broader sequence, roughly 1500 through 1000 B.C. The oldest singular dating was cal. 1601–1266 B.C. (Beta-53472), and the most recent was cal. 1111–811 B.C. (Beta-67874).

Hagatna

Historically, Hagatna supported a large population since the Spanish colonial period and presumably much earlier, but so far no early-period settlement site has been found here. In fact, no early site is likely ever to be found here, because the Hagatna area consisted of an uninhabitable lagoon and marshland prior to 1000 B.C. (Carson 2011). At the landward margin of the swampy zone, narrow fringes of stable terrain bordered the base of surrounding hillslopes (see Fig. 3.2). These narrow habitable landforms incrementally expanded during and after sea-level drawdown, beginning about 1000 B.C.

Given the natural history of the Hagatna Basin, the likelihood of finding preserved sites continually increases for the centuries following 1000 B.C., entirely post-dating the potential early-period range. For one locality in Hagatna, Cordy and Allen (1986: 34) cited a 1985 personal communication from Michael W. Graves concerning a date of cal. 906–411 B.C. for the base of a buried pottery-bearing layer. A nearly identical date of cal. 1049–499 B.C. preceded the cultural habitation layer.

Tumon

Beneath today's densely developed tourist-haven of Tumon in Guam, a narrow sandy fringe once bordered the base of a steep limestone cliff during the potential earliest settlement period 1500–1000 B.C. (see Fig. 3.2). No early cultural deposit has yet been found here, but numerous later-dated deposits have been documented in the more recently formed coastal terrain (Fig. 4.2). Following 1000 B.C., broad patches of stable beach formed at the west and east ends of the Tumon embayment, and the beach in the central portion of Tumon gradually expanded (Carson 2011).

At the west end of Tumon, the Ypao site contained thick-coarse redware, including some pieces with lime-infilled broad incisions (Leidemann 1980). This pottery sometimes is termed the "Ypao Type," noticeably different from the earlier thinner redware with finer decorations. A date of cal. 1023–768 B.C. (CAMS-7868) was reported (Olmo and Goodman 1994: 38), consistent with the above-outlined beach-formation model.

At the east end of Tumon, more than 300 burial features have been described at the Naton site, including many associated with thick-coarse redware pottery. DeFant (2008) selected *Conus* sp. shell beads from necklaces at four different burial features, yielding radiocarbon dates of cal. 730–422 B.C. (Beta-38484), cal. 781–532 B.C. (Beta-238485), cal. 872–661 B.C. (Beta-238483), and cal. 891–731 B.C. (Beta-238486). No reliable ΔR correction is available for *Conus* shells in the Marianas, but the face-value dates suggest roughly the same age as for the Ypao site or perhaps slightly younger.

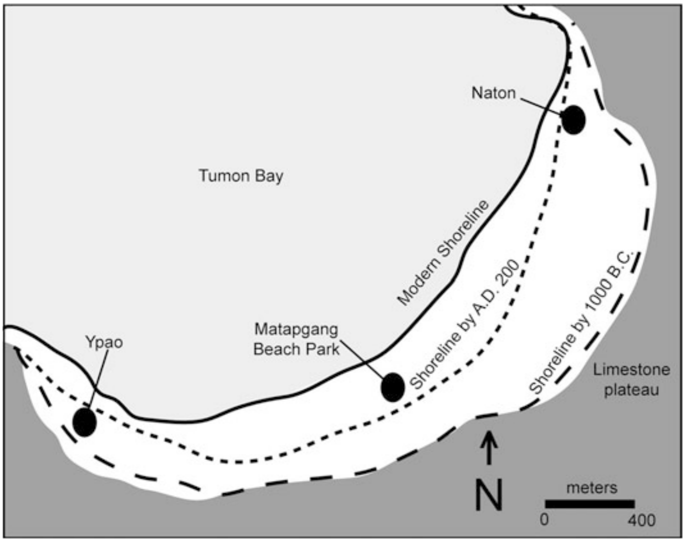

Fig. 4.2 Map of Tumon area in Guam, showing known sites in relation to bech-formation sequence. Location of Tumon is shown in Figs. 1.2 and 3.2

Unexpectedly, early dating was reported from the central portion of the Tumon coastline at Matapang Beach Park (Bath 1986). The oldest sample was cal. 2580–2043 B.C. (Beta-14705), and another was cal. 1614–1271 B.C. (Beta-14704). Both contexts were described as hearths, but they were not related to a material culture assemblage or an anthropogenic layer. If these dates were associated with any kind of cultural activity, then no artifacts or midden have survived as possible verification.

Geoarchaeological investigations found that the vicinity of Matapang Beach Park was a submerged shallow-water zone prior to 1000 B.C. and continuing for some centuries later (Carson 2011). For this central portion of Tumon, habitation of a stable beach evidently began about cal. A.D. 100–200. Given these circumstances, the curiously early dates from Matapang Beach Park (Bath 1986) are extremely unlikely to represent cultural activity, except possibly in re-deposited context.

Ritidian

At Ritidian in northern Guam, an intensive research program provided a 3500 year chronology of landscape evolution (Carson 2012a), presented fully in Chap. 8. An early habitation layer was discovered through an intentional program of seeking earliest Marianas sites, coordinated through an island-wide palaeoterrain model of Guam (Carson 2011; Carson and Hung 2013). For other early sites, the discoveries apparently occurred by chance at locations where researchers had convenient access or where resource-management work was required.

The Ritidian sequence began with a single habitation layer (Fig. 4.3), dated cal. 1550–1322 B.C., buried 235–260 cm (Carson 2010, 2012a). This layer contained thin redware pottery, burned coral cobbles, shellfish remains, and vertebrate bone fragments. The deposit reflects an inter-tidal activity area of limited use, where artifacts and midden were dropped into the tides, possibly from a stilt-raised house or otherwise from the shore.

So far, only a 1 by 1 m excavation found this earliest cultural deposit at Ritidian. Other test pits at 10 m intervals did not encounter cultural materials at this depth. The oldest site deposit therefore is confined within less than 20 by 20 m, and possibly it was considerably smaller. These circumstances underscore the importance of intensive searching for the earliest sites.

The pottery in the lowest layer was broken from amazingly thin (1–2 mm) red-slipped vessels. The collection consisted of 428 pieces (793.5 cm^2) from the single 1 by 1 m excavation. None of these pieces showed significant erosion, and many could be re-fitted. Close examination concluded that the fragments represented about 10–20 % of two different small bowls or jars, plus more than 55 % of another shallow open bowl.

The pottery and other materials were found within a natural deposit of intact *Halimeda* sp. algal bioclasts, overlaying a slightly older *Heliopora* sp. coral

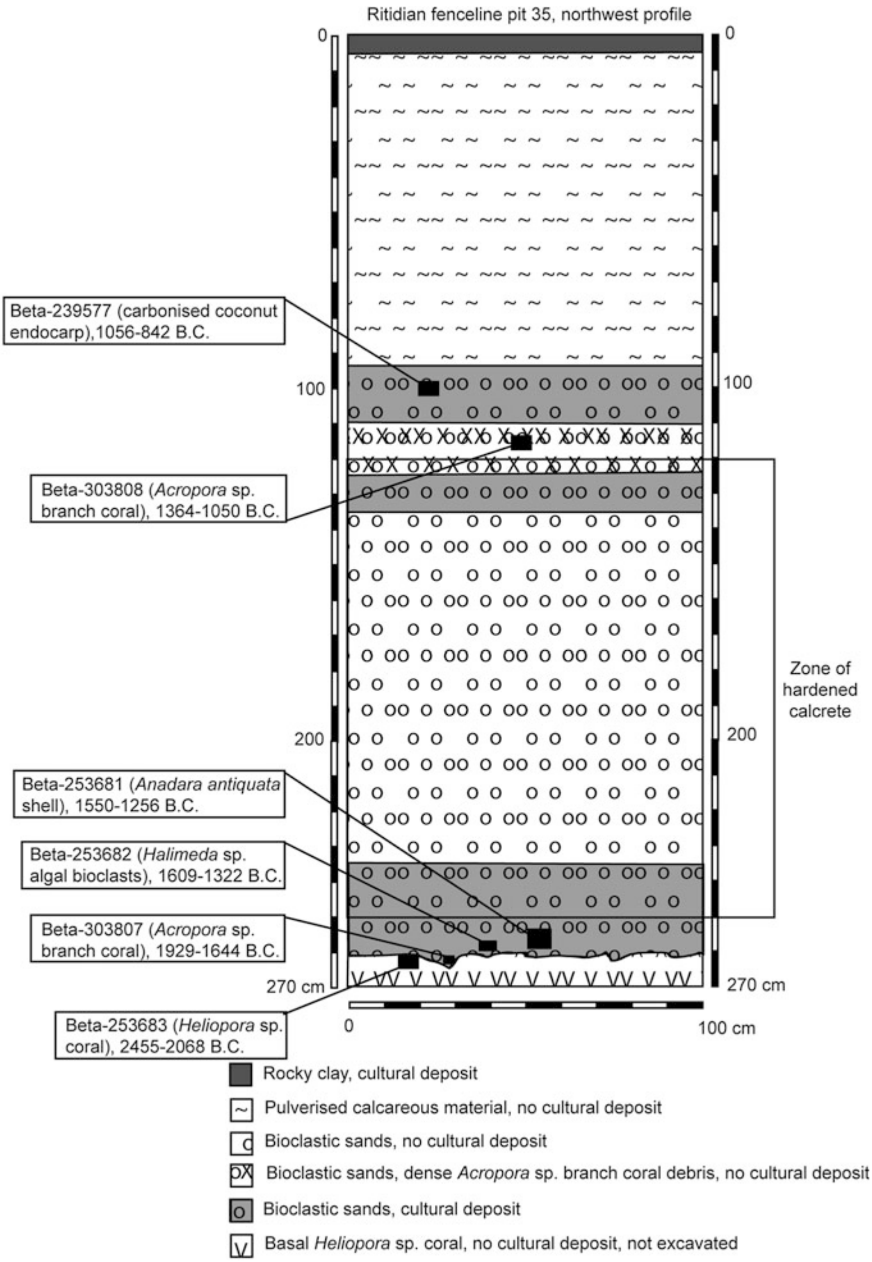

Fig. 4.3 Ritidian fenceline pit 35 excavation profile. Site location is shown in Figs. 1.2 and 3.2

formation. The intact condition indicates very little movement within water or exposure to possible forces of erosion, because the bioclasts otherwise tend to erode quickly into smaller and smooth-edged pieces. *Halimeda* generally live

2–12 months before shedding their bioclasts, thus creating rapid accumulations of this material on lagoon floors and near tidal zones. In higher-energy environments, however, the bioclasts soon are eroded and dispersed.

A date range of cal. 1550–1322 B.C. is proposed for the lowest cultural layer, based on corroboration of two-dated samples. First was *Anadara antiquata* shell at cal. 1550–1256 B.C. (Beta-253681). Second was freshly deposited *Halimeda* sp. algal bioclasts at cal. 1609–1322 B.C. (Beta-253682). After careful recovery and sieving through one-half-mm mesh, no datable charcoal was present, presumably due to the original inter-tidal setting during a time of sea level 1.8 m higher than today.

Any concerns about reliability of sample material and marine reservoir correction (ΔR) already have been addressed in detail (Carson 2010). A confident ΔR of -44 ± 41 was calculated specifically for two sets of *Anadara antiquata* shells paired with short-lived carbonized coconut endocarp specimens at the Ritidian site. Freshly deposited *Halimeda* sp. algal bioclasts provided the same ages as the *Anadara* shells, and these bioclasts proved accurate for dating in a variety of ancient settings in Guam (Carson and Peterson 2012).

The most probable range of cal. 1550–1322 B.C. for the deepest cultural layer 235–260 cm has been supported by dates for lower (predating) and upper (post-dating) contexts (see Fig. 4.3). Immediately predating the cultural layer, a segment of *Acropora* sp. branch coral was dated cal. 1929–1644 B.C. (Beta-303807), from a context at 262–263 cm lodged within a crevice in the underlying *Heliopora* sp. coral dated cal. 2454–2077 B.C. (Beta-253683). In a much later stratigraphic position at 110–120 cm within a surge layer of branch coral debris, another *Acropora* sp. segment was dated cal. 1364–1050 B.C. (Beta-303820), covered by a cultural layer at 93–110 cm dated cal. 1056–843 B.C. (Beta-239577).

Tarague

The Tarague site in northern Guam revealed more than 4 m of stratified deposits, so far the deepest sequence known in the Marianas (Kurashina et al. 1981). Storm-surges and other post-depositional processes disturbed the sedimentary layers over time, so each major stratigraphic unit necessarily incorporated a degree of internal mixing (Kurashina and Clayshulte 1983a, b). Within the limits of large-scale stratigraphic units, pottery types were found in proper stratigraphic order (Moore 1983; Ray 1981), including undecorated but thin redware in the lowest cultural layer.

The deeply buried redware pottery suggests an early age, but the given stratigraphy allows only a broad-ranging estimate. Although lacking a confident ΔR value, an uncorrected date of 1528–1167 B.C. was produced for a sample of limpet shells (Beta-4897). Greater precision will be desirable, but the available dating appears reasonable in comparison to others regionally.

House of Taga

On the southern coast of Tinian, excavations near the House of Taga proved without any doubt that an early habitation horizon was deeply buried and predated the *latte* occupation of the Marianas. The House of Taga itself is revered as a cultural heritage symbol, known as the largest *latte* structure ever standing in the Marianas (Fig. 4.4). About 30 m landward of the colossal *latte* ruins and buried in a much deeper and older cultural horizon, Pellett and Spoehr (1961) reported diagnostically early type decorated redware and blackware. No charcoal was recovered, and the excavators regarded the shellfish remains as not suitable for radiocarbon dating at that time prior to marine calibration curves.

New excavations in 2011–2013 totaled more than 90 m^2, making so far the best documentation of the early-period material culture of the Marianas, as presented in Chap. 10 of this book. The excavations exposed sets of post-molds, hearths, and other features in a dense deposit of abundant red-slipped pottery, other artifacts, and midden (Fig. 4.5). Among more than 3,00,000 thin red-slipped potsherds, more than 250 were finely decorated, substantiating the largest single-site collection of early-period Marianas pottery.

Seven radiocarbon dates from the earliest occupation layer suggested a few centuries of continuing habitation at the site. All of the dates redundantly overlapped cal. 1413–1371 B.C., so the first site-use occurred during this range or perhaps earlier. The oldest single date range was cal. 1616–1371 B.C. (Beta-316284). The two youngest were identical, cal. 1413–1266 B.C. (Beta-313866 and -313,867).

Perhaps most importantly, a single hearth feature provided a date for carbonized short-lived twigs (1–2 mm diameter) cal. 1413–1266 B.C. (Beta-313866), virtually indistinguishable from the date on *Anadara* sp. shell cal. 1488–1232 B.C. (Beta-316283). These results independently validate the ΔR of -44 ± 41 calculated for *Anadara* sp. shells at the Ritidian site in Guam (Carson 2010). The ΔR apparently does not vary significantly for this taxon in the early Marianas sites.

Fig. 4.4 *Latte* ruins at the House of Taga, Tinian. Site location is shown in Figs. 1.2 and 3.3

Fig. 4.5 Lowest cultural layer at House of Taga, with structural features exposed. Scale bar is in 20-cm increments. Site location is shown in Figs. 1.2 and 3.3

Whether preferring the conservative cal. 1413–1371 B.C. or a more liberal cal. 1616–1371 B.C. for the oldest cultural layer, either range can be affirmed by lower (predating) and upper (post-dating) samples. The underlying natural beach deposit produced a date of cal. 2941–2645 B.C. for a piece of *Acropora* sp. branch coral (Beta-313870). The immediately super-imposed layer with diagnostically later-dated thick-coarse redware produced an age of cal. 1264–1045 B.C. (Beta-316285). The much more recent *latte*-period cultural deposit was dated cal. A.D. 1220–1284 (Beta-313865).

Unai Chulu

Earliest use of the Unai Chulu site in Tinian occurred cal. 1489–1447 B.C., on a sandy beach between an ancient lagoon and inland pond (see Fig. 3.2). The coral reef floor of the ancient lagoon can be seen today partially exposed near the modern shore (Fig. 4.6), indicating where the coral once was growing during a period of higher sea level prior to cal. 1000 B.C. The oldest site occupation

Fig. 4.6 Beach at Unai Chulu. The palaeo-reef is visible in the middle of the picture, extending from the middle out to the distant left-hand side. Site location is shown in Figs. 1.2 and 3.3

extended from 50 to 120 m landward from this location, at the inland shore margin of the former lagoon.

Two investigations gained information relevant to the earliest occupation at Unai Chulu, estimated to have covered perhaps 3,000 m^2. Craib (1993) reported transects of test pits for exploring the spatial limits of the site and identifying specific locations of interest. Haun et al. (1999) reported additional transect-test efforts, plus one large block excavation of 16 m^2 of the lowest cultural strata.

As seen at Mangilao and at Tarague in Guam, the first occupation layer at Unai Chulu was disturbed and partly removed, but its remaining intact portion yielded definite early-period pottery and other material. Thin redware potsherds, including some decorated pieces, were found in the lowest cultural layer. A deposit of dense branch coral debris showed that at least one high-sea event affected the site during or shortly after the earliest occupation.

The remnant intact portion of the lower layer contained denser artifacts and midden in some locations than in others. This pattern could represent multiple activity areas across the large site, or it could be a product of the widespread site disturbance. In either case, one especially dense concentration was in the area of the 16 m^2 block excavation, where several post-molds and other features also were described (Haun et al. 1999).

Craib (1993) obtained two early but noncorroborative dates of cal. 1996–1447 B.C. (Beta-62603) and cal. 1402–1049 B.C. (Beta-62605) for *Anadara* shells from separate locations at the base of the earliest cultural layer. An additional *Anadara* shell dated cal. 1581–1156 B.C. (Beta-62606), possibly beneath the cultural layer. A *Turbo* sp. shell dated cal. 2301–1976 B.C. (Beta-62608), certainly from a deeper and noncultural context.

Haun et al. (1999) reported 13 charcoal dates and three bulk sediment dates from the lowest cultural layer (Stratum VII) at Unai Chulu. The charcoal samples indicate a range of generally cal. 1500–1000 B.C., but the bulk sediments dates consistently were several centuries younger. Of the 13 charcoal dates, 12 overlap in the range of cal. 1379–1269 B.C., and one (Beta-83216) is cal. 1261–1006 B.C.

The numerous dating results can be ordered gradually across the range of, approximately, 1500–1000 B.C., leading to different possible interpretations. In one view, the cultural activities varied in age across the large site, so that Craib (1993) reported the earliest portion cal. 1996–1447 B.C. and Haun et al. (1999) reported a slightly later portion. In another view, the habitation continued over a few centuries throughout the site, extending before and after the majority statistical overlap cal. 1379–1229 B.C.

Ideally, at least two dates can cross-confirm the exact point of first site-use. For instance, if the one early date from Craib (1993) was part of a continuous site occupation at Unai Chulu, then it can be matched with at least one of the earliest samples reported by Haun et al. (1999). Without a matching overlap, the occupation still may have lasted for some centuries, but the exact centuries did not necessarily encompass the outlying early date.

In fact, the one earliest date cal. 1996–1447 B.C. overlaps significantly with five others from the 16 m^2 excavation area, collectively pointing to a range of cal.

1489–1447 B.C. Repeated from a total six dating samples, this range appears most reasonable for the first occupation of the site. Later site-use continued for some centuries as reflected in the other dating results.

Chalan Piao

The Chalan Piao site in Saipan was found buried deeply beneath today's broad coastal plain (Fig. 4.7). When it was first occupied, the site was situated on a sandy berm, with a shallow lagoon on its seaward side and a swamp on its landward side (see Fig. 3.3). The landward terrain today still contains relicts of the original wetland.

Chalan Piao was among the first sites documented as containing early-type redware pottery with lime-infilled decorations (Spoehr 1957: 60–67). It also was the first site to yield an early radiocarbon date, in this case for an oyster shell cal. 1910–902 B.C. (Chicago-669). Unfortunately, the shell and the early pottery were stratigraphically separated, and the date may be too young compared to the redware. The dating result is further questionable for its broad error range.

More recent excavations yielded additional early redware with lime-infilled fine decorations (Moore et al. 1992). Unfortunately, the lowest levels of the site deposit were not excavated. Upon encountering a buried layer of hardened sand, the excavators preferred not to damage the pottery fragments visible within it (Moore et al. 1992: 23). Instead, charcoal was combined from multiple locations of similar depth for two dating samples. In this way, an upper portion of the redware deposit was dated cal. 1390–916 B.C. (Beta-33390), and a deeper portion was dated cal. 1741–1261 B.C. (Beta-33391). The basal portion, however, was not dated.

The pottery findings confirm an early age of the site, but the radiocarbon dating serves only as a general guide. The 2-Sigma ranges appear overall older with depth, but they also overlap at cal. 1390–1261 B.C. The deepest portion of the site must date to the same or earlier age.

Fig. 4.7 Overview of Chalan Piao and environs. Site location is shown in Figs. 1.2 and 3.4

Laulau Rockshelter

An early-period deposit is questionable at Laulau Rockshelter in Saipan. A few pieces of potentially early redware pottery were documented inside the rock-shelter's deep sediments (Spoehr 1957), but no radiocarbon dating was obtained. The deepest levels, containing the few pieces of redware, had been disturbed by much later-dated burial pits that intruded downward. The redware in this case could not be associated with an intact cultural deposit.

The few recovered redware pieces are not necessarily diagnostic of the earliest Marianas pottery, but rather they may represent the slightly later thick-coarse variety with broad incisions. An early date at Laulau Rockshelter indeed would be quite surprising, because overall the Marianas caves and rockshelters have not preserved much at all of ancient human activities. So far the oldest known cave-site dates were about 500 B.C., but most were considerably more recent.

Unai Bapot

The Unai Bapot site in Saipan offers so far the oldest known secure radiocarbon dating of any site in the Marianas at cal. 1612–1558 B.C., for a deeply buried layer containing diagnostic early-type redware and blackware, reported in detail in Chap. 9. The dating needs discussion for clarifying results by four different excavations. Only three of 31 dating samples referred most certainly to the earliest site-use.

The original setting was on a narrow and unstable beach, about 2–4 m above sea level, fringing the base of a limestone cliff. Today's setting is much different, more than 100 m from the shoreline and stabilized 6–8 m above sea level. The separate excavations together reveal that the earliest buried site component covered at least 400 m^2.

Marck (1978) described an early redware deposit, dated by two charcoal samples from upper and lower portions of the buried layer. The two samples produced virtually identical results, overlapping cal. 1433–939 B.C. (UCR-649 and -650). The same-dated charcoal from upper and lower contexts indicates either uniformity in the deposit or vertical movement of charcoal.

Bonhomme and Craib (1987) reported no datable charcoal, but several dates of *Anadara* shells were in stratigraphic order. The deepest dating sample was at 310–330 cm, cal. 1366–782 B.C. (ANU-4,769), but this shell possibly predated the cultural use of the site. The deepest verifiable cultural date was much higher in the excavation at 170–190 cm, cal. 921–407 B.C. (ANU-4,768), but it probably post-dated initial cultural activity at the site.

A renewed effort in 2005 disclosed a complete stratified sequence (Fig. 4.8). Thin redware and blackware potsherds were found at 160 through 220 cm depth, along with stone and shell artifacts, dense shell midden, and a few fish and bird

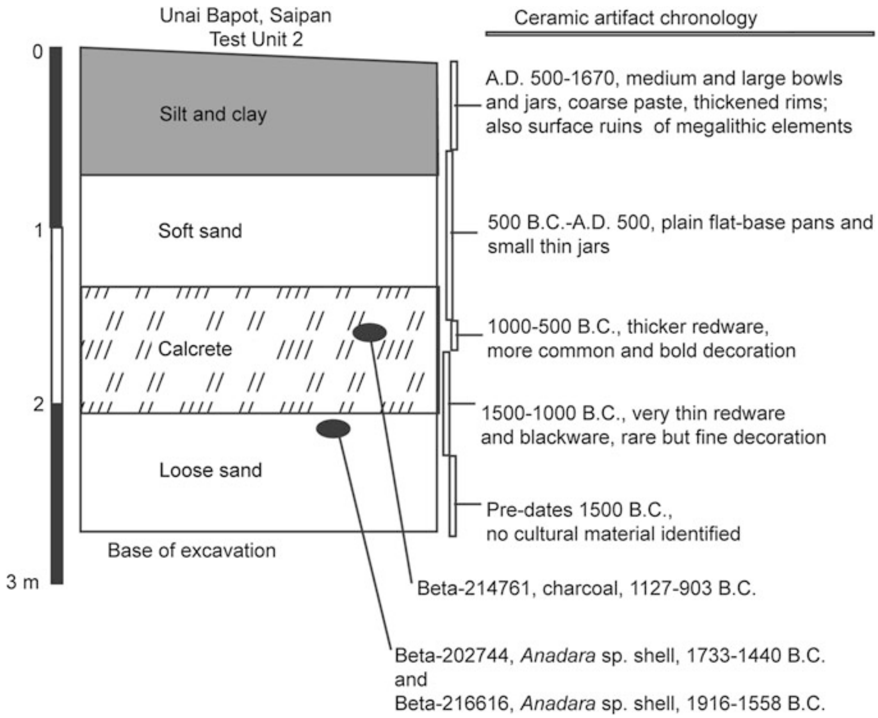

Fig. 4.8 Unai Bapot TU-2 excavation profile. Site location is shown in Figs. 1.2 and 3.4

bones (Carson 2005, 2008). No charcoal was present at this depth, but *Anadara antiquata* shells provided the most reasonable dating material.

The base of the cultural deposit at 200–220 cm was dated cal. 1733–1558 B.C., as affirmed by two overlapping samples (Beta-202744 and -216,616). The dates were based on two different soot-coated *Anadara antiquata* shells from the same small ash-pile. The ash and soot yielded insufficient carbon for dating, but the context very surely verified a cultural activity near the base of the site deposit.

The deepest stratigraphic unit at 200–220 cm must predate the charcoal-based date of cal. 1127–903 B.C. (Beta-214761) for a separate super-imposed layer at 140–160 cm. This upper layer contained a diagnostically later pottery type of thicker redware with bolder incised decorations. This layer formation coincided with a more stabilized landform higher above sea level, and a significantly different nearshore ecosystem was confirmed in the shellfish records (Carson 2008).

The unexpectedly early dates for *Anadara* shells prompt an assessment of the marine reservoir correction (ΔR). The ΔR of -44 ± 41 was calculated for *Anadara* shells at the Ritidian site in Guam (Carson 2010), also confirmed accurate at the House of Taga site in Tinian as described above. The ΔR presumably cannot differ substantially for the Unai Bapot site in Saipan. Carson (2008) originally applied a more conservative estimate of 75 ± 35, before the Ritidian ΔR was available, resulting in calibrations of cal. 1596–1321 B.C. (Beta-202744) and cal. 1741–1431 B.C. (Beta-216616). The younger-biased ΔR of 75 ± 35 now is considered unjustified, but it indicates a most likely age cal. 1596–1431 B.C.

The most recent excavation at Unai Bapot in 2008 supported an additional 20 radiocarbon dates for the site (Clark et al. 2010). At this location, the deepest cultural material was at 230–240 cm, where a sample of *Anadara* shell yielded a date of cal. 1612–1343 B.C. (Wk-25210). This dating most importantly endorses Carson's (2008) above-noted two dates for *Anadara* shells at 200–220 cm, with all three results overlapping significantly cal. 1612–1558 B.C.

Unlike the other excavations at the same site, Clark et al. (2010) noted charcoal continuously to a depth of 230–240 cm. All dated samples from 150 to 160 cm through the basal cultural level produced essentially the same age. A sample at 150–160 cm was cal. 1251–1006 B.C. (Wk-23757). The lowest charcoal at 230–240 cm was cal. 1251–1007 B.C. (Wk-23768).

The charcoal samples most likely originated in the super-imposed layer of stabilized beach landform at 140–160 cm. Carson's (2008) close examination found this layer to contain the deepest charcoal at the site, dated cal. 1127–903 B.C., largely consistent with all of the charcoal dates reported by Clark et al. (2010). Original charcoal may not have been preserved within the deeper layer of an unstable beach zone. The best we can ascertain at present is that the small charcoal particles drifted downward through the sandy matrix, or possibly the excavators erroneously assigned the specimens to deeper provenience during the process of excavation and sieving.

If the charcoal dates are based on out-of-context charcoal particles, then ΔR corrections cannot be calculated reliably for three shell artifacts paired with them (Wk-23769 through -23771). A regional ΔR so far has not been possible for the dated *Conus* and *Cypraea* shells, because the gastropods when alive tend to migrate across coral reef zones of variable ages within their habitat range. The apparent ΔR in one case does not apply in others, but instead variation can be expected.

The three shell artifact dates must be regarded as unreliable, and an equalizing "zero" ΔR demonstrates the inconsistency of these particular shell taxa for dating. One *Cypraea* artifact at 210–220 cm is cal. 1378–1172 B.C. (Wk-23769), reasonable for the stratigraphic position. Another of the same Genus at the same depth, however, is entirely younger, cal. 1166–927 B.C. (Wk-23770). The third sample was of *Conus* shell, deeper at 220–230 cm but also younger, cal. 1147–916 B.C. (Wk-23771).

Unai Bapot so far offers the oldest confirmable site-use in the Marianas. In sum, three *Anadara* shells clearly were dated from the base of the earliest cultural layer, overlapping at cal. 1612–1558 B.C. (Beta-202722, Beta-216616, and Wk-25210). This age is marginally older than expected, in this case referring probably to the very first use of the site.

Achugao

The Achugao site in Saipan produced a large collection of early decorated redware and some blackware, but dating about 1500 B.C. or earlier has been questioned (Butler 1994, 1995). The original habitation covered about 1,500 m^2 on a narrow beach ridge, but dates and material contents varied across the site, even within just a few sq m of each other. The deepest cultural layer varied 20–50 cm thickness, and disturbance was noted throughout most of the deposit.

