PEVA: THE ARCHAEOLOGY OF A VALLEY ON RURUTU, AUSTRAL ISLANDS, EAST POLYNESIA

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A study such as this has naturally involved the work of many people, directly and indirectly. However, it owes its entire existence to Pierre Vérin, Professeur et Président Honoraire of the Université Française du Pacifique, and the first archaeologist to work on Rurutu in the 1960s. It was Pierre who suggested to me in 2001 that I excavate on Rurutu for my future dissertation, then only a distant idea. Up until that time, I had been enchanted by the idea of working in the Australs, but had not yet decided where. Pierre inspired me with the idea of going to Rurutu and taking up where he had left off forty years before. In the summer of 2002 I received generous funding from the Arts & Sciences Advisory Council of the University of Hawai‘i, in order to travel to Rurutu and scout for a site to excavate. In Tahiti, Pierre and his wife Juliette housed and fed me, still a relative stranger. Pierre helped me ceaselessly by traveling with me and introducing me to his friends on Rurutu and to the officials of Tahiti’s Service de la culture et du Patrimoine and the Musée de Tahiti et ses Îles. In such a way I was able to secure permission to excavate without difficulty. It is to Pierre and Juliette that I owe everything.

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Abstract

The Peva dune site on Rurutu, Austral Islands, which the author excavated in the summer of 2003, has yielded a rich archaeological assemblage containing artifacts and both vertebrate and invertebrate fauna from two distinct stratigraphic layers. The first, and earliest layer dates from the East Polynesian Archaic period (ca. A.D. 1000-1450), and the second, and later layer from the Classic period (ca. 18th-19th centuries A.D.), during which time the site was a ceremonial marae. The two layers are entirely distinct from one another, separated by a thick deposit of sterile beach sand. This thesis outlines the results of the excavation, as well as how they fit into current hypotheses concerning East Polynesian prehistory. One of the main issues raised deals with the "regional homeland" hypothesis, which posits an intensive period of interaction and long-distance voyaging during the Archaic period. Evidence for this comes from a general homogeneity in the Archaic material culture, and empirically from the geochemical sourcing of basalt used in tool-making. Another important concept that this study addresses involves the process of colonization, in terms of ecological adaptation and resource exploitation. The process of human interaction with the environment is also explored, as are the consequences for the long-term sociopolitical development of the chiefdom. This investigation analyzes the major temporal trends in Rurutu's artifact and faunal assemblages, and discusses them in terms of both the general efflorescence of East Polynesian culture, and the more specific emergence of a uniquely Austral culture, which impressed early European visitors as being quite distinct.
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Chapter 1. Introduction

The colonization of East Polynesia during the first millennium A.D. stands among the most incredible feats of human exploration. The islands of Polynesia are very diverse, including atolls, high volcanic islands, and temperate continental ones. Polynesians not only reached every one of these, but managed to establish a foothold on even the most inhospitable. The variables of each island demanded different strategies of colonization and settlement. As the centuries passed following initial landfall, these conditions would change, resulting in a dynamic interplay between the islands and their inhabitants. By the time of European contact in the late 18th century A.D., some islands, usually the biggest and most plentiful such as Tahiti, had developed into highly stratified chiefdoms. In contrast, other regions such as the atolls of the Tuamotus had retained a much more simplified social system. Still other islands, Pitcairn for example, had been altogether abandoned. How and why these processes took place reveal a great deal about the nature of human societies and how they interact with their environments.

The present study examines this process of island settlement and sociopolitical transformation from the point of view of Rurutu in the Austral archipelago. The results of the investigation have implications for many of the current hypotheses surrounding the prehistory of East Polynesia. Among these are: the model of the “regional homeland” that has gained favor among archaeologists in the past decade; the related concept of the East Polynesian Archaic period, which lasted from approximately A.D. 1000-1450; how humans transformed their environment from inhospitable forests to productive agricultural landscapes and the consequences upon local biota; and how the sociopolitical
entity known as the chiefdom developed in response to a complicated web of natural and cultural influences. These processes came to an end during the Classic period of East Polynesia in the late 18th and early 19th centuries, when European interference effectively brought the traditional lifestyle to a close. As we examine the findings of the excavation, we will see how many of the traditions of “Ancestral Polynesian Society” (Kirch and Green 2001) persisted throughout East Polynesian prehistory, and formed the foundation of the society itself. Let us now turn to some of the more relevant issues that this investigation will be addressing.

The “Regional Homeland” Model and East Polynesian Prehistory

The nature of the colonization of East Polynesia from West Polynesia has long fascinated scholars. Hypotheses concerning the East Polynesian “homeland” have been especially variable. Before the advent of archaeology in East Polynesia, the view generally held was that East Polynesian culture diffused from the centrally-located Society Islands (e.g., Buck 1938, 1944). In the 1960s, when excavations of key sites in the Marquesas had taken place, opinions changed considerably. An important model proposed that the Marquesas were first settled ca. 300 A.D., making them the East Polynesian homeland (Emory and Sinoto 1965). Allowing two or three centuries for the development of a uniquely East Polynesian culture, the colonists then carried it to Easter Island, Hawai‘i, the Societies, and New Zealand (Figure 1.1). A wave of settlers from the Societies would then have followed for a second colonization of Hawai‘i and New Zealand.
Figure 1.1. The Marquesan homeland model of colonization (after Jennings 1979: Figure 1.1).
The Marquesan homeland model developed and found much favor due in large part to the amount of archaeology done there in the 1960s (Suggs 1961; Sinoto 1966, 1970). Radiocarbon dates revealed an archaeological sequence that apparently spanned around two thousand years. Early artifacts that resembled those from West Polynesia and some shards of pottery, a material apparently unknown in East Polynesia, strongly suggested a direct link between the Marquesas and Samoa-Tonga. However, archaeologists have since refined the Marquesan sequence so that the earliest widely accepted radiocarbon dates fall during the 11th-12th centuries A.D. (Rolett and Conte 1995; Rolett 1998; Anderson and Sinoto 2002). These more recently-obtained dates are comparable to those from other early East Polynesian sites with a material culture very similar to that of the Marquesas.

In part, this early emphasis on the Marquesas reflected the lack of archeological samples from other regions in East Polynesia. This can be attributed in part to the geography of the Marquesas. The islands lack coastal plains, and cliffs flank and shelter the narrow valleys so that deposits of stratified material are preserved in sand dunes. In the Societies, there are fewer cliffs, and most rockshelters are unsuitable for habitation because of their unstable ceilings (Garanger 1967:381). Vast coastal plains also tend to make the deep accumulation of sand rare. In addition, continued agricultural activity in the coastal areas, where early settlement was most likely concentrated, would have long ago obliterated most traces. Sand (tupa) crabs have also played a large part in the disturbance of the coast (Garanger 1967:380). Today, after forty years of continued archaeological investigation, early sites are now known from almost every archipelago in
East Polynesia. However, the Marquesan assemblage, because of its richness, remains the benchmark.

*Changing Perspectives on Voyaging*

As archaeological work progressed in the ensuing decades and more early sites were studied, another model, known as the “regional homeland model” was developed. This view suggests that the archipelagos of East Polynesia were colonized very rapidly, almost simultaneously, and then maintained a degree of contact among themselves for some centuries after, for trade and other reasons (e.g., Finney et al. 1989; Irwin 1992). During this period of interaction, the sharing of ideas allowed for the development of a uniquely East Polynesian culture throughout the archipelagos. How researchers have regarded long-distance voyaging has contributed a great deal to these changing models of colonization. For a long time it was generally accepted that voyaging was a very difficult and dangerous endeavor. Indeed, some researchers believed that the islands must have been settled accidentally (e.g., Sharp 1957). Whether accidental or intentional, these voyages were thought to have been one-way, because tacking into the easterly trade winds would have been far too difficult. If voyaging was so perilous and uncertain, an island, once colonized, would have had to develop from then on in isolation. Traits such as material culture and language would have passed from one island to the next in a stepping-stone manner.

Experimental voyaging (Finney 1977, 1994; Finney et al. 1989) has since demonstrated that two-way journeys were completely possible even between the farthest islands of East Polynesia. Voyages were certainly long, and needed a well-equipped
canoe, a skilled crew, and expert navigators, but they were manageable and perhaps not quite as hazardous as previously thought. The easterly direction of the trade winds, thought to have been such an obstacle, was in fact interrupted by spells of westerly winds, which the Polynesians knew to take advantage of. Tacking into the wind was especially advantageous for explorers seeking new land. If success became impossible, the canoe could turn around and speed home with the wind at its back. In addition, studies using computer simulations that took numerous factors into account, such as distance, sailing difficulty, and wind direction, have launched hundreds of 'voyages' between islands in order to calculate success rates (Irwin 1992). The statistics of safe arrivals are high enough to suggest that intentional voyaging might have been a very active element in the colonization of East Polynesia. Two-way voyages would have allowed colonizers to make return journeys home for supplies or other reasons, and only rarely could an island have been so cut off as to remain in abject isolation.

Resource Distribution and Exchange

Central to the idea of a regional homeland is the fact that important resources are unevenly distributed from island to island throughout East Polynesia. Two of the most important raw materials are fine-grained basalt for adze manufacture and pearlshell (Pinctada margaritifera) for fishhook manufacture. Islands that did not have one or the other may have had to import it from an island that did. Following the colonization of an island, multiple trips back to the home island or to neighboring ones might have been necessary to supply the new population with raw materials and other necessities. This would have required inter-island voyaging and some sort of trade network.
X-ray fluorescence analysis of volcanic basalt is currently the most successful method of empirically demonstrating long-distance interaction. Results have traced adzes to geological sources hundreds and sometimes thousands of kilometers from where they were found. Many of these tools were found in the early strata of East Polynesian deposits, indicating that communication did take place, and may even have flourished prior to ca. A.D. 1450. Afterwards, until the period of European contact, imported artifacts tend gradually to diminish from the archaeological record. This pattern is seen throughout East Polynesia. For example, adzes from Eiao Island in the Marquesas were exported as far as Mo’orea in the Society Islands and Mangareva in the Gambiers, all from deposits dated to before A.D. 1450 (Weisler 1998; see also Weisler and Green 2001:420; Green and Weisler 2002:233). The same pattern is evident within the Marquesas themselves, as the number of Eiao adzes becomes drastically reduced in the archaeological sequence in Hanamiai after A.D. 1450 (Rolett 1998:193). On Aitutaki in the Southern Cooks, adzes from pre-A.D. 1450 deposits have been geochemically sourced to Mangaia, Samoa, and the Society Islands (Allen and Johnson 1997).

A similar pattern emerges when the archaeological occurrence of pearlshell, which grows best in sheltered lagoons, is compared to its natural distribution. In the southern Cooks, on Aitutaki (Allen 1992a:192-3, 2002:199), Mangaia (Kirch et al. 1995:52), and Ma’uke (Walter 1998:100), fishhooks of possibly imported pearlshell dominate in the early strata, and hooks made of inferior local Turbo setosus shell replace them in the later strata. In the Gambiers, Mangareva and Henderson Island imported stone tools, oven stones and volcanic glass from Pitcairn Island. In turn, Mangareva,
which had the best access to pearlshell, exported it to the other two islands, both of which lacked this resource (Weisler 1996a, 1996b, 1997a, 1997b; Weisler and Green 2001; Green and Weisler 2002). In each case, local materials such as *Turbo* shell for fishhooks and *Tridacna* (Giant clam) shell for adzes begin to phase out imported ones after the 15th century A.D., and eventually come to replace them altogether, suggesting a marked decline in exchange and inter-archipelago relations.

By the time of European contact in the late 18th century, long-distance voyaging had practically vanished from many regions of East Polynesia, with only the atolls of the Tuamotus maintaining regular trade out of necessity (Irwin 1992:182-3). Both imported basalt adzes and locally-made *Tridacna* ones are evident in ethnographic collections from those islands (Emory 1975). Postulated reasons for the decline in interaction include climatic change (Bridgeman 1983), economic impracticality (Finney 1994; Walter 1996; Kirch 1988), resource, especially timber, depletion (Weisler 1994), and repercussions from political changes in the Societies (Rolett 2002). Some islands had lost all touch with others, and may have given up the construction of voyaging canoes altogether. Concerning Tubuai in the Australs, *Bounty* sailor James Morrison (1935:68) wrote, “They have no sailing Vessels and Never leave the land except they are blown off as all the Islands of which they have any account are at too great a distance for them to hold any intercourse.” The Tubuaian whom Morrison spoke to did not even know of the existence of the Societies (1935:65). In some cases, long-distance voyaging had become relegated to the heroic demi-morts of myth, such as Maui in the “Tahitian Circuit of Navigation” chant (Henry 1928:464). However, some Polynesians, most notably James
Cook’s Polynesian guide Tupaia, had knowledge of other islands and archipelagos, and successfully guided Cook to many, including Rurutu in the Australs (Cook 1955:154-7).

Identifying “interaction spheres” has become a major focus for researchers working in Polynesia, and has been central the development of the regional homeland model. Results continue to suggest that voyaging persisted for at least two to three centuries after the settlement of East Polynesia. This seemed to have the effect of circulating ideas among the islands and archipelagos to the point that a clear degree of homogeneity can be seen in the archaeological record of the early 2nd millennium A.D. This uniquely ‘Archaic East Polynesian’ culture would then develop in fascinating and different directions from region to region until the arrival of Europeans in the late 18th century.

Despite the wealth of information now available, it is clear that we are only beginning to understand the complexity of the regional homeland. Much research remains to be done in key areas. Importantly, the role of the Australs and the extent of its interaction with other islands remain unknown due to a paucity of archaeological excavation in the region (Weisler 1998:528; Rolett 2002:186) and a lack of geochemical analyses (Allen and Johnson 1997:129; Weisler and Sinton 1997:187; Weisler 1998:526; Weisler and Green 2001:433). While interaction is well documented in the more marginal areas of East Polynesia such as the Mangareva-Pitcairn group and the Marquesas, it still remains incomplete for the central region of the Societies, Australs, and southern Cooks (Figure 1.2). Additionally, how the Societies, Australs, and southern Cooks interacted with Mangareva and the Tuamotus remains hypothetical (Weisler and
Green 2001:439). The Australs stand out as an area of key significance, and are critical for determining how East Polynesia was colonized. As Kirch (2000:230) stated, “In part, this debate reflects a lack of primary archaeological fieldwork in many Eastern Polynesian islands; for example, the Austral Island chain, one possible corridor of ‘archaic’ expansion into southeastern Polynesia, remains largely unexplored.”
Figure 1.2. East Polynesian exchange pathways. The solid lines indicate archaeologically-confirmed interaction, and the dashed lines show hypothesized but unconfirmed links (suggested by Weisler 1998: Figure 1).
Implications for Colonization

The model of a regional homeland, composed of interaction spheres, has important implications for how researchers now view the initial colonization process. The southern Cooks bridge West and East Polynesia to some extent, and may have been a likelier early target for colonization than the Marquesas (Irwin 1992:85, 1998:121). This does not imply that an East Polynesian homeland is to be found in the southern Cooks, but rather the first of many networks of interaction. A current hypothesis (Kirch 2000:245; see also Green and Weisler 2002:235-7) involves a multiphase colonization sequence from West Polynesia, characterized by extensive interaction. The first wave of settlers, going northward into the Tuvalu and Tokelau archipelagos, may have been responsible for settling some of the Polynesian outliers in Micronesia and Melanesia. The second wave would have been into East Polynesia, with the northern Cooks settled first, followed by the Societies and western Tuamotus, which would then have been linked by an interaction network and linguistic dialect chain (Proto Tahitic). Another wave from West Polynesia may have then passed through the southern Cooks and the Australs as far as Mangareva in the Gambiers. The Australs and Mangareva would then have constituted a second interaction network and dialect chain (Proto Marquesic), which extended all the way to the Pitcairn group. This network could have bridged the gap to the more remote Marquesas through the eastern Tuamotus. From this region, Easter Island would have been settled rather early, since neither the language nor the culture exhibits later East Polynesian developments. Hawai’i would have been settled somewhat later from this same region. The precise dating of this dispersal is an ongoing question, with well-stratified deposits lacking in key locations such as the Australs (Kirch
However, radiocarbon dates do corroborate this model so far, since sites in the southern Cooks that possess an Archaic material culture date from within the A.D. 1000-1450 range, which is consistent with dates from other Archaic sites in the Marquesas, the Societies, and New Zealand (e.g., Anderson and Sinoto 2002).

**The East Polynesian Archaic**

The concept of a regional East Polynesian homeland has also changed how archaeologists now view artifacts associated with early, pre-A.D. 1450 deposits. The number of shared characteristics can be attributed to the exchange and diffusion of ideas and technology in the centuries following colonization when long-distance interaction was taking place, rather than simple diffusion (Rolett 1993, 1996; Walter 1996). Walter (1996:525) noted that the Archaic “does not exist as a culture phase, but represents a period prior to regional isolation, local territoriality, and socio-political divergence...the homogeneity reflected archaeologically is superficial...and undoubtedly masks the existence of quite localized cultural traditions.” The term ‘Archaic’ comprises what was once called the “Moa-Hunter” period of New Zealand (Duff 1956) and the “Settlement/Developmental Period” of the Marquesas (Suggs 1961; Sinoto 1966, 1970). Most Archaic period sites date from the 12th-15th centuries A.D.

The Archaic artifact assemblage is quite unique, and lacks immediate parallels in the West Polynesian material culture of the mid-1st millennium A.D., from where it is most likely the main migrations set forth. We are therefore probably missing the hypothetical “first landfall” sites that would ideally contain typical West Polynesian artifacts and quantities of pottery. As Archaic East Polynesian material culture is already
distinct from its West Polynesian ancestor, it can be inferred that it had some time to
develop on its own. Therefore it comes from an early period in East Polynesian
prehistory, but not the earliest, and represents the time when the culture was developing
its own distinctive style (Bellwood 1970:97). A conservative estimate of around one to
two centuries may be sufficient for differentiation to have taken place.

The Archaic East Polynesian kit (Figure 1.3) is characterized by diversity.
Diagnostic artifacts include perforated tooth pendants (whale, human, dog, seal, porpoise)
that were strung together to form necklaces and bracelets, bone reel units that could be
combined with tooth pendants to form a necklace (see Duff 1956:Plates 8-25), pearlshell
pendants, tattooing needles, and coconut graters, a variety of one-piece pearlshell
fishhooks, pearlshell harpoon tips, and a wide array of adze types of which most are
untanged. The only characteristic Archaic objects that have direct counterparts in West
Polynesia are untanged adzes. West Polynesia lacks abundant pearlshell and one-piece
fishhooks of this material are exceedingly rare, and those that have been found may have
been imported (Bellwood 1970:97). Ornaments of the Archaic East Polynesian type are
also unknown in West Polynesia. Other items common, but not restricted to Archaic
assemblages are *Terebra* shell chisels, files and abraders of sea-urchin spine and coral,
and octopus-lures made from cowrie shells, which are not unique to East Polynesia. The
few shards of pottery that have been found in East Polynesia come from Archaic strata,
and probably represent imports. The Archaic kit occurs with little variation throughout
East Polynesia, ornaments being the scarcest artifact type, most often associated with
burials, such as Wairau Bar (Duff 1956) and Maupiti (Emory and Sinoto 1964). No site
has yet been found in which pottery-making occurred. Archaic habitation sites are often round-ended huts, and there is no distinctive religious architecture (see Sinoto 1970:128). This is not surprising, since in West Polynesia there were no ceremonial structures similar to the later East Polynesian *marae* of the Classic period.
Figure 1.3. Archaic period artifacts. From top left, a: perforated whale tooth pendant (after Duff 1956: Figure 23); b: bone reel necklace unit (after Duff 1956: Figure 15f); c: serrated pearlshell disc ornament (Duff 1956: Figure 35 o); d: shouldered pearlshell pendant (after Sinoto 1996: Figure 4q); e: pearlshell tattoo needle (after Kirch et al. 1995: Figure 7a); f-j: various one-piece pearlshell fishhooks (after Suggs 1961: Figure 26i, j, k, o, p); l-m: compound pearlshell fishhook portions (Suggs 1961: Figure 26x, u); m: pearlshell trolling lure shank (after Suggs 1961: Figure 26q); n: bone harpoon head (after Sinoto 1996: Figure 5b); n: pearlshell grater (after Pigeot 1987:Planche l).
Environmental Transformation

The interaction between island populations that contributed toward a uniquely East Polynesian culture occurred at the same time as the equally critical interaction between populations and their island homes. This dynamic interplay between human beings and their environments is central to the study of colonization. East Polynesia offers a striking array of island types spread over vast distances. Before human contact, these islands were hardly the paradisiacal gardens of plenty that European explorers found so enchanting. Most were practically uninhabitable, with dense forests containing virtually no useful or edible plants or fruits, and birds as the only terrestrial source of protein. The Polynesians brought with them a wide range of cultigens, including tree and root crops, domesticated animals, and some stowaways such as rats, geckos, and weeds. The concept of the “transported landscape” is inherent to modern Polynesian research. The islands, isolated as they were, were immediately vulnerable to the introduced species. How these islands were transformed into agriculturally-productive economies is a critical element of culture change and sociopolitical development.

Colonizing Cultigens and the Transported Landscape

The Polynesians colonized their islands with a very specific cultigen inventory, which was for the most part derived from Southeast Asia. This inventory consisted of five main groups of starch staples: aroids, yams, bananas, breadfruit and sweet potato (introduced later from South America). These species are ideal because they possess a breeding system that assures the reproduction of adapted genotypes in abundance due to their asexual/vegetative nature. However, these tubers are also sexual reproducers so that
seed and gene recombination do occur, thus providing for variety (Yen 1991:91). These
cultigens were emphasized differently throughout Polynesia. Yams were dominant only
in West Polynesia (Kirch 1991a:117). Bananas were cultivated through both shifting
cultivation and orchard gardens, and were particularly important in Tahiti (Kirch
1991:118). Breadfruit was grown practically everywhere in Polynesia but became
predominant only in the Societies, Mangareva, and especially the Marquesas (Kirch
1991:118, 123). Sweet potato was prevalent only in marginal areas such as New
Zealand, Hawai’i and Easter Island, and was not present in West Polynesia prior to
European contact (Kirch 1991:118). In addition to their array of edible cultigens,
Polynesians brought plants that produced material for building, clothing, medicine, and
other purposes.

The distribution of introduced plant species in Polynesia is significant in terms of
the regional homeland model (Rolett 1996:532). Whistler’s (1991: Table 1) distribution
of West and East Polynesian intentionally-introduced plant species illustrates a high
degree of homogeneity among the Cooks, Societies and Marquesas. Out of a total of 72
West and East Polynesian species, only 21 West Polynesian plants did not reach East
Polynesia, and 7 were found in Tonga alone. 45 were present in the Cooks, 43 in the
Societies, and 42 in the Marquesas. Hawai’i shows a greater deal of isolation with only
28 of these plants. Yen (1991:90) interpreted this even distribution in central East
Polynesian as evidence that colonization was an ongoing process that entailed interaction.
Cultigens were thus very likely a key item being transported in post-settlement voyages.
Introduced animal species, namely the pig, dog, chicken and rat, were also an integral part of the colonization process. In marginal areas, perhaps because of the impracticality of return voyaging, some domesticates did not successfully make the transfer. The pig and chicken were absent in New Zealand, and the pig and the dog were absent in Easter Island (Kirch 1991:123). Animal husbandry, which varied extensively, was inherently related to agricultural development. Pig husbandry was a particularly critical element. Yen (1973b:71) wrote, “the dependence of animals, especially pigs, on agricultural systems seems to be an argument for the transfer of plant agriculture itself. Apart from household waste, pig husbandry is mainly conducted by the feeding of coconut, breadfruit and sweet potato, with the support of foraging for natural products from the flora and sea-shore.” Pig husbandry at its most productive took place where intensive agriculture was practiced, while on most islands dogs and chickens were primarily scavengers (Kirch 1991:123). The pig, therefore, is an important indicator of an island’s ability to produce a surplus specifically to feed a population of this voracious eater. The elaborate cultural significance of the pig in Polynesia is reflective of this. The role of the pig as an item of wealth, a feasting food reserved for the elite, tapu to most of the population most of the time, was vital to the Polynesian sociopolitical system.

Impact on Biota

The changes that human settlement wrought upon islands were irreversible. Indigenous and endemic species of plants were forced to compete, mostly unsuccessfully, with introduced ones. The establishment of agricultural systems also required deforestation. The universal practice of shifting, or slash-and-burn cultivation had an
especially profound impact. As tracts of land were fired for planting dryland crops such as yams and sweet potato, the relatively thin soils on the hill slopes became denuded of their natural forest cover, thus exposing them to accelerated erosion. After prolonged periods of repeated burning, which could grow out of control, little other than pyrophytic *Dicronopteris* ferns and *Miscanthus* grass were able to grow on the hillsides. This had the overall effect of reducing the total amount of an island’s arable land. At the same time however, as soils washed off the hill slopes they could eventually accumulate on the valley floors and enrich them, which was ideal for wetland taro cultivation. As a population expanded and more land was cleared, the processes of deforestation, erosion, and sedimentation fed upon themselves. Small islands with low elevations were especially vulnerable to advanced deforestation.

Landscape modification also combined with human and animal predation to severely affect native species. The archaeological record has revealed numerous extinct and extirpated land and sea bird species from a variety of islands (Steadman 1989, 1995). Human predation and habitat destruction were probably the two principal factors that led to these events. Recent studies (e.g., Holdaway and Jacomb 2000; Steadman et al. 2002) have demonstrated that these extinction events were extremely rapid, occurring within around 200 years. The evidence from New Zealand suggests that even a small founding human population of 100 people would have been capable of exterminating the native moa population in less than 160 years (Holdaway and Jacomb 2000). There, the force of predation appears to have been felt immediately upon colonization, which radiocarbon dates place to around the 13th century A.D., and the moa vanish from the archaeological
no later than the 15th century. Throughout Polynesia, these extinction events likely occurred within a period that is short enough to fall within the range of a given radiocarbon date, which is no more than two centuries. This is significant in terms of correlating initial colonization to the earliest archaeologically-visible sites.

Impacts of human predation on marine fauna have also been documented archaeologically. An early-period emphasis on local sea turtle populations is evident in some regions (Kirch and Yen 1982; Kirch 1989). Also significant is a widespread pattern of the reduction of shellfish size over time, probably through the early selection of larger specimens for prey (Anderson 1979; Kirch and Yen 1982; Swadling 1986; Spenneman 1987; Kirch et al. 1995). Another suggestive trend is that flying fox (Pteropus tonganus) remains have been discovered in early sequences on islands in the southern Cooks where today the species is either extinct, such as Ma’uke (Walter 1998) and Aitutaki (Steadman 1991), or extremely rare, as on Mangaia (Kirch et al. 1995).

The introduced domesticated animals were also subject to environmental variability. In sites that represent an early period of habitation, domesticated animals typically make up a small fraction of the faunal assemblages. Some time may have been necessary for the domesticated animals to multiply sufficiently before the meat could be harvested in an economical manner. Once the land could produce a steady agricultural surplus, larger populations of pigs, which are competitive consumers, could be maintained. Large amounts of pig remains tend to appear during late-sequence deposits throughout Polynesia (Suggs 1961; Kirch et al. 1995; Rolett 1998). A dramatic twist to this trend occurred on islands such as Tikopia (Kirch and Yen 1982), Rennell (Chikamori
and Takasugi 1985), and Mangaia (Kirch et al. 1995). In each case, pig remains abruptly cease in the archaeological deposits of the late period. These islands may have found it too costly to support a steady pig population and thus exterminated them intentionally. The deliberate removal of such a culturally-significant resource would have had important social ramifications.

The faunal assemblages also reveal patterns consistent with hypotheses surrounding the East Polynesian regional homeland. In the Archaic strata of many East Polynesian sites, excavated fishhooks and fishbone assemblages point to a strategy of both inshore fishing and offshore fishing (e.g., Rolett 1998:177-8). Remains of larger fishes such as tuna that inhabit deeper water are often found in the early phases of habitation (see also Leach et al. 1997:61-2). The practice of offshore fishing, which requires canoes, is consistent with the concept of the Archaic period as one in which seafaring was still frequent. On the other hand, later period deposits exhibit a shift toward smaller fishes that could be caught inshore. At the same time, fishhook types become fewer and smaller, designed for inshore species. A decline in pearlshell trolling lures, used to catch offshore fishes such as tuna, is also evident. This overall trend toward the inshore environment corresponds to the decline in imported materials, notably fine-grained basalt and pearlshell. These lines of evidence lend support to the concept of a gradually-declining use of canoes, both for voyaging and fishing, which occurs at around the same time that long-distance trade diminishes throughout East Polynesia.
Sociopolitical Developments

The colonists of East Polynesia also brought with them a social framework that had developed subsequent to the Lapita colonization of West Polynesia (Green 1981). What is known about “Ancestral Polynesian Society” (Kirch and Green 2001) is based on the linguistically-reconstructed Proto-Polynesian language supplemented by archaeological and ethnographic data. If a culture trait and its cognate terms are universally distributed across East and West Polynesia then the trait can be assumed to have had its origin in an ancestral society. Assumptions about the roles and functions of social classes, which of course cannot be observed archaeologically, can be made with ethnographic comparison. Based on lexical reconstruction, social classes in Ancestral Polynesian Society included such categories as the chief, the warrior, the expert/craftsman/specialist, and the sea expert/navigator (Kirch and Green 2001: Table 8.7). With the settlement of the East Polynesian islands, what was probably once a largely uniform society began to change, in a response to varying environmental and social conditions. By the time that European contact occurred in the late 18th century, significant linguistic and sociopolitical variation had taken place from region to region. The number of classes or ranks differed greatly between chiefdoms, from two at the lowest extreme (basically chiefs and non-chiefs) to many gradations of chiefly and non-chiefly status with very specific rights and privileges relegated to each. The processes that led to such cultural differentiation were fundamentally bound up in the ongoing dialectic between human society and the island environments.
The chief, his *mana*, and *tapu*, are universal and critical elements of traditional Polynesian society. The Proto-Polynesian term for chief, *qariki*, signifies a leader and an “oldest child” (see Kirch and Green 2001:227). Among the duties of the chief was the propitiation of gods and ancestral spirits, of whom he was regarded to be the closest living descendant, to ensure the people’s well-being, especially in terms of crop fertility. Kirch and Green (2001:239) wrote, “Nothing could be more fundamental to an understanding of Polynesian conceptualizations of the sacred than *mana* and *tapu*.”

*Mana* is defined as “supernatural power, effectiveness, prestige, thunder” and *tapu* as “prohibited, under ritual restriction, taboo” (Kirch and Green 2001: Table 9.1). A chief’s success in life was regarded as being based on the amount of *mana* he possessed. This was in turn determined by how well he paid tribute to his divine ancestors in the form of feasting and sacrifice, for example. For fulfilling his duty, the chief was given the first fruits of the harvests by his subjects. The first fruits provided the chief with surplus wealth to spend in feasting, thereby acquiring additional *mana*. Among the many privileges accorded to the chief and the most elite members of society were access to certain special, high-status foods, notably pig and turtle. These foods were *tapu* to the majority of people, and thus the consumption of them was a further manifestation of status.

Chieftainship was an ascribed, inherited office that carried both sacred and secular power. The dialectic between achieved and ascribed status is a crucial element of the Polynesian sociopolitical system. As Goldman (1955:680) stated, “Polynesian society is founded upon social inequality and, despite an aristocratic doctrine of hereditary rank,
permits its members to compete for position, for prestige, and for power.” Although the chief was by birthright privilege to *mana*, its accessibility to other social classes was a source of potential conflict in the competition for power (Kirch 1984:64). The ideological emphasis on *mana* led Kirch (1984:64) to suggest that the inherent element of competition between social classes can probably be traced back to Ancestral Polynesian Society. People born outside the chiefly class were thus able to escape the confines of the class system and actually compete with the chief himself.

Goldman (1970) defined a three-stage evolutionary sequence based on the relative degrees of achieved and ascribed status. While the linear evolutionary aspects of his hypothesis are largely rejected now, his classification is still extremely useful. By the late 18th century, some areas of Polynesia (Society Islands, Tonga, Hawai’i) had experienced considerable “evolution” in that highly complex, rigidly-stratified sociopolitical systems had grown out of the simpler ancestral form. In these societies, the chief possessed a much higher degree of power than is attributed to the traditional office. These are known as “Stratified” societies. Other regions, such as the Marquesas, Mangaia and Easter Island, are “Open” societies, in which opportunities for power were available by means of accomplishment, and land became a reward for service. It is now thought that instead of being somewhere along an evolutionary continuum toward being Stratified, Open societies had experienced a process of “devolution” (Thomas 1990), because the chief actually appeared to have lost a great deal of the prestige associated with the Ancestral Polynesian concept. These societies were characterized by endemic warfare, and often one or more non-chiefly classes had gained some of the chief’s
privileges. The least stratified society in Goldman's classification is "Traditional", in which seniority was the key factor in determining authority. These were found on smaller islands such as the atolls of the Tuamotus.

A model that is complementary to Goldman's emphasizes ecological factors as an important part in the differential development of island chiefdoms (Sahlins 1958). In the late 18th century, Stratified societies (Tahiti, Hawai'i) were found on large, productive islands, whereas Traditional ones were found in impoverished environments such as atolls. A wide range of Open societies existed where conditions can be described as marginal. The amount and variety of natural resources are relevant as they determine how wealthy and powerful a chief could become. Agricultural surplus was necessary to allow a chief to display his wealth and mana, through feasting, gift giving, and monumental architecture. These deeds would enhance his mana, thus increasing his social standing in the eyes of the people. On the other hand, a chief without strong mana was vulnerable to competition from other social classes, such as the warrior or priest.

Open societies typically developed on islands in which resources were strained or not evenly distributed, or where there was a degree of unpredictability due to hazards such as drought. Three examples of Open societies in which environmental difficulties played an important role were Mangaia, Easter Island, and the Marquesas. On Mangaia, a small makatea island with limited but geographically-concentrated resources, a series of wars over the irrigated taro fields eventually resulted in a system in which the mightiest warrior came to supreme power (Kirch 1994:276-277). These wars were important for survival, because by the time they had begun, the island had probably reached its total
productive capacity and a growing population was putting untoward pressure on its limited resources. On Easter Island, irreparable deforestation was a major element in the process of devolution. Canoes for fishing became severely limited and erosion made the land less productive for dryland crops. Raiding became so frequent that warriors were turned to for protection. The ambitious warriors seized the opportunity and eventually completely displaced the hereditary chiefs (e.g., Kirch 1984:276-277). In the Marquesas, where arboriculture was emphasized, stochastic droughts were responsible for periods of famine. In this case, it was the priestly class of tau’a who appeared to have usurped a good deal of chiefly rights (Thomas 1990:119-121, 175, 181; Kirch 1991b:141-142; Rolett 1998:252-253, 256). In each of the above cases, the chief was no longer perceived as an effective intermediary between the human world and the spirit world. Failing to inspire divine plenty, chiefs with questionable mana found themselves in a precarious position.

It is important to note that neither ecological nor social factors can be given primacy. Rather, it is a complex dialectic in which there is no sense of determinism from the outset. No two islands underwent precisely the same process of transformation, either environmental or cultural. The powerful social factors that drove ambition had to contend with some natural restrictions. At the same time, how the landscape was shaped and changed depended upon the society itself. We can only hypothesize regarding the finer points of the processes, largely based on what was observed at the “endpoint” (Yen 1991:68) of their independent development, when European observers began to document them.
Pathways to Intensification

As island populations grew, larger amounts of food were required. Food was essential not only to survival but to the social system as well, particularly for a chief to display his wealth. In the Pacific, root crops such as yams (*Dioscorea*) and taro (*Colocasia*) provided the majority of calories. Tree crops such as breadfruit (*Artocarpus*) were also emphasized. The optimal growing conditions of these staples have led to what researchers now call the “wet/dry” dichotomy (Barrau 1965; Kirch 1984:168; 1994). Dry crops such as yams and sweet potato flourish where there are well-drained soils, which often exist on the leeward side of a given island. Taro, which can be grown in dry conditions, is far more productive when cultivated in wet, swampy land, typically found on the windward side of islands. If an irrigation system is employed, taro will prosper even more. Very different techniques were needed to make dryland and wetland systems put forth higher yields, which in turn profoundly impacted the character of the chiefdom itself.

Wetland taro is the single most productive Pacific root crop. The simplest method of cultivation was practiced on atolls (Spriggs 1984:124). A pit was dug to tap the freshwater lens, and the taro was planted within. The next degree of complexity requires swampland. Ditches are dug, forming watercourses that flow among raised garden plots. Pondfield systems are the most widespread form, the largest being found in Hawaiʻi, New Caledonia, and Futuna (Kirch 1994). They consist of flat terraces with earth, wood, or stone embankments. Pondfield agriculture involves a relatively high initial labor input to construct the channels and plots, which entail permanent modification to the landscape. This “landesque capital intensification” (Brookfield 1972; Kirch 1994) necessitates
comparatively little work following its completion, with weeding being the primary activity. Taro yields can be up to around eight times as much as yams and other dryland crops, per unit of labor input (see Kirch 1994:8).

In slash-and-burn cultivation the cropping period is usually shorter than the fallow one. Dryland taro, yams, sweet potato, bananas, and other cultigens are planted in rotation. New swiddens are typically cut each year, and there are usually several in various stages of growth per household. Intensive dryfield cultivation utilizes a fallow length shorter than the cropping period. To offset erosion, terracing is constructed, and mulching has to be constant. There is a permanent demarcation of plots and it involves more labor than simple shifting cultivation or irrigated pondfield systems. Unlike the landesque capital intensification of pondfield agriculture, “cropping cycle intensification” requires constant labor input, and the crops are vulnerable to droughts and cyclones, and thus encompass a certain degree of risk (Kirch 1994:63-4). The island of Anuta (Yen 1973:125) is an example of rigorous dryland intensification, in which taro and manioc are rotated without a fallow period. The field systems of Lapakahi, Hawai’i Island, displayed an increasing trend of complexity, subdivision, and expansion from around A.D. 1200 until European contact (Kirch 1985:234).

As a dryland system, arboriculture was often supplemental to other crops. Breadfruit (*Artocarpus*) produces large harvests around two times a year (Kirch 1994:10). To make the yield last for the intervening months, the technology of ensilage was developed throughout the Pacific. Surpluses of breadfruit were fermented in large storage pits and could keep for years if tended properly. In the Marquesas, breadfruit and
its storage were emphasized, and root crops such as yams and taro less so. Arboriculture is also susceptible to droughts and other natural disasters, which often led to famine and social stress, and thus potentially to an Open chiefdom as in the Marquesas.

On the whole, dryland agriculture is less productive and riskier than wetland agriculture. Wet and dry conditions often co-exist on the same island, sometimes corresponding to the windward/leeward halves, or as components of a single valley. In addition, entire islands within a single archipelago (Hawai’i, Societies) can be broadly classified as either “wet” or “dry”. The distinction has profound social ramifications, especially in terms of intensification. While population pressure surely impelled “dry” chiefdoms to intensify and expand, the social importance of intensification itself was a critical factor (Kirch 1994:310-12). Chiefdoms that existed in “dry”, circumscribed conditions were often the most stratified, aggressive, and expansionistic (Kirch 1994:318). Warfare was often motivated by the desire to seize neighboring “wet” territories and annex them. Most dramatically, this occurred in Hawai‘i, where the “dry” chiefdoms of Hawai‘i Island and Maui campaigned against the “wet” islands of Molokai, Kauai, and Oahu (Kirch 1994:264). A similar process took place in the Societies, where the leeward islands of Borabora and Raiatea attempted to take over Tahiti and Mo’orea (Oliver 1974:1131; Kirch 1994:318-19).

The Classic Period

The East Polynesian Classic period (ca. 18th-early 19th centuries A.D.) emerged as the “endpoint” of centuries of adaptation to divergent environments and the sociopolitical development that ensued. Many changes accompanied this transition from the Archaic
period. As inter-island and inter-archipelago voyaging lessened after around A.D. 1450, languages differentiated at a greater pace, and islands developed along more individual lines. Overall East Polynesian trends do occur, however. These include a demographic shift away from the coast and into the valleys, the efflorescence of monumental architecture, and the reduction in the forms of utilitarian items, most notably fishhooks and adzes.

As agriculture intensified and populations grew, habitation shifted away from the coast, becoming more and concentrated in the backs of valleys. Kirch (1984:247) described this change as it occurred in Halawa Valley, Moloka'i: “An expansion of permanent residential sites up the valley, to encompass the gently sloping colluvial ridges, apparently mirrors the rapid increase in population witnessed throughout the islands during this era.” It is likely that during this time, inter-valley competition over resources intensified, making the valley mouths more dangerous. Suggs (1961:185) wrote, “the beaches were generally shunned, and the entire population seemed to gravitate inland, moving high into the valley heads for protection from increased raiding from the sea.” Rolett (1998:255) also interpreted the post-A.D. 1450 falloff in exchanged material to suggest potentially hostile interaction between groups.

Competition was not only evident in increased warfare, but also in the monumental architecture of the era. This correlated directly to the ability of chiefs to command the surplus necessary to mobilize a labor force. Garanger (1967:386) found that all radiocarbon samples from marae in the Societies dated to within the last centuries prior to European contact. Because of this, the Classic period has also been referred to as
the _Marae_ period (Garanger 1967:387). Ceremonial architecture such as the _marae_ of the Societies, Cooks, and Australs, the _me’ae_ and _tohua_ of the Marquesas, and the _heiau_ of Hawai’i were built beginning in this period. Rolett (1998:255) suggested that monumental architecture developed in a context of competitive, possibly hostile interaction. In fact, these structures were often directly related to warfare. In Halawa Valley, two war temples were built beginning in around the 18th century (Kirch 1984:247). Similarly, in Makaha Valley, Oahu, Kane’aki _heiau_ was converted to a war temple of human sacrifice at approximately the same time (Kirch 1984:251). Even more closely connected to warfare are the _pa_ fortifications of New Zealand and Rapa, also constructed during the Classic period.