Five radiocarbon dates were based on charcoal taken from the lowest cultural layer, and they produced results not entirely in stratigraphic order. The two samples from the lowest portion were the earliest, but they differed from one another. The other samples from higher in the cultural layer conflicted with their respective depth positions.

The two distinctly separate dates from the lowest portion were cal. 2133–1502 B.C. (Beta-36190) and cal. 1497–1269 B.C. (Beta-36191). These results unfortunately are just barely outside each other's statistical range for potential corroboration. The disparity raises questions of possible differences in the sample material. Although not provable, the earlier date may have been influenced by in-built age of old-growth wood or driftwood.

Scattered portions of the site appeared reasonably intact, but most of the site's contents were mixed variably throughout a single undifferentiated layer. The stratigraphically mis-ordered middle to upper dating samples were cal. 794–412 B.C. (Beta-28218), cal. 1392–939 B.C. (Beta-29087), and cal. 1051–816 B.C. (Beta-28086). Similar to these dates, the pottery and other artifacts included a mixture of types from diagnostically separate ages.

Presuming mixture of the stratigraphic unit as a whole, the earliest confirmable site-use may be indicated by significant overlap in two samples, cal. 1392–1269 B.C. (Beta-29087 and -36191). A possible earlier site-use may be witnessed in the outlying oldest date, cal. 2133–1502 B.C. (Beta-36190). An unknown point within this early range probably is accurate, but it cannot be refined any further based on the available data.

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Chapter 5
Early-Period Material Culture

For archaeologists, “material culture” comprises the essential substance of how to learn about past human behavior. People continually make and use objects as part of human life, and this characteristic may well define part of what it means to be human (MacGregor 2010). A portion of the material remnants survive for archaeologists to gather clues about what people did in the past.

Within the known early sites, what tools, ornaments, and other objects did the first Marianas settlers make? What items in their repertoire were invented uniquely for the first time, and what others may have been inherited from a remote-distance homeland source? A brief review here will build a foundation for addressing these questions in later chapters of this book. The early-period materials have been most thoroughly documented at the House of Taga in Tinian, as presented in Chap. 10, but of course other sites have yielded important findings as well.

Pottery

The earliest pottery will be reviewed fully in Chap.6, but it most efficiently can be described as a series of small earthenware bowls and jars, generally less than 20 cm diameter. The vessel walls are remarkably thin, generally 1–2 mm, and most often they are red-slipped. Decorations are rare, but they show combinations of fine line incisions, rows of circles, and point-impressed patterns usually enhanced by white lime infill.

Stone and Shell Artifacts

Stone and shell artifacts may be categorized as cutting and slicing tools, fishing gear, and personal ornaments (Fig. 5.1). Each category has been represented by finished products, discarded in-process pieces, and the inevitable masses of

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by-products from workshop debitage. Manufacture certainly was local within the Marianas, making use of a range of materials from the environment.

Certain artifacts can suggest different time ranges, as depicted in Fig. 5.2. Given the low numbers of these artifacts as compared to hundreds or thousands of potsherds from most sites, the chronology must be regarded as only an approximation. Within these limits, time ranges are derived from the radiocarbon dates and associated stratigraphic layers at several sites.

Cutting and slicing tools mostly were made in the forms of adzes, chisels, and small utilized flakes. They were made of volcanic stone (andesitic basalt), cherts, and other cryptocrystalline, rarely of quartz, and also of durable giant clam shell (*Tridacna* sp.). The use of chert lessened over time in the Marianas, and chert adzes in particular were virtually unknown after roughly 200–100 B.C. (see Fig. 5.1h). *Tridacna* adzes were made throughout the sequence, usually from the dorsal portion of the shell, but a few were made from the hinge portion (see Fig. 5.1a) more often in the earlier periods than in the later periods. The utilized-edge stone flakes

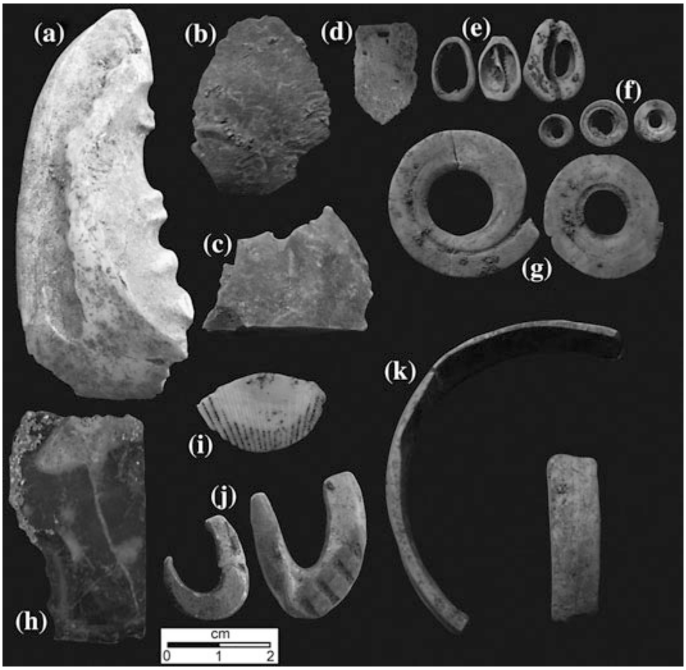

Fig. 5.1 Early-period stone and shell artifacts. **a** Shell adze, hinge portion of *Tridacna* sp., House of Taga. **b**, **c** Utilized chert flakes, House of Taga. **d** Carved coral pendant, Unai Bapot. **e** *Cypraea* sp. shell beads, House of Taga. **f** *Conus* sp. shell beads, House of Taga. **g** *Conus* sp. shell pendants, House of Taga. **h** Chert adze, broken, Unai Bapot. **i** *Anadara* sp. shell artifact, unknown purpose, Unai Bapot. **j** *Isognomon* sp. fish-hooks, House of Taga. **k** *Conus* sp. bracelet fragments, House of Taga

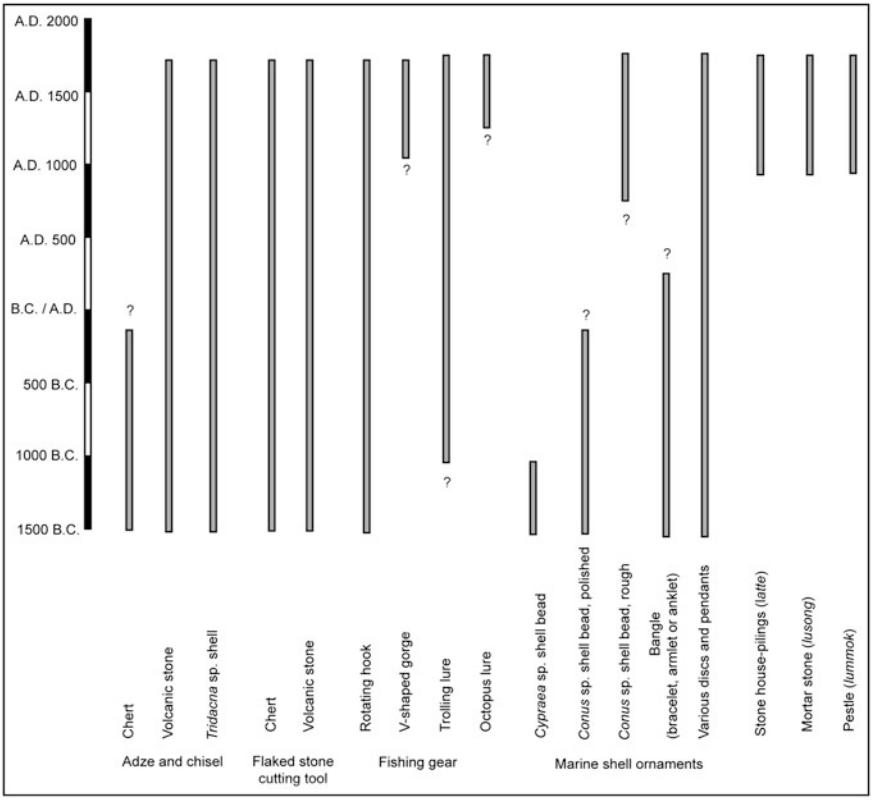

Fig. 5.2 Approximate chronology of stone and shell artifacts in the Mariana Islands

presumably were cutting blades or saws (see Fig. 5.1b and c), possibly set into a stick of wood originally.

Unlike for the *Tridacna* shells that could be found easily off virtually every coastline, the useful stone-tool sources could not be found without at least some exploration of the environment. This knowledge of the environment evidently existed during the earliest period of Marianas settlement, or else the diversity of chert and other stones could not have been made into the adzes and other tools found in the earliest sites. Especially important, the geological sources in some cases were far inland or in other locales distant from the actual sites where the stone tools were found.

Fishing hooks were made usually of *Isognomon* sp. shell, valued for its nacreous quality and easily worked flat surface. Other shells were used rarely, and pieces of bone were used even more rarely. Only very few fishing hook pieces are known from the earliest sites, but they resemble small rotating-shape hooks (see Fig. 5.1j). Trolling-lure pieces, compound octopus lures, and V-shaped gorges are known in later periods, mostly after A.D. 900–1000, but a few rare pieces may in fact date earlier.

Regarding the simple rotating fishhooks, the preference for *Isognomon* shell may seem unusual in a larger perspective of the western Pacific. The same shape of hook typically was made from *Turbo* shell in Island Melanesia and West Polynesia (Kirch 1997). Plentiful workshop debitage in the Marianas verifies the incremental stages of reducing the whole *Isognomon* shells eventually into the finished products.

The most popular personal ornaments so far consist of cut and polished shell beads, bangles, and pendants. A peculiar variety of small *Cypraea* shell bead so far has been found only in the earliest sites pre-dating 1000 B.C. (see Fig. 5.1e), yet they occur in very low numbers. The more common form was a small polished *Conus* shell bead (see Fig. 5.1f), apparently later replaced by larger and rougher non-polished items after approximately 200–100 B.C.

Several new artifact forms appeared much later, during the period of megalithic *latte* sites generally post-dating A.D. 900–1000 (Carson 2012b). Most obvious are the stone mortars and pestles, as well as slingstones. If their functional counterparts existed in earlier periods, then they may have been made of wood or other easily perishable materials that did not survive in the archaeological record.

Faunal Records

Earliest faunal records consist almost entirely of shellfish remains, plus a few bones of fish, turtle, and bird. The evidence suggests primary reliance on nearshore habitats, as expected for the early sites in shoreline niches. The bird bones in some cases suggest forays into the interior or upland forests, although certain birds naturally inhabited the seashore and mangrove zones.

A localized nearshore resource depression is noticed in the shellfish records around 1000 B.C., due to the combined effects of sea-level drawdown and cultural harvesting. Certain shellfish like *Anadara* sp. thrived in mangroves and shallow swampy settings that began to transform significantly with the lowering sea level, and their populations declined rapidly after 1000 B.C. (Amesbury 1999; Carson 2008). Meanwhile, the shells included larger specimens in the earliest period, later trending toward smaller size presumably as an effect of cultural harvesting. These and other trends are best documented at Ritidian (Carson 2012a) and discussed in Chap.8 of this book.

The Marianas faunal records differ from those of other Pacific Islands in at least three ways:

(1) Perhaps due to the long voyaging distance, no domesticated animals were imported to the Marianas until after Spanish contact, whereas most other Pacific Islands subsistence economies relied partly on imported pigs, dogs, and chickens (Wickler 2004).

(2) Rats were not evident until after A.D. 900–1000, although they appeared with the first people in almost every other case in Oceania (Pregill and Steadman 2009).
(3) An extinction of birds is known in most other Pacific Islands very shortly after first settlement (Steadman 1995), but no such record so far has been found in the Marianas, possibly due to the delayed introduction of rats and other animals.

These differences reinforce the unique culture history of the Marianas when compared to other Pacific Islands. Domesticated animals were not part of the cultural adaptation to remote island living in the Marianas, and the wild animal resources likely were viewed differently here than in other settings.

Structural Features

Information is just now emerging about ancient house forms and related structural features, as larger format excavations begin to uncover these details for the first time, for example at the House of Taga in Tinian (see Fig. 4.5). Stilt-raised houses are evident in arrangements of post molds, sometimes braced by small stones (Fig. 5.3). Hearths were made with medium to large cobbles used as heating stones (Fig. 5.4). Less formal features included small ash piles and excavated rubbish pits.

Possible Missing Items

The early-period Marianas record poses some difficulties for cross-regional comparison, because it appears to be missing some important items commonly found at sites of the same and older age in neighboring regions. The apparently missing

Fig. 5.3 Photograph of post mold with bracing stones at House of Taga, Tinian. Scale bar is in 20-cm increments. Detail of one of the features shown in Fig. 4.5

Fig. 5.4 Photograph of hearth with cobble heating stones at House of Taga, Tinian. Scale bar is in 20-cm increments. Detail of one of the features shown in Fig. 4.5

items include domesticated animals, baked clay spindle whorls, stone bark-cloth beaters, and earrings. In fact, they do not appear at all until after Spanish contact, so they most likely never were part of the local indigenous material culture, at least not in quantities large enough to be noticed archaeologically. Similarly, rice and rats so far have not been confirmed any earlier than the *latte* period, potentially as early as cal. A.D. 900–1000. However convincing this negative evidence may seem, future findings may overturn some of these notions.

We can think of the full cultural repertoire as ingredients in a cooking recipe, related to each other in ways that are not always obvious to us today. Sometimes, the ingredients themselves are not as important as what people do with them for producing a specific result. We can imagine what happened when certain ingredients were missing in the Marianas case or added for the first time. Although not necessarily intended, a unique set of products resulted from the available materials, ingenuity, and skills.

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Chapter 6
Defining Earliest Marianas Pottery

With each fragment of pottery unearthed from a site, we can hold a piece of ancient life in our hands (Fig. 6.1). We can appreciate the technical and artistic work of how it was made, and we can imagine the hands that made it. Viewing the shape of a broken piece, we can see how it most likely fits into the complete original pot. We can contemplate what certain individuals once did with this particular cup, platter, bowl, or jar.

Abundant pottery in the Marianas offers fascinating insights into the lives of the people who made and used it. The observable material attributes lend themselves to studies of the interplay among technical craft, artistic expression, and final practical use. These characteristics help us to define what was unique about the earliest Marianas pottery. What special skills were involved? What purposes did the vessels fulfill economically, socially, or otherwise? How did this ancient pottery relate to other traditions in neighboring regions?

When attempting to define the earliest Marianas pottery, it first must be recognized as different in many ways from the pottery made in later periods, as depicted in Fig. 6.2. Compared to the later pottery, the early-period products were small but finely made, thin-walled vessels. The deepest stratigraphic layers contain very thin pieces, often red-slipped and with rare decorative patterns, produced approximately 1500 through 1000 B.C. After approximately 1000 B.C., a notably thicker and coarser variety of redware was manufactured, also with bolder decoration. Later forms continued the trend of larger, thicker, and coarsely made vessels.

Well-made pottery signifies the established crafting abilities among the first island colonists from the very beginning of Marianas settlement. These first potters must have brought their skills and knowledge from their original homeland, but their works necessarily represented only a sub-set of whatever was known in their larger homeland region. Additionally, the potters needed to adapt their craft according to local raw materials and other new conditions.

Comparisons with pottery in potential homeland regions are examined in Chaps. 10 and 11. The decorative system in particular concludes a link with the Philippines (Carson et al. 2013; Hung et al. 2011). The more technical and

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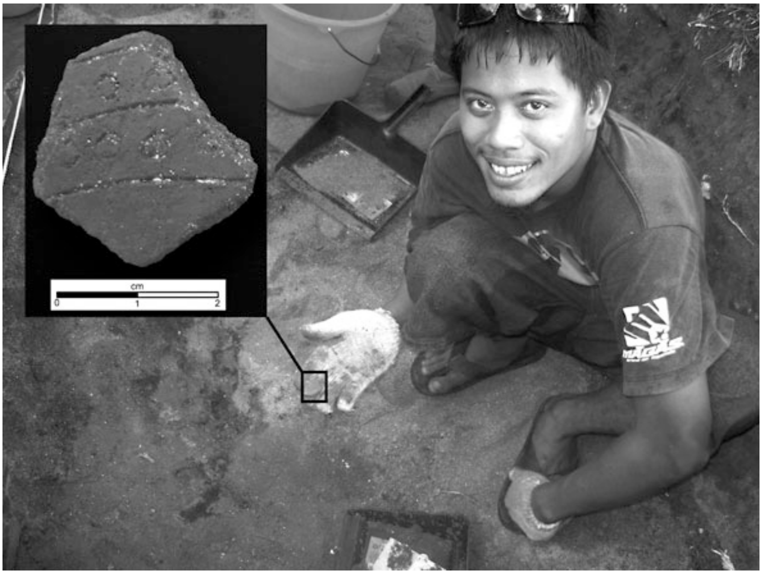

Fig. 6.1 Tinian resident Lino Cangco uncovered the first of hundreds of pieces of finely decorated pottery from the lowest cultural layer at House of Taga, Tinian, in 2011

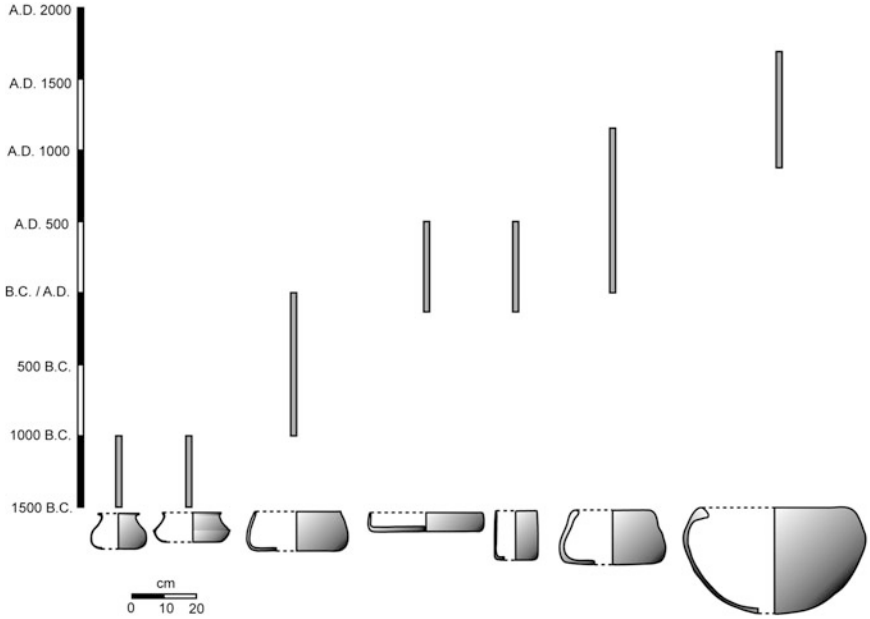

Fig. 6.2 Approximate chronology of major types of pottery in the Mariana Islands

practical attributes indicate localized differences within a broadly shared generic model of pottery-making.

The present review concerns the process of how people made the earliest Marianas pottery, from the choice of raw materials through the final products, as a means to appreciate the artifacts as works of technical and artistic achievement. The manufacturing process was studied from observations of pottery excavated from Unai Bapot, Ritidian, and House of Taga. Greater details of the final products are presented in Chap. 10, concerning the most incredibly informative collections from the House of Taga.

The pottery-making process can be outlined from start to finish, but the final products must be kept in mind throughout. The first Marianas potters made small earthenware bowls and jars, about 20 cm diameter or less, for a variety of purposes of cooking, presentation, serving, and storage. Remarkably thin-walled vessels, generally 1–2 mm, must have required special preparation, especially for potters making earthenware without high-temperature kilns and without formal wheel-thrown technology. Artistic expressions are evident in the red-slipped pot exteriors, occasional black-burnished surfaces, rare cases of paddle-marked patterns, and the few known examples of decorations in incisions, circles, and point impressions highlighted by white lime infill.

Material Composition

The Marianas pottery-makers produced earthenware composed of local clays, with sand grains added as temper for controlling the workability and baking of their pots. Suitable clay sources could be found in several areas of deep iron-rich reddish sedimentary deposits, especially along streams and rivers. Although several options were available, most were situated some distance from the oldest habitation sites.

The pots were not transported from a homeland or other external source, but rather they were made locally in the Marianas. Most indisputably at the House of Taga site in Tinian, an unfired lump of clay displays partial shaping and a line of fingertip impressions (Fig. 6.3). In potsherd samples from Unai Bapot in Saipan, fine-grain beach sands dominated the temper inclusions, but low frequencies of both andesitic and dacitic aggregates were consistent with local geological sources (Dickinson 2006: 143).

The preference for fine-grain beach-sand temper may have been the only practical choice for making the thin vessel walls, although this choice had other technical consequences. The alternatives of quartz and volcanic sands mostly would include 1–2 mm grains, compared to the general 1–2 mm thickness of the pots. Calcareous beach-sand temper, however, posed limits on firing temperature and resulting material strength (Clough 1992; Intoh 1982; Rye 1976).

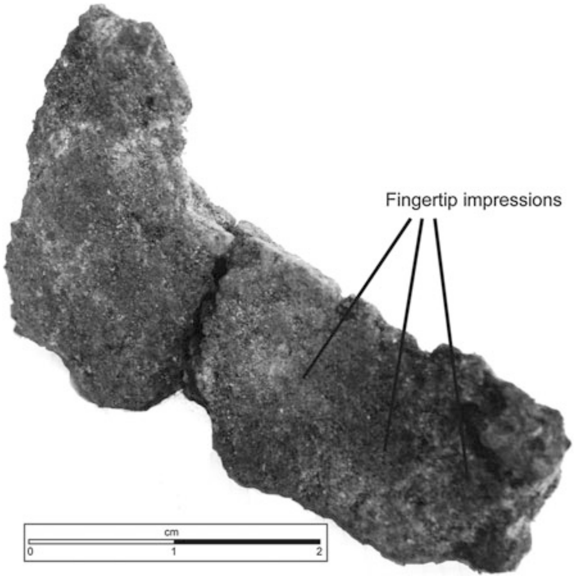

Fig. 6.3 Partly shaped lump of unfired clay, showing fingertip impressions, found at House of Taga, Tinian

Primary and Secondary Forming Techniques

In the absence of wheel-thrown technology, wet clay typically is made into a desired shape by hand, through a series of primary and secondary forming techniques. In reality, several stages make a continuum of pottery-forming that we conveniently label as primary or secondary for sake of easier discussion. The initial stages of primary forming could include slab-building, coil-building, or other rudimentary shaping, each creating diagnostic traces in the clay paste. Predictable traces can be witnessed for example along the seams of folded slabs or adjoined coils (Fig. 6.4). Later stages of secondary forming could include paddle-beating, trimming, or other approaches for finishing the vessel shapes.

Primary forming has been curiously difficult to specify in the earliest Marianas pottery, because diagnostic forming-features occurred in less than 1 % of the examined collections. Later secondary forming may have obliterated traces of the original shaping, along with any potential flaws and weaknesses. Special processing must have been necessary for achieving sufficient strength in the unusually thin vessels, meanwhile removing the typical signs of primary forming.

High-speed wheel-thrown technology is unknown in the Marianas, but some form of spinning or turning is hinted by horizontal striations in a few rare pieces (Fig. 6.5). These marks suggest removal of excess clay from the vessel, wiping or trimming in one direction while turning the pot in the opposite direction. This mode of pot-turning must not be must not be mistaken for wheel-thrown technology, but instead it most likely entailed casual and low-speed hand-turning, perhaps aided by a simple support-base.

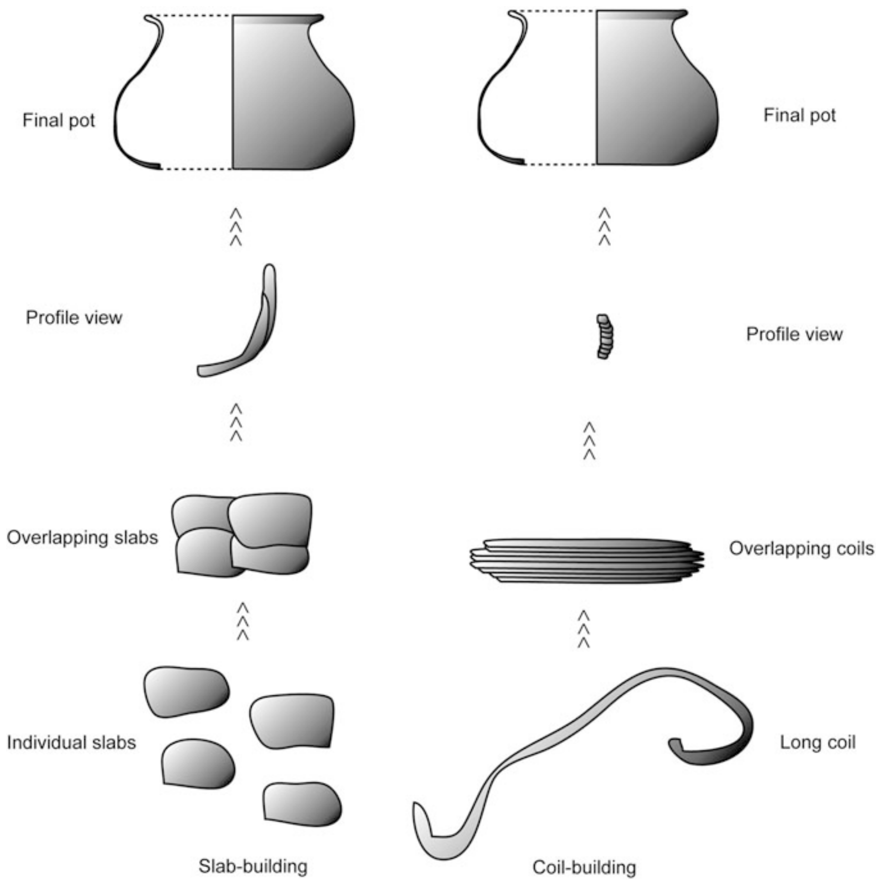

Fig. 6.4 Idealized examples of slab-built and coil-built traces in pottery

The postulated low-speed hand-turning further suggests that some primary forming already had occurred, and then the partly shaped pot was turned slowly while proceeding closer toward the final form. If this speculation is accurate, then the process likely removed or obscured some of the pre-existing traces of pottery-forming. If a wiping action applied enough pressure, then it conceivably could compress and strengthen the walls of a pot. Additionally, trimming potentially could remove a substantial amount of material for achieving the final thin-walled products typical of early-period Marianas pottery.

Secondary forming is most clearly evident in the form of paddle-beating, but it is found only rarely in the earliest Marianas pottery. Paddle-impressed exteriors are visible on a few potsherds from the House of Taga (Fig. 6.6). Paddle-beating typically refines the shape of a pot and adds strength by compacting the clay fabric. If these procedures were conducted extensively, then they very well could obliterate pre-existing manufacturing marks and any potential weaknesses in the thin-walled pots.

Fig. 6.5 Horizontal striations on pottery fragment, House of Taga, Tinian

Fig. 6.6 Paddle-marked pottery fragments, House of Taga, Tinian

Where paddle-impressions still are visible on a pot, they could reflect a merging of technical and artistic process. The paddle-marks and any other irregularities easily could have been erased by wiping or trimming the clay while it still was wet, as apparently was done in many cases. The retention of paddle-marks created opportunities for artistic patterns and textures in some but not all of the earliest pots. However, too much trimming at this stage of the pottery-forming potentially could make the vessel walls dangerously thin, for example if the paddle-beaten surfaces already were within the preferred 1–2 mm thickness.

Some potsherd interiors bear traces of thumb and fingertip impressions, probably resulting from both primary and secondary forming stages. We can feel through our own hands today how potters pinched and shaped the wet clay into a rough shape more than 3,000 years ago. We further can trace the movements and sensations of how a pot-maker may have used one hand as an anvil on the interior, while using another hand or perhaps a paddle to beat the exterior of a pot.

The most visible outward faces of pots invited potters to make choices of how to make these surfaces both practical and appealing. Interior surfaces often retained finger-impressions or other irregularities, but the exteriors received greater attention. The exteriors mostly were worked into smooth surfaces, except for the cases of paddle-marked pots.

As a practical matter, shape-forming probably did not follow any single formula, and indeed the archaeological evidence reflects a range of techniques for shaping the pottery within each site. Individual potters could make several choices at any point along the continuum of primary through secondary forming, depending on what was deemed best for the given materials and desired outcomes. Surely some pot-makers experimented more than others with new materials, forms, and ideas.

Finishing Techniques

After working the wet clay into a desired shape of a pot, the rough surface typically was treated into a finished texture. Usually, this finishing occurred after the clay had dried into a leather-hard condition, or else the wet clay was too easily reshaped accidentally. As this stage in the manufacturing process, the potter still could make the clay wet again to assist in controlled re-shaping of the pot. Finishing techniques were applied to the pot's surface only after the shape had been finalized.

Finishing techniques in early Marianas pottery apparently began with rubbing the pot surface to varying degree, smoothing away the rough irregularities. This action presumably required a piece of wood or stone, drawn repeatedly over the pot's leather-hard skin. After making a matte-like surface, a red slip was applied on most of the pots. A few others, however, were abraded more extensively through burnishing for a glossy texture.

A red slip is obvious on nearly all early pottery, giving it the name "redware." The red slip consisted of a thin coating of nontempered red clay, applied to both interiors and exteriors of the ancient pots. The color often is a brilliant flashy red, but it also occurs in duller varieties and sometimes "buff." Coloring may have been affected by choice of additive plant or mineral pigments, notably hematite or other iron-rich material bearing a reddish color. The possible use of a sticky binding agent presently is unknown.