Another interesting trend is apparent in the material culture of the Classic period. Variety among utilitarian objects such as fishhooks and adzes decreased dramatically. Additionally, pearlshell was used less and less as a material for making utilitarian items (fishhooks, coconut scrapers, tattoo needles), presumably because it was harder to obtain. Instead, where it was not abundant, it tended to be restricted to ornamental use. Local substitute materials became preferable for manufacturing fishhooks, such as _Turbo_ shell or bone. In terms of morphology, the reduction in fishhook styles appears to have been linked to an emphasis on inshore fishing. Small jabbing hooks, which are relatively minor in Archaic assemblages, become predominant in Classic ones. Changes in adze form may also be linked to a different lifestyle. One hypothesis suggests that earlier Archaic forms were designed for canoe-making, and later forms for tree-chopping, used
to clear forests (Best 1977). These changes in the tool kit agree well with the overall environmental and social trends here explored, and merit further attention.

**The Austral Islands**

The Austral Islands are an area of key importance to the study of the East Polynesian regional homeland, and the colonization and changes that took place. Their position and character in East Polynesia is quite unique. In terms of surface area, they form the smallest archipelago in East Polynesia, save for the Pitcairn group. They include five high islands with a maximum elevation of only 422 m (Tubuai). The Australs lie on the periphery of central East Polynesia and define its southern boundary. They are more temperate than the Societies to the north and the southern Cooks to the northwest. The Australs are at the same time one of the most centrally-located groups in East Polynesia, and one of the most isolated. They have strong cultural and linguistic bonds with both the Societies and the southern Cooks, yet are far enough from each to possess a distinct character. The Australs are also one of the most unknown areas of East Polynesia, due to a paucity of published material. There are few firsthand observations of traditional life, primarily because the islands were out of way for most European ships to stop at.

*Rurutu: European Contact and Evangelization*

James Cook (1955:155) was the first European to reach the Australs, arriving at Rurutu on August 14, 1769. At the time it was called Ohetiroa, for Hiti-roa, the old name of the island (‘Iti = border + roa = distant, i.e., borderland (Seabrook 1938:192)). Cook’s crew did not reach shore, due to the absence of a good anchorage and the belligerent
attitude of the inhabitants. The occasion was not etched into the oral tradition of Rurutu (Seabrook 1938:69). Few ships stopped at Rurutu in the following years. In the 18th century the only European to have spent any considerable time in the Australs and to have written about life there was James Morrison (1935), an unwilling member of the Bounty’s party of mutineers that tried in vain to establish a foothold on Tubuai. The missionary William Ellis (1969a, 1969b), who arrived in the 1820s, was responsible for most else of what we know. In the early 1800s, European contact introduced diseases that decimated the population, as happened throughout Polynesia. Beginning in the early 1800s, the population of Rurutu fell from an estimated 3000 people to 2-300. By the 1920s the population had grown to 1240 (Seabrook 1938:10).

The Australs were extremely quick to convert to Christianity. In 1819 Pomare II of Tahiti visited Ra’ivavae and left an agent of his behind. Two years later all but 25 people were converts (Ellis 1969b:377). The story of Rurutu’s evangelization is rather unique, as set down by Ellis (1969b:395-404), who was an eyewitness. In 1820, because of the spread of a disease on the island, the populace began to attempt to appease the gods in order to be rid of it. When this failed, a group led by a young Rurutuan chief named Auura decided to move to Tubuai. Some weeks later they tried to return to Rurutu, but were unable to land, and a storm blew them off course all the way to Maupiti in the Societies. There the locals took care of the weary crew. They proceeded onto Borabora and then Raiatea, where for the first time they saw the homes of European missionaries, as well as the chapel and school. Auura and his companions decided to adopt Christianity. After several months of tutelage, in 1821 a ship on which Ellis himself was
on board picked up Auura, his companions, and two Raiatean Christians, and conveyed them to Rurutu. Upon landing, the Raiateans inadvertently broke several *tapus*, yet no divine punishment was forthcoming. This so impressed the locals, that Auura convinced the majority of people to put their faith to a test only one day after his arrival. They would hold a feast the next day, on which sacred foods such as turtle and pork would be consumed. Women, who were forbidden to eat in the company of men and to whom these foods were *tapu*, were invited to participate. The local priests declared that divine retribution would be swift against any who partook. As nothing occurred, this was enough to convince the population to demolish the *marae* and the wooden idols that decorated them, burning them to the ground that very day (Ellis 1969b:399-400). Some, like the famous statue of the god A’a now in the British Museum, were sent as trophies to Raiatea. Upon Ellis’ return to Rurutu in 1822, he noted that already some had learned to read, the people had begun to erect plastered houses, and they had built a chapel 80 feet long and 36 wide (Ellis 1969b:400-1). The same year Tubuai, hearing of these developments, sent word to Tahiti requesting teachers (Ellis 1969b:385). Also in 1822, missionaries arrived in Rimatara, where they too met with eager pupils (Ellis 1969b:390-1). In 1824 Ellis observed that many more were living in more modern homes and wearing “decent clothing” (Ellis 1969b:200).

After the arrival of missionaries on Rurutu, people began to concentrate in the valleys of Moerai, Avera, and ‘Auti. *Calophyllum* trees, previously used for canoe-making, were cut down for timber, and Moerai, Avera, and ‘Auti became shipbuilding centers. Traditional activities such as canoe-building were abandoned. Soon the
carpenters were far more expert at constructing European schooners and whaleboats. Cotton and coconut was grown for export, and weapons, tapa, and carved wooden objects were traded to missionaries for plug tobacco. Women began to weave pandanus basketwork, notably plaited hats, for money, and imported clothing quickly replaced local tapa, and the art of its manufacture was forgotten soon thereafter (Seabrook 1938:8).

The converted Polynesians who evangelized the Australs were not concerned with documenting the traditional culture, as many European missionaries did. Consequently, there are very few firsthand accounts. As the journals of missionaries provide us with some of the best eyewitness descriptions of Polynesia prior to complete westernization, the lack of such documents for the Australs leaves a large blank in our knowledge of indigenous customs, religion, and prehistory. As Buck (1938:164) wrote, “Extremely little is known of the myths and early traditional history of the Austral Islands, presumably because of the complete break in continuity that followed early proselytizing.” It was not until the 1920s, when the Bernice P. Bishop Museum of Honolulu sent ethnographers to the Australs, that any information was gathered. Of course by this time, a century after evangelization had occurred, the ethnographers had to rely on the accounts of people generations removed from the events and customs they described.

**Ethnography**

The group responsible for the Australs was comprised of John Stokes, Robert Aitken, and Frank Stimson. Robert Aitken’s (1930) research on Tubuai, which includes a section on adzes written by Stokes, is the only one to have been published. Stokes did
limited research on Rurutu, and more on Ra’ivavae and Rapa, the manuscripts of which are housed in the Bishop Museum archives. Stimson’s focus was Ra’ivavae, and a man named F. Alan Seabrook, a gentleman living in Tahiti with a strong interest in Polynesian studies, assisted him. As Seabrook plays an important part in this investigation, it is important to discuss him further. In the late 1930s, upon the suggestion of Dr. C. Montague Cooke, a Bishop Museum malacologist, Seabrook compiled an ethnography of Rurutu (Stimson, in Buck 1939:9). The present study takes full advantage of his excellent unpublished manuscript, which Peter Buck purchased on behalf of the Bishop Museum. In the 1950s Seabrook accompanied Donald Marshall (1961) to Ra’ivavae to follow up on the research he had done with Stimson 20 years earlier. Marshall (1961:22) described Seabrook as “a brilliant man,” and “one of that breed who prefer living in Polynesia to anywhere else in the world. He is a thinker, a writer, and intellectual, who now works a beautiful plantation in one of the far valleys of Tahiti, where he lives with his wife” (1961:30-1). Seabrook died in Tahiti a few years later, having seen none of his work published.

Archaeology

The lack of documented ethnographic information in the Australs has its parallel in the archaeology done there. Excavation in the Australs has for the most part been restricted to Classic period sites, namely Vitaria on Rurutu (Vérin 1969), the *marae* Te Rae Rae and the hilltop terrace of Hatuturi on Ra’ivavae (Skjølsvold 1965a, 1965b), and various sites, primarily fortifications, on Rapa (Ferdon 1965a, 1965b; Mulloy 1965; Smith 1965; Kennett et al. 2003; Walczak 2003). Additional survey on Ra’ivavae
(Edwards 1998, 2003) and Rimatara (Eddowes 2004) has contributed to our knowledge of Classic period sites and settlement patterns. These sites have yielded typical Classic period artifacts, and have all been dated to no earlier than the 17th century. Excavations on Archaic period sites have been far more limited. Vérim’s work on a rockshelter on Rurutu yielded some artifacts reminiscent of the Archaic, but the stratigraphy was confused and a radiocarbon sample, likely contaminated, yielded a date of 150 B.P. (Vérim 1969:146, Annexe I). More recent work on Tubuai (Eddowes 1998) has unearthed many diagnostic Archaic artifacts, but the site is incompletely documented. Consequently, while we have a sufficient database for the endpoint of Austral island culture, we are missing the early sites that would allow us to construct a developmental sequence.

**The Peva Investigation**

This study examines an archaeologically-excavated site in the valley of Peva on Rurutu. Rurutu is an ideal island to study the formative period of East Polynesian prehistory for a region that has remained unknown for so long. The developments that were taking place in the central region of the Societies, Australs, and southern Cooks in the early 2nd millennium A.D. are critical in terms of the regional homeland model. In order to connect Archaic sites in the southern Cooks and the Societies, a reference point is needed in the Australs. Rurutu was chosen as the study site for the following reasons. First, Pierre Vérim (1969) had already excavated a Classic period habitation site in the valley of Vitaria. His work yielded the single largest archaeologically-excavated Classic period assemblage that we possess. A corresponding Archaic assemblage from the same
island would offer a valuable comparison between the two periods. Secondly, Rurutu’s
topography made the location of a deeply-stratified coastal site possible. High makatea
cliffs flank its valleys, allowing the accumulation of calcareous sand dunes, which are
exception in their ability to preserve organic material. Sand dune sites in the Marquesas
such Hane (Sinoto 1966, 1970), Ha’atuatua (Suggs 1961), and Hanamiai (Rolett 1998)
have yielded some of the richest Archaic period assemblages in East Polynesia. Rurutu
therefore held the promise of becoming an exceptionally well-documented island. As it
turned out, the valley of Peva on Rurutu also contained a sand dune site with intact
stratigraphic deposits.

As a reference point in the Australs, the Peva investigation will allow us to test
hypotheses concerning East Polynesian prehistory. It will address to what extent the
Australs were participating in the interaction spheres that have already been documented
for other regions of East Polynesia. This will be done by examining the Archaic East
Polynesian material culture. Does it correspond to that of the neighboring southern
Cooks and Societies, or will a “founder effect” become evident? How is it different from
assemblages from more distant regions, such as the Marquesas, New Zealand, and
Hawai’i? Given the position of the Australs as a rather isolated archipelago compared to
the southern Cooks and Societies, how did the material culture change from the Archaic
to the Classic periods? Did decreasing contact over the centuries lead to pronounced
differences? This will allow us to examine the issue of long-distance voyaging and
exchange. Empirically, x-ray fluorescence analyses will allow us to see if Rurutu was
relying primarily on local or imported basalt for tool making. This will also address
patterns of resource exploitation on Rurutu itself. How many sources of basalt were being quarried? Do they appear to have changed through time? The Peva investigation will also examine the end of the East Polynesian Archaic period. As the most southern archipelago in central East Polynesia, the Australs have faced different conditions than in other regions. Was Rurutu a “typical” East Polynesian island in that offshore fishing was more common during the Archaic than later on? What kinds of strategies were economical, and did they change? The answers can have important implications regarding the frequency of canoe use, and hence the extent of seafaring.

The Peva investigation will also be valuable regarding environmental adaptation and subsequent sociopolitical development. Environmentally and culturally, the Australs are similar in many ways to the southern Cooks. As three of the islands in the southern Cooks, namely Mangaia, Aitutaki, and Ma’uke, are well documented archaeologically, a contemporaneous site on Rurutu is invaluable. For example, Mangaia and Rurutu both emphasized taro as a starch staple. As an Open society, Mangaia was characterized by frequent warfare, primarily over the limited taro fields. The environmental stress placed on Mangaia’s resources is reflected in the archaeological record, in which the pig vanishes around 500 B.P. Will Rurutu also emerge as a typical Open society? Did frequent competition over limited resources contribute to sociopolitical development in the same way? As Rurutu is even smaller than Mangaia, will a similar pattern emerge? As relatively low high islands that do not possess rugged topography, the Australs can also address the following questions. Were extinction events as rapid as those documented on other islands, or more so? Were bird populations preyed upon in the
same manner, or were other protein sources emphasized as well? What other kinds of wild food resources were exploited during the Archaic and Classic periods?

While no single island can represent an archipelago as a whole, the Peva investigation is an important step in the archaeology of the Australs. As the first site in this archipelago for which long-term change can be documented, Peva is quite significant, and helps to clarify the role of the Australs within East Polynesia. This is becoming increasingly relevant to Polynesians in the modern world, who are becoming increasingly aware of their rich and complex past. Experimental voyages such as those of the canoe *Hokule‘a* (Finney 1979, 1994) have helped to restore a tremendous sense of cultural pride among Polynesians from all over West and East Polynesia. These “voyages of rediscovery” (Finney 1994) have shown that such undertakings were feats of tremendous skill and bravery. Importantly, they have managed to traverse the modern political boundaries that separate Polynesians from one another. While the southern Cooks and the Australs currently represent the overseas interests of two different European nations, it is becoming increasingly clear to the Polynesians who live there that such boundaries are entirely artificial. In the past they faced and surmounted considerable difficulties by working together, in terms of colonizing untouched islands, remaking them, and then helping each other in the precarious centuries following landfall. These accomplishments are equally applicable to future issues, when today’s overseas territories may well become tomorrow’s independent nations that will no longer be able to rely on welfare. Fortunately, this sense of cultural pride through the revival of tradition has already taken root in Rurutu, in large part due to the tremendous
contribution of Pierre Vérin, who continues to visit it forty years after his excavation. It is hoped that the present study will follow in his tracks.
Chapter 2. The Environmental Setting

The Austral archipelago comprises the eastern portion of the Cook-Austral chain, which includes the southern Cooks to the west (Figure 2.1). The Australs extend almost 1500 km from Maria in the northwest to Marotiri in the southeast, cutting across the Austral Fracture Zone\(^1\) between Tubuai and Ra'ivavae. The Australs are the southernmost archipelago in French Polynesia and include the volcanic islands Rimatara, Rurutu, Tubuai, Ra'ivavae, Rapa, and two uninhabited islets, the atoll Maria (formerly Hull), and the small isolated rock spires of Marotiri (Bass rocks). Distances of approximately 150-200 km separate the islands from each other. The Australs have the smallest total landmass (144 km\(^2\)) of any East Polynesian archipelago except for the Pitcairn group (43 km\(^2\)). Although high islands, the elevation of the Australs is not sufficient to produce orographic rain. However, they are exposed to the cooler, wetter climate of the southern Pacific. The average yearly temperature is 23.1\(^\circ\)C with an average annual rainfall of 1848 mm/year (ORSTOM 1993).

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\(^1\) The Austral Fracture Zone is a fossil transform that separates areas of crust that differ in age, and possibly heat flow and thickness. The older and cooler lithosphere is to the north, and the younger and hotter one is to the south (Woodhead 1996:16).
Figure 2.1. The Societies, southern Cooks, Australs, and western Tuamotus.
**Geology**

The Cook-Austral chain is one of many linear island chains in the Pacific (Figure 2.2). Like most island chains, the Cook-Austral chain is oriented from the southeast to the northwest. It stretches approximately 2700 km from one of its principal sources, the still-active underwater MacDonald volcano, which lies at 140° W 28° S, at a depth of 27-40 fathoms (Johnson and Malahoff 1971:3284-5), to Palmerston atoll far to the northwest. It comprises over 60 volcanic edifices, 11 islands, and two atolls. The islands are of many different sub-types, including atolls, almost-atolls, volcanic islands, volcanic islands combined with uplifted *makatea* to varying degrees, and rock spires (Table 2.1, Figure 2.3). The chain occupies little area above sea level, the largest island being 70 km². The Cook-Austral chain rests on the southern part of the Pacific plate, on an anomalous portion of shallow seafloor known as the South Pacific superswell, which in turn corresponds to a broad geochemical anomaly known as the South Pacific isotopic and thermal anomaly, or SO-PITA (Bonneville et al. 2002:1023). The Cook-Austral chain is quite distinctive from other archipelagos in Polynesia. The MacDonald hotspot’s first volcanic activity appears to have occurred around 30 Ma (Dickinson 1998:1043) making the Cook-Austral chain geologically older than other chains such as the Society Islands (0-4.5 Ma) and the Marquesas (1.3-6.3 Ma) (Pirazzoli and Montaggioni 1988:155). In general, islands reach the atoll-stage after 9 million years, but the Cook-Austral chain still comprises mainly high islands (Maury et al. 2000:9). The chain is also much longer than either the Society Islands or the Marquesas, which are approximately 500 km long apiece.
Figure 2.2. Bathymetry of the Cook-Austral Chain (after Woodhead 1996: Figure 3). Island ages are in millions.
Table 2.1. Geographical statistics of the Cook-Austral chain (data from Dickinson 1998; Turner and Jarrad 1982; Woodhead 1996; Morhange 1997) Note: percentages of land area can overlap.

<table>
<thead>
<tr>
<th>Island</th>
<th>Island type</th>
<th>Sub-type Area (km²)</th>
<th>Max. Elev. (m)</th>
<th>% Volcanic</th>
<th>% Karst</th>
<th>% Plane</th>
<th>Age (Ma)</th>
<th>Renewed Volcanism (Ma)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Southern Cooks</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Aitutaki</td>
<td>Almost-atoll</td>
<td>18</td>
<td>124</td>
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<td>30</td>
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<td>Coral atoll</td>
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<td>9</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>N/A</td>
<td></td>
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<td>Rarotonga</td>
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<td>67</td>
<td>653</td>
<td>75</td>
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<td>25</td>
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<td>1</td>
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<td>Sand cay on reef shoal</td>
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<td>0</td>
<td>0</td>
<td>100</td>
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<td>Volcanic-makatea</td>
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<td>27</td>
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<td>63</td>
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<td>9</td>
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<td>76</td>
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<td>Coral atoll</td>
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<td>0</td>
<td>100</td>
<td>N/A</td>
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<td>23</td>
<td>51</td>
<td>?</td>
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</tr>
<tr>
<td>Ra'ivavae</td>
<td>Volcanic, barrier reef</td>
<td>18</td>
<td>437</td>
<td>81</td>
<td>0</td>
<td>19</td>
<td>7.3-5.5</td>
<td></td>
</tr>
<tr>
<td>Rapa</td>
<td>Volcanic, without reef</td>
<td>40</td>
<td>635</td>
<td>96</td>
<td>0</td>
<td>4</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>Marotiri</td>
<td>Volcanic</td>
<td>&lt;1</td>
<td>113</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>MacDonald</td>
<td>Seamount shoal</td>
<td>0</td>
<td>-50</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>3.3</td>
<td>.35</td>
</tr>
</tbody>
</table>

Figure 2.3. Subtypes of volcanic-makatea islands (after Morhange 1997: Figure 2).
The Cook-Austral chain is one of immense geological complexity, with possibly at least three different hotspots responsible for the creation of the islands. The “hotspot” (or plume) hypothesis proposes that a source of magma in the asthenosphere produces volcanism above, creating islands on the overriding plate. The movement of the drifting plates carries off these islands, forming a chain of volcanoes (Wilson 1963). For decades, the Cook-Austral chain has proven a source of endless idiosyncrasies, which seem to run counter to nearly every prediction the hotspot hypothesis has made (Dickinson 1998). Hypotheses of multiple hotspots and “hot lines” have been proposed to account for the irregularities (Turner and Jarrad 1982). Currently, it appears that the MacDonald hotspot was probably not responsible for the formation of all the islands in the Cook-Austral chain. Indeed, it now seems likely to have formed along three separate hotspot tracks (Bonneville et al. 2002). In the northern section, an extinct volcano at Ra’ivavae, which stopped producing 6.5 Ma, created the islands of Rurutu, Tubuai, and Ra’ivavae. Rurutu and Tubuai have similar geochemical and petrologic characteristics, and the distance between the islands corresponds to the absolute rate of the motion of the Pacific plate (Bonneville et al. 2002:1024). The Arago seamount, which was discovered in 1993, located 130 km southeast of Rurutu, appears to be the missing link in the equation. Arago was known to the Polynesians who fished in the shallow waters above it (the summit is only 27 m below sea level) by the name of Tinomana (Bonneville et al. 2002:1024). Arago is actually the name of only the highest cone of three coalescent volcanoes. It was possibly responsible for forming the following: the Mauke-Mitiaro-Atiu cluster; the first stage of Aitutaki’s volcanism; the formation of Rimatara; and Rurutu’s second stage of volcanism as the island passed over it 1.1 Ma (Bonneville et al. 48
2002). At the southern end, the MacDonald hotspot probably created Mangaia, Rapa, and Marotiri. To complicate the picture even further, Rarotonga, the youngest island (2.2 Ma), may sit over the end of yet another volcanic track, which may have been responsible for the renewed episodes of volcanism on Aitutaki (1.2 Ma). The existence of at least three hotspots agrees well with the age ranges and the wide variety of geochemical signatures, primarily in terms of isotope ratios, which tend to cluster with relative homogeneity within each hotspot track (see Matsuda et al. 1984; Woodhead 1996; Bonneville et al. 2002). Rurutu is unique in the Cook-Austral chain because it is the only island whose volcanic activities are related to both those of Atiu’s to the west and Tubuai’s to the east (Chauvel et al. 1997:126).

The islands within the Australs themselves are quite varied geologically. Rimatara and Rurutu are both volcanic islands ringed by makatea cliffs. Both experienced tectonic uplift in their geological history. Rimatara, the westernmost volcanic island in the Australs, consists of a small and weathered central volcanic hill with a maximum elevation of 83 m. The makatea rises to an elevation of 11 m and is separated from the central hill by low swampy areas. No visible outcrops of basalt are present (Turner and Jarrad 1982:203). Rurutu, similar in composition but larger, also consists of a high volcanic core surrounded by makatea cliffs, which rise to 100 m. Rimatara and Rurutu both have fringing reefs, and not barrier reefs. Tubuai and Ra’ivavae are severely dissected volcanic islands that do not appear to have experienced the tectonic uplift that affected Rurutu and Rimatara (Pirazzoli and Salvat 1992:434, 448), and they exhibit no morphological peculiarities (Dickinson 1998:1068). Tubuai,
the largest island in the Australs, has a barrier reef. A large lagoon (85 km$^2$), almost
twice as wide as the landmass, encircles the island. Ra’ivavae also has a barrier reef,
which supports a number of small atoll-like islets (motu). Rapa and the Marotiri islets,
situated in colder waters to the southeast, have neither fringing nor barrier reefs. The
lack of reefs may be due both to their young age and to the colder temperature of the
water (Dickinson 1998:1051).

**Formation of Rurutu**

Rurutu is a basaltic island located at 151°21 W and 22°27 S, 472 km southeast of
Tahiti. Its nearest neighbors are Tubuai to the east (225 km) and Rimatara to the west
(150 km). Both Rurutu and Tubuai rest on a section of oceanic crust that dates from the
late Cretaceous (Campanian, 83-74.5 Ma), at a depth of 4500 m below sea level. The
island of Rurutu is one of five peaks, the other four of which are submarine seamounts
under 500-2000 m below sea level (Figure 2.4). The entire ensemble has a diameter of
100 km and a depth of 4000 m.
Figure 2.4. Bathymetry of Rurutu, depth in meters (after Maury et al. 2000: Figure 3).
Rurutu is a dissected shield volcano consisting of submarine basaltic pillow lavas up to 90 m thick (Stoddart and Spencer 1987:6). Rurutu’s shield building stage took place from 12.68-12.13 Ma (middle Miocene). During this first phase the majority of the island was formed (Maury et al. 2000:18). The deposits consist of flows and breccias of alkaline basalts and hawaiites (Figure 2.5). These deposits are <215 m thick above surface and ≤130 m thick below sea level. Ten million years of subsidence followed, which allowed for the formation of coral reefs that would become the makatea, bioclastic limestone formations. This late Miocene subsidence occurred with a gradually reducing velocity (Pirazolli and Salvat 1992:448). On Rurutu, periods of intermittent volcanism may have hindered the development of a complete encircling reef (Stoddart and Spencer 1987:11). When Rurutu passed over the Arago seamount 1.2 million years ago it underwent a period of uplift and renewed volcanism (Bonneville et al. 2002). This episode of Pleistocene volcanism deposited fresh basalt on the island (Figure 2.5, Figure 2.6). On the northern end, the major cover of Pleistocene hawaiites attains a thickness of <100 m. Hawaiitic strombolian breccias <150 m thick make up the high points of the island, Manureva (385 m) and Taatioe (389 m). On the southern end, near Naairoa, a smaller succession of basanites attains a thickness of <50 m (Maury et al. 2000:21-2). There are additional deposits of hydromagmatic basanites and manganese in the south. Exactly how much the island was uplifted is unknown, due to the concomitant erosion of the limestone. It is estimated that 1-2 million years would have been necessary to raise the makatea to its present height (Pirazolli and Salvat 1992:448).
Figure 2.5. Geological deposits on Rurutu with selected dates (after Maury et al. 2000).
In French Polynesia, the sea level arrived at a position close to that of today around 6000 B.P. (Pirazolli and Salvat 1992:448). It reached a maximum height, approximately one meter higher than that of today, around 5000 B.P. The sea level began to drop only around 1200 B.P., reaching its current position around 400-500 B.P. In the area of Rurutu, while the sea level has dropped by around one meter in the past 1500 years, the island itself has lifted about 24 cm (Pirazolli and Salvat 1992:449).

**Geography**

Rurutu (Figure 2.7) is 7 km long (north-south), and 1.75-2.4 km wide (Stoddart and Spencer 1987:6). Its landmass has been estimated as little as 32 km² (Stoddart and Spencer 1987:6) but a recent calculation of 38.5 km² (Maury et al. 2000:11) is probably
more accurate. Raised *makatea* constitutes approximately 28% of Rurutu’s total landmass (Stoddart and Spencer 1987:6).
Figure 2.7. Rurutu (map courtesy of Yves Gentilhomme).
Rurutu’s central volcanic core attains a maximum elevation of 389 meters at Mt Taatioe. *Makatea* outcroppings encircle the core, to maximum elevations of about 100 m high and depths of 100 m thick. Rurutu has the highest *makatea* of all the islands in the Cook-Austral chain. This *makatea*, which at one time completely ringed the island, is now discontinuous. At the bottoms of the cliffs, the ocean has eroded hollows 2-3 m high and 3-6 m deep. The lowlands between the *makatea* and the volcanic core appear to have been created by surface and subsurface runoff (Stoddart and Spencer 1987). The runoff eroded the limestone between the central volcanic core and the *makatea* cliffs that face the sea (Figure 2.8). On Rurutu, the groundwater has dissolved much of the *makatea*, eroding the bases of these cliffs. The *makatea* exists as six large blocks and at least sixteen smaller ones (Stoddart and Spencer 1987:11). These *makatea* cliffs form natural barriers between the nine ancient districts, Moerai, Peva, ‘Auti, Paparai, Naairoa, Unaa, Narui, Avera, and Vitaria, preventing coastal passage from one valley to another in some cases (see Figure 2.14). Paparai is the only district to be hemmed in on all sides, including the seaside, by cliffs (Seabrook 1938:47). Marine notches on these cliffs mark the position of former shorelines, evidence of tectonic uplift. In the lowlands between the volcanic core and the *makatea* stratified manganiferous clays occur (Stoddart and Spencer 1987:11).

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2 The advent of modern roads, blasted through the cliffs, has overcome this to a certain degree. The coastal road that connects Moerai to Peva, for example, did not exist before the 1970s. An overland dirt path is still available that goes around the *makatea* cliffs some way inland. A road, paved for 36 km between Vitaria and ‘Auti, surrounds Rurutu. The road that crosses the interior of the island from Moerai to Avera is also paved. The remainder of the roads are all dirt, and several cross the interior.
Rurutu's narrow coastal plains consist of sand and coral debris. Resting against the fringing reef, the plains attain a maximum height of approximately 2 m above the high tide level. The absence of a lagoon on Rurutu can be attributed both to the renewed volcanism and to the accompanying uplift of the coral reef (Maury et al. 2000:11). There are no coral islets or reef conglomerates (Pirazzoli and Salvat 1992:442). The flat of the fringing reef is for the most part around 100 m wide but does not exist uniformly around the island. The reef flat is at its widest in the bay of Avera, reaching a width of 500 m. Normal tides range from 60-90 cm (Pirazzoli and Salvat 1992:433). Most of the passes (ava) through the fringing reef are too small for anything but a small boat to pass through. Only the passes at Moerai (passe Tauaatua) and Avera (passe Opopu) are large enough for sizeable boats. This had the effect of concentrating most of population into these valleys following European contact. The clarity of Rurutu's waters inspired Joseph Banks (1962:332) to write, "The water was clearer than I ever saw it, I saw distinctly the ground at 25 fathoms deep."
Soils

The soils that cover the core of Rurutu are mostly moderately desaturated ferralitics, of reddish to grayish color, called mamu locally (Maury et al. 2000:13, 63). Between the central core and the makatea the patches of swampland consist of hydromorphic soils of pseudogley and gley (soils that develops under conditions of poor drainage in marshes, swamps, seepage areas, or flats, resulting in a reduction of iron and other elements, and in gray colors and mottles). On the coastal coral sands and on some patches of makatea there are rendzines (calcareous clayey soil) (Maury et al. 2000:13). Stokes (Notes on Rurutu, manuscript, p. 5) observed that the richest soils for agriculture were on and around the makatea, with the best patches being located on the inland border of the cliffs. He attributed this to the mixture of lime with the volcanic soil.

Climate and Hydrology

The Austral climate is of the oceanic subtropical type, with two seasons. The summer, or rainy season, lasts from January through May. It is rather warm and humid, and it rains almost daily. The winter, or dry season, lasts from June until September and is chillier and drier than the summer. During the winter there are frequent spells of cold wind. The Austral winter is the season of planting and also corresponds to the migration of whales and a variety of birds. Annual rainfall is between 1800-2000 mm distributed over 180-200 days (Figure 2.9). Rurutu, like Tubuai, is in a converge zone between the Kermadec anticyclone and the Easter Island anticyclone. Cyclones, most dramatically in 1979 and 1991, can cause considerable damage. Rainstorms can be quite violent with very strong winds. During the day the average temperature is 20-26° C, and at night 10-
12° C. Except for Vitaria and Naairoa, every district has its own permanent watercourse for consummation and irrigation.

![Graph showing average rainfall and temperatures on Tubuai](image)

**Figure 2.9.** Average rainfall and temperatures on Tubuai (data from Guillin 2001:107).

### Vegetation

The flora of the Australs closely resembles that of the Societies, with 139 species in common (Florence 2003:140). The Australs are small islands with relatively low elevations and easily accessible terrain, and this has contributed to their extensive degradation (Florence 2003:140). The vegetation of Rurutu is exceptionally impoverished compared to other high islands. Its barren landscape prompted Joseph Banks (1962:332) to write, “The Island to all appearance that we saw was more barren than any thing we have seen in these seas.” Most of Rurutu is covered by secondary
growth, and there are few endemic species (Hallé 1983:141). Hallé (1983:147) speculated that Rurutu’s lack of a lagoon might have made it more vulnerable to strong winds from the east and southeast. While we cannot be certain what the original, pre-human vegetation of the islands of Polynesia was composed of, it is most probable that they were all forested, especially islands with sufficient rainfall (Fosberg 1991:16). However, this native vegetation was not particularly useful to the human colonists, who had brought their own array of cultigens with them. Between initial colonization and European contact huge transformations took place, most of which were intentional, resulting in a “transported landscape.” These human-induced modifications often resulted in deforestation and landscape degradation. Large expanses of pyrophytic vegetation on the mountainous slopes, caused by repeated burning for agriculture, are characteristic of Polynesian high islands. Stokes (Notes on Rurutu, manuscript, p. 5) wrote that on Rurutu, the “uplands have been frequently visited by fire, exposing the red soil in many places. Here the vegetation seems slow in returning. The fires, the results of which were observed, were due to the work of clearing land for farms and trash fires at lower elevation, and had got beyond control.” It is not surprising that the majority of Rurutu is covered by either degraded landscape now useless for agriculture, or else by secondary growths in the more favorable areas. Rurutu possesses few vegetation groups, and primary vegetation is restricted to littoral azonal formations, cliffs, high makatea, and some mountainous ravines.

The most comprehensive study of Rurutu’s vegetation is that of Hallé (1983), elaborated upon in the *Atlas de la Polynésie française* (ORSTOM 1993). Figure 2.10 is a
vegetation map of Rurutu (adapted from ORSTOM 1993), which subdivides the island into areas according to two major groups, zonal and azonal vegetation. Zonal vegetation depends on climatic factors. The vegetation of a hot and dry zone will naturally differ from that of a wet and cooler one. Likewise, the vegetation will vary according to altitude. Zonal vegetation is naturally far more diverse on larger, higher islands such as Tahiti, and less so on smaller, lower ones such as Rurutu. Rurutu’s maximum elevation (389 m) is too low to have much effect on the precipitation (ORSTOM 1993). The vegetative zones are primarily influenced by the nature of the substratum, which is either volcanic or makatea. Azonal vegetation includes the local variants within zonal formations. The factors that affect it the most are abiotic rather than climatic. The presence of salt and the availability of water are examples of such variables. The following descriptions of vegetation zones are keyed to their map code numbers (Figure 2.10).

Azonal Vegetation

1. Psammophile groups of Scaevola-Argusia type. Psammophile (sand loving) plants, as their name indicates, grow in coral sands. Species such as the beach naupaka (Scaevola sericea), octopus bush (Argusia argentea), and bay cedar (Suriana maritima) are common. Rare species include Schleinitzia insularum, moon vine (Ipomoea macrantha), and hinahina (Heliotropum anomalum).

2. Saxicole groups. Saxicole (rocky area) groups, such as are found on the makatea formations, are home to pemphis shrubs, caperbush (Capparis spinoza), and Hedyotis foetida.
3. Plain groups. Forests of beach gardenia (Guettarda speciosa) and Pandanus tectorius occupy the coastal plains until around 100 m in elevation, and Guettarda and Hernandia nymphaeifolia are also found upon the makatea karst. Other species, such as Barringtonia asiatica, Neisosperma oppositifolia, and Ficus tinctoria also grow in these rocky areas. Herbaceous saxicole plants and epiphytes are common inside the more humid pockets of karst. The Guettarda-Pandanus forest has retreated to its present locations in the wake of human development. Polynesian-introduced species such as candlenut (Aleurites moluccana), breadfruit (Artocarpus altilis), as well as the post-European introduction coffee (Coffea arabica) can be found in the less-steep slopes of Vitoria and Avera.

4. Swamp groups. Most of the swampland suitable for taro cultivation now lays fallow. These swamps are fed by subterranean springs, and the species found there are common to wet areas, such as false primrose (Ludwigia octovalvis), cowgrass (Paspalum conjugatum), and climbing dayflower (Commelina diffusa).

Zonal vegetation

All zonal vegetation on Rurutu is included within a single mesophyle group, as the precipitation probably does not exceed 3000 mm/yr. Within this zonal group there are two sub-categories, the valley forests of Hibiscus and Metrosideros, and the drier forests of Dodonaea-Xylosma.

5. Forest of Hibiscus-Angiopteris. This type of forest is found in the north of the island. It is comprised of Hibiscus (Rur. purau, Hibiscus tiliaceus), whose status as a Polynesian
import is uncertain (Whistler 1991:64), and the tree fern Angiopteris. Both Hibiscus and Angiopteris are characteristic of the upper elevations of high islands such as the Marquesas (Rolett 1998:32). On high islands, Angiopteris typically occurs in anthropogenic forests beginning at around 400 m, and continues to the cloud zone until around 900 m. Seabrook (1938:2) wrote that Hibiscus was the most common tree on the island, beginning in the watercourses of Rurutu’s high gullies. On Rurutu, Hibiscus exists primarily on the northern cone, in the area surrounding its summit. In addition to there are also Cerbera manghas and Glochidion raivavense trees, and maile (Alyxia stellata) and Macropiper latifolium shrubs.

6. Secondary forest of Mangifera-Coffea. These low-altitude forests represent zones that have been drastically modified by human behavior, and include many introduced species, both Polynesian and European. Among the Polynesian introductions there is candlenut (Aleurites moluccana) and Tahitian chestnut, or mape (Inocarpus fagifer). Coconut trees (Cocos nucifera), mingled with Hibiscus, ascend gently until an altitude of around 150 m. More recent introductions include mango (Mangifera indica) and Chinaberry tree (Melia azedarach). Albizia (Paraserianthes falcataria) was introduced around 20 years ago. Coffee (Coffea arabica), another post-European introduction, has infiltrated the low altitude forests as well.

7. Ravines of Metrosideros. These ravines contain forests wetter than those of Hibiscus. Black tree fern (Cyathea medullaris) and Metrosideros collina var. villosa grow in these areas. The ravines are also home to shrubs such as Coprosma velutina var. anderssonii, Cyrtandra elizabethae (both endemic), and bleeding heart (Omalanthus nutans).
Formations of dales and dry hills

In these areas human alteration is most visible. Repeated firing of the vegetation and grazing have resulted in extended degradation.

8. Forest of *Dodonea-Xylosma*. This is a low and open forest, and is not composed of primary vegetation. It is found in transitional, mid-slope areas. It includes perennials such as the hop bush (*Dodonea viscosa*) and *Xylosma suaveolens* ssp. *gracile*, and *Tarenna sambucina*. Another plant that is suggestive of forest clearance, and which grows in the drier areas, is the Polynesian import *Casuarina esQuitifolia*, or ironwood (toa). In Polynesia, this tree was used for making weapons such as war clubs and spears. Rurutu, it seems, was quite remarkable in that it had an abundance of it. Joseph Banks (1962:332) wrote that it seemed that *casuarina* was the island’s main product, and that “indeed everywhere along shore where we saw plantations they were covered by trees of this kind planted between them and the sea.” William Ellis (1969b:394) also remarked that the *casuarina* of Rurutu was both abundant and large. In the early 20th century, coconut plantations appear to have replaced the *casuarina* groves, as well as the essential shipbuilding wood, ‘ati (*Calophyllum inophyllum*). *Casuarina* and *calophyllum* were both intensively harvested in the 19th century, resulting in their drastic depletion (Seabrook 1938:3).

Also in these areas are the secondary plants guava (*Psidium guajava*), and *Lantana camara*. These patches of *Dodonea-Xylosma* are similar in composition to the most degraded areas of the island’s landscape, the fernlands comprising *Dicranopteris linearis*, *Lycopodium cernuum* and *Nephrolepis hirsutula*. 65
Degraded areas

9. *Dicronopteris* fernland. The bracken fern (*Dicranopteris linearis*) and Swordgrass (*Miscanthus floridulus*) are both pyrophytic plants that grow where repeated firing has taken place. *Dicronopteris* tends to grow in higher elevations than *Miscanthus*.

10. *Miscanthus* savannah. *Miscanthus* is another byproduct of burning. It tends to grow in the lower elevations, often giving way to *Dicronopteris* higher up. This can be seen in Figure 2.10 on the northwest coast of Rurutu, where areas of *Miscanthus* savannah merge into larger patches of *Dicronopteris* in the higher elevations. The patches of savannah are plainly visible on the slopes in Figure 2.11 and Figure 2.12.

Mosaics

11. *Miscanthus* and *Hibiscus-Angiopteris*

12. *Dicranopteris* and *Dodonaea-Xylosma*

13. *Dicranopteris* and *Mangifera-Coffea*

14. *Dicranopteris*, coconut plantation, and *Mangifera-Coffea*

15. *Dicranopteris* and forest of *Hibiscus-Angiopteris*

16. *Dicranopteris* and forest of *Hibiscus-Pandanus-Weinmannia*

17. *Guettarda-Pandanus* and *Mangifera-Coffea*

Other vegetation zones

18. Coconut plantation
19. Ligneous plantation

20. Taro field (active)

21. Urban zone
Figure 2.10. Vegetation of Rurutu, with degraded areas shaded (after ORSTOM 1993: Plate 55).
Figure 2.11. A taro field of Rurutu. Note the secondary forest in the back of the valley and the light patches of savannah in the background (Photo courtesy of Yves Gentilhomme).
Figure 2.12. View of Avera, taken from the island's summit. Note the ferns and degraded grasslands (Photo courtesy of Yves Gentilhomme).
Anthropogenic Forests and Gardens

Agriculture on Rurutu has changed considerably over the past decades. Previous cash crops for export were coffee, manioc, vanilla, oranges, and mushrooms. Today the most common crops are potatoes, carrots, and leeks. Coffee, which was the Australs’ major cash crop until the 1960s, has dwindled in importance, in part due to the high cost of labor. As subsistence cropping is a relatively minor component of life on Rurutu these days, reconstructing the traditional agricultural system requires that we rely on ethnographic and archeological evidence.

Surface remains that date from the 18th century and possibly earlier indicate that settlements were concentrated in the backs of the valleys, within eyeshot of the taro fields. The villages were shaded by groves of casuarina and Tahitian chestnut. Tahitian chestnut still grows in the backs of the valleys around streams, although people no longer depend upon its fruit (Seabrook 1938:3).