Rare cases of "blackware" entirely lacked red slip, and instead they were treated by polishing or burnishing to produce a lustrous black surface. These deliberately polished surfaces can be distinguished from cases where the red slip simply has deteriorated, revealing an underlying red or black surface with a rough matte-like character. A slick burnished surface probably could not perform as well as a roughened surface for adhesion of a wet red slip.

Decoration

Decoration was finely executed (Fig. 6.7), but it was rare, so far seen on less than 1 % of potsherds in the earliest site collections. Statements about the decorations must be understood as limited by the necessarily small numbers of relevant examples. Moreover, no complete decorated pot has yet been found, so the total design motifs remain mysterious to us today. Most surviving pieces are just a few sq cm in size, allowing only narrow but deeply valuable glimpses into an ancient design system. With close study, we can learn about how people composed these designs through various combinations of simple lines, circles, and points.

We instinctively ask several questions about the ancient pottery designs. Could they have served to identify the pot-maker, the community, or the person using the vessel? Could they have conveyed messages or meanings relevant for specific contexts now lost to us? If the decorations were indeed so rare, then what purpose did they realistically fulfill in the larger community? These questions may never find clear answers, but they motivate us to learn more from the little evidence available to us.

Where decoration occurs, it is limited to the most easily visible area of a pot, on the upper portion near the rim or in the upward-facing portion above the shoulder or carination (Fig. 6.8). These designs were made to be seen. They were not accidental markings, and they were not obscured by later stages in the pottery-making process. If the decorations were somehow on display, then what else about the pots, their contents, and their surroundings may have been on display as well?

The display-qualities of decorated pieces often were enhanced by color. In most cases, a white-colored lime infill emphasized the decorative elements and created a stunning white-on-red (or rarely white-on-black) contrast. The same principle of contrasting elements can be noticed in other aspects of the design system.

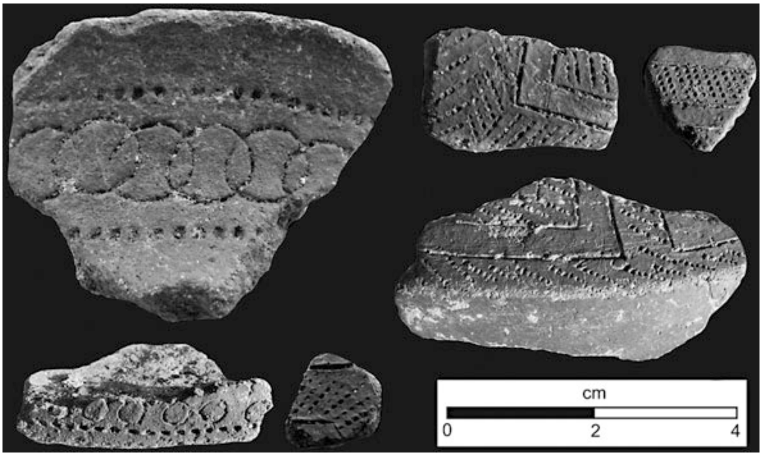

Fig. 6.7 Examples of decorated pottery, House of Taga, Tinian

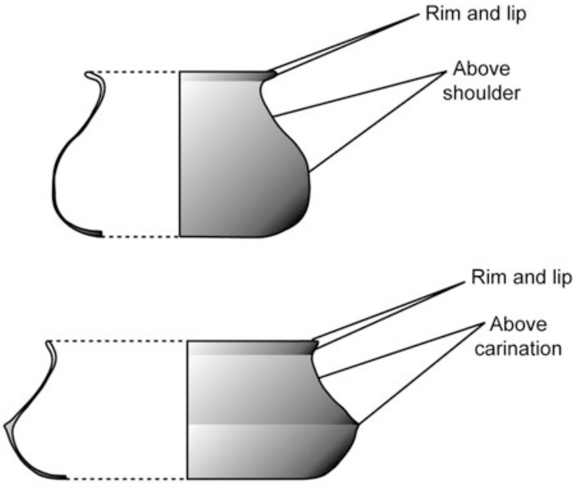

Fig. 6.8 Most common locations of known decorations in early-period Marianas pottery

A full view of design motifs unfortunately is not yet possible, due to the low numbers of mostly very small-sized decorated potsherds. In the surviving fragments, only partial samples of the original motifs are detectable today. Nonetheless, an impressive design system is evident (see Fig. 6.7).

The smallest-scale essential design elements were made by techniques of line-incision, circles, and point-impression (Fig. 6.9). These individual elements were combined by two methods creating larger compound patterns. First was repetition of singular elements, most often in horizontal bands (Fig. 6.10). Second was juxtaposition of different elements to create zones of contrast (Fig. 6.11).

Line-incision most often was applied unidirectionally or in rectilinear combinations, but curvilinear "garlands" of connected half-circles became more popular toward the end of the early-period. Butler (1994) termed the rectilinear patterns "Achugao Incised" and the curvilinear patterns "San Roque Incised." The rectilinear (Achugao Incised) patterns tended to occur earlier, whereas the curvilinear (San Roque Incised) patterns tended to occur later.

Circles were both hand-drawn and stamped, repeated in rows. Each row consisted of same-sized circles, but the size varied from one pot to another or sometimes among the different rows in a single pot. Irregular forms identified the hand-drawn circles, whereas perfect circles indicated the use of a prepared stamp.

Point impressions were labor-intensive, repeatedly applied in extended lines or as an extensive zone-filler. An immediate distinction is obvious between circle-tipped and rectangular-tipped points. The circle-tipped examples were both single-pointed (pin-impressed) and rows from a multi-tipped combs (punctate-impressed). The rectangular-pointed examples are rare, so far known only in rows from a "toothed" comb-like tool (dentate-stamped or -impressed).

The rectangular-pointed dentate-stamping is especially informative for cross-regional comparison, because it otherwise has been regarded as the defining trait of Lapita pottery in Oceania (Kirch 1997). This technique now can be recognized as

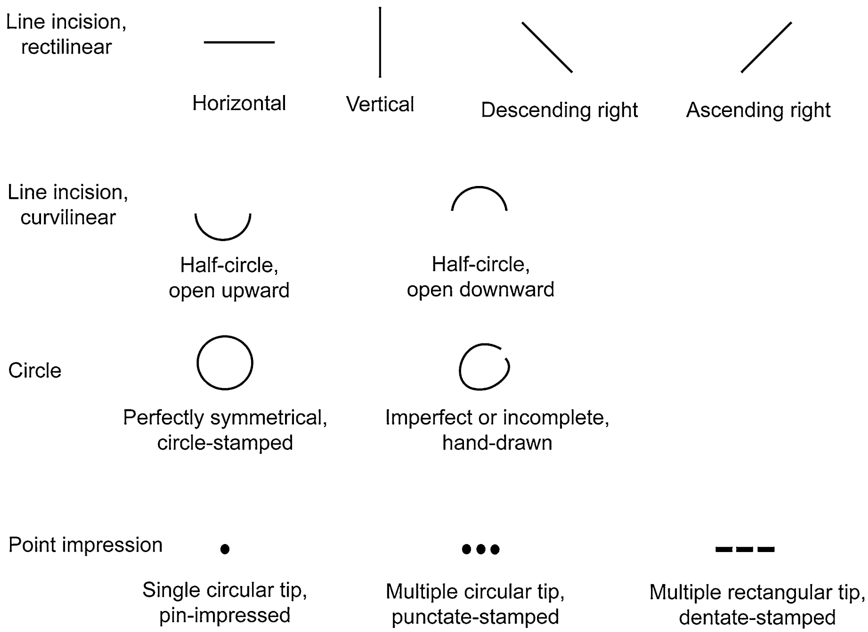

Fig. 6.9 Schematic of essential design elements in Marianas early pottery

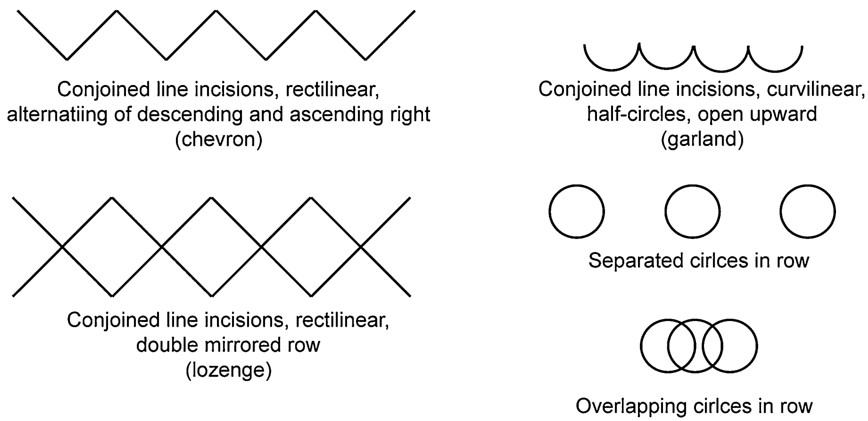

Fig. 6.10 Schematic of repetition of essential elements

not exclusively a Lapita invention, but rather its origins may lie outside the defined Lapita region. Moreover, a few rare cases in the Philippines now can be understood as ancestral roots of the traditions that developed later in the Marianas and Lapita (Carson et al. 2013).

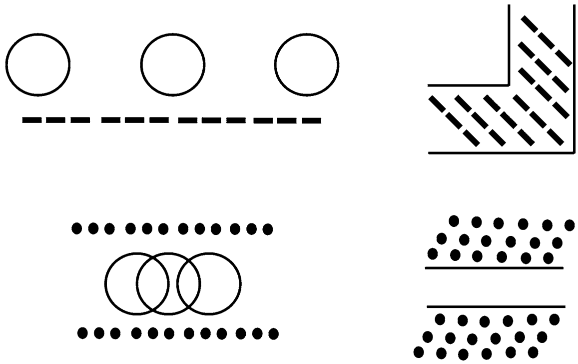

Fig. 6.11 Schematic examples of juxtaposed elements

Although found only rarely, the fragments of decorated Marianas pottery represent the missing pieces in an archaeological puzzle. We now can follow a cross-regional trail of a distinctive technical execution and artistic design system, originating in the Philippines and then dispersing into both the Mariana Islands and into the Oceanic Lapita realm (Carson et al. 2013). According to these findings, a specific decorated pottery tradition intentionally was brought with the people who settled in these new colonies, explored further in Chaps. 10 and 11.

Whatever was the cultural purpose of the decorative system, it was considerably more elaborate and complex for Lapita than for anything so far seen in the Marianas. The more extravagant qualities in Lapita coincided with a multi-cultural setting in the preinhabited region of Near Oceania, where the decorated pots may have signaled cultural identity or group membership (Summerhayes 2000a, b). These same concerns could not have been so pronounced in the Marianas, where the first settlers inhabited a previously unpopulated region and interacted only with each other.

Today, we can see only partial surviving elements of a design system that once adorned some of the earliest Marianas pottery. It occurred only rarely, on less than 1 % of the known pottery fragments, so it likely was reserved for a special-use context that emphasized display-qualities and perhaps performance. We may never know precisely what this context was, but it was brought by the first inhabitants of the Mariana Islands and re-enacted in this new setting.

Firing

Without formal kilns, the ancient Marianas pottery was fired into earthenware. The final products necessarily were softer than stoneware or porcelain made in kilns at sustained high temperatures. The pots most likely were dried for a period of time and then baked inside piles of wood, leaves, and other burnable material. These bonfire-like creations potentially could reach or even exceed temperatures of

1,000 °C for short duration, but the effective baking into earthenware mostly likely occurred at 800 °C or less.

The thin vessel walls may have hastened drying and facilitated thorough firing for stronger products. This goal otherwise was difficult to achieve for the pastes containing calcareous beach-sand temper inclusions. Rye (1976) noted how calcareous materials increasingly decomposed with firing temperatures above 750 °C, thereby limiting the potential for well-fired earthenware.

The ceramic paste often has been fired thoroughly black, indicating reduced oxygen flow or possible organic material packed close to the pot surface during firing (Fig. 6.12, note item 8). For instance, these pots may have been covered by layers of palm-fronds, in addition to any other wood-fuel. This technique may have been most useful for the so-called "blackware" pottery.

When viewed in profile, some potsherds display a black interior core, but thin reddish outer portions are visible near interior and exterior surfaces (see Fig. 6.12, items 3, 4, 9, and 10). This profile pattern could indicate open firing conditions with more oxygen flow (for Fig. 6.12, items 3 and 4), made possible by air-spaces between the pots and any burning wood, leaves, or palm-fronds. It also could indicate a reduced firing condition, followed by cooling in the air (for Fig. 6.12, items 9 and 10). Conceivably, the red outer coloring may have acted as an "undercoat" for a red slip. None of these red-surfaced examples were made into blackware.

Final Vessel Forms

What did the earliest Marianas pottery actually look like? What shapes did the potters produce, and how were they used in real life? These questions have been difficult to answer, because nearly all of the known early period pottery has been broken into tiny fragments of just a few sq cm each. Occasional larger pieces are more informative, especially those that include portions of rims, carinations, or bases.

Although each of diminutive size, the early-period pottery fragments number in the hundreds or thousands from even the smallest excavation areas. For instance, 428 pieces were recovered from just 1 m^2 of excavation at Ritidian, and more than 1200 per m^2 were recovered at Unai Bapot, and more than 3000 per m^2 were recovered at House of Taga. The density of broken pottery is astounding, but what can we learn from so many tiny fragments?

By examining a "triage" of rims and other large pieces, we can see that they were broken from a variety of small bowls and jars, often with a carinated shoulder (Fig. 6.13). The rim pieces indicate diameters of generally 20 cm or less. A larger size probably could not maintain practical strength within limits of the generally 1–2 mm vessel walls, impressively thin for low-fired earthenware. Some portions are less than 1 mm, but others approach 4–5 mm at critical points near a carination or angled base-corner.

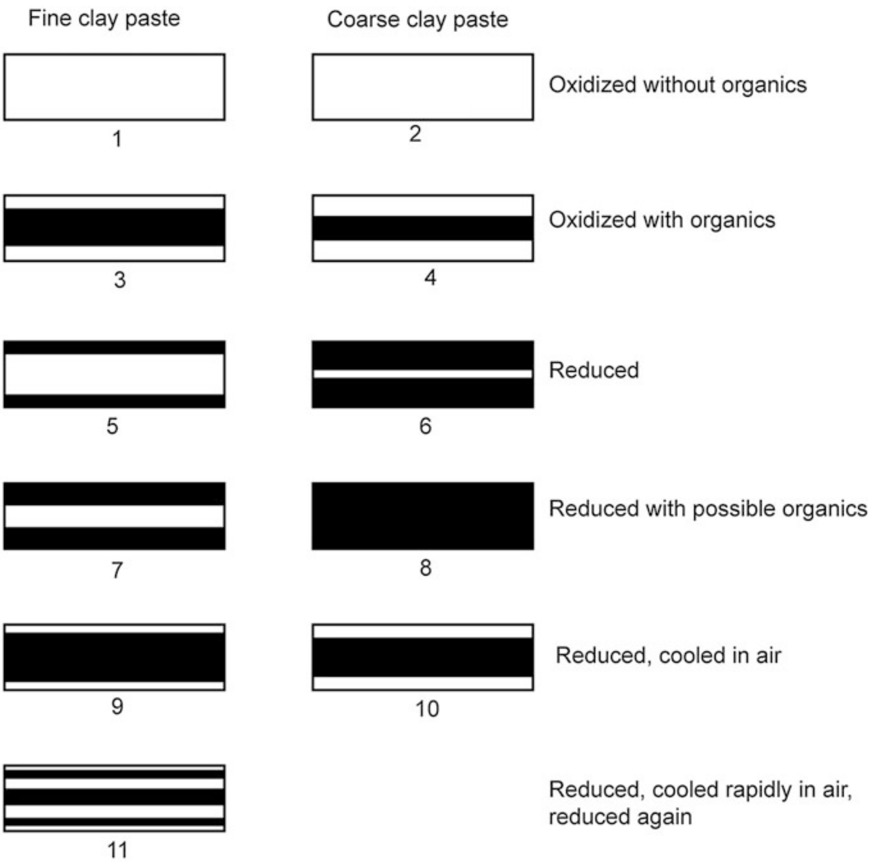

Fig. 6.12 Schematic diagram of firing cores in profiles of pottery fragments, based on information from Rye (1981). *1–2* oxidized without organics. *3–4* oxidized with organics. *5–6* Reduced. *7–8* Reduced with possible organics. *9–10* Reduced, cooled in air. *11* Reduced, cooled rapidly in air, reduced again

The "triage" observations are limited to the portions of the pots that happened to survive in best condition. For instance, the thicker sections near rims and bases are not as easily fragmented as the thinnest body sections. Although biased in favor of larger and thicker pieces, the triage results clearly are useful, but are we missing something important from the thousands of little potsherds left unattended?

Before considering the numerous small potsherds, we need to pause for questioning how this extensive breakage occurred in the first place. Why have we not yet found any complete or nearly complete pots? The known early-period Marianas sites so far do not include well-preserved contexts like intact burial features with whole grave-goods. Rather, they are composed of general habitation debris, and the same locations were reused and reworked over the course of several

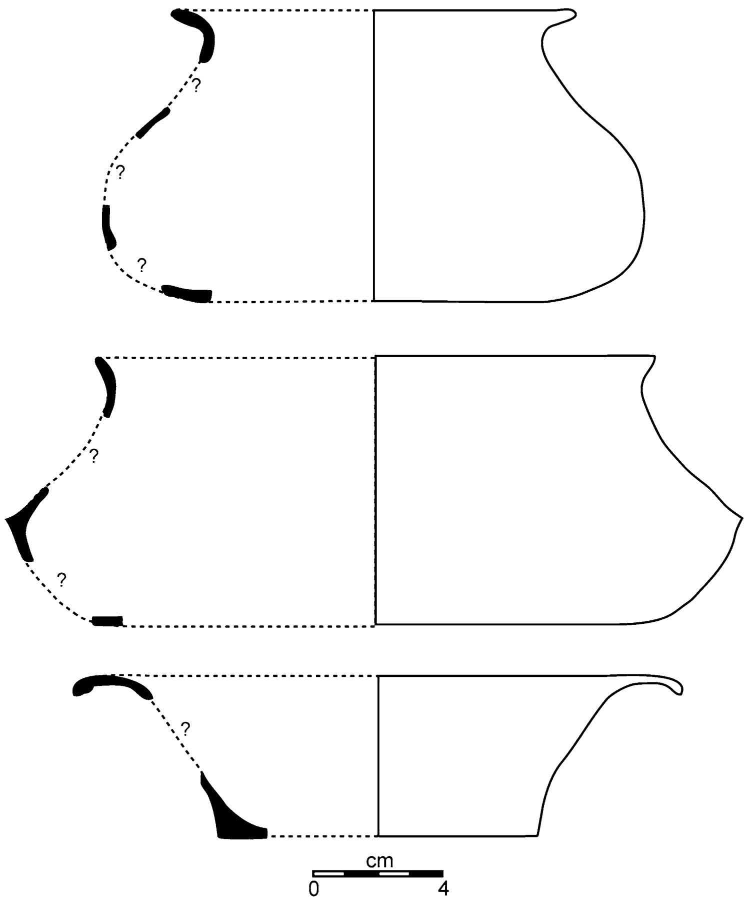

Fig. 6.13 Approximate vessel forms of early-period Marians pottery, as estimated from pieces of rims, cariations, and bases. Areas of "?" indicate unknown portions, estimated from adjacent pieces

centuries. Additionally, the ancient cultural layers were exposed to repeated annual rainy seasons, tree-root disturbance, and compressive pressure under more recent sedimentary build-up.

The low-fired and thin-walled pots easily could break into the small pieces that we find today. In the original shoreline-niche site contexts, saturation in ocean-water may have increased friability and breakability, but the potsherds were not subjected to harsh re-working in tidal currents. Water-rolling quickly can wear down soft earthenware into smooth pebble-like lumps and crumbs, but the Marianas pottery fragments retain clear edges and red slip. Most of the broken edges can be refitted with one another, so they were not extensively abraded, reworked, or disturbed.

The tiny potsherds presumably were broken from the same bowls and jars as outlined by the more easily understood rims, carinations, and base pieces (see Fig. 6.13). By examining all of the small fragments, even those less than 1 cm^2, we can see more clearly how much of each vessel was represented in any single site-excavation. We also can confirm or refine the overall estimates of vessel size and shape.

New efforts examined the total collections of 4,897 pottery fragments from Unai Bapot and another 428 from Ritidian, amounting to more than 10,000 cm^2 of potsherd surface area. Not all potsherds could be related to clearly designated vessels, but the successful results are depicted in Fig. 6.14. The same general forms, as well as additional variants, were found in the more numerous collections from the House of Taga, as presented in Chap. 10.

Four vessel forms (a–d in Fig. 6.14) and one partial appendage (e in Fig. 6.14) were evident at Unai Bapot and Ritidian. The most common shape was a slightly restricted bowl or jar, appearing in at least two sizes at Unai Bapot (a, b) and one smallest size at Ritidian (a). A wider bowl with low carination was found in both Unai Bapot and Ritidian (c). A flat-bottomed, shallow open bowl was found only at Unai Bapot (d). Also unique to Unai Bapot was a singular occurrence of an incomplete appendage, possibly a pedestal-stand (e).

The open versus restricted vessel shapes imply different functional purposes. A type of shallow open bowl (d in Fig. 6.14) may have been more suitable for

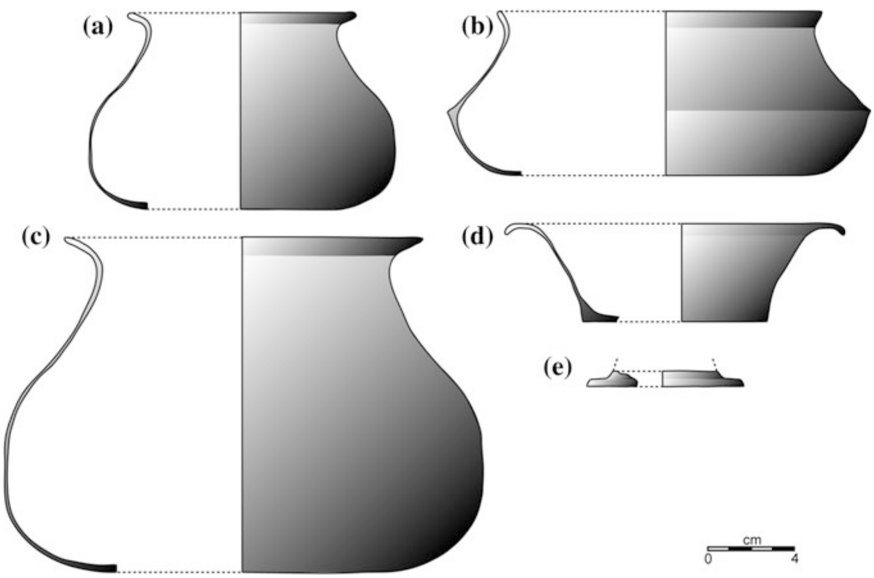

Fig. 6.14 Definite earliest vessel forms in the Mariana Islands, reconstructed from 100 % analysis of broken fragments from Ritidian in Guam and Unai Bapot in Saipan

serving or other presentation. The other vessels with slightly restricted shapes (a through c in Fig. 6.14) achieved better containment of whatever was inside the pots.

The known pottery forms all possessed at least some flat-bottom portion, so they likely were stable without needing support-legs or tripod-stones. In this case, the possible pedestal appendage at Unai Bapot is curious (E in Fig. 6.14), so far the only specimen of its kind in the Marianas. The excavated collection did not reveal precisely how the appendage may have attached to a larger vessel, but perhaps it was a separate component on its own. The solid interior shows that the piece is not the type of hollow ring-foot known in the Philippines (Hung 2008).

The early pottery forms were rather small, generally 20 cm or less in diameter, with both technical and social implications. The size-range partly may have been limited by the thin-walled vessels, unable to maintain sufficient strength if the pots had been much larger. The small sizes also made the pots appropriate for single-serving purposes, but they were not suitable for serving large numbers of people from a single pot.

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Chapter 7
An Epic Adventure?

What do the broken pottery fragments, layers of sediments, discarded shells, and other abandoned vestiges of a bygone era reveal to us today about the lives of people more than three millennia ago in the Mariana Islands? How did people make the unprecedented long-distance overseas voyage and then establish a viable community for the first time in such an isolated environment? This book builds answers for these questions, drawing on the past several years of archaeological research in the Marianas.

Unearthed from deep beneath today's dazzling tropical beaches of the Mariana Islands, the long-neglected archaeological evidence finds a new meaning, regaling us with a tale about the tender beginnings of human life in these truly remote islands. At 1500 B.C., the first Marianas settlers established the world's most isolated community of the time, separated more than 2,000 km from any other human population, and they would remain that way for a few centuries before additional colonies emerged elsewhere (see Fig. 1.1). These events heralded mankind's final conquest of the last inhabitable parts of the earth, known today as Remote Oceania.

Eventually, Austronesian people penetrated through the farthest reaches of Remote Oceania, but the first daring cross-over into this remote island world occurred in the Marianas (Fig. 7.1). A few centuries later, Lapita colonists flooded into Island Melanesia and West Polynesia about 1100–800 B.C., making voyages up to 900 km. Later population movements into Micronesia and East Polynesia continued after A.D. 100–200, with voyages up to 1,500 km. Only much later were the outermost corners of the Pacific settled through voyages up to 4,000 km, shortly after A.D. 1000 in the Hawaiian Islands, Rapa Nui (Easter Island), and Ao Tea Roa (New Zealand). All of these feats were impressive, but the long-distance migration to the Marianas about 1500 B.C. was by far the most extraordinary of its time. Any quest to understand first Remote Oceanic settlement logically must look at the archaeological evidence in the Mariana Islands, hence the focus of this book.

If Remote Oceanic settlement began in the Marianas as early as 1500 B.C., then why was the Lapita crossing into the Melanesian-Polynesian part of Remote Oceania delayed until a few centuries later for a shorter distance of travel? At one level, these kinds of questions may be dismissed, because the early Marianas

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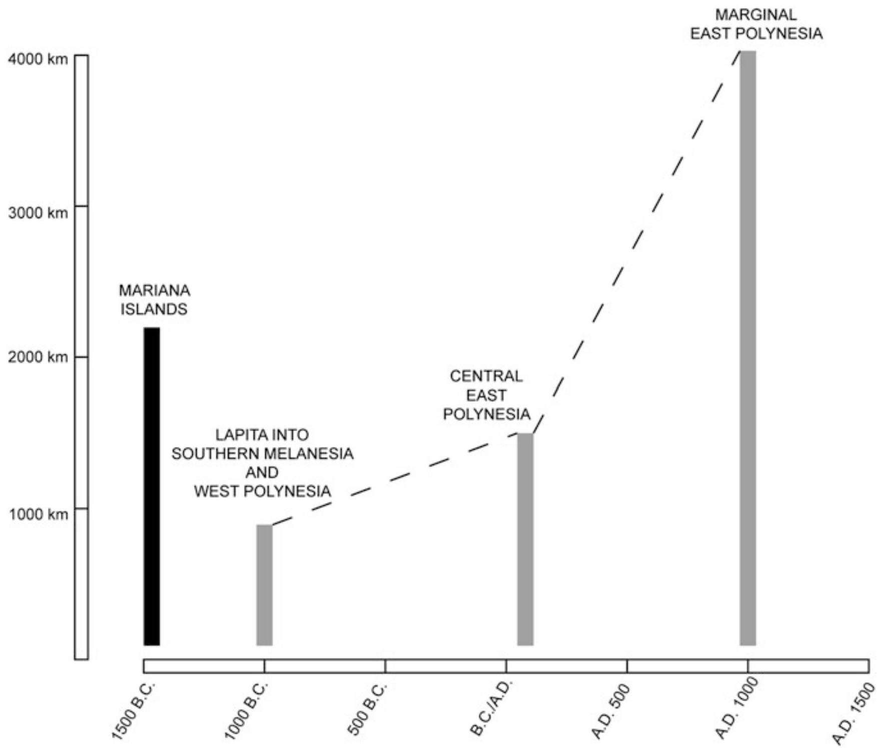

Fig. 7.1 Comparison of voyaging distance for different parts of remote Oceania, noting approximate timing according to the currently known archaeological information

settlers already had managed one of the greatest achievements in human history, and they probably were unaware that scholars more than 3,000 years later would expect them to have continued journeying into farther uncharted zones. What gives us the right to burden these people with an obligation to explore and colonize the entirety of the remote Pacific?

For a more serious answer about the curiosity of early Marianas settlement, we can appreciate at least two lines of reasoning. First, the Marianas environment was in some ways more familiar to people from a Southeast Asian homeland, still within similar weather patterns and navigation signals. Second, the Marianas voyage entailed neither the benefits nor the challenges of passing through previously inhabited territory as in the Lapita case. Whatever explanation may be offered, distance alone was not a sufficient barrier against Austronesian Neolithic people spreading through the remote Pacific. The full exploration and settlement of the Pacific evidently took place over several centuries, and it involved probably hundreds if not thousands of individuals with different abilities, motivations, and circumstances.

Regardless of however difficult it must have been for an early Marianas settlement, the archaeological evidence leaves no doubt that it really did occur. The scientific facts are well attested in a tangible material record, described in the chapters of this book. In this sense, we do not need to ask whether or not the voyage was possible, because of course it happened one way or another. Nonetheless, our human minds naturally query what kinds of sailing craft were used, how people managed the unprecedented long-distance journey, and so on. These questions refer to events that occurred necessarily prior to the archaeological record of people living in the Mariana Islands, but they give us a necessary back-story for making sense of the full context.