The Austral islanders had access to all the Polynesian staples. Concerning Rurutu, Ellis (1969b:394) wrote, “The soil is fertile: most of the productions, used as articles of food in the Society Islands, flourish here.” On Rurutu, Ra’ivavae and Tubuai, coconuts, yams, and breadfruit grew (Morrison 1935:67; Marshall 1961:35; Aitken 1930:16-24) although taro (Colocasia esculenta) was the prominent staple (Seabrook: Study of taro and taro planting in Raivavae, manuscript, p. 1); Aitken 1930:16; Marshall 1961:149). Dryland crops such as yams and sweet potato were less emphasized. According to Stokes (Notes on Rurutu, manuscript, p. 10), the sweet potato, of which he
recorded three varieties, was planted best in January, ripened in six months and was then
gathered. If left longer it was vulnerable to damage by insects. There was another
planting in July, with a December harvest. The yam (‘u’i), of which there was only one
variety, could be left in the ground two months longer than the sweet potato. It was
planted in dry ground on hill slopes, where there was well-drained soil. The ground was
cultivated to a depth of half a foot. Sugarcane (to), of which he recorded four varieties,
was planted in most, rich soil, and was harvested in one to two years. Coconuts do not
grow well in the Australs, and copra, even when it was grown, was never a major
resource compared to other regions of Polynesia (Lextreyt 1997:85). Neither coconuts
nor bananas (Musa) appear to have been very prominent foods in the Australs. Aitken
(1930:21) recorded fourteen varieties of banana for Tubuai, some of which were exported
(in the 1920s) to Tahiti and the Tuamotus. Seabrook (1938:57) noted that on Rurutu
coconuts and bananas were a negligible source of food, even in times of famine.
According to Seabrook (1938:94), the fruit of the a’ia (Eugenia) tree was eaten, and ti
(Cordyline) was the principal sweetening ingredient for dishes. The missionary William
Patterson Alexander provided an excellent description of Rurutu’s anthropogenic
landscape after his visit there in 1832, which can be compared to Hallé’s vegetation
profile of Rurutu in Figure 2.13. His account of a walk from Avera to Moerai runs as
follows:

Being told that the largest settlement was on the opposite side of the island, & that
the labor of crossing was not very great, having procured a guide, Mr. Tinker & I
resolved to go. We had not gone far when we came to a stream, which we
crossed on the shoulder of our guide, & before we reached the ascent we passed through a delightful grove of *tamamu* (*Calophyllum*), chestnut, breadfruit, ironwood, *hala* (*Pandanus*), *papaya*, *cocoanut*, paper-mulberry, sugar-cane, bananas, &c. We passed by a large bed of *taro*, tracts of sweet-potatoes, & a large orchard of pineapples. We found the ascent steep and tiresome, the part over which we passed being probably 800 feet above the level of the ocean, the highest part of the island being 1,200 feet high. The thick brakes & tall grass which overhung our path sometimes almost covered us. After resting awhile on the summit, under the shade of the *hau* (*Hibiscus*), we had just begun to descend when we met a company from the village to which we are going...we proceeded, entering as we descended groves still more dense that those through which we had first passed (in Alexander 1934:109-10).

Figure 2.13. Schematic profile of the altitudinal distribution of some of Rurutu's characteristic contemporary vegetation. The view faces north, and includes the eastern portion of the island. Except for the bars representing coconut, *Inocarpus*, and *Passiflora/Coiffa*, all other bars represent elements of secondary growth. The thickness of the bars in an approximation of the relative frequency of the species within the limits of altitude. Note: the species described here are not all to be found in the vegetation map of Figure 2.10 (drawn after Hallé 1983: Figure 2).
In the Australs, the importance of the different starch staples, particularly breadfruit, appears to have changed from the Classic period to the early 20th century. Morrison (1935:67) wrote about Tubuai, “Their Food is Chiefly Breadfruit (which they preserve as the Society Islanders do making it into a sour paste Calld Mahee) Yams, Tarro, Plantains, Cocoa Nuts, Wild Roots, & fish which they Bake in the Same Manner as at the Society Isles.” Aitken (1930:22) believed that breadfruit formerly ranked with taro in importance as a staple on Tubuai, although it was not very abundant during his stay. However, he maintained that breadfruit was never as critical in the Australs as it had been in the Marquesas. Rurutu may also have emphasized breadfruit as a supplement to taro. Seabrook (1938:3b) noted that on Rurutu, the cold and dry season “matures a breadfruit crop that is envied in Tupuai, 120 miles further south.” On Rurutu, as on Tubuai, breadfruit was fermented into a paste called tio’o, formerly known as ma’i (Seabrook 1938:110). A pit two and a half feet square was lined with nono’a, banana, and ti leaves, into which soft breadfruit was left to sit for ten days. After this interval, water and more breadfruit were added, and the process was repeated after a fortnight. When a total of fifty breadfruit had been fermented in this manner, it was regarded as enough to last a family a year (Seabrook 1938:110-11). Tio’o was also used to flavor taro poi (Seabrook 1938:110). The ability to harvest and store breadfruit would have offset the food shortages that we might expect to have menaced a district that had no taro, namely Vitaria (Vérin 1964:47). Of all the Australs, only Rapa, far to the south, could not grow breadfruit or coconut (Florence 2003:141).
The extensive coconut plantations that today occupy most of the coastal plains of Rurutu appear to be a relatively recent addition to the landscape. Seabrook (1938:2) noted that the thousands of trees were planted by the generation he was witnessing. These plantations began with the flourishing copra trade that began at the end of the 19th century (Seabrook 1938:8). Seabrook also observed that coconut plantations had replaced the former *casuarina* groves, which had been almost entirely depleted by that time for their use in the construction of whale ships.

*Cultivation of Taro*

The cornerstone of the traditional Austral subsistence system was taro, cultivated in both raised-bed systems and pondfields (Seabrook, Study of taro and taro planting in Raivavae, manuscript, p. 1). It remains the favorite staple in the Cook Islands as well (Whistler 1990:400). The methods used to cultivate taro in the Australs seem to have varied depending on population size. Seabrook (Study of taro and taro planting in Raivavae, manuscript, p. 3) wrote that in the Australs, “Taro fields may be irrigated artificially or not: the small Rimatara population did not have to do more than weed and plant the borders of the natural swamp land surrounding their island, while the crowded Rurutuans had to adapt their too-well drained island by terracing endless slopes and re-channeling stream-beds: the Raivavaean cultivation was a compromise.” Morrison (1935:65) described Tubuai’s extensive taro plantations as follows: “The Island is Watered with innumerable rivulets from the hills, which being bankd up for the Cultivation of Tarro, affords shelter to Wild Ducks (probably the Gray Duck, *Anas*  

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3 In the Australs the copra trade peaked in 1938 with an export of 310 tons, fell to 151 in 1961, and in 1995 copra production for the entire archipelago was only two tons (Vérian 1964:61; Guillin 2001:74).
superciliosa), which are here in plenty & affords also plenty of Fine Eels Shrimps prawns & a fish like the Millers thumb." Morrison's account of taro cultivation is without parallel for the Australs:

They Cultivate nothing but the Tarro, a root of the Nature of a Yam which Grows in Watery Ground, the tops of which Make excellent greens, in the Cultivation of this root both Men & Woemen labour, taking great Pains to level the Ground and bank it up, so that the Water May Cover the Whole of it, their only Method of digging being with a pointed Stick and hauling the Brush up by the roots and when they find it Necessary to level a piece of Ground, they Carry the earth about in baskets saving the Stones for embankments, and find whether it is properly leveled by turning a Stream of water into it; as some of them are always employ'd weeding or planting, they always Carry with them a long staff or wand, with which they knock down the Ducks which they come within reach of, at this they are expert and frequently Come on them unperceived the leaves of the Tarro keeping them from the sight of the ducks till they are within reach. (1935:69)

The Nutritional Value of Taro

As taro was such a fundamental aspect of the Austral subsistence system, it is necessary to discuss this crop in some detail. Quantitatively, taro is the most important crop in the Pacific (Wang 1983:3). It is highly polymorphic, with around 300 cultivated varieties (Plucknett et al. 1970:415). The varieties are distinguishable based on size, leaf shape, the color of the petiole, and the leaf and corm flesh. On Rapa, Hanson (1970:69) distinguished around 15 different varieties of taro during his ethnographic fieldwork there.
in the 1960s. In the 1920s, Stokes (1930b: vol. 1, p. 231) was provided with ten different pre-contact Rapan taro varieties, plus two introduced ones. He recorded twelve varieties for Rurutu (Notes on Rurutu, manuscript, p. 9). Aitken (1930:17) reported that on Tubuai 16 varieties are recognized, and Edwards (2003:4) recorded 13 varieties of wet taro and one of dry taro on Ra’ivavae. Henry (1928:35-6) listed 29 cultivated varieties in Tahiti. At present, there are around 60 varieties in Hawai‘i, but many more probably existed in the past (de la Peña 1983:172).

Taro reproduces vegetatively. It does flower, but rarely, sprouting shortly after planting (Plucknett et al. 1970:155). Taro is an advantageous plant because it can be grown in a wide range of soils, such as upland dry soils, lowland well-drained soils, non-flooded soils, and marginal areas as well. It is extremely versatile, as there are varieties that grow in both brackish and freshwater swamps, sand, mud, both grasslands and forests, and at high elevations. It can support humid conditions, high rainfall, and also waterlogged, saline, and saturated soils (de la Peña 1983:167). In general, it grows best in a warm, moist environment, and in slightly cool waters (28° F). Ideally, taro is cultivated under irrigated conditions. In general, wetland taro matures in 12-15 months but can be left in the field for up to 18 months. In this way, the crop is field-stored, an advantageous strategy as only what is immediately needed can be harvested (de la Peña 1983:175). Taro can also be fermented utilizing ensilage. Fermentation requires 14-21 days in an undisturbed and airtight silo, and can remain stored for more than six months without detriment to its nutritive qualities (Steinke et al. 1984:230).
Taro is an extremely nutritious tuber. The corm is a rich source carbohydrates, while being low in fat and protein, and the raw starch is excellent in terms of digestibility (Standal 1983:142). The cooked leaves contain good amounts of calcium, phosphorus, iron, potassium, vitamin A and ascorbic acid, and the protein is of good quality as it contains most of the essential amino acids (Plucknett and de la Peña 1971:248, Table 3). Taro is one of few major staples of which both the leaf and underground portion are eaten, and it can be processed into more forms than any other root crop. Apart from its nutritive qualities, taro has medicinal value. For example, in Hawai‘i its juice was used for styptics and poultices, and mixed with sugarcane juice for pulmonary congestion (Ghosh et al. 1988:283).

Despite its advantages, taro is relatively unsuitable as animal feed, due primarily to its irritant qualities, the elimination of which requires much preparation (Carpenter and Steinke 1983:270). Uncooked taro can cause serious irritation and swelling in the mouth and throat. While the absolute cause is uncertain, it is probably due to the presence of calcium oxylate crystals that contain cells called raphides and druses (Steinke et al. 1984:226). Cooking or fermentation destroys this acridity and makes taro suitable for consumption. Experiments have demonstrated that as animal feed, taro flour or ground corm meal did not contain enough protein for the animals to attain maximum potential (Steinke et al. 1984:227). On the other hand, taro that has been fermented has proved promising for feeding sows during their gestation periods (Carpenter and Steinke 1983:297). Pigs and other livestock fed on fermented taro tend to grow accustomed to it as well (Steinke et al. 1984:232). However, fermented taro as animal feed was probably
not emphasized in prehistoric Polynesia. Early attempts to utilize taro or its products as animal feed were made in Hawai‘i in the late 1930s (Carpenter and Steinke 1983:271). In this respect, crops other than taro, namely breadfruit and coconut, would have been highly advantageous in prehistoric Polynesia, both to supplement the human diet and to feed domesticated animals.

*The Pondfields of Rurutu*

Rurutu can be broadly divided into four basic zones: coastal plain, makatea, swampland, and volcanic core (Figure 2.14). The majority of the swampland, which is suitable for taro cultivation, is now unused. The portions which are today given over to irrigated taro probably represent a mere fraction of what was cultivated in the prehistoric era. The taro fields of Avera (Figure 2.15) are typical of those found in the other valleys of Rurutu. Stokes described taro terracing on Rurutu in some detail:

Wet taro is grown in terraced ponds fed from water conducted from the rivers in artificial ditches. Some engineering skill must have been used in constructing these ditches, as the flow of water is very gradual. The fall of water from one pond to another varies greatly, varying, as noted from half a foot to five feet. The size and shape of the ponds also vary, from forty by ninety feet to three times that size. Likewise the arrangement of the inflows and outflows; there may be a single in and out flow, two inflows and one outflow, or one inflow and two outflows, but they are not carefully arranged so as to draw the water thoroughly through the pond. All these matters seem dependent on the contour of the country. Referring back to the in and out flows - it was noted in some cases that both were on one
side of the pond, so that one might imagine that the water in the greater part of the pond would become stagnant; however it appeared fresh enough. The ponds are situated in general at the mouths of the valleys where they adjoin the level land near the sea. A few small groups of ponds are also to be found on the mountain slopes from one to two miles inland, but they constitute a very small proportion of the area under cultivation in taro (Notes on Rurutu, manuscript, pp. 7-8).

The terrain chosen for a pond was either on swampy ground or on ground adjacent to a watercourse on higher ground that could be diverted to the area by an irrigation canal. When the taro was cultivated on a hillside, terraces (repo) would be cut in successive stages. Before planting, the soil was overturned and leveled by means of a simple digging stick (ta'auara'a). The taro setts were then driven into the soil. As the taro grows, the fields must be weeding regularly. The humidity is conserved in the patches through a covering of coconut fronds that prevents evaporation (Vérin 1969:201; see Figure 2.16).
Figure 2.14. Map of Rurutu showing areas of coastal plain, volcanic core, makatea, and swampland (after Stoddart and Spencer 1987: Figure 3).
Figure 2.15. Aerial photograph of the taro fields of Avera (Photo courtesy of Yves Gentilhomme).

Figure 2.16. A young man of Rurutu standing on an embankment. Note the irrigation ditches on either side, and the freshly planted patch on the right covered with coconut fronds (Photo courtesy of Yves Gentilhomme).
Terrestrial Fauna

The Polynesians imported the pig (Rur. *pua’a, Sus scrofa*), dog (Rur. *pore, cf. ‘uri* in Tahitian, *Canis familiaris*), chicken (Rur. *moa, Gallus gallus*), and Pacific rat (Rur. ‘iore, *Rattus exulans*) to Rurutu. Following this, Europeans introduced geese, turkeys, cattle, horses, sheep, goats, cats, as well as other species of birds. The only reptiles are geckos and skinks. The flying fox (*Pteropus tonganus*) did not reach Rurutu (Seabrook 1938:4) but bones found in the earliest deposit of Peva might suggest an earlier presence (see Chapter 5). The freshwater streams contain crayfish, minnows, and eels. Insects such as mosquitoes are rarely bothersome in the cold season. Spiders, land mollusks, and centipedes are rare (Seabrook 1938:4). Extant bird species are summarized in Table 2.2. The Australs and the southern Cooks were so famous for their parakeet feathers that in the 19th century the Tahitians called them the Paroquet Islands, or *Fenua-ura* “Red land” (Henry 1928:464). The name “Red Land” probably refers to Kuhl’s Lorikeet (*Vini kuhlii*), also called the Rimatara Lorikeet because it is endemic to that island, and whose Tahitian name is *vini-‘ura* (red *vini*) (Henry 1928:385). Species of *vini* such as this were probably once found throughout the Australs. Seabrook (1938:4) noted that tropicbirds were still numerous on Rurutu, perhaps because the high *makatea* cliffs afforded adequate protection. It is likely that there were more species of birds present on Rurutu during its prehistory than today, as has been shown on Mangaia in the southern Cooks (Kirch et al. 1995). The Gray Duck (*Anas superciliosa*), which is found in the Australs, is now rare in the southern Cooks, and possibly extirpated in Rarotonga (Pratt et al. 1987:100). A duck that inhabits taro patches, this is most likely the species that Morrison described as being hunted on Tubuai.
Table 2.2. Birds of Rurutu (from information compiled by Philippe Raust, from observations made in 2002 by Philippe Raust, Georges Sanford, Yves Gentilhomme, and Albert Varney, published on the internet at [http://www.manu.pf/E_RURUTU.html](http://www.manu.pf/E_RURUTU.html); habitat information is from Pratt et al. 1987)

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Rurutu Name</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sea Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Anous stolidus</em></td>
<td>Brown Noddy</td>
<td><em>o’io</em></td>
<td>Nests in varied locations, from sandy beaches to tall inland trees</td>
</tr>
<tr>
<td><em>Anous minutus</em></td>
<td>Black Noddy</td>
<td><em>o’io</em></td>
<td>Nests on rocky sea cliffs and trees</td>
</tr>
<tr>
<td><em>Fregata minor</em></td>
<td>Great Frigatebird</td>
<td><em>otaa</em></td>
<td>Swoops inland to drink in freshwater ponds</td>
</tr>
<tr>
<td><em>Fregata ariel</em></td>
<td>Lesser Frigatebird</td>
<td><em>otaa</em></td>
<td>Like <em>Fregata minor</em>, but nests more often on ground</td>
</tr>
<tr>
<td><em>Phaeton lepturus</em></td>
<td>White-tailed Tropicbird</td>
<td><em>tavae</em></td>
<td>Nests on cliff faces and trees</td>
</tr>
<tr>
<td><em>Phaeton rubricauda</em></td>
<td>Red-tailed Tropicbird</td>
<td><em>tavae</em></td>
<td>On high islands, nests on coastal cliffs and offshore islets</td>
</tr>
<tr>
<td><strong>Indigenous Land Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Anas superciliosa</em></td>
<td>Gray Duck</td>
<td><em>mo’ora</em></td>
<td>Inhabits streams, meadows, ponds, marshes, taro patches</td>
</tr>
<tr>
<td><em>Egretta sacra</em></td>
<td>Pacific Reef-Heron</td>
<td><em>otuu</em></td>
<td>Forages on reefs, mudflats, taro patches, ponds; nests in trees, rock ledges</td>
</tr>
<tr>
<td><em>Porzana tabuensis</em></td>
<td>Spotless Crake</td>
<td><em>moo</em></td>
<td>Varied: coastal marshes, fern-covered hillside, secondary forest</td>
</tr>
<tr>
<td><strong>Migratory Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Calidris alba</em></td>
<td>Sanderling</td>
<td></td>
<td>Sandy beaches, reefs, mudflats, open ground inland</td>
</tr>
<tr>
<td><em>Eudynamis taitensis</em></td>
<td>Long-tailed Cuckoo</td>
<td><em>oroveo</em></td>
<td>Secretive and not easily seen; frequents forest canopy</td>
</tr>
<tr>
<td><em>Limosa lapponica</em></td>
<td>Bar-tailed Godwit</td>
<td></td>
<td>Visits tropical Pacific during the northern winter</td>
</tr>
<tr>
<td><em>Numenius tahitiensis</em></td>
<td>Bristle-thighed Curlew</td>
<td></td>
<td>Wary bird, prefers sand bars, mudflats, open grasslands</td>
</tr>
<tr>
<td><em>Pluvialis fulva</em></td>
<td>Pacific Golden-Plover</td>
<td></td>
<td>Open short-grass fields, roadsides, sandy beaches, mudflats</td>
</tr>
<tr>
<td><em>Heteroscelus incanus</em></td>
<td>Wandering Tattler</td>
<td>‘<em>i’ivi</em></td>
<td>Frequents rocky shorelines, tidal flats, rocky streams, may perch in trees</td>
</tr>
<tr>
<td><strong>Introduced Species</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Acridotheres tristis</em></td>
<td>Common Myna</td>
<td></td>
<td>Varied: from seacoast to forest edge, open countryside, agricultural and urban areas</td>
</tr>
<tr>
<td><em>Gallus gallus</em></td>
<td>Red Junglefowl</td>
<td><em>moa</em></td>
<td>Inhabits remote undisturbed forests, interbreeds with nearby domestic stock</td>
</tr>
<tr>
<td><em>Lonchura castaneothorax</em></td>
<td>Chestnut-breasted Mannikin</td>
<td><em>vini</em></td>
<td>Flocks in moist grasslands, roadsides, and fern brakes</td>
</tr>
<tr>
<td><em>Zosterops lateralis</em></td>
<td>Silveryeye</td>
<td><em>vini</em></td>
<td>A foliage and flower gleaner, varied habitats</td>
</tr>
</tbody>
</table>
Marine Mammals

Every year, humpback whales (*Megaptera novaeangliae*) pass by Rurutu on their way from the Antarctic to Polynesia. They come to give birth to their young, resting several months in the warmer waters and nursing the offspring until they are ready to undertake the journey back. While in Polynesia, the whales hardly eat, and must wait until they reach the cold Antarctic waters to feed on the krill that is their staple. Although one can see the whales throughout the Australs and the Societies, Rurutu is famous for its whales because they come the closest to shore there. The scenic stops on the *makatea* cliffs make fine viewing points and several whale watching tours operate. The last time a whale was hunted and caught on Rurutu was in 1957 and today the practice is forbidden (Guillin 2001:86; Walker 2002:23).

Fishing and Marine Foraging

While Rurutu is no longer a true subsistence economy, fish still comprises an important part of the average diet. Rurutu lacks a lagoon and the fringing reef that encircles the island encourages a dependence on inshore fishing and the occasional gathering of shellfish. The most common method is seine net fishing, which can yield large catches and can be accomplished by as few as one individual, but more often by two or three. In this way, large catches can be frozen for later use. Men also fish with a rod and line, but as the chances of a large haul are small, this is more of a recreational activity. Flying fish are caught at night by lamplight, using hand-held nets. Octopus is hunted on foot on the reef flat with a steel pick, which is poked into its hiding places. Less often, underwater spear-gun fishing is practiced, as is night fishing with a spear-gun.
As these methods depend to a large part on modern equipment, they are relatively recent developments. Lobsters are rarely eaten, as they require diving. Today, relatively few families own their own canoe. In order to obtain deep-water fishes, one must reserve in advance a portion of a potential catch with one of the professional fishermen on the island. Demand for these species is quite great and the fish are therefore expensive.

The lack of a lagoon on Rurutu limits the variety of species found (Vérin 1969:29). Most commonly, there are freshwater eels (Anguillidae), reef and moray eels (Muraenidae), squirrelfish (Holocentridae), wrasses (Labridae), parrotfish (Scaridae), surgeonfish (Acanthuridae), triggerfish (Balistidae), needlefish (Belonidae), goatfish (Mullidae), hawkfish (Cirrhitidae), cornetfish (Fistulariidae), rudderfish (Kyphosidae), mountain bass (Kuhlidae), puffers (Tetradontidae), and porcupinefish (Diodontidae). In the deeper waters on the margin of and outside the fringing reef there are Flying fish (Exocoetidae), groupers (Serranidae), snappers (Lutjanidae), emperors (Lethrinidae), jackfish (Carangidae), sharks and rays (Elasmobranchii), and green sea turtle (Chelonia mydas). Open-water fishes and turtles can also swim within the fringing reef where there are passes through it. Further out to sea it is possible to troll for tuna (Scombridae) and skipjack (Katsuuronidae). Some of these also wander inside the boundaries of the fringing reef at high tide to look for food.

The fringing reef is home to wide variety of mollusks, crustaceans, and echinoderms. Nowadays shellfish gathering does not constitute a major component of subsistence. Gathered shellfish are typically a part of “traditional” meals that take place on special occasions. Of the mollusks, Turbo setosus (pūpū) is by far the most common.
Sea cucumber (*rori*) is also a popular and easy catch, but softening the flesh is time consuming. Small sand crabs are collected to flavor coconut cream, which is eaten with taro leaves, rice or taro, and meat. Bivalves are also collected on the reef, but rarely. Many varieties of shells are gathered from the beach to make necklaces and other ornaments.

**Discussion**

The Australs are a geologically diverse archipelago with one of the smallest total landmasses in East Polynesia. They are high islands whose altitude is too low to produce orographic rain, but yet are advantageously situated to receive ample precipitation. They are fertile islands on which both dryland and wetland crops flourish. However, their accessible topography and relatively low elevations render them especially vulnerable to human landscape modification. On an island such as Rurutu, vast areas of degraded *Dicronopteris* and *Miscanthus* landscape bear witness to centuries of forest clearance and burning. While the Australs are highly deforested islands, their wet lowlands are particularly well suited to irrigated pondfield agriculture. The erosion that followed deforestation had a positive side effect in these islands, as large amounts of rich alluvial soils were deposited in the swampy lowlands. Despite their small size, the islands are highly productive, and irrigated taro has sustained them for centuries. While other cultigens were employed, such as breadfruit and yams, taro has remained dominant since prehistoric times.

Rurutu’s complex geological history makes it at the same time a very old and a very young island. Upon its ancient 14 million-year old foundation a second period of
volcanism around one million years ago deposited a younger layer of basalt on the island. These later volcanic events were partially responsible for the tectonic uplift that raised portions of *makatea* around its circumference, thus shaping the interesting geography of the island. While Rurutu lacks the lagoons in which pearlshell can grow, a fringing reef circles the island. This makes the exploitation of inshore fish species especially advantageous, and renders offshore fishing a less economic alternative. While Rurutu is no longer a subsistence economy, traditional fishing strategies are still in use today.

The culture of the Australs developed in response to both internal and external stimuli. On the one hand, it responded to the unique conditions the Australs offered, including their isolated position far south of the Societies. On the other hand, all lines of evidence indicate that they maintained some ties with their neighbors until late in the course of prehistory. The Australs are the eastern half of the Cook-Austral chain, and this relationship extends beyond their geological origins. The Australs bear close cultural ties with the neighboring Societies and southern Cooks. Their position in this region makes the Australs a vital link within the core of central East Polynesia. In Seabrook’s (1938:16b) words, “The chapters that follow will attempt to show that the Rurutuan culture was not a supine thing...that it was, in essence, a dynamic thrust between the Cook and Society Groups.”
Chapter 3. The Austral Islands and East Polynesian Prehistory

The Australs are an archipelago of key importance to the prehistory of East Polynesia. In terms of testing the model of the regional homeland, the Australs are especially interesting because some degree of interaction appears to have been occurring between them and the Societies and southern Cooks even into the Classic period. The Australs are also significant in terms of documenting culture change in a region whose environment differed considerably from that of its nearest neighbors. However, relatively little excavation has been done in this archipelago compared to other regions of Polynesia. Prior to the present study, most archaeological investigation has been concerned with monumental architecture and survey (e.g., Heyerdahl and Ferdon 1965; Edwards 2003; Eddowes 2004), with Vérin’s (1969) work on Rurutu being the major exception. While this precludes establishing an overall long-term archaeological sequence, some distinct trends do become evident. This chapter examines the available ethnographic and archaeological evidence in order to develop a hypothetical model for the development of Austral island culture. In subsequent chapters, we will see how the results of the Peva investigation fit into this model.

The Epicenter of the Societies, Australs, and Southern Cooks

Before focusing on the Australs and Rurutu in particular, it is necessary to examine the larger geographical context in which the archipelago is situated. Because of their relative proximity to one another, the centrally located Societies, Australs, and southern Cooks are of particular significance to models of interaction, and thus to the
concept of the regional homeland. Prior to the archaeological work done in the Marquesas during the 1960s, the Societies were generally considered to have been the East Polynesian homeland from where all other archipelagos were settled (e.g., Buck 1938). Culture traits were regarded as having originated there, and then to have diffused outward. With the archaeology done in the Marquesas during the 1960s, the focus then shifted away from the Societies, but the concept of a single homeland remained relatively unchanged. Nowadays most researchers do not favor any single island or archipelago as a homeland. Instead, interaction is emphasized as a major factor responsible for circulating traits that made up the unique East Polynesian culture. However, this notion of post-settlement voyaging is by no means a new one, although archaeology has demonstrated empirically that such was taking place. Buck’s model of diffusion from the homeland in the Societies was also concerned with post-settlement voyaging:

The first step toward diffusion is connected with ocean transport and the causes that led to continuance of voyages between island groups. One should imagine that after the various island groups had been settled by emigrants from the Society Islands, the voyages would have ceased; but a sentimental attitude toward the old home in central Polynesia survived for a long time, and tradition records that return voyages were made to visit relatives and pay respect to the gods on the old established temples. The islands which were closer to the center - the Cook Islands, the Australs, and the western Tuamotu - maintained communication for a longer period, and marriage alliances between chiefly families provided a cause for ceremonial visits and the interchange of gifts and information. With
succeeding generations, personal sentiment became tradition and communication between the distant ends of the radials and the center ceased. There was plenty of scope for development in the new lands, and they became home both in sentiment and reality. (1944:484)

Certainly oral tradition suggests that there was some degree of communication among the Societies, Australs, and Cooks. The “Tahitian Circuit of Navigation” chant, recorded in 1854 (in Henry 1928:464), preserves the memory of this tradition of interaction in the myths of the voyages of the hero Maui and his fleet: “They went to the borders. They went to the east, to the Tuamotus and to Mangareva. They went south, to Tubuai, to Rurutu, to the Paroquet Islands, Rimatara and Mangaia and on to Te-ao-tearoa [New Zealand]. They went everywhere in these directions. The went west, to Tutuila, Upolu, Savai’i (Samoa); and to Vavau, Atiu, Ahuahu and Ma’atea (or Makatea, formerly called Papatea). They went north, to the distant Marquesas and to burning ‘Aihi (Hawai’i).” Although many of these tales deal with semi-legendary characters, oral traditions should not be disregarded as mere myth, as Finney (1994:303) cautioned.

What is quite clear is that in the Classic period the Societies, Australs, and southern Cooks shared numerous traits among themselves that were absent in the more marginal areas of East Polynesia. Buck (1944:415-73) discussed the similarities in material culture in some length. Among items that for the most part are found only in these three archipelagos are: uniquely carved wooden bowls; wooden poi pounding tables; one-piece four-legged wooden seats (which also reached the western Tuamotus); the tapa cloth poncho (tiputa); unique methods of making wooden drums; slit gongs,
although they may have occurred in Mangareva as well; war clubs with a carved ornamental protuberance that decorates the boundary between the blade and the shaft; and long clubs with a sharpened butt end. The Type 3A triangular adze, to be discussed in Chapter 9, was also characteristic of this region. Additionally, some things were unique to the Australs and Cooks, such as coiled coir caps, and Rurutu and Aitutaki shared similar methods of attaching feathers to headdresses. Woodcarving motifs of the Australs and southern Cooks were also clearly related. The Australs and Cooks shared the medium-sized, short and thick variety of poi pounder, while the larger flared kind was prevalent in the Societies. One item unique to Mangaia is a variety of the pitching disc used in games, which is also present in Samoa and Tonga. These shared traits are summarized in Table 3.1, a modified version of Buck’s (1944: Table 6).

Table 3.1. Material culture shared by selected regions of Polynesia (modified from Buck 1944: Table 6)

<table>
<thead>
<tr>
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<th>Type 3A adze</th>
<th>Four-legged stool</th>
<th>Four-legged grater</th>
<th>Pounding table</th>
<th>Poncho</th>
<th>Coiled cap</th>
<th>Decoration technique</th>
<th>Medium-type poi pounder</th>
<th>Pitching disc</th>
<th>Drum making technique</th>
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Based on these similarities in material culture, most of which do not appear to have reached the more distant archipelagos of East Polynesia, it is apparent that the Societies, Australs, and Cooks represent what might well be the remnant of the Archaic regional homeland. The decline in long-distance voyaging in the 15th century A.D. had
the effect of isolating many islands from one another. However, while some objects and elements were circulating among the Societies, Australs, and Cooks into the Classic period, it was not the same situation that had existed during the Archaic. Archaeological evidence is unambiguous in this respect, especially concerning the decline in raw materials such as imported pearlshell and fine-grained basalt. In terms of sociopolitical structure, these societies differed considerably from one another by the Classic period, as a result of centuries of localized adaptation and development. Being aware of the similarities between these central archipelagos, we are now in a position to observe the emergence of the unique culture of the Australs.

**The Austral Island Culture**

The islands of Polynesia are ideal for observing the interrelation between production, agricultural intensification, and chieftainship. While not the only factor, the productive capacity of an island is of key importance to the development of the chiefdom. As populations grew and all available land was claimed, choices had to be made as to how to increase the yield of a circumscribed area. The amount of arable land also gradually diminished due to the effects of shifting cultivation, thus aggravating the situation further. The pathways to agricultural intensification that are available to a society will directly impact its ability to produce a surplus. This has profound bearing on the extent to which the chief can command labor, as the productivity of the land was a reflection of his own mana. It is important to note that no primacy or determinism is assigned to any one, or combination of factors. Rather, it is the interplay between them.

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that resulted in the “endpoint” civilization that Europeans observed in the late 18th century.

By the time of European contact, the Australs had emerged as a culture with clear ties to its neighbors, the Societies and the southern Cooks. However, early visitors were careful to remark on some uniquely Austral traits that defined the archipelago as a distinct entity. Joseph Banks (1962:333) spent only hours around Rurutu but was inspired to write, “Of the few things we saw among these people every one was ornamented infinitely superior to any thing we had before seen: their cloth was better coulourd as well as nicely painted, their clubs were better cut out and polished, the Canoe which we saw tho a very small and very narrow one was nevertheless carvd and ornamented very highly.” James Cook (1955:156) was also impressed: “their arms and in general every thing they had about them much neater made and shew’d great proofs of an ingenious fancy.” It must be remembered that these men had spent months in the Societies and had already seen many remarkable things.

**Linguistic Affinities**

The language of Rurutu (*te reo rurutu*) is an Austral island dialect, which in general is similar to classical Tahitian. The language of Rurutu and the Australs belongs to the Proto-Tahitic language subgroup that includes Western Tuamotuan, Tahitian, Cook Island Maori, and New Zealand Maori, and is distinct from the Proto-Marquesic group that includes Hawaiian, Marquesan, and is related to the Mangarevan language (Green and Weisler 2002: Figure 13). A paucity of dialect studies done for the Australs, due to the lack of sufficient early word lists, has made detailed comparisons with other East
Polynesian languages problematic (Marck 1996:508). As Vérin (1969:161) noted, three factors contributed to this: the short period of separation between dialects, the possibility of borrowings between the Cooks and the Australs, and the changes to the Tahitian language that have been made in the past two hundred years. The most immediate difference between Rurutuan and Tahitian is the absence of the f and h sounds in Rurutuan, which have been replaced by a glottal stop (see Fischer 1999). However, Seabrook (1938:15) pointed out that this was not always the case on Rimatara or Tubuai, and that Ra’ivavae had a consonant that represented both f and h. While there are six consonants in Rurutuan (m, n, p, r, t, v), Seabrook (1938:15) noted that some districts used additional ones, or variations of the six. Because of the influence of modern Tahitian since Seabrook’s time, it is probably now impossible to determine the original character of these dialects. Cook (1967:185), among the first Europeans to hear the Austral dialect, wrote of Tubuai’s speech, “These men spoke the Otahiete (Tahitian) language consequently must be of the same nation.” Morrison’s (1935:72) impression of the language of Tubuai was similar. Seabrook (1938:16) remarked that “Tahitians say that the Rurutuans sing when they talk.”

*Traditional Sociopolitical Structure*

It is indeed unfortunate that we do not possess the wealth of ethnohistoric accounts for the Australs as we do for the Societies and the Marquesas. However, there is enough information to allow us to glimpse the endpoint that the Classic period represented. The culture of the Australs was the result of centuries of development from a common Ancestral Polynesian Society. However, the Austral environment was unlike
anywhere else in Polynesia. It reacted differently to landscape modification and agricultural intensification. As populations grew, the choices the people made reflected the conditions and possibilities of their surroundings. In Austral society, one of the most significant sociopolitical developments that took place was its “devolution” into an Open society (Goldman 1970). Open societies were characterized by competition between social classes, which were able to vie for the power traditionally wielded by hereditary chiefs. Perhaps the most important chiefly duty was to ensure the fertility of the land through being an intermediary between the human and spirit world. In marginal, circumscribed environments, where agricultural productivity is somehow hampered by unpredictability or risk, the chief appears to have been perceived as having lost the mana so essential for performing this task effectively. Not surprisingly, these Open societies typically existed on the most environmentally transformed and degraded islands such as Mangaia, Mangareva, the Marquesas, and Easter Island (Kirch 1994:309). As Kirch (1994:309-10) stated, “The ecological context common to these Open chiefdoms is…a modification of the physical and biotic landscape so severe that even the intensification of agriculture through irrigation or arboriculture was insufficient to offset the overall degradation of the resource base.”

In an Open society a non-chiefly class is able, through the more fluid social structure, to garner considerable power. The warrior (toa) class did this on Mangaia, Mangareva, and Easter Island, and the spiritual priests (tau’a) in the Marquesas. In Austral society the priestly class (‘ara’ia) appears to have accomplished this. Seabrook (1938:190) defined the ‘ara’ia of Rurutu as “The semi-secular official who directed
warfare and the crafts.” He (1938:22) also recorded a song describing the mythical
demigods who were the progenitors of this priesthood: “Nuunuu-Ao, Nuunuu-Po, Rave­
uta, Rave-tai, Te Anau. These were creative beings; (but not those that had created the
first chiefs). They were double beings; Five gods in one aspect- Five human beings in
another. By them were anointed the kings, and they were supreme down to the chief
Ruamotu. They gave their lore to the modern priesthood, and the chiefs flourished under
them.” William Ellis (1969b:394) stated that Rurutu’s “temples were numerous, and
their idols, especially their great god, Taaroa, were among the most singular we have met
with in the Pacific. Their priests, who were their physicians, maintained great influence
over the people, though their system of worship appears less sanguinary than that of their
more civilized neighbors. They were addicted to war.” Naturally, when Auura and his
Christian converts from Raiatea arrived in 1821 and proceeded to prove the old religion
false by breaking critical tapus, the priests were the first ones to object. Ellis described
the encounter in some detail, and it is very revealing as to the attitude of the priests
themselves:

At a previous meeting, Auura, one the chiefs, had told a priest, who pretended to
be inspired, that he was the very foundation of the deceit, and that he should never
deceive them again. The priests, however, appeared at the appointed meeting;
and one of them, pretending to be inspired, began denouncing, in the name of his
god, the most awful punishment upon those that had violated the sacred place.
One or two of the natives of Raiatea went up to him, and told him to desist, and
not attempt to deceive them any longer, that the people would not tolerate their
imposition. The priest answered, that it was the god that was within him, and that
he was the god. When uruhia, (under the inspiration of the spirit,) the priest was
always considered as sacred as the god, and was called, during this period, atua,
god, though at other times only denominated taura, or priest. Finding him
determined to persist in his imprecations, one of the Christian boatmen from
Raiatea said, “If the god is in, we will try and pinch, or twist, him out.”
Immediately seizing the priest, who already began to shew symptoms of violent
convulsive muscular action, they prevented his throwing himself on the ground.
For a long time, the priest and one of the Raiateans struggled together; when the
god, insulted at the rude liberty taken with his servant, left him, and the priest
silently retired from the assembly. (1969a:375-6)

The priests of Tubuai also appear to have exercised considerable power. James
Morrison provided an invaluable account of what happened when the crew landed for a
second time on Tubuai:

But the Priests, who Seemd to have all the A thority and be Nearly on a footing
with the Chiefs, Seeing that we were no Other then Common Men and liable to
accident like themselves, Could not bear to see such superiority as the Europeans
in general usurp over those who differ from themselves, and became jealous of us
with respect to their religious authority to which they saw that we not only refused
to take notice of but even ridiculed, for this reason they used all the Means in their
power to keep the Chiefs from making Friends, thinking perhaps that if we staid
in the Island, their Consequence would be lessen’d, which in all probability would have been the Case.

The Island is Govern’d by three Chiefs, Tinnarow, Tahoohooatuumma & Heeterirre before Named, each of whom are absolute in His own district and of these two are related by Marriage, Tinnarow having The Sister of Tahoohooatuumma to Wife, yet they do not agree; and notwithstanding the Smallness of their territories they are continually at War. There Are Other Chiefs, who reside as private gentlemen...Their classes are the Same as at the Society Isles, but the Priests seem to have more Influence and appear to be next to the Chiefs in point of Authority. (1935:71-2)

Ellis (1969b:382) also remarked on the jealous attitude of the Tubuaian priests as his ship approached the island: “A tabu had been recently laid on the island by the priests, which they had supposed would prevent the arrival of any vessel, and they were consequently rather disconcerted by our approach.”

However, while the priestly class certainly rose in power, the Austral island chief does not appear to have lost as much status as in other Open societies such as the Marquesas. On Rurutu, the right of first fruits was still accorded to the chief, a custom that persisted to some degree until 1900: “Under the old government a fine of fifty Chilean dollars was imposed for failure to give the first-fruits to the chief. An interesting taboo-extension connected with this custom was laid on certain families...(one of which) was not only required to give the regular share of the first catch to the arii, but to bury their own portion in the ground” (Seabrook 1938:158).
Endemic warfare between chiefdoms is another characteristic of an Open society, as chiefs compete among themselves for land and prestige. According to ethnographic accounts, Rurutu (Seabrook 1938), Tubuai (Morrison 1935; Aitken 1930; Ellis 1969a, 1969b), Ra’ivavae (Tyerman and Bennett 1831:167), and Rapa (Stokes 1930) were all characterized by frequent warfare in the centuries prior to European contact. On Rurutu, wartime ceremonies entailed human sacrifice and cannibalism (Seabrook 1938:157). It appears that hostilities extended between islands as well. For example, Seabrook (1938:30) recorded accounts of a Tubuaian conquest of Rurutu. Aitken’s information concerning the prehistory of Tubuai’s wars runs as follows:

...a Raivavae man told me that in early days the king of Raivavae went with some followers to Tubuai, married a Tubuai woman, and established a ruling dynasty which for generations controlled the entire island. Other legends indicate that heroes from Tubuai invaded Tahiti, Rurutu, and Borabora; and that heroes from Tahiti and the Tuamotus invaded Tubuai. Historical accounts state that Tubuai was peopled from Raivavae in the latter part of the eighteenth century or the early part of the nineteenth century. All the evidence point to great political unrest before the early missionary days, to continual wars both between districts on the island and between Tubuai and other islands, and in general to a political state such as prevailed in the Hawaiian group before the days of Kamehameha I. (1930:33)

The basic Austral social structure may have served to foster an environment of competition over land rights. Seabrook trusted the genealogical records that he examined
on Rurutu that provided him with much of the island’s traditions, primarily because they were written for legal purposes: “Every important property claim in Rurutu appears to rest on an ancestral acquisition through warfare; the present account may be said to include only those events that have been related in court to the satisfaction of the magistrates, native and French. For this reason the history of Rurutu is more than a story; it is a hard-working, current instrument, the basis to modern property rights, and in a sense the foundation of the present social system” (Seabrook 1938:13). The emphasis on “acquisition through warfare” is especially interesting. By examining what is known of the social structure of Rurutu, the basic reasons for the necessity of conflict become discernible.