Untangling Voyages of Discovery and Settlement

We may never be able to point to definitive answers of how the break-through remote-distance voyage to the Marianas actually happened. So far, no ancient sailing boats have been discovered that might divulge their engineering secrets. Meanwhile, native Chamorro sailing traditions in the Marianas were effectively extinguished after the Spanish *reducción* program in the late 1600s that exterminated most of the population and forced the survivors into a few controlled villages in Guam. Under Spanish rule, sailing beyond the nearshore reefs and fishing-zones was prohibited, and today the only intact traditions of long-distance sailing in Micronesia come from other island groups outside the Marianas.

Working with the limited historical notes, other Micronesian traditions, and tenacious clues living in today's Chamorro language, we can postulate that the first colonists to reach the Marianas did so aboard single-hulled outrigger sailing canoes. The oldest written account of a sailing craft in the Marianas was in the sketchy notes of Antonio Pigafetta's diary during Magellan's visit in 1521, marveling at the speed and agility of the elegantly simple outriggers that could change direction almost magically, reversing bow and stern on a whim (in Pigafetta and Alderley 2007). More than two centuries later, in 1742, Peircy Brett recorded the first-detailed illustration of a Marianas sailing outrigger (Fig. 7.2), and Lord Anson noted that the small outriggers were designed to sail as close as possible into the wind and with greater speed than any known vessel (in Barratt 1988). In the 1742 illustration, a triangular sail hangs in a default evenly balanced position, although it necessarily would have been repositioned by poles, ropes, or other props at various angles both vertically and horizontally for catching the wind in the desired direction.

Essentially the same type of small outrigger sailing canoe was used throughout Micronesia, documented by visitors in the 1700s and 1800s (Haddon and Hornell 1936–38). In the Marianas, these canoes became confined to short trips, but they retained their original name of *sakman*, a word cognate with the ancestral Malayo-Polynesian term known widely in the western Pacific (Pawley 2007). Although the practice was lost among the Mariana Islanders, other Micronesians successfully

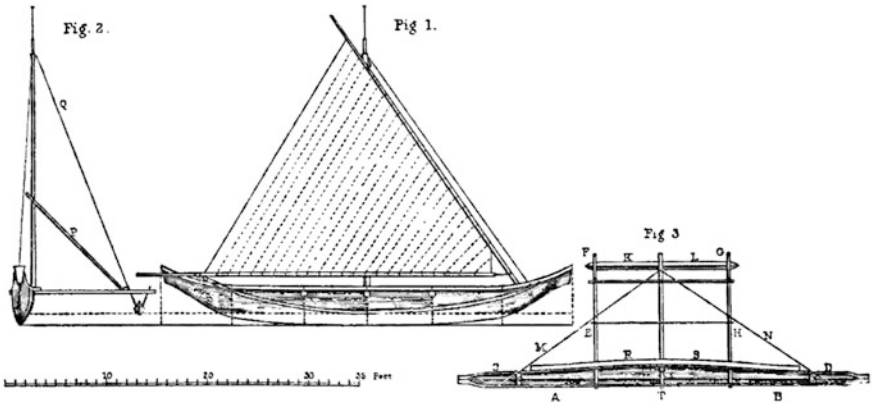

Fig. 7.2 First known detailed illustration of a sailing canoe in the Mariana Islands, by Peircy Brett in 1742, during the visit by Lord Anson (see Barratt 1988). Image is considered in public domain, copied from the library archives at the Micronesian Area Research Center, University of Guam, Mangilao

conducted long-ranging interarchipelago expeditions in these canoes, for example between Yap, Chuuk, Palau, and even the Marianas (Haddon and Hornell 1936–38).

While archaeologists have yet to recover the ancient remains of a *sakman* in the Marianas, linguists have reconstructed a vibrant vocabulary of sailing technology and navigational knowledge, shared among the Malayo-Polynesian languages in the western Pacific, including the native Chamorro language of the Mariana Islands (Pawley and Pawley 1994). A reconstructed Proto-Malayo-Polynesian (PMP) language thus suggests that the vocabulary existed in the distant past, before these particular language communities split from one another. We can postulate this split as early as 1500 B.C. for the Chamorro language in the Marianas. Later, different vocabulary developed for the Oceanic-speaking communities in Melanesia and Polynesia, along with inventions of double-hulled outriggers, a fixed mast, and other new technologies not evident in the Marianas or elsewhere in the far western Pacific (Pawley 2007).

Something like the *sakman* could sail quickly, and most importantly it could sail close to the wind, essential for the major west-to-east colonizing migrations in the Pacific, made against the prevailing winds that generally blow in the opposite direction, east-to-west. Sailors could take advantage of periodic wind-shifts, but the ability to sail closer against the wind could translate into invaluable benefits when covering long distances and when not necessarily having the luxury of favorable winds for the duration of a journey. Back-and-forth sideways "tacking" (Fig. 7.3) took a path of less resistance at an angle against or across the wind, and it enabled steady incremental progress (Horridge 1995; Irwin 1989, 1992), but these long-angling journeys became at least 2–3 times lengthier than the direct linear distance. The ability of the *sakman* to sail close to the wind therefore

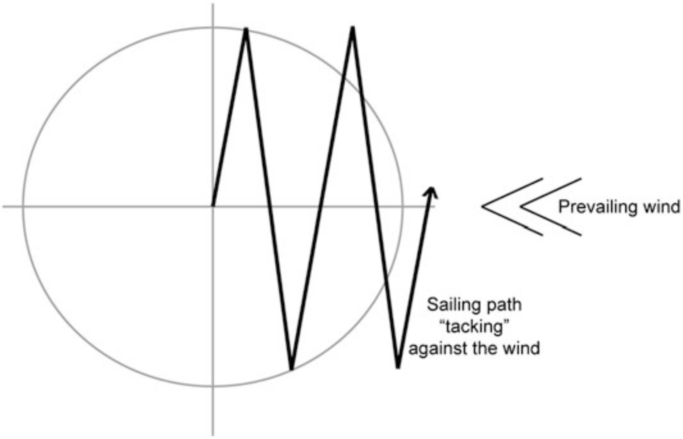

Fig. 7.3 Schematic diagram of "tacking" against the wind

brought a significant advantage for abbreviating the total number of days and nights at sea.

In practical terms, as any salt-hardened sailor can tell us, the most obviously successful sailing strategy is based on knowing the destination before setting a course. A random heading may need several weeks to reach habitable land, still longer if obligated to follow tedious back-and-forth tacking against the wind, and by then a crew simply may not have survived. Some planning was necessary for bringing enough supplies for the journey and then for starting a new life in the foreign Remote Oceanic environment that lacked many important natural resources.

Recognizing the role of fore-planning for a successful long-distance colonizing expedition, Horridge (1995) proposed that initial exploratory voyages achieved first discovery of distant islands, but then permanent settlement occurred later along known sea-routes. Similarly, Anthony (1990) noted that for most immigrant communities in the world today, advance scouts often will precede large-scale migrations of populations. As with Christopher Columbus opening the route from Europe to the Americas, the initial news first was reported back in the homeland before large groups of people committed themselves to migrate into a foreign land. A comparable outcome was the case historically in the Mariana Islands, where a minimum Spanish presence continued for more than one century before organizing large-scale colonial efforts in the late 1600s. Could a similar situation have transpired for the original Marianas settlement?

Irwin (1992) concluded that Remote Oceanic sea-routes became known through preliminary explorations, made intentionally against the wind, for ensuring a safe and quick downwind journey back home whenever needed. The long tacking against the wind meanwhile permitted full coverage of a broad geographic range, collecting important navigational information along the way. Other important scouting information was about the new islands themselves, specifically concerning where fresh water could be found, what kinds of plants and animals lived there naturally, and what kinds of soils were available for growing new crops. Thanks to the news returning home, a viable founding population then could make proper preparations for a formal migration.

The Adventure Continues

With this absorbing back-story, we can appreciate that the adventure of finding the islands and making the long-distance journey to the Marianas formed a prelude to yet another adventure. Just as amazing, if not more so, was the story of how people survived in the new environment with all of its trials and tribulations. Whether we regard it as a spin-off, sequel, or continuation of a multi-part saga, here is where the archaeological record steals the show, and many deep questions actually can be answered with hard evidence. Archaeological investigations in essence made this book possible.

The body of archaeological evidence gives us a picture of an early horizon of habitation in the Marianas. During the centuries 1500 through 1000 B.C., the first generations of Mariana Islanders selected certain shoreline-niche zones for their new homes, where they maintained a set of cultural traditions now embedded in the deeply buried sites. They made fine red-slipped pottery, used a diverse tool-kit of stone and shell technology, wore an impressive array of shell ornaments, cooked plentiful meals, built houses with sturdy timber posts, and engaged in many other activities in support of what must have been a small but thriving population.

The amount of habitation debris in multiple locations implies that a formal population migration already had occurred, and we are seeing the proof of its success in the material record. This tangible record so far has been verified at three sites in Guam, two in Tinian, and another three in Saipan. Among these sites, the earliest radiocarbon dating has been at Unai Bapot in Saipan, slightly before 1500 B.C., and the other sites cluster just after 1500 B.C. By this time, the Mariana Islands were no longer a faraway fantasy destination in the minds of a few people, but rather the islands had become the permanent homes of several families, their children, and continuing generations that would grow up as the world's first ever true natives of Remote Oceania.

Making a New Life

With their unprecedented long-distance voyage now securely behind them, the first settlers faced entirely different prospects and challenges. What foods were available to eat? How would they grow their essential life-giving crops in this strange new land? What were the best locations for finding high-quality workable stones for their tools, clays for their pottery, durable woods for their houses, and so on? Meanwhile, how could these people establish or enforce a set of practical social relations, organization of their labor tasks, cooperative means of helping each other in times of crisis, and fair manner of resolving the inevitable disputes between family members, friends, and neighbors?

Remarkably, the early-period Marianas sites exhibit an almost perfectly homogeneous material signature, reflecting a lifestyle shared at each site. These people made the same kinds of choices of where to live, close to the same sets of critical resources. They made their pottery, tools, and personal ornaments with a broadly shared repertoire of technical execution and artistic expression. The findings are so similar, in fact, that we can imagine a person from one site could live comfortably in any other, because these earliest communities all shared so much in common. Perhaps we can envision a single community, whose people were dispersed into a number of locations, where they followed the same rules and customs in weddings and rites of passage, knew each other's cooking recipes, and exchanged stories and gifts.

The first colonists and their descendants inhabited each site for several consecutive generations, eventually developing different forms of artifacts, artistic styles, locations, and sizes of settlements, and on the whole a new way of life by about 1000 B.C. We thus can define early-period Marianas settlement within a few centuries of 1500 through 1000 B.C. During these years, the first islanders established their colonies, made their initial adaptations to their new home, and maintained a set of shared cultural practices that we can identify today in the traces they left behind in the ancient archaeological sites.

From the broken pottery and other physical remains, we can characterize the cultural practice of early-period Marianas settlement, but we must keep in mind that these early settlers were the first human beings ever to live in a Remote Oceanic environment. This "first contact" between humankind and Remote Oceania brought mutual impacts between people and their natural environment. While the early settlers transformed the natural world into a culturally inhabited place, they also needed to adapt to the hard realities of this natural world.

A Transforming World

The latest archaeological discoveries have shown us that the world of the first Marianas settlers changed substantially by 1000 B.C. (Carson 2011, 2012). Whatever adaptations they had made during the prior few centuries, their descendants would need to adjust yet again to new conditions. Their strange and beautiful island world was changing, as the result of something completely outside their control. The sea level was falling, and it would continue a draw-down trend for the next several centuries (Dickinson 2000, 2003), potentially devastating for people like the first Mariana Islanders, living in such a close relationship with the sea.

In precisely the shoreline niches where the earliest settlers chose to establish their colonies, their descendants were forced to change some of the most fundamental defining characteristics of their lives. Due to a falling sea level, their preferred habitats were no longer livable, at least not in the same way that people once learned, and the essential natural resources no longer existed in the same configurations that people once knew quite intimately. People witnessed how their narrow beach fringes began to expand into broader coastal plains, their mangrove zones disappeared, and their coral reef ecosystems were disrupted. Their productive niches, once teeming with life, were becoming depleted, and nobody could stop it.

By 1000 B.C., the archaeological deposits show a depression in nearshore resources. Certain taxa of shellfish could not tolerate the new conditions of a lowering sea level, and already they were under some stress from cultural harvesting (Carson 2008, 2012). Perhaps most alarming was the impact on the arc clam, *Anadara* sp., a major food source that previously was found in superabundance in mangroves and shallow swampy zones, now flirting dangerously close with possible local extinction. Other prime shellfish resources, like sea urchins, limpets, and chitons, had been so heavily harvested that they already had become rarities near the earliest habitation sites, although they still existed in healthy numbers elsewhere. Meanwhile, the resident human population base was growing, living in greater numbers in more and more places, and demands for food were mounting. A real crisis was at hand, and eventually it was overcome through long-term adaptation.

Also by 1000 B.C., the Mariana Islands were no longer the solitary lonely outpost of Remote Oceanic settlement, as other remote islands began to support new communities of their own. The wild expanse of the great ocean was becoming a tamed "sea of islands" (Hau'ofa 1994), inhabited and transformed into a network of living communities, reinforced by long-distance trade and exchange. These networks were most active across Melanesia and West Polynesia, amidst a frenzy of Lapita expansion (Kirch 1997), while the Mariana Islands were on the fringe of the action and only minimally connected if at all to the new developments in the Lapita world. Judging by numerous sites all dated about 1100–800 B.C., a mere blink of an eye in archaeological terms, the Lapita populations infiltrated through a broad region in full force. By this time, the fragile era of first contact between humankind and Remote Oceania was a thing of the past, but its tale has been chronicled in the oldest Marianas archaeological sites.

Continuing Our Quest

If we want to learn about what happened when the first people lived in a Remote Oceanic environment, then we need to look at the records preserved in early-period Marianas sites. As documented in this book, the nature-culture relationship was symbiotic, and moreover it evolved over a long-term chronology. It was not a one-way street of people reshaping the natural world to suit their bidding, just as it was not a foregone conclusion of the environment dictating how people could behave. As history has taught us repeatedly, the human capacity for adaptation is far-reaching and complex, but so is the power of nature.

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Chapter 8
Long-Term Human-Environment Relations at Ritidian in Guam

Research at the Ritidian Site explores the deep complexities of long-term human-environment relations, beginning with earliest Marianas settlement and the first contact between humanity and Remote Oceania. Multiple lines of evidence allow us to visualize how these conditions soon underwent a number of significant transformations. This long-term and high-resolution data-set supports several larger questions. For instance, what were the advantages and disadvantages of early-period site locations? How many people could have lived at one of these sites? How did the new environment, including its changing conditions, affect the course of first Remote Oceanic settlement? What impacts did the first colonists bring into this new world?

Multi-year research 2006–2011 at Ritidian built a unified natural-cultural history of this magnificent jewel of natural beauty, spanning the entire 3,500 years of human occupation in the Marianas Region. The following presentation expands on a prior summary (Carson 2012a). The results notably have been incorporated into information-panel displays, self-guided hiking trails, staff-directed tours, and other programs at Ritidian.

Hidden at the end of a long and perilous road, Ritidian rewards its resolute visitors with an unforgettable experience, where a protected ecosystem holds a clear lagoon, stunning white-sand beach, dense forest, and dramatic limestone escarpment (Fig. 8.1). The area today is preserved as the Ritidian Unit of Guam National Wildlife Refuge (GNWR), managed by US Fish and Wildlife Service (USFWS). It is open to the public, but it strangely has survived almost in secret from the rest of Guam (Fig. 8.2). The landscape and its many archaeological resources have been spared from the heart-breaking outcomes of urban development, as well as from even more damaging vandalism, trash-dumping, and other practices that have been far too common throughout the island. Ritidian gracefully has escaped the fate that has befallen other areas, thanks to dedicated USFWS staff, energetic community members, and a potent spiritual connection that many visitors describe in their own personal ways.

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Fig. 8.1 Overview of Ritidian, northern Guam

Fig. 8.2 Opening of hiking trail at Ritidian Unit of GNWR, with representatives from US Fish and Wildlife Service, US Navy, and Guam public community

Ritidian Research Program

The 2006–2011 research program was inspired during my first visit at the site in January 1998. At that time, the Refuge officially was closed for clean-up after a devastating super typhoon, but USFWS staff permitted access for evaluating the archaeological resources. I instantly knew that years of my life would be linked to this magical place.

After some years of attending to field research in other parts of the Pacific, I returned to Ritidian in 2005, and eventually I continued my long-postponed research program earnestly in the following year of 2006. In retrospect, my experience at other sites prepared me for what I envisioned at Ritidian as an ideal model case-study of integrating long-term natural and cultural history. At last launched in 2006, the investigation was sustained through 2011, whenever possible during "free" time from work duties. The practical reality was possible by enthusiastic support of USFWS, as well as occasional volunteers from the local community and Historic Preservation Office staff from Saipan and Palau (Fig. 8.3). Adding to the sweat equity of this project, Guam Preservation Trust granted substantive financial support for radiocarbon dating of an impressive 28 samples.

My study was by no means the only research ever accomplished at Ritidian, but it drastically differed from other approaches. My goal was to uncover deep layers and build a comprehensive model of how these layers accumulated over several thousands of years to create the breathtaking landscape that we see today. For several decades previously, the site was known for its abundant surface-accessible remnants of a *latte* village, panels of enigmatic cave-art, and Spanish colonial ruins (Hornbostel 1924; Kurashina 1990; Osborne n.d.; Reed 1952; Reinman 1977), all certainly important, yet a completely different approach was needed for unearthing the more ancient landscape.

Concurrent with my 2006–2011 investigation, other researchers focused on *latte* household labor organization (Bayman et al. 2012a; b) and cultural transformations during Spanish contact in the late 1600s (Jalandoni 2011). The, *latte* sites further facilitated personal connections for Guam residents and students learning about archaeological field techniques and methods.

Fig. 8.3 Saipan Historic Preservation Office staff member, Mr Diego Camacho, practices excavation technique at Ritidian

Ruins of a *latte* village at Ritidian are abundant and widespread, but they may not be immediately obvious to most visitors. A few of the *latte* house-pillar sets now have been cleared of vegetation and maintained in "open" condition for people to see and appreciate, but mostly the sites are cloaked beneath grass, ferns, trees, and vines that grow luxuriantly in this humid tropical setting (Fig. 8.4). After adjusting to the jungle's characteristics, a trained eye can detect fragments of pottery, stone and shell tools, and other signs of the ancient *latte* village on almost every square centimeter of the rich soil surface. After cleaning the blankets of leaf-litter and vegetation-growth from the surface, clusters of grinding-basins (Fig. 8.5) and stone-lined wells (Fig. 8.6) reveal some of the range of activities once associated with village life. Numerous internal components of the ancient village include some parts dated as early as A.D. 900–1000 and others that were used into the Spanish colonial contact period of the late 1600s.

In addition to the *latte* village ruins, Ritidian is well known for its rare concentrations of pictographs inside a series of caves that have been protected from vandalism or other destruction (Figs. 8.7 and 8.8). Several caves contain images of handprints, male and female figures, and other shapes, made in red, black, and white pigments. Direct dating has not yet been attempted of the pigments, but the cultural deposits inside these caves are constrained within the last 2,000 years and most intensive within the last 500 years. Images of headless bodies perhaps commemorate rituals of post-mortem head-removal, known ethnohistorically in the Marianas (Cabrera and Tudela 2006). The handprints imply markings by individual participants in rites of passage. Numerous other interpretations have been suggested, and surely more will continue to emerge.

The Ritidian research 2006–2011 revealed a much deeper story than the surface-accessible *latte* ruins and cave-art, significantly pre-dating the development

Fig. 8.4 Surface-visible megalithic *latte* ruins at Ritidian. Scale bar is in 20-cm increments

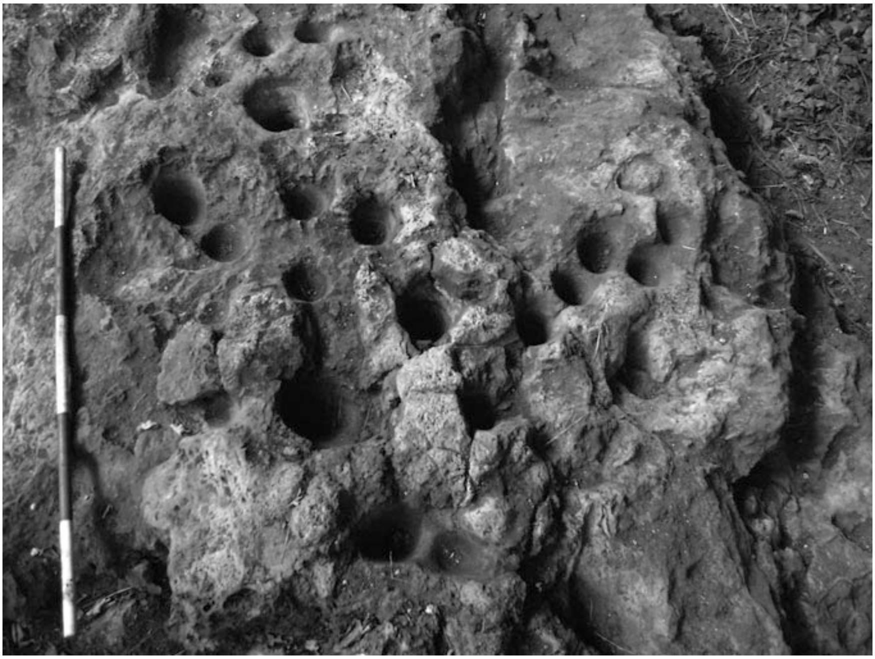

Fig. 8.5 Bedrock grinding mortar, *lusong*, at Ritidian. Scale bar is in 20-cm increments

Fig. 8.6 Stone-lined well at Ritidian, probably from early Spanish era

of the landscape as seen today. The oldest buried site deposit was confirmed as nearly 3,500 years old, among the earliest in the Mariana Islands as a whole (Carson and Kurashina 2012). These findings pre-dated the *latte* and other

Fig. 8.7 One of many large caves at Ritidian, formed in the limestone escarpment

materials by more than 2,000 years. An ancient habitation layer was found more than 2 m deep and more than 100 m inland from today's shoreline (Fig. 8.9), but originally people lived at the water's edge here more than three millennia ago. Without any doubt, the landscape evolved dramatically during the time span of human habitation at Ritidian.

Unearthing the Ancient Landscape

The Ritidian study was the most high-resolution and data-rich of several investigations that comprised an island-wide palaeoterrain modeling of Guam (Carson 2011). Subsurface findings all around Guam built a cohesive picture of how the island terrain had evolved over the last several thousands of years, with particular attention to where people could have established the first settlement sites during the period 1500–1000 B.C. (see Fig. 3.2). The Ritidian example was unique, in that it boasted a complete 3,500-year sequence in high resolution, with plentiful archaeological and ecological data from each part of a securely validated radiocarbon chronology.

An essential key in the palaeoterrain research was a local sea-level history (Dickinson 2000, 2003), wherein we know confidently that the sea level prior to 1000 B.C. was about 1.8 m higher than today (see Fig. 3.1). Looking at emerged coral reefs in offshore waters and tidal notches along rocky coasts, the ancient sea level can be measured, and then it can be dated from samples of the coral. One excellent example is the algal ridge of an ancient coral-reef lagoon along one

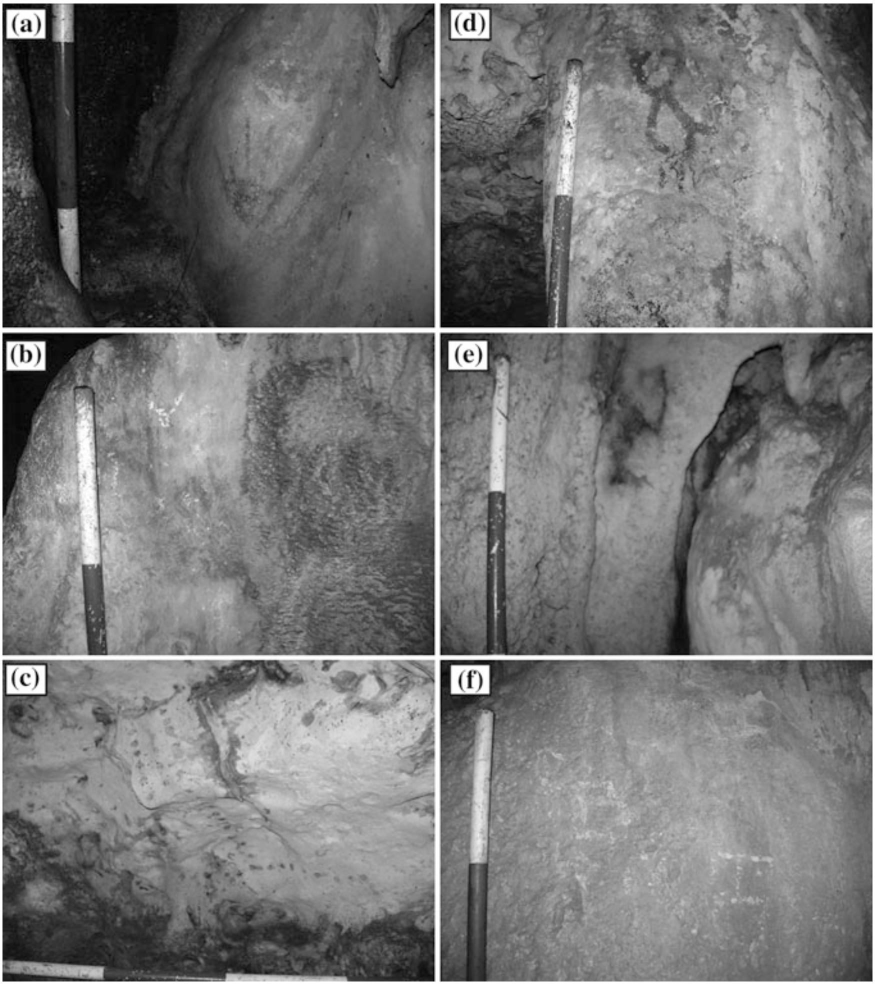

Fig. 8.8 Examples of pictographs in caves at Ritidian. Scale bars are in 20-cm increments

section of the Ritidian coast (Fig. 8.10), now elevated above the present sea level and stranded inland of the entirely new coral-reef growing there today (Fig. 8.11). The measurements vary somewhat from one locality to another, but our study area in Ritidian is remarkably consistent with a former sea-level highstand about 1.8 m during the period 3000 through 1000 B.C. Additionally, deep test excavations measured the depths of the original coral reefs (see Fig. 4.3), now buried beneath the more recent coastal sediments, and direct radiocarbon dates tell us when these reefs last were alive, all corroborating the 1.8 m higher sea level during first human settlement (Carson 2011, 2012a).

Fig. 8.9 Finding the deepest cultural layer at Ritidian, overlaying the ancient coral reef

Fig. 8.10 Ancient algal ridge of palaeo-lagoon at Ritidian. In the distance, the waves are breaking over the present-day algal ridge that borders today's lagoon. Scale bar is in 20-cm increments

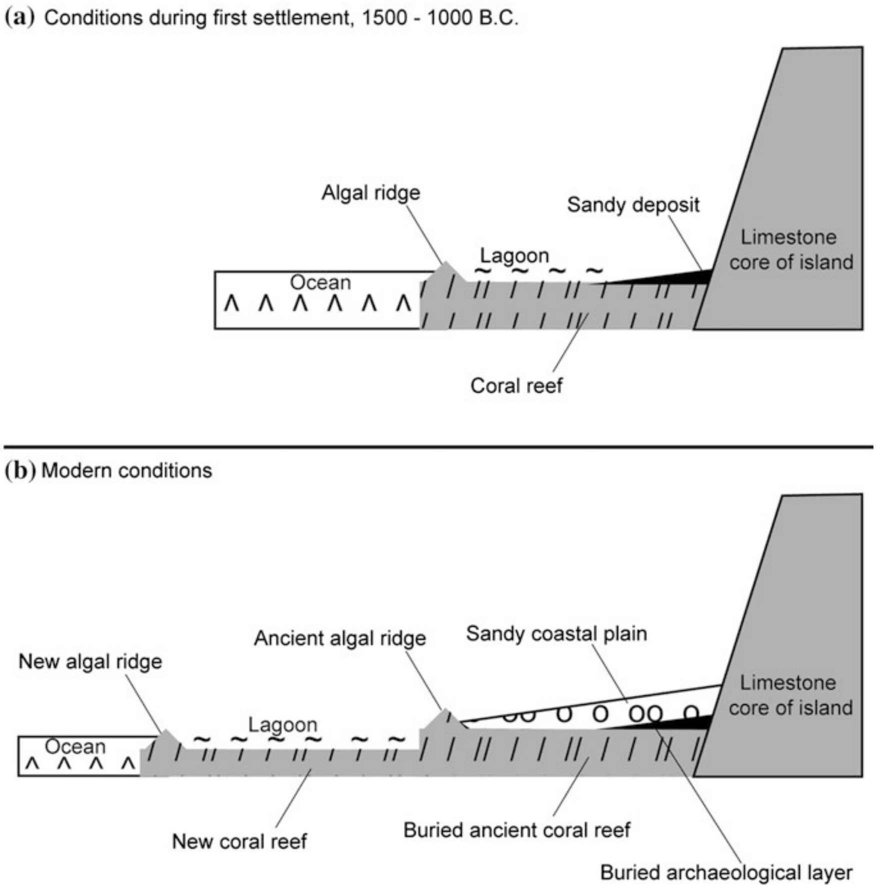

Fig. 8.11 Schematic profile of Ritidian beach, showing: **a** palaeo-terrain conditions with ancient lagoon and other features; and **b** modern conditions with today's existing lagoon and other features

Most of the Ritidian area does not in fact display the fortuitously ideal example of the exposed algal ridge of the palaeo-lagoon, but rather Ritidian for the most part consists of a surreal dreamy expanse of white-sand beach (Fig. 8.12). The individual grains of calcareous beach sands are quite recent in geological terms, all post-dating the lowering of sea level since about 1000 B.C. Deep test excavations found layers of sands from storm-surge events, covering lower beds of sands that represented an older lagoon setting (see Fig. 4.3).