Politically, Rurutu was divided into nine districts, in which either one or several clans (‘opu) held sway, each dominated by a chief (ari‘i). Each ‘opu, centered on the male line, was a descendant of an original founding household (‘atia) that had multiplied and branched out over a period of generations. The ‘atia remained the ‘opu’s nucleus and its representative. Seabrook (1938:76) wrote, “The fundamental group was the three-generation one that naturally gathered around a pater-familias. The first-born son (mata’iapo) inherited everything. His brothers and sisters were apt to remain under his roof; and even raise their families in association with his wife, children, grandchildren, adopted children, and menials.” While the family was the most central unit, the ‘opu was the basis of the social community because it owned the land (Seabrook 1938:80). In addition, the ‘opu collectively possessed the water supply, chestnut trees, and taro beds, while only the ‘atia could own house sites and fishing canoes as well. Administration of
the property was the duty of the first-born son of the nucleus family. As the 'opu grew they branched out into sub-clans called te'iiti which were subservient to the original 'opu. The te'iiti were replicas of the parent 'opu, each with its first-born son as manager (Seabrook 1938:80).

Agricultural Intensification, Landscape Degradation, and Warfare

As I outlined in Chapter 1, there are three basic systems of agriculture in Polynesia: dryland shifting cultivation, arboriculture, and wetland irrigation. In order to increase the yields of shifting cultivation, fallow periods must be shorted. Labor-intensive activities such as terracing and mulching are also necessary to counteract the erosion of the topsoil. Because land clearance involves cutting and burning the vegetation, areas of degraded Dicronopteris fernland and Miscanthus savannah spread, thus reducing the overall arable land available. Arboriculture, which is not very labor-intensive, was less emphasized in Polynesia as a primary source of starch staples. Both shifting cultivation and arboriculture are “dry” area crops and are susceptible to environmental hazards such as drought and cyclones. On the other hand, wetland irrigation of taro requires an initial output of labor to construct the pondfields, but relatively little thereafter, with weeding constituting most of the work. In addition, pondfields are far less vulnerable to catastrophe than are dryland crops. The yields of irrigated taro are also much higher than those of dryland crops.

This contrast between wet and dry systems, which often corresponds to windward/leeward areas or islands, is at the heart of Kirch’s (1994) influential hypothesis of sociopolitical development. Kirch’s work challenged the “hydraulic hypothesis” of
Wittfogel (1957), which broadly argued that as complex irrigation systems required management, social stratification eventually followed. The large productive capacity of irrigation further increased the wealth of the leader and the society. According to the hydraulic hypothesis, where complex irrigation is found we should expect greater social stratification. Kirch used the case study of the twin islands Futuna and Alofi in West Polynesia to emphasize that shifting cultivation and arboriculture had been overlooked in hypotheses centered on the relation between productive capacity and political power. In Polynesia, the most stratified, aggressive and expansionistic chiefdoms often developed in areas without the capacity for irrigation. Kirch (1994:9) attributed this oversight in part to the fact that “Intensive dryland field systems are not well described ethnographically, since this kind of labor-intensive agricultural production was often the first to be abandoned following Western contact and consequent population decline.”

Futuna and Alofi are situated midway between Fiji and Samoa. Futuna is divided into two areas, the western “wet” chiefdom of Sigave, and the eastern “dry” chiefdom of Alo. Water is unevenly distributed over Futuna itself, and permanent watercourses exist mainly in Sigave. The smaller neighboring island of Alofi, just to the southeast of Alo, has no permanent water sources. Alo and Alofi are both dependent upon rainfall. Sigave’s water resources allow it to emphasize irrigated taro, whereas both Alo and Alofi depend upon shifting cultivation supplemented by arboriculture. Extensive deforestation and erosion have severely limited the total area of arable land on the islands. Droughts have been responsible for famine in the dry areas, and cyclones can threaten the wet area’s pondfields with flooding. Archaeological investigation has revealed that Sigave’s
pondfields probably originated no earlier than one thousand years ago, and reached their
apex in the early historic period (Kirch 1994:221, 227, 242). Kirch attributed this late
development of irrigation to a combination of factors, none of which can take primacy.
Population pressure was certainly one influence. Additionally, shifting cultivation led to
expanded degraded areas of land. This both reduced the amount of arable terrain on the
hill slopes and created expanded areas of alluvial terrain on the valley floors. Social
factors were also important, such as the chief's need to produce a surplus over and above
the needs of the population (Kirch 1994:242).

Both the archaeological record and ethnographic accounts confirm an ongoing
documentation of intense competition and warfare between the wet and the dry sectors.
Contrary to what the hydraulic hypothesis might predict, it was the dry chiefdoms of Alo
and Alofi that were the more stratified and bellicose (Kirch 1994:211). While the wet
chiefdom of Sigave did compete within itself for irrigated land, it was Alo-Alofi that
experienced political amalgamation and consistently embarked upon wars of conquest.
Kirch (1994:211) stated, “The driving pressures behind these wars of conquest are quite
explicit: a desire for land, and the food and other resources associated with land.”
Sigave, whose productive capacity was superior, could meet the needs of a growing
population simply by expanding the pondfields. Alo-Alofi, however, which appears to
have had densely populated regions, was virtually compelled to embark upon territorial
expansion, the target of which was often the taro fields of Sigave (Kirch 1994:212).

Mangaia in the southern Cooks serves as an especially appropriate comparison to
Rurutu. Mangaia is larger than Rurutu, with a surface area of 52 km². Like Rurutu,
Mangaia consists of a very degraded central volcanic core surrounded by *makatea*. The “wet” areas are the valley bottoms where taro irrigation is emphasized. These are distributed relatively evenly around the island into six territories. The “dry” areas consist of the adjacent *makatea* together with the lower hill slopes of the volcanic core, on which dryland agriculture and arboriculture could be practiced. Each polity therefore had access to both a wet and a dry sector (Kirch 1994:273). However, a large portion of the island comprises barren *makatea* (20% of the total land area), and degraded fernland (24%) that was a result of widespread shifting cultivation. This had the overall effect of making the inhabitants especially dependent upon the limited taro fields that occupied only 2% of the total land area (Kirch 1994: Table 15). On Mangaia, it was the women who worked in the taro fields, something that men do more often in Polynesia. Kirch (1994:320) wrote, “Where irrigation itself was the only significant mode of increased production, we indeed see the intensification of female labor in the wetland sector.” This situation also existed on Rapa, where taro was the most important staple (Hanson 1970). Population density appears to have been especially high on Mangaia, perhaps to the extent that the agricultural base could no longer sustain a pig population as well. Pigs disappear from the archaeological record after around 1450 A.D., whereas rat bones become increasingly prevalent, containing signs of having been eaten, such as charred surfaces (Kirch 1994:284-5). On Mangaia, warfare over the precious taro lands was so intense that it had the effect of transforming the social and religious system, so that the chieftainship could be won through might of arms (Kirch 1994:287).
Rurutu provides an interesting comparison to Mangaia, which it resembles in a number of respects. To begin with, Rurutu is smaller than Mangaia, at around 38 km². As on Mangaia, Rurutu’s irrigated taro fields are dispersed around the island, and not concentrated on one side, as on Futuna. The *makatea* is basically useless for agriculture, and Rurutu’s degraded landscape was striking enough to inspire Joseph Banks (1962:332) to comment that the island was more barren than any other he had seen. As on Mangaia, *Dicronopteris* fernland and *Miscanthus* savannah cover approximately 24% of Rurutu, representing the long-term results of shifting cultivation on an island whose interior was almost entirely accessible. Similar to Mangaia, Rurutu’s dry areas coexisted with its wet ones, as all the valleys that had irrigation also possessed areas given over to shifting cultivation and arboriculture. However, approximately 7% of Rurutu consists of valley floor swampland, over three times that of Mangaia (see Figure 3.1; calculation based on Stoddart and Spencer 1987: Figure 3). However, there is one district of Rurutu that can be considered only dry, namely Vitaria, the district that Vérin (1969) so thoroughly mapped and excavated.
Vitaria was the only inhabited district of Rurutu without a permanent stream, water source, or taro. It is not a valley, but a narrow strip of land between the coast and the core. Nevertheless, it was home to a sizeable population in the Classic period. The large, oval-ended houses were situated in close proximity to one another, and resembled a village more than another typical East Polynesian settlement. Seabrook (1938:54) estimated that there were approximately one hundred dwellings, which were able to house a total population of around one thousand people. The uniformity of the houses suggests that Vitaria was built and occupied quickly, perhaps to serve an immediate housing need (Seabrook 1938:54). It is possible that Vitaria represents a refuge village.
that was constructed when the inhabitants of another valley were forced to flee. It was undoubtedly the least favorable district of Rurutu to inhabit. Vitaria sustained itself by growing breadfruit and yams. The people developed the technique of storing fermented breadfruit paste. This emphasis on arboriculture is significant, whose role as a system of intensification is often overlooked, as Kirch (1994:10) pointed out. However, Vitaria was not entirely self-sufficient and had to rely on taro from other valleys. When warfare cut off the outside supply, the valley starved (Seabrook 1938:54). Not surprisingly, Vitaria exhibited many of the characteristics typical of dry chiefdoms: high population density, stratification, and belligerence. Ultimately, it was the chiefs of Vitaria who became the ruling class of the entire island. It was for this reason that the genealogy of its chiefs and its oral traditions were so carefully preserved.

According to genealogical records, Vitaria was the last district to be settled on Rurutu. Its founder was named Amaiterai, the younger son of a Tubuaian chief of the Uruariʻi dynasty. Based on genealogical charts, Amaiterai was ten generations removed from the chief who probably reigned when James Cook arrived in 1769, placing Amaiterai roughly in the 15th century. Whether or not Amaiterai was an historic personage is irrelevant to what ensues. As a younger son on the lookout to build his own chiefdom, Amaiterai spent many years wandering, and had numerous wars and adventures on Rurutu, Raiatea, and Rarotonga, before settling down to establish himself on Rurutu (Seabrook 1938:30-5). In describing this event, Seabrook (1938:35) provided

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4 In his article on the oral traditions of Rurutu, Babadzan (1985) discussed the figure of Amaiterai in considerable detail. Amaiterai is a character with an extensive mythology that has continued to develop through syncretism throughout the 20th century. For example, in some accounts his travels take him as far as China or Japan, and New Zealand, before his return to Rurutu.
an absolutely archetypal profile of a dry chiefdom: “When Amaiterai returned to Rurutu there seems to have been one remaining district that was open for settlement. That was little, rocky Vitaria, surrounded by cliffs, quite fertile, but unsuited for taro cultivation. Breadfruit grew there, but not dependably, as in the Society Islands. The Amaiterai group moved into Vitaria, and appear to have been hungry from the start.”

While every other district on Rurutu was wet, one in particular had achieved prominence over all others, the valley of Peva on the east coast, and the site of the present study. The ruling family there was the Pevatunoa. The Pevatunoa owned not only the vast taro fields of Peva, but also those of Moerai. It was the most powerful chiefdom on the island (Seabrook 1938:36-7). Seabrook (1938:54-5) wrote, “The strength of the Pevatunoa may be gathered from the fact that the restless Vitarian population put up with such a situation for generations.” Eventually, the Uruari’i descendants of Amaiterai who lived in Vitaria had succeeded in forming a rough leadership over eight family units, four in Vitaria and four in neighboring Unaa. This “coalition” was known as Te ‘Are Ari’i (the House of the Chief). The families of Unaa, sandwiched between the Uruari’i of Vitaria and the Pevatunoa of Moerai, maintained neutrality between these two powers (Seabrook 1938:36). The Uruari’i and the Pevatunoa exercised some influence over their neighbors. The northern district of Unaa tended to ally with Vitaria, and the southern districts of ‘Auti, Paparai, and Narui with Peva. The southern valleys were also busy fighting among themselves (Seabrook 1938:38).

Vitaria’s capacity to provide enough breadfruit for a growing population was limited. Four generations after Amaiterai settled in Vitaria, the first wars of predatory
expansion were about to begin. Seabrook (1938:42) wrote, “When the population in Vitaria multiplied it became necessary to obtain gifts of taro from Unau (Unaa) relatives, and a stolen supplement from Peva. Thieving led to fighting, and war in earnest during the reign of Taaroaaiatua (a chief of Vitaria). This chief took the offensive.” Interestingly, it was said that a priest from Raiatea came to Rurutu and joined the Te ‘Are Ari’i at this time: “Ruata[i]to was the priest who directed the government of Taaroaaiatua up to the time of Tamatoa (Taaroaaiatua’s son and the next chief)” (Seabrook 1938:42). Seabrook considered the possibility that this priest might have given Taaroaaiatua the idea to go to war. The Te ‘Are Ari’i augmented its priesthood and secured alliances with neighbors. Despite these preparations, Vitaria’s attacks against the Pevatunoa failed, and Taaroaaiatua was slain in the taro fields of Moerai (Seabrook 1938:43-4). His son and successor Tamatoa appears to have learned from his father’s defeat and did not attack Peva during his reign. However, another influential priest called Tama-‘ara’ia rose to power and influenced the next three chiefs: “This priest directed the governments of Tamatoa, Ariititia, and Matairuatea” (Seabrook 1938:44).

Vitaria did not always resort to attacking the resources of Peva. During peacetime it was possible to bargain for food, and Seabrook (1938:49) wrote of one man who went to Vitaria to sell taro, although for what is not stated. Nevertheless, Vitaria grew increasingly more desperate while the wet valleys remained passive and complacent. Seabrook (1938:53) described the situation as follows: “Signs of degeneracy appear in accounts of the well-fed families that ate the taro of Unau (Unaa), Avera, Moerai, and Peva; the Vitarians lived under tension, and planned ahead.” One strategy Vitaria
adopted was to increase its population: “there was a contest for children; childless wives soon found themselves on a different sleeping mat because fertility was supposed to depend on the right sex combination” (Seabrook 1938:55). Because there were more women than men, polygamy was encouraged. One priest was renowned for the number of wives and children he had. Refugees from wars in Unaa and Avera further swelled the population (Seabrook 1938:55). In essence, Vitaria was breeding a generation of warriors for itself. This caste lived, trained and danced in the Vitaria’s most impressive structure: the 'are 'arioi.

Vitaria began to expand in earnest during the reign of Ta’atini, who probably lived in the early 18th century. When the Pevatunoa had killed two Vitarian taro-thieves, Ta’atini seized this opportunity to take revenge. Led, not surprisingly, by an old priest, the Vitarian force managed to rout a Pevatunoa army near Avera. In retaliation, the Pevatunoa besieged Vitaria. A siege was possible simply through blockading the narrow entrances to the valley. Vitaria quickly began to starve, and Seabrook (1938:57) wrote that the inhabitants were reduced to eating mashed breadfruit cores, wild fig berries, seeds of the wild yam, the fruit of the Indian mulberry, wild taro, candlenuts, the root of the weed Dracontium polyphyllum, plantain trunk centers, fern rhizomes, and candlenuts. Even the chiefly family was in dire straits (Seabrook 1938:61). When Ta’atini saw one of the children of his own household licking a discarded leaf that had been used to wrap food, he began what came to be known as “The war caused by the licking” in order to break the siege. Eventually, it was Teauroa, the son of Ta’atini (who was killed), who
brought about the decisive defeat of the Pevatunoa (Seabrook 1938:62-5). Moerai was seized and claimed by the Vitarian elite, thus becoming the principal valley of the island. It was Teauroa who gave Moerai its present name (moe ra'i “great repose”) on account of the peace he had brought about. A vera was also captured, and the Pevatunoa fled to Naairoa. Teauroa was the father of the chief who probably reigned during the time of Cook’s visit, placing these events in the early-to-mid 18th century. Vérin’s (1969) excavation in Vitaria yielded only artifacts typical of the Classic period, which supports the timetable supplied by the genealogies.

Vitaria’s competitive nature is reflected in the abundance of monumental architecture there. The number of house platforms is unrivalled anywhere else on Rurutu, and possibly in East Polynesia as a whole. Its finely-built marae and the grand ‘are ‘arioi are especially noteworthy. The sheer concentration and spatial organization of structures are also without parallel. Vitaria was not only competing with the other districts through augmenting its population and warrior caste, but also through large-scale building projects. This behavior is typical of a dry chiefdom. Peva, on the other hand, which has been abandoned more or less intact since the 19th century, has surprisingly few features. The massive taro fields, now entirely overgrown swampland, are the valley’s most striking constructions. Its central marae (upon the grounds of which the present study took place) is a very crude structure in comparison to Vitaria’s marae, or the

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5 The story of how Vitaria prevailed appears to have becomes considerably embellished, including various supernatural events that lead up to the final battle for supremacy. Seabrook (1938:65-6) realized this and devoted a short section to rationalize the accounts, which he did very well.
superbly crafted ‘are ‘arioi. The same is true for Rurutu’s other districts. Monumental architecture is minimal and surface remains are sparse.

Competitive emulation through monumental architecture is visible throughout the Australs of the Classic period. The major period of building appears to have been during the late 17th-18th centuries, when populations had begun to challenge the islands’ carrying capacities more than ever before. Based on genealogical records and oral tradition, Edwards (2003:204) calculated that at least eight of Ra’ivavae’s marae date to the early to mid-18th century. Among Ra’ivavae’s most elaborate constructions are the hilltop terraces of Hatuturi (Skjøsvold 1965b), which resemble the pare forts of Rapa in many ways. Excavations there, which yielded no artifacts, gave a radiocarbon date of A.D. 1777±200 (Skjøsvold 1965b:116), which, despite the fact that it was analyzed more than 40 years ago, appears quite on target. However, on no other island in East Polynesia did the construction of fortifications approach that of Rapa. Rapan life was far more centered on its taro fields than any other island in the Australs. As noted above, so much emphasis was placed on taro cultivation that women were shifted from the domestic sphere into the agricultural one, as was the case on Mangaia. Rapa could not grow coconut or breadfruit well, and did not possess the pig, dog, or chicken at the time of European contact (Stokes 1930: vol. 1, p. 3, 154), and archaeology has not yet revealed whether there were prehistoric populations of these animals there. Rapa’s isolation might have precluded return voyaging for some of these cultigens and domesticates, ending in a pronounced “founder effect.” Classic period artifacts from Rapa are very different from those of the other Australs, suggesting an Archaic period colonization and little or no outside
influence from then on. Rapa is heavily deforested, and *Diacronopteris* fern and *Miscanthus* cover much of its interior. The familiar cycle of shifting cultivation, land degradation, erosion, and sedimentation eventually resulted in a unique landscape of warfare after centuries of occupation. Hilltop fortified villages overlook the pondfields, and these constructions appear to have been built at roughly the same time as the *marae* on the other islands of the Australs, as radiocarbon dates have shown (Mulloy 1965; Kennett et al. 2003). The fortresses were abandoned probably no later than 1830 (Ferdon 1965a:12; Mulloy 1965:59) and likely long before that, due to the rapid decrease in population from introduced European diseases.

**Summary**

The constraints that the environment placed on these chiefdoms are of central importance. Long-term forest clearance for shifting cultivation was especially deleterious in the Australs, relatively low islands without many inaccessible areas. The erosion that eventually limited the amount of land available for shifting cultivation also made the valley floors exceptionally fertile. On an island such as Rurutu, wet chiefdoms constituted the majority. Only Vitaria, compelled to emphasize arboriculture and shifting cultivation in a heavily degraded region, was forced to resort to other means such as population growth, the development of a powerful warrior caste, and predatory expansion. As Kirch’s (1994) wet-dry model predicts, the district that finally achieved a strong degree of hegemony and power was the one in which taro irrigation was not an option. Seabrook (1938) drew attention to the fact that the wet chiefdoms had become somewhat lax. For them, intensification was merely a matter of extending the taro fields.
Vitaria’s hunger for food and taro-producing land were ultimately successful, and it is significant that its chiefly families immediately moved into Moerai. In other respects, Rurutu’s large areas of swampland that were suitable for taro were sufficient to produce an agricultural surplus. All the islands in the Australs, except for Rapa, supported pig, dog, and chicken populations until the time of European contact. In the Australs, rights such as first fruits were still accorded to the chiefs, a custom that was absent in the Marquesas. Overall it appears that in the Australs, chiefs still possessed some degree of traditional hereditary authority, but were confronted with a priestly class that exerted considerable influence.