The ancient lagoon floor at Ritidian evidently composed of a reef of *Heliopora* sp. and other corals, with "meadows" of *Halimeda* sp. algae. Important for the Ritidian research, the bioclasts from *Halimeda* sp. are shed rapidly, forming thick beds of bioclastic sandy sediments. These bioclasts are easily eroded and dispersed when subjected to turbidity, but they can remain intact in calm lagoon settings, for

Fig. 8.12 Broad sandy beach at Ritidian today

example where they have settled into beds as at Ritidian (Fig. 8.13). The intact bioclasts proved reliable for direct radiocarbon dating (Carson and Peterson 2012), making the basis for a superb chronology of landscape evolution at Ritidian, even better when combined with a local reservoir correction for marine samples as calculated specifically for the Ritidian site (Carson 2010).

Fig. 8.13 *Halimeda* sp. algal bioclasts, freshly deposited on the beach, after a storm-surge in Guam

Guided by clues from the sea-level history and an expectation of at least 2 m depth of more recent coastal sediments, numerous test pits were distributed through the coastal plain at Ritidian, and others were concentrated in and around caves or other points of interest (Fig. 8.14). The excavations documented layers of storm-surge sands, beds of algal bioclasts, and eventually the basal coral reef (see Fig. 4.3). In this way, the ancient site deposits could be contextualized in reference to their original settings.

The excavations needed to penetrate through a zone of hardened sand, called calcrete, that had solidified over time due to settled moisture (Carson and Peterson 2011). Astonishingly, the oldest artifacts and midden had been sealed within and beneath the hardened sand (Fig. 8.15). The calcrete was removed in chunks and blocks by hard-labor chiseling, then dissolved in light (5 %) acid solution to release the constituent pottery, shells, and other materials. A bath in distilled water then halted the acid reaction, and of course some time was needed for full drying of the soggy residues, later sifted through one-half-millimeter wire mesh to ensure maximum recovery of even the tiniest particles. Never for one moment did I question if all this effort was worthwhile.

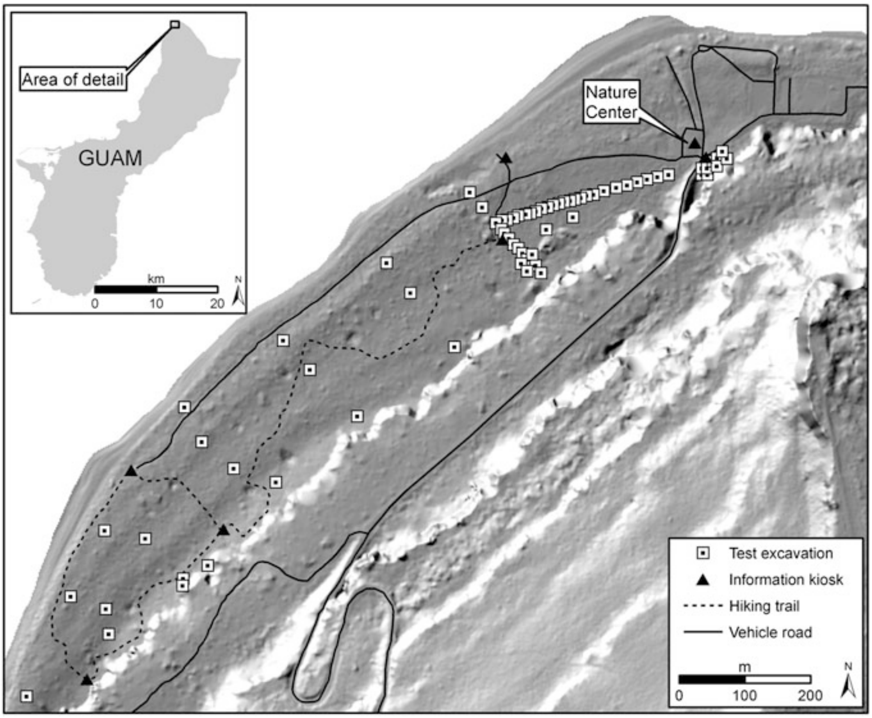

Fig. 8.14 Distribution of 2006–2011 test excavations at Ritidian

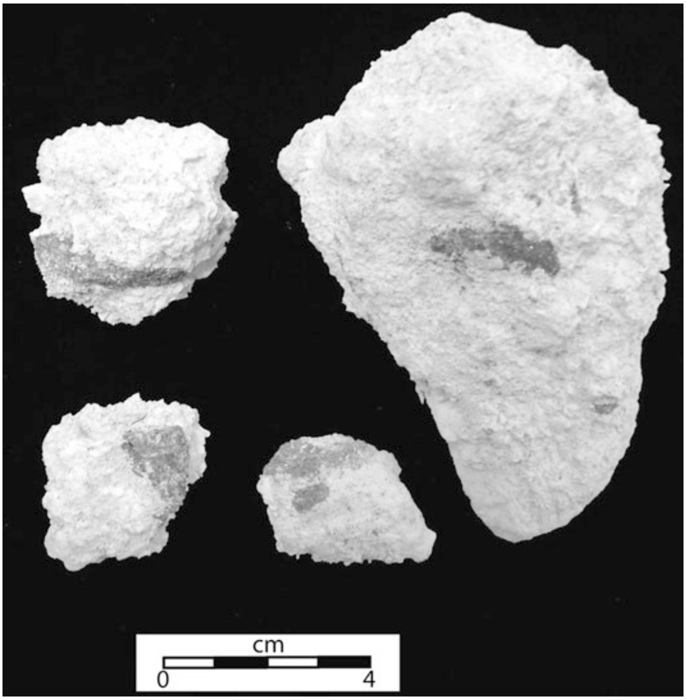

Fig. 8.15 Solid calcrete, containing potsherds, excavated from Ritidian

Palaeoterrain Model

The palaeoterrain model for Ritidian was compiled from the local sea-level history in conjunction with depths, dates, and spatial extent of sedimentary layers for a complete 3,500-year sequence (Fig. 8.16). The dating was especially clear from numerous radiocarbon samples that enabled absolute date-ranges for the stratigraphic layers (see Carson 2012a for details). Within this lively framework, other information was coordinated for each time interval, for example noting chronological trends in the shellfish records, number and size of habitation sites, and artifact associations (Fig. 8.17).

The complete landscape chronology has been presented elsewhere (Carson 2012a), but a few key points can be stressed here for understanding the context of first settlement at Ritidian. Most striking visually is the difference between first habitation and the modern setting (see Fig. 8.16). The full chronological sequence allows us to appreciate how the setting changed incrementally over time, primarily with lowering sea level and expanding coastal plain. The first settlers clearly targeted a specific shoreline niche, but this niche soon was transformed and then no longer existed after some centuries.

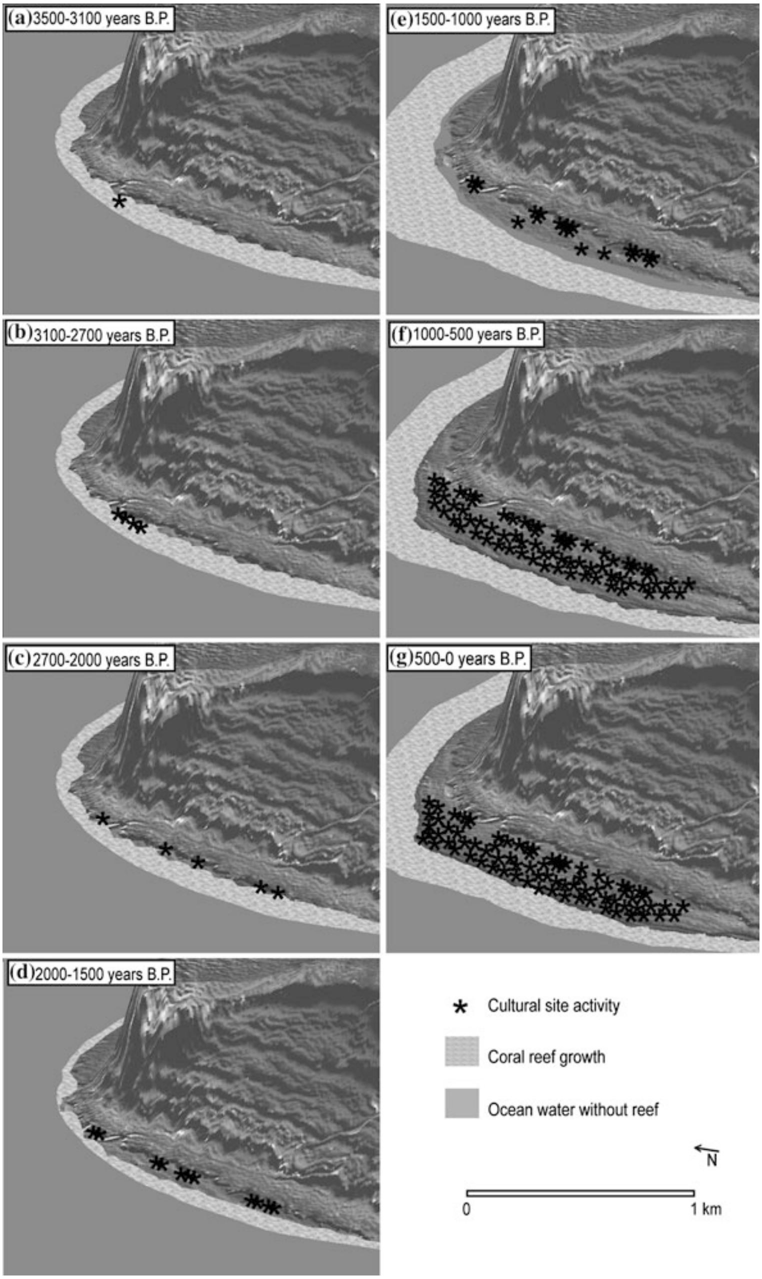

Fig. 8.16 Palaeo-terrain sequence at Ritidian

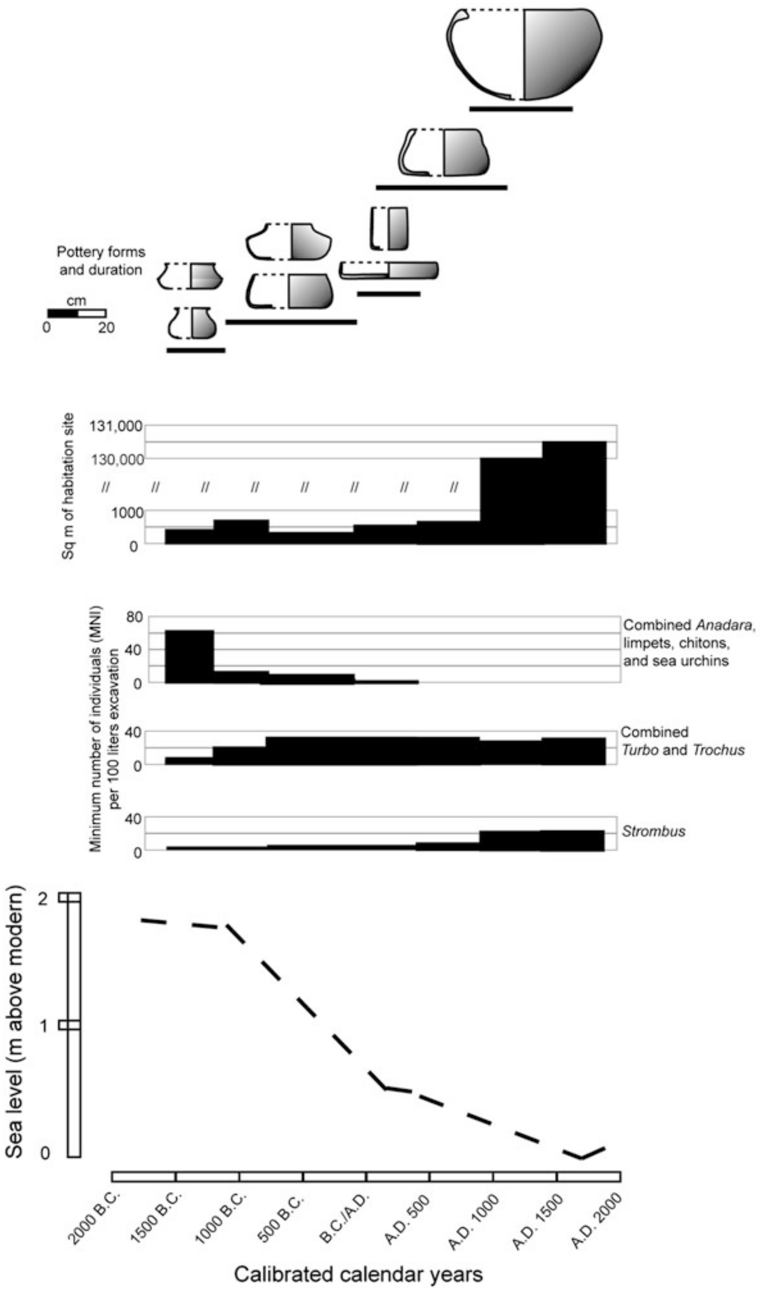

Fig. 8.17 Integrated chronology of pottery types, habitation size, shellfish remains, and sea-level history at Ritidian

As the sea level lowered, the most immediate effects were witnessed in expansion of the sandy coastal plain. The algal bioclasts of *Halimeda* sp. became stranded as beds over the basal *Heliopora* sp. coral formation. Later, layers of storm-surge sands accumulated more and more over the deep bed of intact *Halimeda* sp. lagoon sands. Eventually, slope-eroded silts and clays became incorporated into the matrix of the coastal plain sediments. Meanwhile, a new coral reef formed in the lowered ocean waters.

The original shoreline habitation 1500–1100 B.C. was buried beneath increasing layers of sand, but people continued to live on the changing beach zone for as long as they could. We can see that people inhabited a newly formed beach ridge about 1100 B.C. Their descendants shifted into different settlements farther landward only after increasingly transformed coastal environment about 700 B.C.

People of course adjusted to the transforming coastal ecology in several ways. Most simple were technical and economic responses, such as choosing new locations for habitations and harvesting from different sets of available resources. More complicated were choices of habit and lifestyle, learning to live in a different relationship with the sea, the shore, and the larger environment. We may never fully comprehend what people thought or felt, but we can find important clues in material records of the kinds of pottery that they made and the kinds of foods that they ate.

When Ritidian's first people lived directly on the very narrow shore of a coral-reef lagoon 1500–1100 B.C., we can discern a set of cultural practices and expressions exclusively during this same time-range. For instance, the first inhabitants made very thin red-slipped pottery that became replaced by thicker and coarser earthenware after 1100 B.C. We also can identify an array of shellfish in the earliest habitation midden, characterizing the lives of the first inhabitants in ways that simply were not possible later in a much transformed environment.

Resource Zones

The faunal records from Ritidian show a major change after 1100 B.C. (Fig. 8.18), resembling a nearshore resource depression. The first habitation midden included *Anadara* sp. (arc clams), chiton, sea urchin, and limpet shells that all declined rapidly and eventually disappeared entirely from the faunal records of the site. These trends were due to the natural sea-level drawdown, combined with impacts of cultural harvesting. It was not a simple matter of the environment determining how people could behave, nor was it a case of people mercilessly besieging their fragile environment.

Three simple points can clarify how the faunal records are presented in Fig. 8.18. First, for each major taxonomic category, the individual pieces were examined for calculating the minimum number of individuals (MNI), meaning the number of individual animals that must have existed in order to create the fragments in the archaeological record. Next, these results were standardized as MNI

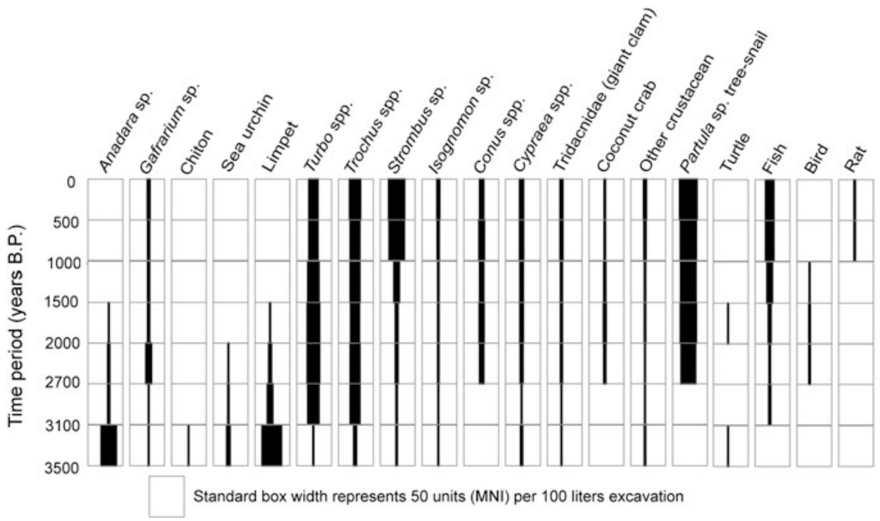

Fig. 8.18 Chronology of faunal remains at Ritidian

per 100 l excavation in each represented time period, so that the findings could be most easily cross-compared. Third, several taxonomic categories were not depicted in the final graphic output, because they were represented by just one or very few specimens that otherwise created overly complicated and practically incomprehensible graphics.

How can we evaluate what shellfish taxa were affected by sea-level drawdown, versus those affected more by human harvesting? One idea is to compare the Ritidian findings against those of other sites of shallower time-depth, where first human occupation occurred later than the effects of the earlier sea-level change (Fig. 8.19). In this way, we can separate sea level from first human impact.

When comparing sites of different ages, the decline in *Anadara* can be linked to the natural sea-level change, but other taxa (e.g., limpets, chitons, and sea urchins) were affected by cultural harvesting shortly after human occupation in each location, regardless of the time period involved. In the Ritidian case, the co-occurring factors contributed to a localized resource depression of all these shellfish taxa at once, otherwise not witnessed in most other later-dated sites missing the early record of sea-level change.

The depopulation of *Anadara* is especially informative about the ancient coastal habitat transformation. *Anadara* prefer to live in settings such as mangrove swamps or beds of sea-grass (Amesbury 1999, 2007). They no longer exist in the Mariana Islands today, except in a few rare swampy zones. We may postulate that the first islanders targeted shores near these kinds of zones, where plentiful *Anadara* shellfish could be harvested, yet soon the coastal habitat underwent a major transformation that no longer supported large numbers of *Anadara*.

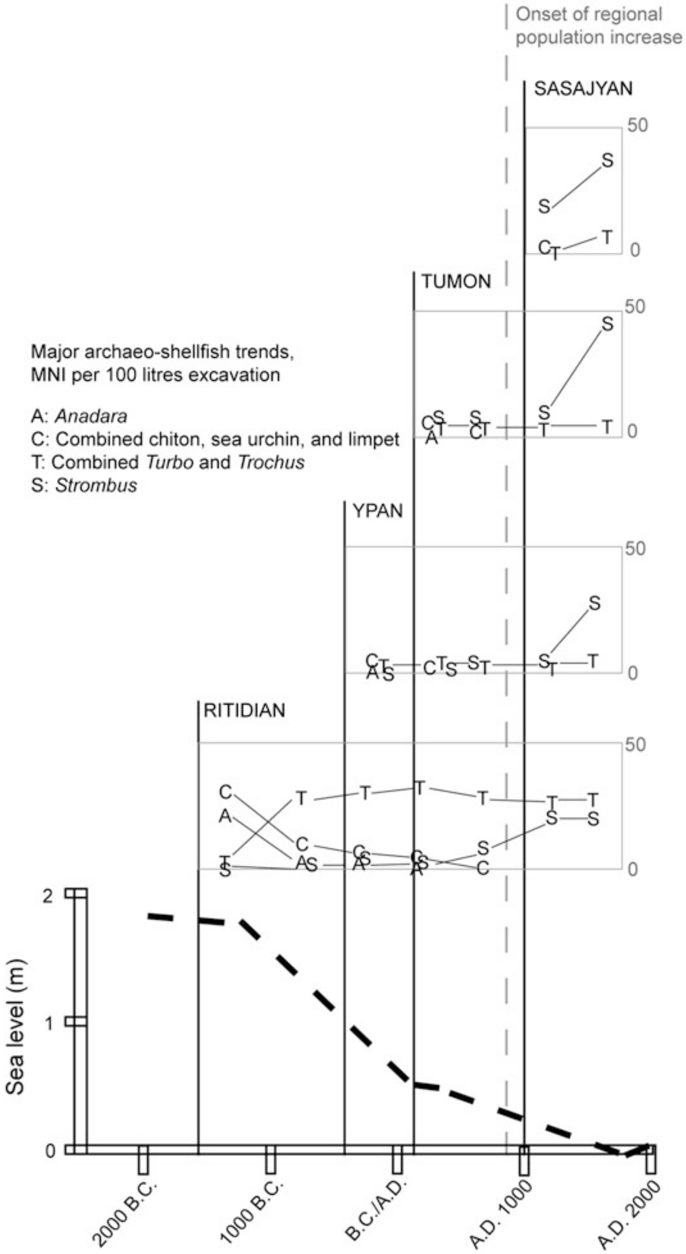

Fig. 8.19 Comparing archaeo-shellfish records from sites of different age-depth in Guam, noting differences in represented taxa before, during, and after sea-level change

People immediately compensated for lesser availability of *Anadara* and other shellfish by shifting their harvesting strategy to target other taxa. The choice of shellfish was not necessarily for whatever was most abundant or easily accessible. For example, *Gafrarium* could tolerate and probably thrive productively in the changing coastal conditions, but they became just slightly more numerous in the site middens. More abundant midden-contributors were shellfish such as *Turbo* and *Trochus,* taken from the middle-outer reef zones that have been more resilient to the changing ecosystem. Just a few of these large shellfish could provide more protein and nutrition than several dozens of *Gafrarium*.

The later part of the Ritidian sequence shows a marked increase in *Strombus* in the site middens. The particular species was the rather small *Strombus gibberulus*, overwhelmingly dominant in most *latte* period site middens (Carson 2012b). The species prospered in the new lagoons of this later period, and moreover the shellfish may have become a preferred culinary ingredient.

Another important finding was the appearance of terrestrial snail shells, namely the tree-snail *Partula* sp., following the formation of larger stable terrain about 700 B.C. These animals live in forested areas, so their absence in the earliest period indicates an absence of forested habitat along the narrow beach-fringe. Their increasing presence later indicates the expanding coastal terrain with healthy forest growth.

When considering faunal records, the absence of domesticated animals has raised some curious questions in the Marianas, as noted in Wickler's (2004) thorough review of this topic. In most other Pacific Islands, domesticated pigs, dogs, and chickens were introduced by the earliest Austronesian settlers. In the Marianas, though, the exceptionally long distance of ocean voyage may have made translocation of animals impractical.

First Settlement Landscapes

With the entirety of the Mariana Islands open for settlement, why did the first colonists select places like Ritidian for their habitations? People clearly chose the shores of the largest islands of Guam, Tinian, and Saipan where they could find the most ecological diversity and presumably more reliable sources of fresh water, but what else did they consider when choosing one specific location rather than any other? What were the benefits and challenges of the chosen locations?

The first settlers at Ritidian and other sites evidently favored locales at the shoreline with direct access to productive coral reefs, mangroves, and other resource-zones. Forested landmasses were accessible in inland interiors, in some cases easier than others, but the focus of habitation was at the shore. We know that people preferred places with access to marshy zones containing *Anadara* clams, but they also gathered shellfish from sandy beaches, rocky exposures, and coral reefs. Crabs and sea turtles entered the local diet as well.

We do not see evidence of lizards or birds in the very first habitation layer at Ritidian, but they are known in later contexts and at other sites. These animals may have been collected from dense forests, such as in the limestone plateau far above the beach at Ritidian, but then the bones may not have entered the site midden at the shore. The beach at Ritidian was isolated from thick jungle forest until 700 B.C. For the earliest settlers to access this kind of deep forest, then they were obligated to climb up the limestone cliff, surely within their ability but not necessarily ideal for generating large amounts of bones from forest-dwelling animals back at the beach habitation site. Of noteworthy comparison, bird bones were verified in the earliest layers at Unai Bapot in Saipan (Chap. 9) and at House of Taga in Tinian (Chap. 10), in settings where forests were more easily accessible than at Ritidian.

These earliest habitations each occupied an ideal nexus of primary natural resources, but they were dispersed by some appreciable distance from one another. We know that people visited the uninhabited areas and took back special stones for fashioning tools, clay for making pottery, probably large trees for house-construction, and presumably more. In other words, the uninhabited territory and even some entire islands served as potential supplementary resource zones. The ability to recruit from a potentially broad resource catchment may have been critical for survival of the founding colonies.

First Inhabitants

What can we say about the number of people in the founding settlements of the Marianas? We know that the number of people was lowest during this period, then increasingly larger thereafter until crashing during intensive Spanish colonial influence in the late 1600s. So far, we can confirm at least eight early-period sites, as reviewed in Chap. 4, but others may yet be discovered.

We can propose that the first settlements consisted probably of just a few families each, but we cannot be any more specific than that. Some families may have been larger than others, and some sites may have supported more families than others. Meanwhile, we cannot be confident that we know the total number of sites, so estimates of numbers of people probably are not realistic at this time. The number may have varied greatly from one site to another, hinted by the small area of less than 20 by 20 m at Ritidian and much larger habitations elsewhere, while we have not yet explored enough of the deep subsurface to measure the exact spatial extents and boundaries of these early sites.

First Contact Between Humanity and Remote Oceania

Although the physical footprints of the first settlers were less numerous than those in later periods, these people created a definite impact on the fragile island environment. In addition to the effects we have seen in the shellfish records, we can see a clear horizon of human-induced change in the native forests, archived in botanical remains preserved in lake-bottom and swamp-bottom sediments (Athens and Ward 2004). These records show thousands of years of uninterrupted, healthy forest growth, followed by a sudden influx around 1500 B.C. of episodes of burning, disturbance of forest composition, increase of new disturbance-related grasses and shrubs, and eventually the first appearance of definite introduced tree and root crops that must have been imported from elsewhere.

People clearly affected the island environment, but the environment meanwhile affected where people chose to live, what resources they could collect, and how they made decisions for creating their new lives in the small and remote Mariana Islands. The interplay of natural and cultural history was truly complex, and moreover it evolved over centuries or millennia. The Ritidian case illustrates exactly these kinds of long-term links among the changing environment, cultural use of the landscape, and population growth.

Landscape Ecology and Evolution

The Ritidian study was inspired by a seemingly simple question of how the landscape today came to exist, but the answer to this question proved to be incredibly complicated. The results show that the habitat structure or landscape ecology at any one time did not occur in isolation, but rather it was shaped by a longer chronological sequence. The oldest and youngest time periods were almost entirely foreign to one another, in terms of the natural setting and how people behaved within the given setting.

Shortly following the first settlement, a significant change occurred in the landscape structural identity. We can define an early period of 1500–1100 B.C., with a unique set of natural environmental characteristics and cultural practices that simply did not exist in later centuries. People attempted to maintain the original shoreline-oriented lifestyle through changing coastal conditions, for example shifting habitation from the shore to newly formed beach ridges and then to other coastal landforms. They meanwhile shifted their shellfish-collection strategies and other resource-use patterns. At a certain point or threshold, though, all of these factors changed to such a degree as to compose an entirely different ecological structure, detectable to us in the material record of how human communities interfaced with the landscape.

The natural environment certainly changed dramatically since the time of first settlement, but of course the island ecosystems continued to exist with adjustments to the new conditions. New coral reefs developed, and many of the same fish and other sea creatures continued living in new habitat ranges and configurations. Meanwhile, the native forests suffered great disturbance and some devastating losses, yet native species continued to survive in lesser numbers alongside newly imported taxa.

Like the changing environment, the human populations of course survived through consecutive centuries of changing conditions. We have seen how people over time expressed themselves differently with new forms of pottery and other artifacts, positioned their homes in new locations, and learned to harvest foods and resources from a changing world. Overall, people continued a close relationship with the sea, but they necessarily needed to adjust to substantially different coastal ecologies. In still later periods, people concentrated more and more on land-based food production, but the coastal zones always were important for island communities.

The Ritidian case, like for the Marianas overall, reminds us that humankind possesses an ability to adapt to almost any variety of changing conditions. Marianas settlement in itself signaled the first human life in the extreme environment of Remote Oceania. The first settlers and their descendants adapted to this bizarre new setting where no other people ever had lived, and moreover they successfully survived through drastic transformations of their most prized life-giving coastal ecosystems.

Ancestral Landscapes

Although it was short-lived due to unforeseen environmental change, the original choice of site setting was consistent for the known early-period sites, always in the same types of shores with a narrow beach fringe and close access to swampy zones and coral reefs. These productive resource centers were targeted intentionally, but were they part of a preconceived notion of the locales where the first settlers desired to make their new homes? Could people have been looking for familiar environments, where they most easily could envision living? Alternatively, could they have created their own artificial habitats almost anywhere, but they began with the most productive coastal zones as a practical starting point?

The first Mariana Islanders settled into much the same coastal niches that supported Lapita colonists slightly later in Remote Oceania (Nunn 2005, 2007), but they did not rework the natural landscapes into artificial life-supporting systems to the impressive degree that has been documented for Lapita settlement (Spriggs 1997). Most noticeably in the Lapita-associated areas of Southern Melanesia and West Polynesia, the first inhabitants after 1100 B.C. brought packages of useful plants and animals that were essential for establishing viable subsistence economies in the impoverished Remote Oceanic settings (Kirch 1997). The Lapita colonists created sudden and widespread impacts, rendering their newly claimed islands into culturally useful landscapes at a scale and speed that was not witnessed in the earlier Marianas case.

Whereas the Lapita colonists may have besieged their islands with artificial habitat-forming strategies, the earlier Marianas settlers took advantage of certain pre-existing locales that best suited their particular needs during their adventurous years of first settlement. What made these niches seem inviting in the eyes of the first settlers? Did people imagine their new homes in reference to an ancestral homeland, or were they seeking something completely different?

If we want to entertain the notion of people seeking familiar home-like environments in the Marianas about 1500 B.C., then we need to consider the kinds of settings where they potentially could have lived in their homeland region before they reached the Marianas shores. At that time-range, very few conceivable homelands existed where people knew the traditions of red-slipped and finely decorated pottery that eventually were duplicated in the Marianas. Of the possible candidates, a scattering of small villages had been inhabited in the Philippines for at least a few centuries since 2000–1800 B.C., in both coastal and inland zones (Carson et al. 2013; Hung et al. 2011). Other less convincing candidates appeared about 1700–1500 B.C. and later in Indonesia, lacking the diagnostic decorative style in the generic red-slipped pottery (Bellwood 2007; Bellwood et al. 2011; Simanjuntak 2008).

We will explore more details about the ancestral homeland location in Chaps. 10 and 11, but for now we can appreciate a general idea of a source in Island Southeast Asia prior to 1500 B.C. At that time, lively settlements were emerging in several locations simultaneously, primarily in the Philippines but also in parts of Indonesia. The Lapita-associated movement into Oceania had not yet started (see Fig. 1), but it would begin very soon after 1500 B.C. with the oldest sites in the Near Oceanic Bismarck Archipelago (Summerhayes 2007). As noted in Chap. 2, people in Island Southeast Asia as early as 2000–1800 B.C. began to make the region's first pottery, live in formal sedentary villages, and gradually replace the long-established hunter-gatherer groups, but these processes unfolded over several centuries at least through 1000 B.C.

House construction, crop growth, and other evidence confirm that sedentary village life was gaining strength as a preferred lifestyle in Island Southeast Asia during 1800–1500 B.C., exactly in the range expected for a homeland of the people who settled in the Marianas for the first time. Rather than the earlier hunter-gatherer pattern of informal mobile camps and cave dwellings, now clusters of houses were built on elevated wooden posts over coastal plains, hilltop ridges, and riverside terraces (Hung 2008; Peterson 1974a, b). Communities were supported by a blending of wild and cultivated foods from the surrounding lands, seas, rivers, and forests. At a far-inland site in the Philippines, Snow et al. (1986) dated a rice husk broadly 2000–1400 B.C., possibly the oldest rice imported by agriculturalists into Island Southeast Asia. Nonetheless, we do not yet see clear evidence of formal rice fields during this early period, and people may have relied more heavily on tree and root crops for most of their plant-food base. The same people generated dense middens and mound-heaps of shellfish-refuse, including marine-shells near coasts and river-shells in the farther interior zones. The first domesticated pigs appeared at this time (Piper et al. 2009), further signifying components of sedentary life among a combination of wild and domesticated resources.

The available evidence may not be as clear as we would like, but we can portray the general setting of the Island Southeast Asian homeland of the first Marianas settlers. The people came from a society focused on sedentary village life, in part supported by artificial crop growth, but they were very well aware of nature's wild resources in the sea, coasts, rivers, and mountains. In whatever location, access to shellfish was important for overall diet. Communities always were near a shore of some kind, whether by the sea or by an inland river, where they built wooden post-raised houses, made finely decorated pottery, and centered their activities primarily around their households while drawing secondarily from a broader resource catchment.

This generic portrayal matches reasonably well with the earliest Marianas sites, except for a strong preference for seashore habitations in the Marianas, not necessarily making homes in the island interiors. These island interiors did not include the large river valleys as known in the Philippines or Indonesia. A few small stream valleys cut through the mountains of southern Guam, but they were nothing like the size or number of the river systems of Island Southeast Asia.

Another minor difference for the Marianas case was a lesser emphasis on domesticated crops and animals that seem to have been important in the Philippines and other areas of Island Southeast Asia. The non-introduction of pigs, dogs, and chickens into the Marianas may be understandable due to the long ocean-crossing. The same reasoning can explain the limited imports of economic plants, although a few tree and root crops were transported. We further can note that large flat lands were entirely absent in the Marianas during the earliest settlement period prior to sea-level drawdown and expansion of the coastal terrain, so the optimal rice growing areas simply did not exist. We also must remember that domesticated plants and animals were gaining prominence in Island Southeast Asia prior to1500 B.C., yet they certainly did not entirely replace wild resources.

The strong shoreline orientation of first Marianas settlement underscores a most probable coastal homeland of at least some of the first settlers, and indeed a coastal zone must have been involved in recruiting the seafaring experts who made the unprecedented remote-distance ocean voyage for reaching the Mariana Islands. Presumably, accomplished seafarers lived among coastal people in Island Southeast Asia, and some of them made the journey to the Marianas possible. Historically, sea nomads or "sea gypsies" have lived in the seas of Island Southeast Asia, best known in the Philippines and Indonesia, where they have maintained close interactions with shore-oriented coastal communities (Sather 1995).

Surely not every person aboard the first Marianas-bound canoes was an expert navigator or sailor. At least some members of this group likely possessed certain knowledge and skills that others did not, for example in seafaring just as much as in pottery-making, house-building, crop-growing, and other important specialized activities that we know were practiced at the earliest Marianas habitation sites. We can imagine roles of men, women, children, and elders each with their own important contributions at Ritidian, Unai Bapot, House of Taga, and other earliest settlements.

Were the Marianas shores viewed as remote outlying examples of the Island Southeast Asian shores? The coastal ecologies were remarkably similar at that time, prior to sea-level drawdown that began to change the coastal habitats after 1100–1000 B.C. (Carson 2011). The weather patterns also were mostly the same in the humid tropics, and people would experience the same monsoon and typhoons as known in the Philippines. The same northern hemisphere stars, solar light regime, and other factors remained familiar all the way out to the Mariana Islands. These points of consistency cannot be made for a more southerly homeland in Indonesia, so a northern or central Philippines source becomes increasingly credible (Blust 2009).

We can appreciate that the Marianas shores offered familiar coastal settings for the founding communities, but we must not forget that these locales were secluded in exceptionally remote and small islands with no other people in residence. What could have made this unprecedented setting attractive to people coming from Island Southeast Asia? Were these people seeking a less crowded place to live, avoiding possible conflicts at home, or hoping to establish a different lifestyle not suitable in their homeland? Realistically, multiple motivations probably were involved for the full scope of the founding population, and perhaps different factors pushed or pulled later migrants coming to the Marianas. In any case, the successful settlement marked a major change in human history, for the first time entering the world of Remote Oceania, and we continue to learn about it from research as detailed in this book.

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Chapter 9
Considering Earliest Site-Dating at Unai Bapot in Saipan

Queries of first Marianas settlement cannot advance very far without a solid chronological frame of reference. As outlined in the early site inventory in Chap. 4, the oldest known habitation in the Marianas so far has been verified 1612–1558 B.C. at Unai Bapot in Saipan (see Fig. 4.1), slightly earlier than our often-noted rounded date of 1500 B.C. for the Mariana Islands overall. The earliest site-dating is considered closely here, along with deeper contemplation of what the most ancient site layer truly represented.

Project History at Unai Bapot

In January 2005, a shocking once-in-a-lifetime opportunity fell into my hands. As part of my duties at the International Archaeological Research Institute, Inc. (affectionately known as IARII), based in Honolulu, I traveled to Saipan for archaeological investigation at Unai Bapot, a site known for its surface-visible *latte* ruins but also for containing perhaps one of the oldest subsurface cultural deposits of the region. Seven years had passed since I first dreamed of launching a research program in the Marianas, as described in Chap. 8. While I reveled in the blessed good fortune of this special assignment, my friend and long-experienced Marianas archaeologist Lon Bulgrin proclaimed that I was a "lucky dog," and indeed he was right.

Prior to my work at Unai Bapot, the site gained notoriety in Asia–Pacific archaeology as one of the few possibly earliest sites in the Marianas, although details of the dating and the site contents were ambiguous. Spoehr (1957) found questionably early-dated pottery in a nearby rockshelter, but the Unai Bapot site itself was described mainly in terms of its *latte* ruins of much later dating. In the first known deep excavation at the site, Marck (1978) obtained dates of at least 1000 B.C. in association with what appeared to be early-type red-slipped pottery, but a formal research publication was not forthcoming. Slightly later, Bonhomme and Craib (1987) published a list of several radiocarbon dates for the site, again

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noting the oldest probably about 1000 B.C., yet still the full details were not disclosed beyond the obligated government report (Ward and Craib 1985).

According to the prior studies, Unai Bapot contained an early-period cultural deposit, deeply buried beneath the *latte* remnants covering the site today. Preliminary dating of at least 1000 B.C. was certainly ancient, but it could not compare with much older dates from other sites in the region. The site needed more attention to clarify the oldest dating and what exactly was associated with it.

In my mind, my goals at Unai Bapot in 2005 were very clear for solving the site's chronology. I wanted to excavate deeply, record the stratigraphic layers, document the pottery and other materials in stratigraphic order, and acquire radiocarbon dates from secure contexts. I remember more than a few excited discussions with my dear colleague Steve Athens, as well as with the project's nominal lead investigator David Welch, both at IARII in Honolulu. Surely, either one of them could have managed this project instead of assigning it to me, but I was the one of us who happened to be available at the moment for this particular work.

The 2005 work at Unai Bapot quickly became exposed as disappointingly different from my eager imagination, and instead the formal justification was blandly to update the site record for inclusion in the US National Register of Historic Places (NRHP). In the view of our local government sponsor for this project, the officially sanctioned scope of work included a detailed map of the *latte* ruins, also noting the surface-visible pottery and other materials, preferably with reference to a contour-elevation map of 1 m intervals. Small and shallow "shovel tests" were encouraged in transects throughout the site, each no more than 50 cm deep, for ascertaining the spatial extent of the artifacts and midden associated with the surface-visible *latte* ruins. Deeper excavations were not considered necessary for updating the site records that primarily should concern the *latte* ruins.

The limited funding allowed me to travel to Saipan with one field assistant, the refreshingly high-spirited Pat O'Day, for just 5 days at Unai Bapot. The CNMI Historic Preservation Office (HPO) generously provided labor for clearing the thick vegetation (Fig. 9.1), so that we could make the required detailed 1 m contour map. HPO staff members were busy with other duties, but nearly every employee joined the field research at one point or another, especially Herman Tudela and John Castro as our die-hard daily companions. Together, we mapped the site and documented the surface ruins with remarkable efficiency, and then we shifted our efforts for excavating two formal test pits, each 1 by 2 m plan and more than 2 m in depth (Fig. 9.2). HPO administrators graciously accepted this surprising change in plan. Within just a few days, we accomplished the necessary field-work for documenting what became known as the oldest site deposit so far ever reported in the region (Carson 2008; Carson and Kurashina 2012).

Our 2005 work was more than sufficient for listing Unai Bapot in the NRHP (Carson 2005), yet the research value of the deep and early cultural deposit was not part of the financial budget. In several lengthy after-hours sessions at the IARII office in Honolulu, I slowly made progress studying each of the individual

Fig. 9.1 Clearing vegetation at Unai Bapot, thanks to hard work by Saipan historic preservation staff members Mr Herman Tudela (*left*) and John Castro (*right*)

Fig. 9.2 Field assistant Patrick O'Day, excavating a test pit at Unai Bapot in 2005, with help from staff members of Saipan historic preservation office

artifacts, shells, and other materials. My bank savings paid for two radiocarbon dates, as the project's original funds supported just one dating sample.

The 2005 research convinced me that Marianas settlement absolutely occurred earlier than any other habitation in Remote Oceania. I made plans to continue working at Unai Bapot, as well as to re-connect with my earlier attraction of studying long-term landscape evolution at Ritidian. I anxiously applied for research grants to support formal investigative programs, but every attempt met failure. Meanwhile, manuscripts about the new archaeological discoveries met one rejection after another, often riddled with demoralizing commentary in the peer-review process.

In 2007, Steve Athens mentioned that an opportunity for decent funding just might be possible after all, in partnership with our colleague Geoff Clark at the Australian National University (ANU). Geoff shared my interest in the early Marianas dating, and we agreed that Unai Bapot was most promising for a joint research program. Geoff enlisted the help of his PhD student Olaf Winter, and I called on my prior field assistant Pat O'Day who was hoping to develop a new Ph.D. thesis. Unlike in my solo efforts of the preceding 2 years, we instantly obtained suitable grant funding from the Australian Research Council (ARC).

The newly funded excavation at Unai Bapot began in 2008, just as the 2005 findings at last were published (Carson 2008). I secured the research permit, selected a location conveniently between my prior two test pits, and excavated the uppermost layer of a new 3 by 3 m gridded area for a total 9 m^2 that we hoped would supply enough new data to answer our questions about the site (Fig. 9.3). Geoff, Olaf, and Pat then arrived in Saipan to continue the excavation according to their preferred protocols, eager to uncover the deeper layers of the site. They continued digging for the next several days, while I returned to my unforgiving job

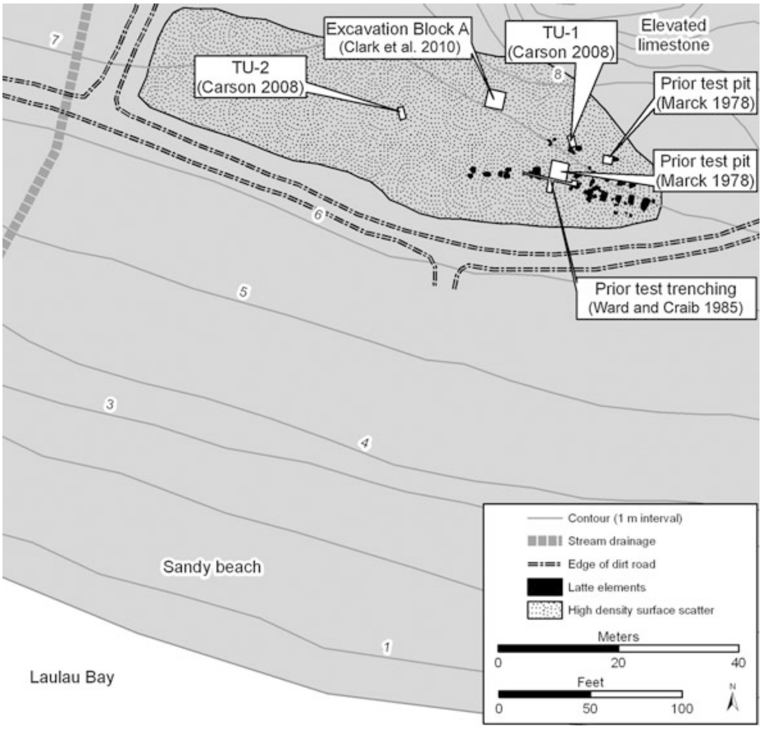

Fig. 9.3 Locations of archaeological excavations at Unai Bapot

duties at IARII's satellite office in Guam, in the midst of a mind-boggling magnitude of work for US military build-up in the region.

The 2008 excavations most importantly verified that the deepest and oldest cultural layer at Unai Bapot contained finely decorated and red-slipped pottery, as well as a diversity of other artifacts and midden. This work peacefully settled my prior questions about the chronology of the decorated pottery, because my prior smaller test pits did not find any decorated pieces in the lowest stratigraphic layer (Carson 2008). The more robust 3 by 3 m excavation made the pottery sequence entirely logical, confirming the distinctive decorated tradition from the very beginning of settlement.

My colleagues and I disagreed about how to select the radiocarbon dating samples and then about how to interpret the results. Of course I supported my colleagues when they published their version of the dating (Clark et al. 2010). Without belabored discussion, the hard data can speak volumes on their own, as in Chap. 4 (see also Carson and Kurashina 2012).

We honestly can describe Unai Bapot as one of the most important sites in the Asia–Pacific region, because of its early dating in secure context. Nonetheless, some key issues need to be clarified. How can we be so sure of the early dating? Exactly what kinds of cultural activities can we verify in the deepest and earliest site layers? What is the possibility of finding even earlier sites in the Marianas or elsewhere in Remote Oceania?

Early-Dating Context at Unai Bapot

The dating of 1612–1558 B.C. gives Unai Bapot the distinction of so far the oldest confirmed site in the Mariana Islands and in the entirety of Remote Oceania. The date nrange refers to the redundant overlap of radiocarbon dating by three samples, each obtained from the deepest cultural layer. The associated layer contained the diagnostic early-type red-slipped pottery and other materials in an ancient beach setting, fully consistent with expectations of the earliest habitation in the Marianas.

The title of Remote Oceania's oldest known site is a heavy burden. Several good questions emerge about the context of the dating samples. Were the samples obtained from clear stratigraphic units? Do they relate to real cultural activities of the distant past? What was the original setting of the site, and what artifacts or midden were found in this setting?

The site stratigraphy is best understood in reference to the layers of beach-formation, sequence of pottery types, and association of radiocarbon dating samples (Fig. 9.4). The results show first habitation on an unstable beach-front, followed by continued use of a stable back-beach that formed after sea level began a period of drawdown toward its present-day level (Dickinson 2000, 2003). People continued living at the site in changing contexts through the late A.D. 1600s, but our primary concern here is with the earliest dating.

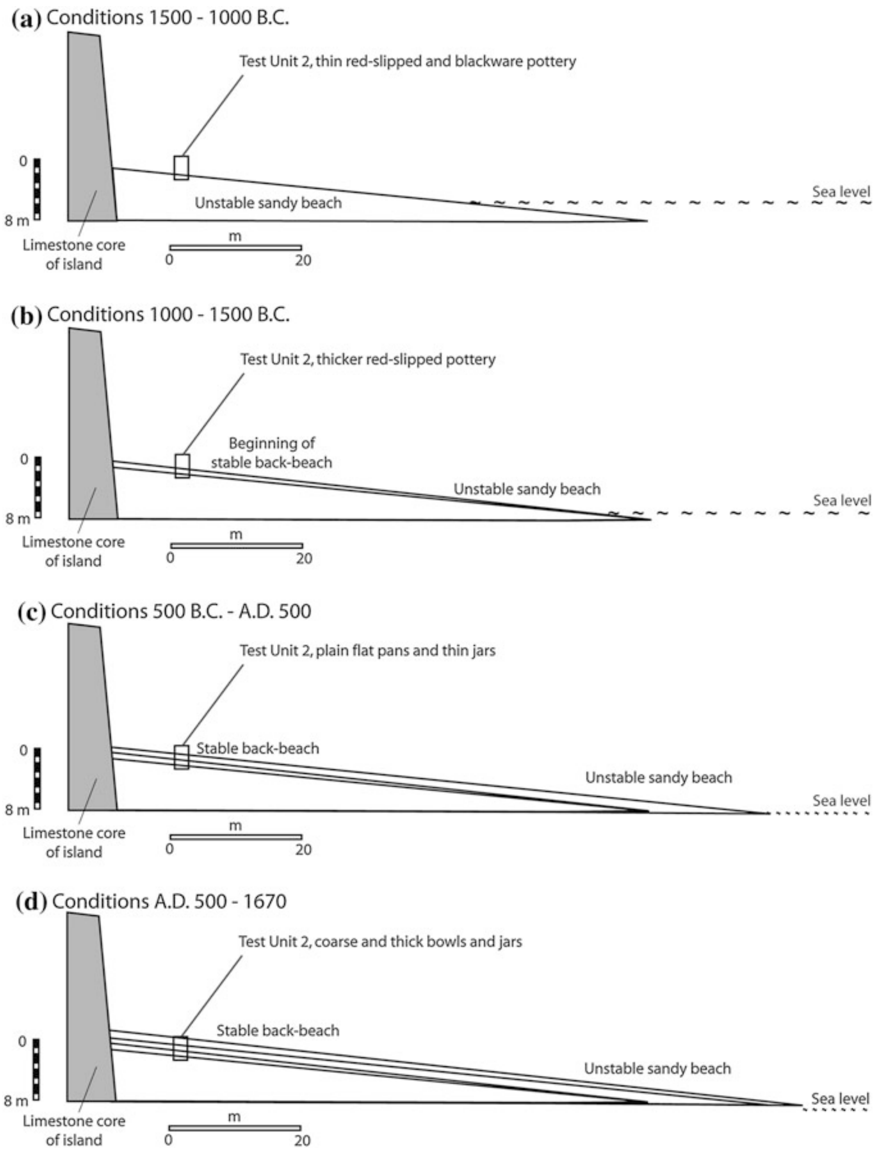

Fig. 9.4 Chronological development of coastal terrain and habitation layers at Unai Bapot

The oldest cultural layer at Unai Bapot originally was part of a slender fringe of sandy beach, between the inland limestone cliff and the nearby lagoon. Now buried more than 200 cm deep, this setting was inhabited when sea level was about 1.8 m higher than today's elevation, but this ancient beach did not last for very long thereafter. As sea level lowered, the coastal plain enlarged, and meanwhile newer

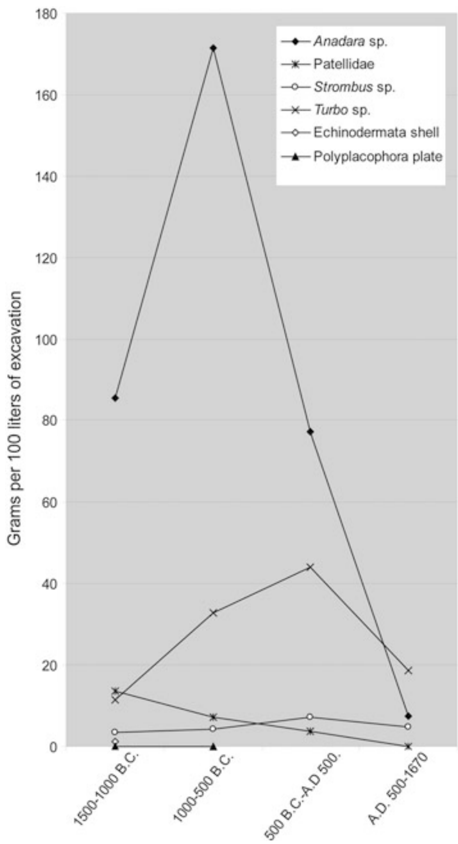

Fig. 9.5 Chronological change in key shellfish taxa at Unai Bapot

sediments buried the original habitation layer incrementally deeper and farther from the changing shoreline.

After the sea level had lowered at least a little, a stable back-beach formed, now evident in the sedimentary layer buried at 140–160 cm depth. A substantially transformed coastal ecology is obvious in the shellfish records (Fig. 9.5), much like we reviewed for the Ritidian Site in Chap. 8 (see also Carson 2012b). The stability of the back-beach at Unai Bapot is clear in the stronger soil-formation characteristics that began in this layer. Unlike in the lower unstable beach-front layer, the new stable back-beach conditions preserved abundant datable charcoal that produced radiocarbon dating of 1127–903 B.C.

The change in natural beach setting coincided with a change in cultural activities at the site. The new patterns in cultural behavior necessarily involved modification of shellfish-harvesting in the transformed coastal zone, but people also made noticeably different forms and styles of pottery. A thicker and coarser type of red-slipped pottery replaced the earlier thin and fine redware.

Fig. 9.6 *Anadara antiquata* shell from Unai Bapot, prior to radiocarbon dating. The shell was found within an ashy discard pile, with ash and soot clinging to the shell. After cleaning, as shown here, the shell exhibited no signs of heat-damage or other physical alteration that potentially could affect the result of radiocarbon dating

These observations clarify that the deepest and oldest habitation occurred in an unstable beach-front, certainly pre-dating about 1000 B.C. The oldest and deepest stratigraphic unit contained a distinctive assemblage of artifacts and midden, meeting our expectations of an early-period material culture. A few internal stratigraphic sub-divisions were noted, typical of sediments that accumulated over at least a few generations or more likely over a few centuries.

The oldest habitation pre-dated 1000 B.C., but how old was it? As reviewed in Chap. 4, three radiocarbon dates overlap significantly in the range of 1612–1558 B.C. All three dates were based on *Anadara* sp. shells from the lowest cultural layer, including two from inside an ashy discard-pile and one from the matrix of artifacts and midden (Fig. 9.6).

Why are only three dating samples mentioned here, whereas the site has produced numerous other radiocarbon dates? Very simply, these three samples are the only specimens most clearly associated with the lowest cultural layer. As discussed in Chap. 4, the other samples came from higher and later stratigraphic positions, unknown contexts, or different locations across the site that appeared incompatible with the stratigraphy of the three highlighted shell samples. Two of our three most confident samples came from the deepest layer as documented in the 2005 excavations, and the third came from the 2008 excavation with essentially the same stratigraphic sequence of the 2005 findings.

Are the radiocarbon dates of three *Anadara* sp. shells reliable in this case? Is something about the shell material possibly creating older dates? Some decades ago, dates of marine shells were difficult to interpret as intrinsically different from the carbon isotope issues that affect radiocarbon dating of terrestrial specimens like wood charcoal. Today, a marine calibration curve solves this problem by correcting for the overall offset age of carbon stored in the world's oceans versus on land (Reimer et al. 2009). Within this global average, even more refined dating is possible through calculating local marine reservoir correction (ΔR) for a specific area and ideally for a specific type of shell, as has been done for *Anadara* sp. shells in the Mariana Islands (Carson 2010).

The shell material does not present any inherent dating complications, and the cultural contexts of the samples definitely were associated with ancient cultural activities. In other settings, anomalous old dates conceivably could be questioned as influenced by in-built old age of drift-wood or old-growth trees, but this argument does not apply to rather short-lived *Anadara* sp. shells. Such concerns certainly do not apply to the cases of food-refuse contexts at Unai Bapot, where people must have collected the shellfish while fresh.

The early dating at Unai Bapot refers to the oldest known habitation of a narrow beach fringe, beginning about 1612–1558 B.C. and continuing for some centuries. The site's inhabitants discarded much of their durable refuse at the site, today making a deeply buried site record. The site's first people relied heavily on their diverse and abundant nearshore resources, while they made and used fine red-slipped pottery, stone and shell tools, and shell jewelry.

The early dating has been the strongest contribution from Unai Bapot, whereas other issues about environment setting and material cultural have been addressed better at other sites. Nonetheless, the findings at Unai Bapot are remarkably consistent with those at other sites but at a lesser scale. The environment setting was best documented at Ritidian (Chap. 8), and the material culture was best documented at House of Taga (Chap. 10).

Possibilities of Other Early Dating

What is the realistic likelihood of finding sites older than Unai Bapot, elsewhere in the Marianas or even in other islands of Remote Oceania? What is the possibility of an older period of low-intensity cultural activity that did not necessarily generate durable archaeological materials in formal settlement habitation deposits? If these kinds of findings ever truly will occur, then what are the implications about our proposal of early settlement in the Marianas about 1500 B.C.?

Within the Mariana Islands, Unai Bapot has provided the oldest confirmed site-dating as known today, but other older sites may yet be discovered or verified. For at least a few sites already known in the Marianas, the potential non-confirmed date-ranges could extend earlier than the date proposed for Unai Bapot (see Fig. 4.1). As discussed in Chap. 4, non-confirmed date-ranges begin as early as 1616 B.C. at House of Taga, 1741 B.C. at Chalan Piao, and 2133 B.C. at Achugao.

According to the current critical review of the Marianas site records, people unquestionably lived in the islands by 1500 B.C., but a slightly earlier presence would not be too terribly shocking. Unai Bapot in fact slightly pre-dated 1500 B.C., and other sites may be shown to date earlier as well. As the volume of early-period research inevitably increases, we gradually refine the overall dating, and occasionally we can verify dates perhaps older than expected.

How much earlier than 1500 B.C. are we willing to accept as a possible date of Marianas settlement? If the founding communities came from the Northern or central Philippines, then dates from those regions suggest at least 1800 B.C. for the origins of the pottery-making traditions that eventually appeared in the Marianas (Hung 2008; Hung et al. 2011). Related populations were expanding into other territories in Island Southeast Asia at least as early as 1500 B.C. (Bellwood 1997; Simanjuntak 2008), although these did not bear the distinctive decorated pottery as seen in the Philippines and Marianas. Could some of this expansion have spawned the conditions for first Marianas settlement?

The archaeological evidence may be giving us only the durable material signal of successful settlement, visible at several sites around Guam, Tinian, and Saipan. Could we be missing the record of even earlier people in the islands, perhaps just a few individuals or families? Could such a small group have generated minimal physical traces that we have not yet detected in the archaeological record?

What is the purpose of discussing an ephemeral archaic settlement without any clear archaeological trace? At best, this notion reminds us that remote islands like the Marianas may have been discovered by a few people, perhaps visited on a short-term and low-intensity basis for some time, and eventually supported substantial settlement at a later point. In this view, the most convincing archaeological markers of successful settlement post-dated the earlier parts of a long process of how the islands were found and settled.

If a small group of people discovered the Mariana Islands prior to the archaeological record of substantial settlement, then we might expect to see results of human-caused impacts in the fragile Remote Oceanic environment where no people ever had lived previously. Within the Marianas, evidence of environmental disturbance reflects intentional forest-clearing and other cultural activities (Athens and Ward 2004). Most important is a sudden appearance of inland forest burning about 1500 B.C., following several millennia of absolutely no evidence of forest-fires. These earliest impacts created a clear horizon within sediment columns that have been retrieved from lake-bottom and swamp-bottom deposits. Nearly all of these studies indicate dates precisely at 1500 B.C., but some interpretations have suggested the possibly of dates as old as 2200–2000 B.C. (Athens et al. 2004).

Dates as early as 2000 B.C. have been noted for the first sedentary populations in the Philippines (Bellwood et al. 2011; Hung 2008), and in principle this date could be entertained for the first discovery of the Mariana Islands. The Philippines-Marianas link is most convincingly diagnosed in a finely decorated pottery tradition, so far dated as early as 1800 B.C. but possibly earlier (Hung et al. 2011). The decorated pottery tradition in this case signifies a definite cultural practice, intentionally reproduced by the first Mariana Islanders by 1500 B.C., and it can be traced to its earlier source in the Philippines (Carson et al. 2013).

The Philippines-Marianas link is further attested in regional linguistic history, wherein the Chamorro language (native language of the Mariana Islands) split very early from a source in the Northern or central Philippines (Blust 2000, 2009a, b; Reid 2002). In this case, "very early" means just shortly after the Malayo-Polynesian groups in the Philippines began to differentiate from their even older homeland source in Taiwan (see Fig. 2.1). The split into the Chamorro language of the Marianas occurred early in the development of Malayo-Polynesian languages, prior to the set of changes that continued in the Philippines, elsewhere in Island Southeast Asia, and ultimately in the Oceanic-speaking communities of the Pacific (Blust 2009a). Most importantly, Chamorro is *not* an Oceanic (Oc) language, so its linguistic history differs from all other groups in Remote Oceania. Instead of grouping with the large-scale Oceanic-speaking population movement into Remote Oceania, the Chamorro linguistic history reveals a separate migration, coming directly from Island Southeast Asia at an earlier date than the Oceanic-speaking branching.

As in the linguistic evidence, studies of modern DNA suggest a "very early" split of the Chamorro population from a lineage in Island Southeast Asia (Vilar et al. 2013). In its present-day form, maternally inherited mitochondrial DNA (mtDNA) reflects a remarkably limited genetic pool for the native Chamorro people, compared to other island populations with notably more diversity, and it is dominated by a lineage not found anywhere else in Remote Oceania. Today, this peculiar mtDNA lineage is known only in the Marianas, the Philippines, and some parts of Indonesia. Although acknowledging important caveats about their work, the genetics analysts suggest that the Chamorro mtDNA lineage split from Island Southeast Asia about 120 generations ago, perhaps about 2000 B.C. if calculating 33.3 years per maternal generation (Vilar et al. 2013).

From multiple lines of inquiry, the evidence is mounting about an early settlement in the Marianas, and it marks by far the oldest known population movement into Remote Oceania (see Fig. 1.1). The archaeological material record indicates first Marianas settlement by 1500 B.C., but it may have begun slightly earlier as reviewed here. We surely can remain open to possible new findings that can convince us more strongly about earlier dating, but we also must remain aware of what the available evidence credibly can support.

Unai Bapot and other sites have provided the best evidence of early Marianas dating, yet the context of first settlement needs to be explored through more than just radiocarbon dating alone. We cannot fully comprehend the meaning of the early dates without also knowing about the natural environment and cultural setting. The Ritidian Site disclosed so far the most informative records of the environmental setting (Chap. 8). The House of Taga supplied so far the most detailed view of the cultural setting (Chap. 10).

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Chapter 10
Early-Period Material Culture at House of Taga in Tinian

Now after establishing the parameters of early-period Marianas environment and chronology (Chaps. 8 and 9), we can proceed with a full disclosure of the earliest material culture as documented at the House of Taga in Tinian. These voluminous findings come from 90 m^2 of excavation, so far the largest single contiguous archaeological excavation in the Marianas. No other site has provided such thorough detail of early-period material culture as we can see in the results from House of Taga.

We at last can examine a comprehensive view of the ancient artifacts and assess the total package as a reflection of the society responsible for producing the finely made pottery, stone and shell tools, and personal adornments. What do these findings tell us about the people who made and used these artifacts? What components of this assemblage were inherited from possible homeland locales in Island Southeast Asia, and what components were developed uniquely in the Marianas?

Project Development

The House of Taga is probably the most famous archaeological site in the Mariana Islands, and it survives as one of the most impressive megalithic architectural ruins of the Pacific (Fig. 10.1; see also Fig. 4.4). The site is named for its large stone pillars that once supported a house, mentioned in local legend as the house of a strong chief. The house itself disintegrated long ago, made of perishable wood and fibers that simply could not survive for long in the humid tropical environment. Today, the only enduring components are the limestone columns and capitals, locally known as *latte*.

The megalithic *latte* ruins at House of Taga are famous as the largest of their kind ever standing in the Marianas. They tower at 4 m in height, whereas most other *latte* stones stand less than 2 m high. The site was made famous to the world by Lord Anson's praising description, after his visit in 1742 (Barratt 1988). The site gained further distinction during the first known archaeological expedition in the region by Antoine Alfred Marche in 1887 (Marche 1982).

M. T. Carson, *First Settlement of Remote Oceania*,
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Fig. 10.1 House of Taga *latte* ruins in Tinian

Upon knowing that *latte* were built during the potential time range of A.D. 900 through 1700, this kind of site seems unlikely to hold evidence of first Marianas settlement as early as 1500 B.C. Excavation by Hans Hornbostel in the 1920s found a cultural layer associated with the surface-visible *latte* ruins (Hornbostel 1924). Spoehr (1957), specifically, was looking for deeper and older deposits, yet he found no older cultural deposit beneath the *latte*-associated layer at House of Taga. Spoehr (1957) triumphed in documenting a deeper layer with the earliest Marianas red-slipped pottery at other sites, but he did not find it at House of Taga.

The early-period deposit was found not directly at the *latte* ruins but rather farther landward. After Alexander Spoehr had departed the islands, his former field companion Father Marcian Pellett excavated about 30 m landward (north) from the *latte* at House of Taga (Pellett and Spoehr 1961). This location disclosed more than 2 m of stratified cultural deposits, where the lowest and oldest contained red-slipped pottery and several examples of finely decorated pieces. No radiocarbon dating was processed for the site at that time, but the deep deposit and early-type pottery were convincing of a date equal to the red-slipped and decorated pottery that Spoehr (1957) had dated about 1500 B.C.

Marcian Pellett's motivation for digging 30 m landward from the *latte* has become unclear to us today, but it could not possibly have been designed any better for learning about the earliest period of Marianas settlement. The location is precisely at the ancient shoreline where people lived prior to 1000 B.C., although now it has become buried deeply and stranded far inland. Just a few meters farther, either landward or seaward, the excavation would not have found the deep cultural deposit. When comparing the terse field report (Pellett and Spoehr 1961) with new discoveries at other sites, the deposit at House of Taga proved to be incredibly dense with pottery and other artifacts, richer than at any other early-period site reported ever since then.

For the last few decades, House of Taga has attracted considerable attention, not only as an icon of cultural heritage in its *latte* ruins, but also as one of the key sites where an early-period cultural deposit was waiting to be studied in full detail. A new excavation could provide the material basis for potentially re-writing much of the last 50 years of Asia–Pacific archaeological literature. The prospects grew intensively tempting over the years, especially with new advancements in radiocarbon dating and so many other aspects of archaeological science. Several research proposals were devised, yet somehow none were brought to fruition until now. We consider ourselves extremely fortunate for the opportunity to conduct the research presented here.

In July 2009, Hsiao-chun Hung and I visited House of Taga in Tinian, where we certainly were not the first to recognize the potential for learning about the earliest Marianas settlement period. Research already had progressed well at Ritidian and at Unai Bapot (Chaps. 8 and 9), and now House of Taga beckoned. Despite our fiery ambitions, months passed while we prepared our proposals for the necessary government permits and for suitable research funding. Our field investigation would need to wait more than 2 years, at last unearthing the buried layers of the site in December 2011, then again for an expanded effort in February–March 2013.

Thankfully, government permission was granted, through the historic preservation office (HPO) of the Commonwealth of the Northern Mariana Islands. Both the HPO and the Tinian Mayor's Office vigorously supported the research. This support was absolutely necessary for the project, and it fuelled a positive community event.

The community's involvement made our project more successful than we ever could have hoped. Government workers and local residents made substantive contributions each day (Fig. 10.2). We are indebted to the many people who carried bucket-loads of excavated sediment, helped us find small shell beads and fish bones in the fine-mesh sieving, shared their fresh foods and drinks, invented endless jokes, and engaged us in conversations about their cultural history and heritage.

Now that early-period Marianas research had gained great interest, the House of Taga funding was obtained through two sources. We were blessed to be part of a major grant from the Australian Research Council (awarded jointly to Peter Bellwood, Hsiao-chun Hung, and Marc Oxenham), for the purpose of studying ancient sites throughout Southeast Asia and also naming the Mariana Islands

Fig. 10.2 Excavating about 30 m landward of House of Taga, March 2013, with crew from Tinian Historic Preservation Office, Mayor's Office, and public community

within its broad scope. We additionally received our own research grant from the Chiang Ching-kuo Foundation in Taiwan (awarded to Hsiao-chun Hung and Mike T. Carson), specifically for the purpose of investigating the early-period site deposit at House of Taga.

Hsiao-chun Hung must be recognized for her essential role as coinvestigator of the research at House of Taga. While our full report is in preparation for the 2011–2013 investigations, the following summary is possible for now.

Framing the Excavation Findings

Our excavations targeted the terrain inland from the *latte* ruins at House of Taga (Fig. 10.3). In December 2011, we excavated a landward (north) area of 2 by 2 m (4 m^2) and a seaward (south) area of 2.5 by 7 m (17.5 m^2). The seaward area proved to contain the heart of the site, where we returned in February–March 2013 for expanding the excavation to more than 90 m^2 in total.

Today, the site is buried in part of a broad coastal landform, about 350 m from the present-day artificial land-fill of the harbor and 2–4 m above current sea level. In this location, deeply buried deposits (about 2 m) originally would have been within just a few meters of the shoreline 3,500 years ago.

Around the time when people first inhabited the Mariana Islands 3,500–3,000 years ago, the sea level was about 1.8 m higher than current conditions (Dickinson 2000, 2003). Knowing this former sea level was most important for understanding the context of the deeply buried deposits at House of Taga, as we already have seen at other sites.

Something about the setting at House of Taga diverged from the usual pattern of early-period Marianas sites. Most of the other known sites were situated on narrow beach fringes, positioned between a lagoon on one side and the base of a

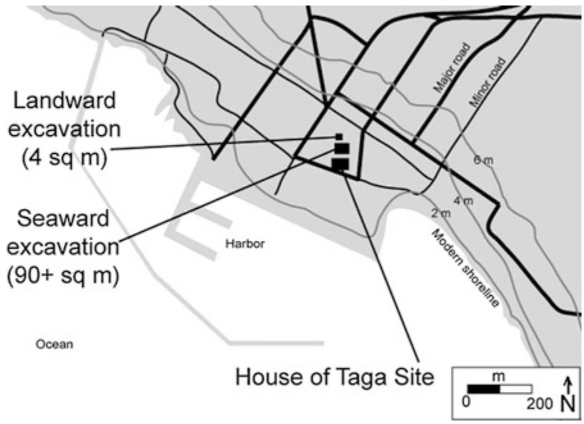

Fig. 10.3 Location of archaeological excavations, 2011 and 2013, landward of House of Taga

limestone cliff on the other side. The setting at House of Taga was noticeably different, along a gently sloping terrain without any imposing cliff-line.

We imagined that the broad coastal plain at House of Taga granted the first inhabitants easy access to inland forest resources, without climbing a limestone escarpment. We wondered if the setting supported stronger terrigenous soil development than could be found in a sandy beach deposit, with the possibility of preserving a different range of evidence than we so far have seen only in shoreline contexts.

Our new excavations found that the oldest cultural deposit indeed was within just a few meters of the ancient shoreline (Fig. 10.4). The site's first inhabitants found thin sediments overlaying a natural terrace of rough limestone. The shoreline zone preserved a dense habitation deposit, but the landward area contained only very sparse artifacts and midden.

Stratigraphy and Dating

Precise and confident dating was possible by combining stratigraphic ordering, artifact-based relative chronology, and radiocarbon dating. Attention to site stratigraphy and artifact typology provided a strong basis for relative ordering of the site sequence, and then radiocarbon dating secured absolute dating of specific points of interest.

Eight stratigraphic units were identified (Fig. 10.5), ordered from youngest (top) to oldest (bottom):

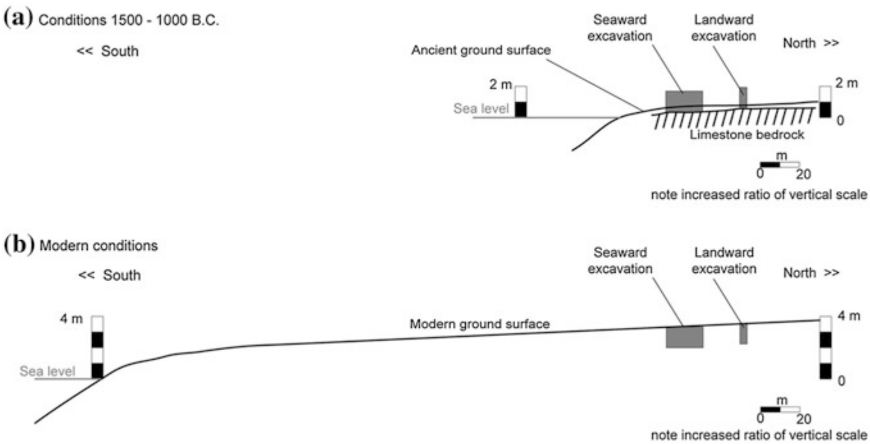

Fig. 10.4 Chronology of coastal development and habitation layers, vicinity of House of Taga in Tinian

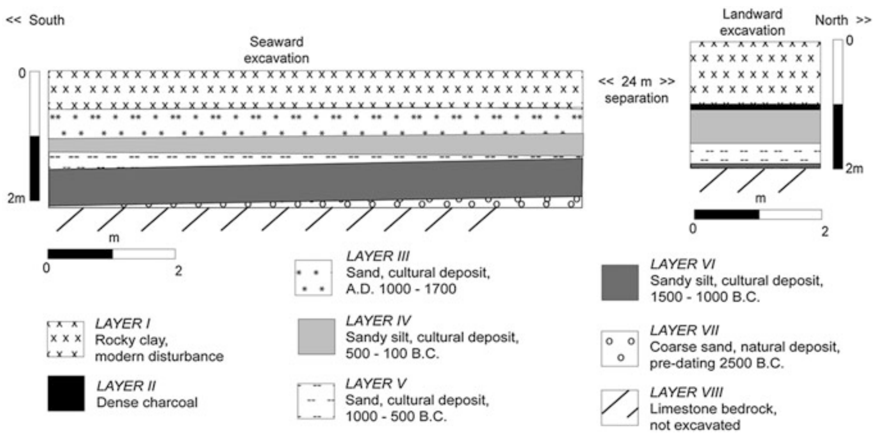

Fig. 10.5 Stratigraphic layers, House of Taga Site

Layer I: This rocky clay contains modern disturbance near the surface throughout the site area, apparently resulted from large-scale mechanical earth-moving. Among the broken and redistributed artifacts and midden, items such as bricks, concrete glass bottles, and high-fired ceramics date to the early through middle twentieth century.

Layer II: This thin layer of dense charcoal was found only in the landward (north) excavation area. It contains no artifacts or midden. It likely related to clearing and burning of rubbish in the area, followed by large-scale earth-moving of Layer I.

Layer III: A sandy layer disclosed artifacts, midden, stone-slab paving, rubbish pits, and burial features associated with *latte* period, dated approximately A.D. 1000–1700.

Layer IV: This sandy silt contained dense artifacts and midden, with a few pit features, dated approximately 500–100 B.C.

Layer V: A sandy layer contained diffuse artifacts and midden, a stone-slab paving, a rubbish pit, post-holes, and a small hearth, dated approximately 1000–500 B.C.

Layer VI: This sandy silt revealed the earliest cultural deposit of the site. Very dense artifacts, midden, cobble-boulder pavings, stone alignments, rubbish pits, post-holes, and hearths all date within the range of 1500–1000 B.C.

Layer VII: A coarse sand was the original beach surface prior to human occupation of the site. It was formed at least as early as 2500 B.C.

Layer VIII: This basal limestone bedrock by far pre-dates any human presence in the region, formed probably prior to 10,000 B.C.

Radiocarbon dating samples were obtained from Layers III, V, VI, and VII (see Table 4.1). Our research concentrated on the earliest habitation represented in Layer V, but dates from the other layers were important for cross-confirmation. In total, the dates provide constraint on the range of the earliest habitation in Layer VI.

Seven radiocarbon dates from clear structural features in Layer VI redundantly overlapped 1413–1371 B.C., so the first site-use occurred during this range or earlier. The individual dates suggest a few centuries of continuous cultural activity. The earliest date was 1616–1371 B.C. (Beta-316284). The two youngest were identical, 1413–1266 B.C. (Beta-313866 and 313867).

We conclude that Layer VI resulted from some centuries of habitation, approximately 1500 through 1000 B.C., followed immediately by habitation represented in Layers V and IV. After 100 B.C., the focus of coastal habitation shifted slightly apart from our excavation location, due to changing coastal ecology of that time. Within our excavation location, the next superimposed cultural habitation layer (Layer III) continued after A.D. 1000 and sustained through A.D. 1700, associated with the *latte* megalithic ruins visible today.

Individual Findings

The materials from this investigation were exceptionally numerous, due to the density of the cultural deposits within our large-format excavations. Most importantly, the seaward (south) area was so far the largest single contiguous excavation of an early-period site in the Marianas. Although impressively surpassing 90 m^2, this size in fact seems pitifully small when compared to the hundreds of square meters excavated in other parts of the world, but archaeologists in the Marianas and generally in the Pacific tend to work with just a few square meters.

Our new approach exposed arrangements of post-holes, pits, and other features within the deepest occupation layer (Fig. 10.6). These findings give us a new perspective on how to interpret specific activity areas within the site. We can address questions about what people did in certain locations, as well as how they related to each other.

Fig. 10.6 Post-holes, stone alignments, and other features in lowest occupation layer, House of Taga Site, shown in portion of 2013 excavation. Scale bar is in 20-cm increments

The features in Layer VI leave no doubt of a formal residential occupation of the site. The post-holes indicate the main supports of a stilt-raised house. The seaward (south) portion of the excavation probably was too close to the ocean for hearth features. The hearth features all were found in the landward (north) part of the excavation.

Pottery

The earthenware pottery in Layer VI consisted of a few forms of bowls, ranging 8–28 cm diameter, yet nearly all in the range of 10–20 cm (Fig. 10.7). Some portions of the vessel bodies were remarkably thin, about 1–2 mm or sometimes

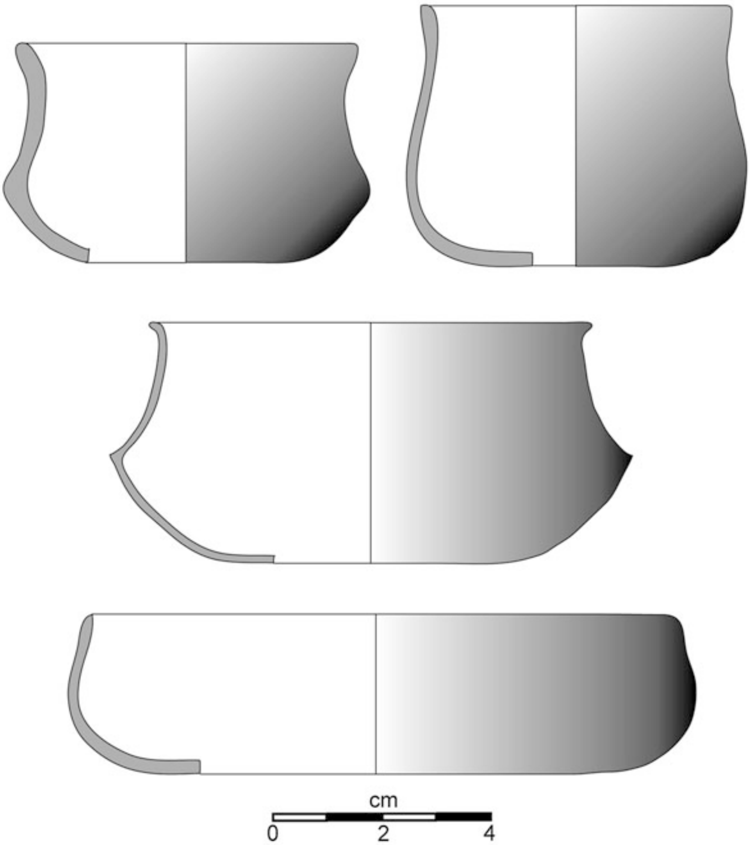

Fig. 10.7 Major pottery forms in lowest cultural layer, House of Taga Site

even thinner, although the portions near critical points tended to be as thick as 5–8 mm. Nearly all were red-slipped, and many were decorated with very fine point-impressed, circle-marked, and incised designs, highlighted by white lime in-fill. All pieces were composed of local clays with fine beach-sand temper inclusions.

Among the thousands of pieces of earthenware pottery, the decorated examples make so far the largest decorated collection from any early-period site in the Marianas, totaling more than 350 pieces. Previously, the largest collection was 143 pieces at the Achugao Site in Saipan (Butler 1994). The new findings greatly increase our comprehension of the pottery design system, especially now with dozens of large-sized pieces and re-joinable fragments.

In the current collection from House of Taga, at least four decorative expressions can be discerned: (a) paddle-impressed; (b) rows of circles; (c) lines of chevrons or garlands; and (d) detailed point-impressed zone-filling.

Paddle-impressed exteriors were found on simple open bowls that originally were about 20–25 cm diameter (see Fig. 6.6). At least 30 pieces showed this distinctive paddle-impressed exterior. In the pieces bearing paddle-impressed exteriors, no other decoration was evident, so that the paddle-impression was the sole decorative expression for these particular bowls.

Rows of circles formed a common artistic element, most often as single repeated circles and other times as overlapping circles (Fig. 10.8). Many of the circles were hand-drawn as seen in irregular shape and size, but others were made from a prepared stamp (presumably a plant stem) that created a perfect circle of standard repeated size. The circles were made consistently in horizontal rows at or above the carination, and sometimes they were made on the lip or rim. Those with overlapping-circle motifs tended to be on the smallest bowls of 8–15 cm diameter, whereas those with circles along the rim or lip tended to be the largest bowls of 20–28 cm diameter.

The circles demarcated rows above and below larger zones that sometimes (but not always) were decorated by other means. In this sense, the rows of circles create important components within larger patterns of zone-filling. Some of these were more complicated than others.

The simplest zone-filling was composed of angular chevrons extended above or below the rows of circles (Fig. 10.9). Sometimes, the lines were drawn in curvilinear fashion, resembling garlands. The garland-style design previously was labeled "San Roque Incised" by Butler (1994).

The more complicated zone-filling was made by point-impression, outlined by fine-line incisions, juxtaposed against areas of non-filled space (Fig. 10.10). These designs previously were labeled "Achugao Incised" by Butler (1994). These designs are restricted to the small upward-facing portion of bowls above the carination, evidently in small-sized bowls, generally 10–15 cm diameter.

Regarding the zone-filling with fine point-impression, these individual points were made by a type of toothed tool that gives the name "dentate stamping." Some of the points were round-tipped, but others were square-tipped. All were made in comb-like rows on the stamping instrument, pressed into the clay skin of the pot.

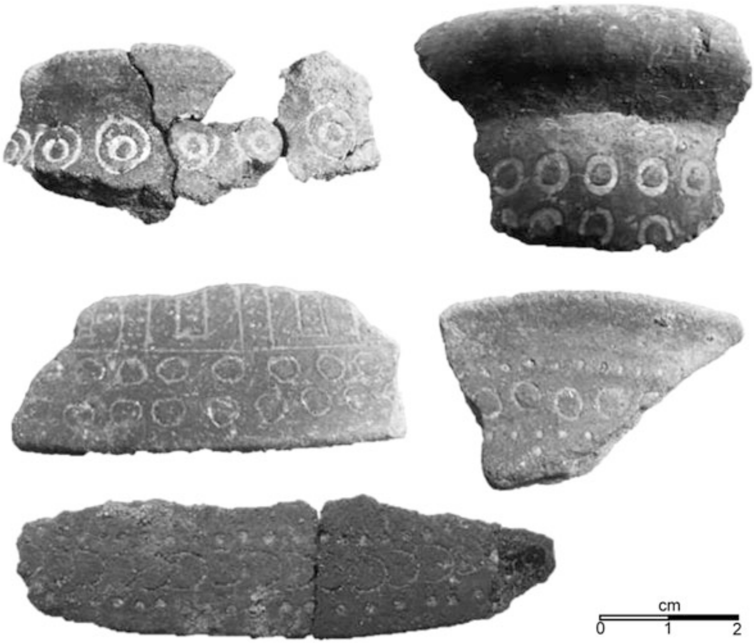

Fig. 10.8 Red-slipped and blackware pottery with *rows of circles*, highlighted by *white lime infill*, House of Taga Site

Cutting and Slicing Tools

Adzes were used for wood-cutting, made mostly of easily accessible *Tridanca* sp. (giant clam) shell and less commonly of volcanic stone. As usually is the case in the Marianas, the *Tridacna* shell adzes were made from the ventral-portion of the shell, except for one rare case of using the hinge-portion of the shell as found in Layer VI (Fig. 10.11).

Flaked stone pieces may have been chipped from larger formal tools, but nearly all showed signs of use-wear on their edges, evidently used for cutting or slicing (Fig. 10.12). Some of these flakes originally may have been attached to wooden handles of tools.

The raw material mostly was chert, but a few pieces were volcanic stone. Chert was more abundant in Layer VI than in later layers. Volcanic stone was most abundant in Layer III.

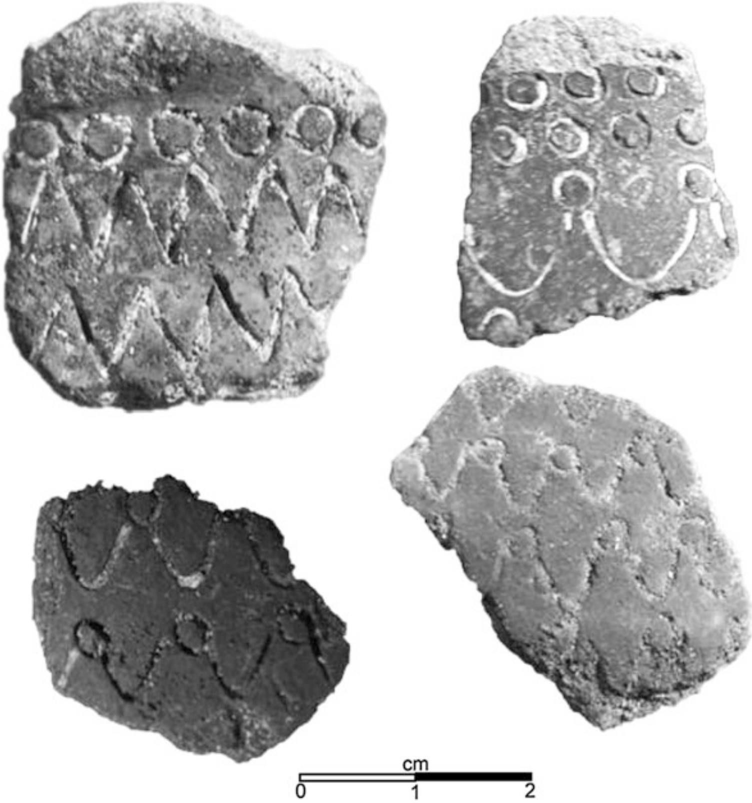

Fig. 10.9 Red-slipped and blackware pottery with *rows of chevrons or garlands*, highlighted by *white lime infill*, House of Taga Site

Fishing Gear

Fishing gear was evident in a few simple fishing hooks made of *Isognomon* sp. shells (Fig. 10.13), as well as abundant flaked debitage from these same shells. The hook shapes mainly were simple rotating hooks, suitable for angling-capture, but a few other rare shapes also were found. In many pieces, the *Isognomon* sp. shell taxon could be identified most easily by the diagnostic ligament attachment groove, but other pieces were more difficult to identify.

Shell Ornaments

Shell ornaments included beads, bracelets, and pendants (Fig. 10.14). Nearly all were made of *Conus* sp. shells, most clearly known in the unfinished pieces that were discarded during various stages of manufacture. In addition, some of the

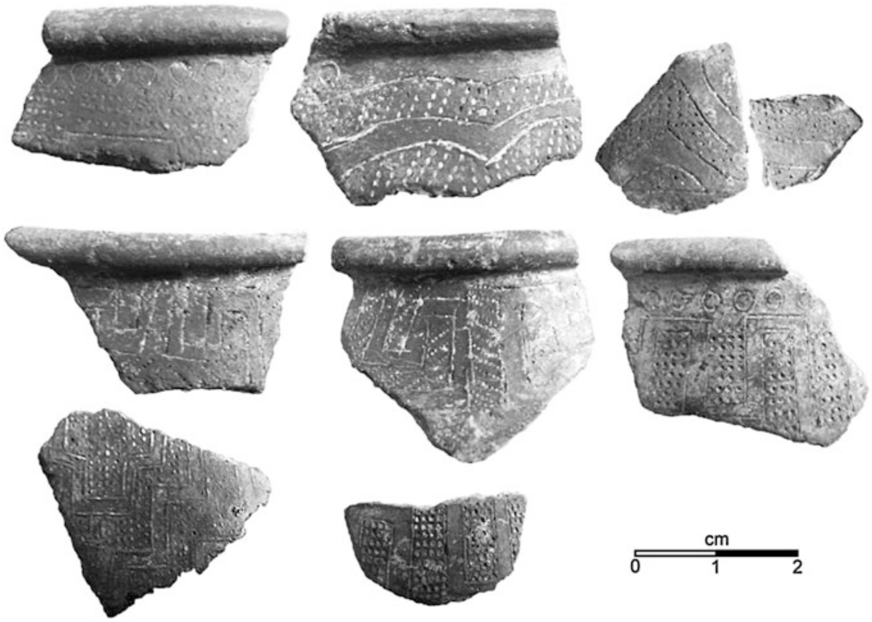

Fig. 10.10 Red-slipped and blackware pottery with *dentate-stamped*, *zone-filled patterns*, highlighted by *white lime infill*, House of Taga Site

items described above as possible fishing gear perhaps may have been parts of ornaments.

Bracelets were made of cut and polished *Conus* sp. shells. The particular species were much larger than for the beads described above. Their stratigraphic distribution was most abundant in Layer VI and then diminishing sharply thereafter.

The most numerous beads were made of cut and polished *Conus* sp. shells. These were most abundant in Layer VI, less common in Layer V, and nearly absent in Layers IV and III. These likely were strung together in necklaces or other strands, possibly making patterns when juxtaposed with other materials.

A rare form of bead was made of *Cypraea* sp. shell. The only examples were found exclusively in Layer VI. They may serve as a good chronological marker of the early period. An exact usage is unclear at this time, perhaps different from the probable necklace-strands of the *Conus* sp. shell beads.

An extremely rare bead type was made of an unknown pinkish material. Only two examples were found, both in Layer VI. The drilled holes curiously were not drilled horizontally through the material, but rather they were drilled transversely at an angle that seems unusual when trying to imagine how the beads may have been suspended on a string.

Rare pendants were made of *Conus* sp. shells, sometimes using the natural coloring as part of the artistic output. These items were found only in Layer VI and in no other stratigraphic association. They possibly were suspended from necklaces of smaller *Conus* sp. shell beads.

Fig. 10.11 Adze made from hinge portion of *Tridacna* sp. shell, House of Taga Site

Fig. 10.12 Chert flakes, House of Taga Site

Fig. 10.13 Fishing hooks, House of Taga Site

Fig. 10.14 Shell ornaments, House of Taga Site

Cross-Regional Comparisons

The archaeological findings at House of Taga grant a treasured close look at early-period settlement in the Marianas. The discoveries tell us about the lives of the first settlers, as well as about their ancestral homelands. As the first people ever to live in the extremely remote Mariana Islands, these settlers must have brought their traditions and skills from somewhere. What can we learn about their origins, and what do these findings teach us about larger patterns in Asia–Pacific settlement?

Most important for cross-regional comparison was the unprecedented large number of decorated pottery pieces from the oldest cultural layer at House of Taga. Pottery holds a multitude of information about the cultural contexts in which it was made, designed, and used. We now can define the details of technical execution and artistic style, with enough confidence to propose links with pottery traditions known in other regions.

The pottery vessel forms, use of red slip with white lime in-fill, and choice of decorative motifs all point to an origin in the Philippines, at sites dated at least as early as 1800 B.C. (Hung 2008; Hung et al. 2011). A clear subset of this style appeared with the first settlement sites in the Marianas, including the House of Taga Site, about 1500 B.C. Another subset, plus important new embellishments, appeared in the earliest Lapita-style pottery found the Bismarck Archipelago, at sites dated around 1500–1350 B.C. (Summerhayes 2007).

Marianas settlement occurred independently from Lapita, but both were associated with the same shared ancestral pottery-making tradition (Carson et al. 2013). We can envision the Marianas settlement as an outlying extension from the Philippines, where the pottery design system was duplicated in a limited bottleneck subset and with only a few unique local inventions. By comparison, Lapita designs in the Bismarcks were considerably more elaborate, possibly related to signaling of cultural identity where different groups of people met in the multicultural setting of Near Oceania (Summerhayes 2000a, b).

In a full-scope of cross-regional comparison, we must note that certain important items were found in other regions that were entirely absent at House of Taga and other early-period Marianas sites. These "missing" items included foreign-import animals (pig, dog, chicken, and rat), certain forms of ear-ring jewelry, spindle whorls for spinning cloth-yarn, and bark-cloth beaters. These items were important in other culture areas of the same age and even much earlier than 1500 B.C., so their apparent absence in the Marianas deserves more study. The large-format excavation at House of Taga did not find any such items, and we now need to consider that they probably never were present in the ancient Marianas sites.

Life in the Mariana Islands differed from anything experienced by any other human beings at 1500 B.C., for the first time bringing human life in truly remote and small islands. Some things may have been important in the ancestral homeland, yet they were impractical or impossible in the new setting of the Marianas. Moreover, the limited number of people in the founding Marianas population probably did not possess the full range of knowledge and skills of the homeland's population. We can imagine that pigs, dogs, and other animals may not have survived the journey. We do not know if anyone at that time was prepared for transporting large amounts of viable plant-food crops across more than 2,000 km of open ocean.

We can look at the Marianas pottery as a good example of a subset of the homeland's cultural repertoire, applied to a new setting in the Marianas in limited form but with some new modifications. The same founder-effect pattern is noticed in the Marianas material culture overall. Much the same can be said of the linguistic history, as well (Blust 2000; Reid 2002).

The evidence so far points to a Philippines origin for the first Marianas settlers, but we cannot pin-point the source. Was the founding Marianas population pooled from a few different villages in the northern and central Philippines? Could some of these people have been recruited from elsewhere, outside the Philippines, for their valuable skills in long-distance voyaging or in remote-island survival? We probably never will answer these kinds of imaginative questions, but they help us to build stronger conclusions about the known facts.

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Chapter 11
Conclusions and Implications of Earliest Marianas Sites

The earlier chapters of this book have been building toward a new synthesis of early-period Marianas settlement. Within the centuries 1500–1000 B.C., an epic adventure took place, in the process of the world's first contact between human society and the Remote Oceanic environment. What was involved in making this unprecedented undertaking into a reality? What were the implications for the larger trends and patterns in both natural and cultural history? The answers are embedded in the material records of the oldest archaeological sites, deeply buried, and long forgotten in the Mariana Islands, only now gaining a voice in our modern scientific discourse.

Early Marianas settlement has been frustratingly questionable for decades, ever since Spoehr (1957) first noticed its traces in stratified deposits. The site settings and contexts were unclear, dating was problematic at best, and the associated material artifacts were documented only vaguely. Nonetheless, just enough shreds of evidence were available to capture some interest, although they were far from convincing.

Dates of 1500 B.C. for Marianas settlement were incomprehensible in the minds of many archaeologists, including myself, who considered early Marianas musings easier to dismiss than to accept. We all learned that Lapita pottery in the Bismarck Archipelago was the harbinger of Remote Oceanic settlement that progressed in orderly fashion through Southern Melanesia and West Polynesia, then eventually to other remote Pacific Islands (see Fig. 1.1). Contrary to this established outline, an earlier dating in the Marianas would have constituted the first settlement of Remote Oceania, separate from Lapita and over a much longer ocean-crossing. How could that have happened at an earlier date? Moreover, how could the dentate-stamped pottery in the Marianas have pre-dated Lapita, unless this tradition can be traced even farther back to an origin in another ancestral homeland? If these findings could be validated, then do we need to redefine our concepts about Remote Oceania and about Lapita as the foundation of Remote Oceanic society?

After some years of sustained effort, we now can answer the basic questions about the oldest site settings, their dating, and their material contents. We now have definitive case studies for illustrating each of these points, including Ritidian

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for site setting and context, Unai Bapot for earliest dating, and House of Taga for details of material culture repertoire. These results allow fuller comprehension of what previously has been incomplete, questionable, or ambiguous in other site records.

As often occurs in incremental knowledge-building, the answers to baseline questions serve as platforms for launching other questions. Where was the homeland of the first Mariana Islanders? How did these people manage their long distance ocean-crossing, unprecedented at their time in human history? What happened during this first contact between human beings and the Remote Oceanic world?

Site Settings

Of the known early sites, each occupied a shoreline adjacent to a coral reef and lagoon, near a swampy or mangrove zone, and also with access to inland forested terrain. These environmental characteristics existed in several places, yet only some but not all of them have yielded evidence of earliest habitations, including three in Guam (Mangilao, Ritidian, and Tarague), two in Tinian (House of Taga and Unai Chulu), and three in Saipan (Chalan Piao, Unai Bapot, and Achugao). What choices did people make when selecting these sites for the earliest habitations in the Mariana Islands?

Additional early sites may yet be discovered, but so far their spatial distribution suggests intentional separation of distance between each habitation. Adjacent to each known site, other coasts with much the same attractive natural resources have shown no signs of habitation until several centuries later. Could the uninhabited zones have been maintained intentionally for gathering resources, for social buffers with neighbors, or other reasons? Was it simply a matter of a small founding population, dispersed in a few scattered communities without completely filling all available space?

Whatever were the actual reasons for selecting the individual sites for habitation, one of the outcomes involved access to broad sets of natural resources for each of these earliest communities. People most often worked with the resource zones in the immediate vicinity of the habitations, but we know that people accessed farther locales as well. People obtained chert and volcanic stone for fashioning tools, clay for making pottery, and supplies of timber and birds from the interior forests. The daily experience of most people, however, stressed repeated activities within and near the coastal areas, close to their homes.

In one view, the uninhabited zones were just as important if not more important than the inhabited sites. The large areas of abundant resources allowed earliest populations to flourish without constraints that eventually would manifest much later in crowded territories. During the first centuries of Marianas settlement, people accessed the inland terrain, coasts, reefs and lagoons, farther deep waters, and even entire islands where nobody else was living at that time.

The evidence points to deliberate targeting of certain shoreline niches, with the ability to access much broader resource zones. The earliest settlements certainly were coastal communities, where people lived in daily interaction with the shore. Probably every person grew up collecting shellfish, watching the tidal changes, knowing about the fish and other animals in the reef and lagoon, and learning about the trees, birds, and lizards in the fringes of the dense tropical forests. Opportunities probably were more restricted for people to venture into the deep waters outside the reefs and lagoons, and even rarer still for expeditions beyond the sight of their home-coasts. Similarly, forays into the deeper inland jungles probably did not happen every day for every person.

For the people coming to the Mariana Islands about 1500 B.C., their available coastal habitats offered narrow beach fringes, often near swampy environs. Soon thereafter, their coastal homes were vastly transformed, as the sea level lowered, coastal plains enlarged, mangroves and swamps were filled, and the total ecosystems underwent major change. The oldest sites eventually became buried deeply under more recent sediments and stranded far inland from the newer shorelines.

During a period of higher sea level, the same kinds of narrow beaches and swampy environs of the Marianas were targeted by coastal communities in Thailand (Boyd 1998; Higham 2002) and in China (Rolett 2012; Rolett et al. 2011; Stanley et al. 1999). To a large extent, the similarity in site setting was due to natural environmental conditions of the time. Other options simply did not exist prior to 1000 B.C. and probably not until the first few centuries A.D. Nonetheless, the coastal dwellers of the broader region prior to 1500 B.C. had learned to live in the conditions as found in the earliest Marianas sites.

Did the first Marianas settlers seek locales where they could most easily continue a lifestyle similar to their experience in a distant homeland? We will return to this theme soon, but of course the Mariana Islands were remarkably remote and small islands, unlike anything so far experienced by people at 1500 B.C. If people were seeking a familiar setting, then they found it only in a miniature and isolated version in the Marianas.

Early Dating

Much of this book centers around dating of the first settlement in the Mariana Islands around 1500 B.C. Dating is in fact slightly older at Unai Bapot in Saipan. Other hints of pre-1500 B.C. dating are found in historical linguistic comparisons, as well as in the beginning tail-ends of radiocarbon calibrations at certain sites. Future research may yet validate these possibilities, but for now we can be confident that people lived in the islands by 1500 B.C.

What makes this early dating so important? In 1500 B.C., settlement in the Mariana Islands required the longest ocean-crossing migration that the world had seen at that time, more than 2,000 km from any other inhabited area. It marked the first time that any human beings crossed from the shores of Island Southeast Asia and the close-packed islands of "Near Oceania" into a new world of "Remote Oceania" with its small and widely separated islands. The next long distance ocean-crossings in the Pacific would occur some centuries later and over shorter distances. Only after some thousands of years would people eventually conquer even longer voyaging in the Pacific.

Now we can place great confidence in the early dating, several other questions spring to mind. What motivated anyone to make this voyage? These people must have come from somewhere, but where was it? If the Marianas settlers were the first human beings ever to inhabit Remote Oceania, then what can their ancient material records tell us about this precious moment in human history? For answering these questions, we first need to define the material culture of the first Mariana Islanders, so that we can know more about their daily routines and practices, their overall lifestyle, and what these findings signify toward our larger questions.

Defining Early-Period Material Culture

The archaeological record reveals only the most durable aspects of past human behavior, so we do not know the complete story of what people did or how they behaved. Despite these limitations, we know at least a few important points about the first centuries of settlement in the Marianas:

1. People lived in post-raised houses close to shorelines.
2. They made and used distinctive forms of pottery, stone and shell tools, fishing gear, and personal ornaments.
3. These same people discarded dense middens composed mostly of shellfish remains, with fair amounts of bones from fish, birds, and turtles.

These observations leave no doubt that the first settlers in the Mariana Islands lived in sedentary coastal communities, although they certainly incorporated a degree of mobility and far reaching resource-catchment into their lifestyle.

The artifacts in the earliest sites are most striking for appearing as a fully developed assemblage from the very beginning. The pottery was finely made and with a distinguished decorative style. Shell beads and ornaments were fashioned in a variety of forms, made by people with expert crafting skill. For making stone tools, raw materials were quarried from particular geological sources that must have required specialized knowledge for their identification and extraction.

The first settlers brought their knowledge and skills from a homeland that was at least 2,000 km distant from the Marianas. They did not spontaneously invent an entire material culture assemblage and way of life. Even so, these people did not replicate everything from their homeland in total, and they surely invented their own respectable share of new traditions.

Tracing Origins

In the Marianas, just like all of the remote Pacific Islands, the first people must have migrated from elsewhere. The homeland cannot be known precisely at the scope of an individual location or village, but certainly it included the northern or central Philippines. What makes us so sure of these parameters?

According to the archaeological evidence, the first Mariana Islanders came from a place where people made red-slipped pottery with a set of distinctive dentate-stamped and circle-stamped designs prior to 1500 B.C. Looking in the closest neighboring regions, we know that the only pottery of any kind prior to 1500 B.C. was made in the Philippines and a few parts of Indonesia. Lapita pottery appeared in the Bismarck Archipelago (east of New Guinea) slightly later. People manufactured pottery much earlier in Taiwan and still earlier than that in Mainland China, but these locations are too distant for the direct homelands of the first Mariana Islanders.

Historical linguistic studies are very clear that the native Chamorro language of the Marianas split from a source in the northern or central Philippines (Blust 2000, 2009a, b; Reid 2002). The founding of a Marianas linguistic community post-dated an earlier split from distant ancestry in Taiwan, but it was roughly equal in time with several separate linguistic developments in other communities of Island Southeast Asia (see Fig. 2.1). It also necessarily pre-dated the development of Oceanic-speaking language communities in the Pacific region.

Just with the pottery evidence alone, plus corroboration from linguistics, we can refine our search to the Philippines and possibly a few parts of Indonesia (Bellwood 1997; Bellwood et al. 2011), but the decorative style of the Marianas so far has been found only in the northern and central Philippines (Hung 2008; Hung et al. 2011). Related variations of these decorations appeared slightly later in Indonesia, post-dating 1500 B.C. (Simanjuntak 2008). We further can add the weight of evidence that pottery-making groups first settled in the Philippines by 2000 B.C., then spread south to Indonesia starting perhaps as early as 1700 B.C. but certainly by 1500 B.C. (Bellwood et al. 2011).

The evidence reveals a trail of migrations, first from Taiwan to the Philippines, then from the Philippines into a number of other places, including the Mariana Islands (see Fig. 1.1). The migrations are attested in historical linguistic studies as noted above, but the dates and hard evidence of the pottery trail come from archaeology (Carson et al. 2013). This series of events very well could explain the modern distribution of DNA lineages of the region, wherein the Mariana Islanders appear unique versus all other Pacific Islanders, yet their lineages are linked most closely with populations now living in the Philippines and parts of Indonesia (Vilar et al. 2013).

Marianas settlement by 1500 B.C. resulted from a radiation of populations outward from the Philippines. At a time when people were exploring for new territories in a number of directions, the Mariana Islands eventually were discovered and populated. The easiest migration routes followed coasts and nearsighted islands in the Philippines and Indonesia, but one extraordinarily different route brought people to the remote Mariana Islands. We can further see the arrival of Lapita pottery-makers in the Bismarcks as another extension of this same out-migration, also following coasts in this case through Indonesia and then along northern New Guinea, slightly after 1500 B.C.

Were the first Mariana Islanders the ancestors of the Remote Oceanic world? Indisputably, they were the first people to live anywhere in Remote Oceania, but curiously all other Remote Oceanic settlement occurred some centuries later and under different circumstances. The Lapita-associated communities in both Near and Remote Oceania developed with Oceanic-speaking language histories, entirely different from the situation in the Marianas and requiring a separate migration through Indonesia (Blust 2009a). These same Lapita communities possessed domesticated animals of pigs, dogs, and chickens that were missing in the Marianas (Wickler 2004), so a different route must have been used for transporting this important cargo.

If Marianas settlement contributed to the founding and spread of Lapita communities, then this contribution has gone unnoticed in the surviving archaeological and linguistic records. Chronologically speaking, Mariana Islanders could have made contact with communities in the Bismarcks or elsewhere, during the formative years of Lapita communities in Near Oceania, but they may not have made a significant impact biologically, linguistically, or culturally in this very different setting of long-established multi-cultural communities in Near Oceania. The complete "Lapita Cultural Complex" could not have derived solely from the Marianas, but rather most of its identifiable components can be traced back to the same Philippines source that launched the settlement of the Mariana Islands (Spriggs 1997, 2007). Other components of Lapita developed from local sources in the Bismarcks and neighboring Near Oceanic communities, necessarily with no links whatsoever to potential origins in the Marianas or anywhere else (Green 2000).

A shared ancestry is evident for the first Mariana Islanders and Near Oceanic Lapita communities, much like separate branches growing from the same tree, but the Marianas settlers were the first people ever to inhabit Remote Oceania. The Marianas branch grew earlier and over a longer distance than ever was the case for Lapita. If we still want to think of Lapita as the founding ancestor of the Oceanic world, then we need to clarify that Lapita was not the base of the tree, but rather it was part of a later branch of this tree. Meanwhile, another branch already had extended to the Mariana Islands.

Long-Distance Migration

What caused the out-migration from the Philippines? Different individuals probably could list a number of motivations, such as seeking less crowded lands, avoiding economic hardships, escaping social or political conflicts, pursuing ideological or religious freedom, or simply preferring a different lifestyle. For whatever reasons, around 1500 B.C., several groups of people were migrating and establishing new communities in distant lands, including the most distant of all in the Mariana Islands.

The first Marianas settlers may have shared much in common with other migrants of their era, except that they made a startlingly long-distance ocean-crossing. At their time, they made the longest ocean-crossing migration in human history. Did they intentionally seek this unprecedented isolation?

The first Marianas settlers may not have been seeking isolation per se, but they certainly targeted coastal habitats with access to specific resource-zones on land and at sea. These prospects naturally were most abundant in uninhabited territories, such as could be found in the Mariana Islands if only people could reach these remote islands in the first place. Meanwhile, the world of Island Southeast Asia rapidly was filling with coastal communities ever since the arrival of sedentary populations, at least as early as 2000 B.C. (Bellwood et al. 2011).

If people in the Philippines (or elsewhere in Island Southeast Asia) were seeking uninhabited coastal zones, then all directions of searching would pass through lands of long-established communities, except of course in one direction across the ocean leading to the remote Mariana Islands. Prior to 1500 B.C., several groups of people already were living throughout the Philippines, Indonesia, New Guinea, and eastward into the Bismarck Archipelago and the Near Oceanic Solomon Islands (Spriggs 1997). Such was the extent of the "known world" at that time, safely within the navigable coasts and seas of Island Southeast Asia and Near Oceania. Indeed, populations had been established there for many thousands of years, but none had yet crossed the boundary to live in the Remote Oceanic world.

The ocean-crossing to the Marianas can be understood as an exceptional feat within a larger tradition of waterborne voyaging in the Asia–Pacific region. Prior to 1500 B.C., people generally followed coastlines and made short-distance crossings to other islands, all less than 350 km and mostly less than 90 km (Bellwood 2007; Irwin 1992, 1998). The geographic configuration of Island Southeast Asia and Near Oceania greatly supports this kind of coastal-oriented mobility, where several islands are packed closely together, each with numerous inhabitable coastal zones. Some of these areas may have encouraged new developments of sea-going voyaging skills, sometimes called "voyaging nurseries" (Irwin 1992). Additionally, some people may have been more comfortable at sea than on land, such as the sea nomads or "sea gypsies" who lived in inter-connective symbiosis with coastal communities in Island Southeast Asia (Chen 2002; Sather 1995).

The early Marianas settlers may not have been seeking islands at all, but rather they were seeking coastal habitats with productive resources, connections to interior lands, and connections with the sea. In the Mariana Islands, they found an idyllic setting, where no other people had been living, but it came at the cost of an incredibly long ocean-crossing and isolation from the rest of the known world.

Although very much isolated, the position of the Marianas could be coordinated with navigation knowledge of the inhabited realms of Island Southeast Asia and

Near Oceania. A canoe leaving the Marianas could reach the Philippines in about 2 weeks, traveling with prevailing winds and currents, as has happened repeatedly in historic and modern times. The major challenge, however, was making the voyage to the Marianas against these winds and currents, necessarily requiring long "tacking," possible way-stations during the long journey, waiting for seasonal wind-changing, or some combination of these strategies (Horridge 1995; Irwin 1992). Any voyage either to or from the Marianas must have been rare, but for sure the voyage occurred at least once.

For the details of how the long-distance voyage was performed, we never will know precisely what happened, because the inherently incomplete archaeological record cannot bring this kind of information to life. Without any doubt, real people made this voyage, and their journey required sea-worthy sailing craft and remote-distance navigation skills. The basic pre-requisites existed in Island Southeast Asia, perhaps more prevalent in some communities than in others, such as in the voyaging nurseries or in contact with sea nomads.

Considering that the Mariana Islands were settled in a few different communities by a viable population and with a full cultural repertoire, the long-distance migration in all probability occurred intentionally. Whether in a single ambitious outing or following reports from other far-ranging adventurers who lived to tell their tale, the first Mariana Islanders brought with them enough people, knowledge, and skills to establish a healthy biological population and a set of cultural traditions.

The first canoes reaching the Marianas surely held talented sea-voyagers, but they were not alone. At least some of the voyagers were experienced in other fields, such as pottery-making, stone tool-production, shell jewelry manufacture, house-building, cooking, and more. The same repertoire of skills was repeated at each of the earliest sites.

The material record of earliest Marianas sites indicates several people with specialized skills, living in at least eight separate communities in three different islands. An exact number of people cannot be known, but the population likely numbered at least in the hundreds. The demographic base presumably grew noticeably within just a few generations.

Among the first Mariana Islanders, some of these people came from homes in the Philippines, where they had learned the crafts of making red-slipped pottery with a distinctive decorative style, presumably for a specific cultural purpose that was replicated in the Marianas. Their language became the primary mode of speech among the next generations. Other people in the first colonizing parties potentially came from elsewhere, possibly even including nomadic sea gypsies, but these imaginative ponderings are not at all provable today. Ultimately, the backgrounds of the first settlers merged in a new cultural identity in the Marianas.

First Contact Between Humanity and the Remote Oceanic Environment

The epic adventure of Marianas settlement involved not only the long-distance voyage but also the survival of a group of people in a strange and distant land where nobody else had lived previously, in the small and remote islands of the Pacific. For the first time in human history, people lived in the region known as Remote Oceania. These people did what nobody else had done before or would do again elsewhere for another few centuries. They further experienced the natural world in a way that very few other human beings ever have known.

In addition to the social isolation, Remote Oceania imposed physical limits on human settlement because of the limited range of natural plants and animals. Most important for human biological nutrition were the plants. Fish, shellfish, and other coastal resources were plentiful, but the islands of Remote Oceania did not offer the same kinds of plant foods that people otherwise found in copious quantities in Island Southeast Asia and Near Oceania.

Life-sustaining crops like taro, yam, and banana necessarily were imported across the ocean, requiring some fore-planning and not always effective. After some weeks at sea, the tender seeds, fruits, nuts, seedlings, cuttings, and sapling may not have survived with enough strength to take root and grow in good health. Coconut palms probably existed naturally in the Marianas, but people manipulated them in favor of larger sized nuts. Other crops necessarily took some time to mature, and probably not all of these experiments met success at first. After all, nobody in human history so far had achieved such an extreme undertaking, and perhaps nobody yet had attempted it.

One of the almost unbelievably good fortunes in the Mariana Islands was a native species of seeded breadfruit, *Artocarpus mariannensis*, that could provide high levels of starch, vitamins, and minerals absolutely critical for human survival in Remote Oceania. This species is not known to exist naturally anywhere else, except possibly in Palau (Zerega et al. 2004, 2006). Breadfruit taxa in all other cases were imported into Remote Oceania. Did the first Marianas settlers know how lucky they were to find a native species of breadfruit in this extremely remote location? Was this factor somehow part of the reasoning for settling in the Marianas and not in any other of the remote Pacific Islands?

When the first Marianas settlers found these seeded breadfruits, then they may have found their saving grace in their strange new land. If they knew how to preserve the annual yields of fruits in fermented pastes, as was practiced elsewhere in the Asia–Pacific region, then they could ensure the survival of themselves and future generations. Curiously, historical records and modern observations reveal no such fermentation of breadfruit in the Marianas, although Safford (2009: 189) reported that slices of baked breadfruit were dried and stored for as long as “one breadfruit season to another.” If at least some edible supply was available, perhaps just seasonally, then other efforts could continue slowly but surely for establishing healthy crops of additional fruit-bearing trees and edible root-tuber plants.

By comparison to Lapita settlement in Melanesia and Polynesia, the first Marianas settlers did not import nearly the same amount or diversity of plants and animals into their new remote-island homes. They likewise did not create the large-scale impacts on native forests, birds, and overall environment as was seen in the Lapita movement into Remote Oceania. Native birds were massively depopulated in the Lapita-settled islands (Steadman 1995), but so far the earliest Marianas sites have yielded only modest amounts of bird bones and no hint of the devastating avifaunal extinction horizon as was common elsewhere. Similarly, impacts of introduced animals were entirely absent in the Marianas, where people brought no domesticated animals with them, and where invasive rats were excluded until perhaps A.D. 900–1000 (Wickler 2004).

The most vital imports into the Mariana Islands were the first people themselves. While they learned how to survive in their new environment, they were in essence an invasive colonizing species. They brought definite impacts on the natural environment, but they equally were affected by the natural world. Human beings are noted for their ability to adapt, but we must remember the power of nature.

The oldest Marianas sites give us the material evidence of an extremely rare event, when people lived in a truly pristine environment previously untouched by any other human beings. If the first Marianas settlers perceived their new home as a divine paradise, then it soon became a "paradise lost" as the landscape underwent irreversible transformations. In other ways, it was a "paradise gained" when this true wilderness was rendered into a habitable landscape with homes, families, fishing-zones, favorite places for collecting shellfish, croplands, managed forests, recognizable landmarks, and new names and stories attached to each place.

The archaeological sites of the Mariana Islands do not reveal dreamy tales of an idyllic bygone era, but rather the hard evidence makes us wonder how people possibly could have survived their trials and tribulations. Exactly during the years of adapting to their new environment in their preferred coastal niches, the first Mariana Islanders found that their coastal habitats were transforming due to a lowering sea level. The ecological change was amplified by the cultural harvesting of certain shellfish and other resources. The people could do nothing at all to prevent the loss of their chosen habitats, so their only option was to adapt as human beings are so well capable of doing.

The first centuries of human-environment contact in the Marianas brought indelible changes to both the people and the islands. The people survived, but later generations eventually would follow a new lifestyle and live in a transformed world almost entirely alien to the experience of the first settlers. Likewise, the island environment evolved substantially, but of course it continued to exist and to accommodate human life.

Future Considerations

The opening chapter of this book described early Marianas settlement as one of the paramount adventures in human history, when people conquered the threshold of populating the last inhabitable lands on earth in Remote Oceania. Unlike classical myths and fairy-tales of heroes exploring the limits of the world, often with help of divine gods, the story of early Marianas settlement is made of scientific data, assembled from the material archaeological record. The story is told from long-abandoned fragments of broken pottery and other discarded items, only just now speaking to us in a way that we can understand.

We now can speak with total confidence about a group of people who somehow crossed more than 2,000 km of deep ocean and established new communities in the remote Mariana Islands, at least as early as 1500 B.C. if not earlier. We know that these people perpetuated a distinctive style of decorated pottery, as well as a spoken language, inherited from a homeland source in the northern or central Philippines. We further know that these first settlers experienced an untouched natural world and adapted to its ongoing transformations.

Despite the fact-based confidence of this story, its details inevitably will be improved with future research. The fundamentals of site settings, dating, and material contents at last are known securely, so now other questions may be addressed productively. New investigations, especially in larger format excavations, very well could recover more information about the shapes of houses, organization of activity areas, and relationships among households of the original communities. Perhaps entire sites will be discovered in places that we have not yet imagined. New scientific techniques conceivably will allow better precision of dating, and finer recovery of tiny (perhaps even microscopic) materials potentially will change our perceptions of the earliest sites.

The facts of early Marianas settlement force a revision of the last few decades of Asia–Pacific archaeology. We now can accept Marianas settlement by 1500 B.C. as the first peopling of Remote Oceania, separate from the Lapita phenomenon in Melanesia and Polynesia, at an earlier date, and over a longer migration distance (see Fig. 1.1). The findings in the Marianas expose deeper origins, with direct links to an ancestral homeland in Island Southeast Asia, effectively bringing Asian and Pacific archaeology into a closer union. These cross-regional connections surely will support a number of new research questions, previously not considered, for example as shown in tracing the pottery-trail from Southeast Asia into the Pacific (Carson et al. 2013).

Early Marianas settlement no longer represents an anomaly to be scrutinized or dismissed, but rather it opens new opportunities. We can embrace more holistic cross-regional views, and we can pose new questions. The contents of this book resurrect the forgotten tale of an epic adventure in human history, and we can look forward to new discoveries.

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