**Contributions of the Peva Research**

The site of Peva on Rurutu is of particular importance to the regional homeland model, the colonization process, the development of Austral island culture, and the implications for models of sociopolitical complexity. The Peva dune site serves to fill a critical gap in our knowledge of the region. The stratigraphic sequence consists of two clearly defined cultural deposits, one Archaic and one Classic, separated by an undisturbed layer of sterile sand, and spanning a total of approximately 600 years. The site provides a new and critical link to other Archaic and Classic period assemblages throughout East Polynesia. In terms of the regional homeland, Peva is significant because the Archaic deposit contains artifacts with direct counterparts from contemporaneous sites in the Societies and southern Cooks. These shared traits are suggestive of continued interaction over a prolonged period of time. Peva also reveals a great deal about the colonization process. The Austral environment is unique in East
Polynesia, and Peva’s faunal assemblage reflects a subsistence strategy that was developed in response to it. Additionally, the site offers the opportunity to examine the exploitation of natural resources, notably inshore fishes, shellfish, and basalt for the production of adzes. As I discuss in Chapter 9, geochemical sourcing reveals that during the Archaic period, at least six different sources of basalt were being quarried around the island for the on-site manufacture of adzes.

Peva is also valuable because it tells us much about the long-term changes that took place on Rurutu. The Australs are ecologically somewhat fragile islands, and especially vulnerable to widespread deforestation. An emphasis on pondfield irrigation allowed the Classic period chiefs to feed a growing population and to amass a rich surplus. The wealth of the valley is reflected in the evidence of feasting, discussed in Chapter 5. The abundance of Classic period pig remains is in stark contrast to islands such as Mangaia, which is similar to Rurutu in many respects, yet was without pigs in the Classic period. This has important implications for our understanding of Open societies and the process “devolution” itself. Peva’s Classic period is also indicative of continued interaction with its nearest neighbors, the Societies and southern Cooks. This impacts hypotheses regarding the eventual breakdown in long-distance interaction that signaled the end of the East Polynesian Archaic period.
Chapter 4.  The Peva Excavation

Peva (Figure 4.1) is the name of the valley district flanked by the makatea cliffs Pointe Arei to the north and Toarutu to the south. It is subdivided into two portions, northern Peva Iti (Little Peva), which extends from Pointe Arei to the makatea formation Toerau, and southern Peva Rahi (Big Peva), which extends from Toerau until Toarutu. Peva Iti is fed by one river, also called Peva Iti. It is a much narrower valley than Peva Rahi, and there is no swampland for taro cultivation. In contrast, Peva Rahi is a deep valley, whose swampland is fed by three rivers (Peva Rahi, Poura, and Maenu). The wet/dry dichotomy is thus found within Peva itself. In prehistoric times, according to modern informants, Peva Rahi was the administrative center of the valley and the chiefly residence while Peva Iti was home to the general populace. Today, Peva Rahi is uninhabited, while in Peva Iti there is one home, a pension, and a farm and cheese factory. Both Peva Rahi and Peva Iti are currently cultivated as pasture and for crops such as potatoes.

Peva Rahi (Figure 4.2) contains one of the most attractive beaches on the island and is one of its favored fishing spots, to which residents from neighboring valleys come for recreation and fishing (Figure 4.3). In addition, one the few passes through the island’s surrounding fringing reef is located there, called Passe Taero. It is large enough only for a small boat such as a canoe to pass through. The mouth of Peva Rahi is one long sand dune that extends the entire length of valley, around .5 km. The sand dune is covered by a layer of topsoil and is heavily overgrown. Because Peva has been largely abandoned for most of the 20th century, prehistoric surface remains are still intact.
Figure 4.1. Topographical map of Peva, showing location of the excavation site ON1.
Figure 4.2. Arial photograph of Peva Rahi. The square marks the excavation area. The position of the road leading into the back of the valley has changed over the years (Photo courtesy of Yves Gentilhomme).
Figure 4.3. Photograph taken from the beach across the road from the excavation site ON1, facing south, of the makatea cliff Toarutu, the southern extent of Peva Iiti.
Preliminary survey of Peva was done in June 2002, with a focus upon the parcel of land called Te Onetietie. This land parcel contains a marae called Uramoa by Rurutu’s residents. Uramoa was first documented by Seabrook (1938:180), who wrote, “Marae Uramoa in south Peva is now represented by less than half a dozen random slabs; it is said to have been built by the rather legendary marae-founder of the Australs, Tupaea; Tupaea founded Uramoa with a cornerstone brought from marae Tonohae in Tupuai.” This was the only marae he listed for the valley, out of a total of only seventeen for the entire island: “many almost obliterated, and two covered by Christian churches” (Seabrook 1938:172). Thirty years later Pierre Vérin (1969:47) was unable to obtain confirmation as to which stone remains made up Uramoa, which he called the most illustrious of Peva’s marae. His map (1969: Figure 8) placed it farther inland than the structure on which the present excavation took place. In 2002, the structure under discussion here was identified as Uramoa to Vérin and myself by the Ajoint-chef de la Mairie and proprietor of Te Onetietie, Fernand Roomataaroa, as well as by Rurutu’s chef de Service de développement rural, Pierre Atai, who is the proprietor of the land parcel called Peva Rahi, which, as its name suggests, comprises the majority of the valley. His wife, Rurutu’s Minister of Culture, Ingride Drollet, also confirmed the identification. What is today called the “stone of Tupaea”, a large black basalt upright, was also shown to us. Years ago, it had been removed for safekeeping to the beachfront cabin in which I resided for the extent of the 2003 field season. Fortunately, during our first visit to the site in 2002, the land surrounding the structure had been cleared, enabling us to see and map the full extent of it. When overgrown, only a few coral slabs are visible, as Seabrook noted. However, the possibility must be acknowledged that Seabrook may
have seen different a structure altogether, although I believe this to be unlikely given the fact that his exploration of the island was very thorough.

Emory (1933:14) defined a *marae* as “a place set aside for religious rites and ceremonies.” However, as Edwards (2003:154) pointed out, some sites that are today called *marae* were not functional *marae* in the past, meaning that they served no religious or ceremonial function. This makes classifying a given structure as a *marae* problematic. The main difficulty regarding the identification of *marae* in the Australs is the fact that so many have been partially or completely demolished. As Figure 4.4 and Figure 4.5 show, Uramoa is badly dilapidated. The initial destruction of Rurutu’s *marae* likely took place directly following evangelization, as Ellis (1969b:400) wrote, and probably involved not only burning the wooden structures upon it, but smashing and toppling the stone uprights as well. Most of Uramoa’s coral slabs and uprights have been either broken, removed, or overturned. Following this initial demolition, *marae* were further vandalized in the following centuries, with their stones and coral slabs being removed for re-use elsewhere. Seabrook (1938:179) wrote, “The Christian-era villages have not spared *marae*-sites located in Avera, Auti, Peva, and Moerai. Avera has dismembered its *marae* and re-distributed them over the community as bridge-foundations, house-piles, culverts and door-steps.” It is indeed true that the best-preserved *marae* on Rurutu are located in the areas whose populations left to settle in Moerai and Avera in the 19th century. Vitaria, which perhaps had been abandoned even before European contact, escaped with the most structures intact.
That Uramoa was indeed a structure of religious significance, and therefore correctly identified as a *marae*, is suggested empirically by the following: 1.) a long, rectangular ground plan, containing a rectangular stone platform and uprights, that is similar to other structures identified as *marae* in the Australs, on Rurutu by Seabrook (1938), on Tubuai by Aitken (1930), on Ra’ivavae by Stokes (Notes on Ra’ivavae, manuscript) and Edwards (2003), on Rimatara by Eddowes (2004), in the southern Cooks by Bellwood (1978), and in the Societies and Tuamotus by Emory (1933, 1934, 1947, 1970); 2.) the presence of human burials; 3.) the archaeological recovery of a conch shell trumpet whose role in religious ceremonies is well attested (see Chapter 10); 4.) the paucity of artifacts associated with a Classic period house platform such as documented in Véron (1969); 5.) the archaeological recovery of large quantities of *tapu* foods, namely pig, turtle, and shark (see Chapters 5 and 6), which were not a characteristic of the house platform documented by Véron; 6.) the fact that residential house platforms of the Classic period are located in the backs of the valleys, and not on the coast; and 7.) it is the only structure of its kind in the entire valley, making it likely that it is the original Uramoa, which was the only *marae* in Peva that was listed by Seabrook (1938).

Uramoa consists of at least one rectangular enclosure (Figure 4.4). The northern portion of the east wall contains three parallel alignments which are now broken down to ground level. When complete, they would have formed a narrow elevated stone platform. An additional perpendicular enclosure juts out to the east. The east wall is where the best-preserved slabs are, which may have represented backrests for priests, chiefs, or ancestor spirits. An additional wall intersects the enclosure to the south. The western
wall ceases to exist to the south after a length of about 15 meters, and contains the only basalt upright that is still standing. Other fallen uprights lie scattered around. The northern portion of the structure contains visible pavement, primarily of coral stones. Excavation revealed additional buried pavement in every unit. As can be seen in Figure 4.5, the marae is in a state of extreme disrepair, is difficult to photograph, and when overgrown, would be almost invisible. In order to imagine how Uramoa might have appeared, it is useful to compare it with the best-preserved marae of Rurutu, that of Te Autamatea in Vitaria (Figure 4.6). One thing that is immediately apparent is the fact that Te Autamatea is built entirely of basalt, while Uramoa consists almost exclusively of coral. The slabs that made up Uramoa were probably taken from large coral boulders on the beach. Seabrook (1938:102) noted that such boulders had since been removed for the manufacture of coral plaster to overlay houses. There are no basalt outcrops in Peva, and the only potential sources of it are river cobbles. Some of Uramoa’s paving consists of fine-grained basalt stones, but the majority is coral. These basalt paving stones and the large basalt uprights were probably all transported from neighboring valleys. The presence of these black uprights upon this mostly-coral marae would have been all the more striking. Vitaria, on the other hand, has plentiful outcrops of basalt and the beaches are littered with boulders as far east as Unaa.
Figure 4.4. *Marae* Utumoa, with excavated area shaded.
Figure 4.5. Northern portion of the marae looking north, showing the remains of the western wall with the sole standing basalt upright, coral paving, and the dilapidated stone platform in front of the casuarina tree.

Figure 4.6. Marae Te Autamatea, Vitaria (Photo courtesy of Yves Gentilhomme).
Fieldwork Strategy and Excavation

The goal of my fieldwork in the summer of 2003 was to document a long-term archaeological sequence for Rurutu. This was contingent upon locating a single site that spanned a long period of time, preferably beginning with an initial Archaic period stratum, and ending with a Classic or early Historic period one. In East Polynesia, some of the best Archaic period sites have been found buried in coastal dunes, where the preservation of organic material is made possible by the calcareous beach sand. Dune sites such as Ha’atuatua (Suggs 1961), Hane (Sinoto 1966, 1970), and Hanamiai (Rolett 1998) in the Marquesas have yielded especially rich artifact and faunal assemblages. Rockshelter sites have also contained Archaic deposits, such as those in the southern Cooks, namely Moturakau on Aitutaki (Allen and Steadman 1990) and Tangatatau on Mangaia (Kirch et al. 1995). Waterlogged sites such as Fa’ahia/Vaitootia on Huahine (Sinoto and McCoy 1975; Sinoto 1977, 1982a, 1982b, 1983, 1988; Pigeot 1986, 1987) and Vaihi on Raiatea (Semah et al. 1978), whose anaerobic conditions have resulted in the preservation of wooden and fiber artifacts as well, are very exceptional.

I visited Rurutu with Pierre Vérin in June 2002. The Arts and Sciences Advisory Council of the University of Hawai’i generously funded this preliminary scouting. The aim during this week-long stay was to locate a potential site for me to excavate the following year. Pierre Vérin was of course very familiar with Rurutu, and together we made a tour of every known site with surface remains, guided by the president of Rurutu’s tourism committee (l’association Ano Mai), Yves Gentilhomme, and Ingrid Drollet, Rurutu’s leading authorities on the island’s history, and who were of invaluable
assistance to me. I knew that in order to locate a site containing an Archaic deposit, I would have to find either a sand dune or a promising rockshelter. I was disinclined to begin with a rockshelter, however, primarily because Vérin (1969:140-6) had already excavated one in Narui that yielded relatively few artifacts and whose stratigraphy was confused. Radiocarbon dates from the site also appear to have been contaminated (Vérin 1969: Annexe I). I believed that sand dune accumulations would be found on Rurutu, because its valleys are flanked and sheltered by cliffs in much the same way as are the valleys of the Marquesas. Urbanization ruled out Moerai, Avera, and ‘Auti, and the coastal plain of Unaa had been leveled to build the airport. Vérin had already demonstrated that an Archaic deposit in Vitaria was unlikely, so that left me with the valleys of Narui, Naairoa, Paparai, and Peva.

Out of all the sites that we visited on the island, Peva Rahi was the most promising. As the land parcel of Te Onetietie had been cleared of vegetation in the weeks prior to our visit, this revealed the marae Uramoa to be a structure of considerably greater size and complexity than the few stones mentioned by Seabrook, if indeed it is the same structure that was pointed out to him. From one end to the other, the mouth of Peva Rahi is an immense sand dune, the Classic period marae having been constructed on top of it. This location was also ideal for early habitation, being located near Peva’s beautiful white sand beach and the pass through the fringing reef. Peva is a perfect valley for human settlement, with its fresh water streams, vast potential for agriculture, and rich fishing grounds. Because Peva Rahi is uninhabited, the human landscape was essentially intact and untouched by modern development. I mapped as much of the marae that was
visible, as well as two other stone structures farther back in the valley. I decided to concentrate my initial efforts in the area of the marae, so that even if no Archaic deposit was found, the marae itself could yield valuable information in the course of test excavations. If the marae turned out to be disappointing, I could then move on to one of the other sites I had mapped and thus change the focus of my excavation.

In May 2003, I returned to Rurutu with official permission to excavate. I was housed in a small cabin on the beach of Peva, a two minute walk away from the marae itself. During the three months of excavation, I was the sole inhabitant of Peva Rahi. The mayor of Rurutu, Frédéric Rivéta, had graciously assigned an assistant named Papua who lived in Moerai to help me. M. Rivéta had for years been planning to build a cultural museum on Rurutu, and his plans coincided very well with my own project. Hopefully, this museum will be constructed in the future and will house the finds of this excavation. More unexpected help came from Pierre Atai's sons, Tapu and Takiri. These young men were very quick to learn the techniques of archaeological excavation. We began placing 1 x 1-m. test pits at intervals around the marae in order to establish the basic stratigraphy of the site and to locate deeper cultural deposits. Natural barriers such as walls and vegetation restricted where the pits could be placed. It was immediately apparent that there was a culturally sterile deposit of white sand beneath the topsoil and the coral stone pavement below. The clear stratigraphy dictated that excavation should proceed according to the natural stratigraphic layers. The topsoil, whose depth did not usually exceed 15 cm and whose abundant pig and turtle remains were clearly associated with the period of the marae, was excavated as a single layer (Layer A). The next layer
(Layer B), which was a mixture of topsoil and sand, was indistinguishable from Layer A in terms of midden and other cultural content. This layer, which did not usually exceed 10 cm in depth, was also excavated as a single layer, and there was no need for arbitrary levels within either. All deposits were screened through 1/8” mesh. The next layer (Layer C), which consisted of beach sand, began abruptly, and after screening several test pits it was clear that it was completely sterile and a waste of time to screen further. Nonetheless, excavation proceeded carefully in this deposit because human burials were encountered in it. Whenever a burial was encountered, excavation ceased in that unit, and the bones were left undisturbed.
Figure 4.7. Extent of the excavation at Peva, Site ON1.
An earlier, Archaic deposit was revealed on the third test pit (L5, see Figure 4.7). This area (Area 1) was then opened up for wider excavation. The Archaic deposit (Layer D), began unambiguously after approximately 40-60 cm of sterile sand. Layer D was dark, compact, charcoal-stained sand that contained abundant shell midden, basalt flakes, and adzes that are typologically distinctive of the Archaic period. All artifacts recovered in situ were plotted on unit maps. Cultural features such as earth ovens were photographed, as were the wall profiles. The Archaic deposit, which ranged in depth from 10-20 cm, was excavated as a single layer. In order to determine how far the Archaic deposit extended, test pits were placed at greater distances east of the initial areal excavation where the dune was highest, directly atop the *marae*. These pits (R9, U7) attained depths of almost two meters without reaching another deposit, at which time excavation in them ceased. A total of 15.5 m² was excavated of Area 1 by opening up units surrounding the initial test pit. Excavation there stopped when the Archaic deposit had thinned too drastically around the margins of the area to warrant further work. By this time, it was clear that as promising as Area 1 appeared at first, the material was insufficient to document the Archaic period adequately. It consisted primarily of debitage flakes with few artifacts. The midden was mostly bivalve shell, with little bone. There was no trace of any pavement, and no boulders of any kind were present. There was an earth oven feature, from which charcoal samples were taken for radiocarbon dating. On the whole, Area 1 resembled a temporary campsite or cooking ground more than a permanent area of habitation. Test pits to the south (L7) and east of Area 1 (X6, Y6/7) had revealed traces of an Archaic deposit but not enough to warrant further investigation.

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At this point, I was prepared to abandon the area of the marae and move on to one of the other sites I had mapped the previous summer. Fortunately, I had decided to place one final test pit (E15) to the southwest of Area 1, where a portion of intact basalt pavement was visible. The presence of this bit of pavement was my only reason for choosing the spot, and both Papua and myself were completely convinced that our efforts would be futile. Thankfully we were proven wrong, and this test pit revealed an Archaic deposit that was both richer and deeper than that of Area 1. Consequently, the remainder of the field season was spent expanding it into an areal excavation (Area 2). There, the Classic deposit was basically identical to that of Area 1, with abundant pig and turtle bone, and few artifacts. This area was also entirely paved beneath the topsoil, suggesting that the marae grounds continued farther than the spatial limits of the excavation. In this area, there were no human burials in the sterile Layer C deposit. The Archaic deposit contained pavement of coral boulders, earth ovens, abundant basalt flake debitage, artifacts of stone, bone, coral, sea urchin, and pearlshell, and dense and varied midden containing shell and bone. Area 2’s Archaic stratum appears to have been a habitation area that had been occupied on a more permanent basis than Area 1. 33 m² of Area 2 were excavated before the Archaic deposit began to dwindle in terms of depth and richness along the margins, which coincided with the end of the field season itself. In every respect, Area 2 was ideal in terms of the original goals of the excavation.

The excavation of Area 2 yielded both Archaic and Classic deposits so that a basic cultural sequence for Peva could be established. As the layers never intersected, there can be no ambiguity concerning the fact that two entirely distinct cultural
occupations are represented, separated by enough time for a deep accumulation of beach sand to develop, thus sealing the Archaic deposit intact.

**Stratigraphy**

The stratigraphy of a site reflects both the natural and cultural deposition of sedimentary particles. The stratigraphic sequence at Peva is extremely simple, as can be seen in Figure 4.8, Figure 4.9, and Figure 4.10. Each stratigraphic layer is defined based upon the color and composition of the sediment. There are five distinct layers at Peva, which were generally consistent around the entire site. There are two cultural deposits separated by a layer of sterile sand, the lower and earlier of which corresponds to the East Polynesian Archaic and the upper and later one to the Classic.

**Layer A.** Very dark grayish brown (10YR 3/1) loamy sand. This layer contains abundant midden consisting of shell and bone.

**Layer B.** Yellowish brown (10YR 5/4) sand. The sand is compact and darkened by renewed vegetation and by the topsoil of Layer A, and is indistinguishable in terms of content. The A/B interface is quite abrupt. Layer B is present in Area 1 and the test pits east, and absent in Area 2. The absence of Layer B in Area 2 might have been due to the thick tree canopy that allows less rain through than upon the exposed marae area.

**Layer C.** Pale yellow (2.5Y 7/4) sand, culturally sterile, with intrusive human burials. The B/C interface is abrupt as well.
Layer D. Light to dark olive brown (2.5YR 5/3-4/4) sand, compact and charcoal stained, containing abundant midden and artifacts. The C/D interface is instantaneously evident, as the sand becomes dark and midden-rich.

Layer E. Pale yellow (2.5Y 7/4) sand. This culturally sterile beach sand is identical to Layer C, and contains some coral fragments and water-rolled shell. The D/E interface is abrupt and cultural remains cease almost instantaneously.
Figure 4.8. South wall profile, Area 1.
Figure 4.9. South wall profile, Area 2.
Layer E represents the pristine sand dune prior to human occupation. Fragments of coral and water-worn shells are clearly a part of the original dune matrix. The transition to the culturally rich Layer D is abrupt and unambiguous. Layer D represents the initial habitation of the dune. It is a dark, charcoal-stained, compact sand matrix. Coral pavement stones and postholes suggest a house platform of indeterminate shape.

Layer C is identical in color and texture to Layer E, and represents a period during which the sand dune was no longer inhabited. It is deposited directly on top of Layer D. In the western portion of Area 2, a buried A horizon is visible situated approximately halfway through Layer C. This thin layer of darkened sand indicates that the dune formation ceased for a period long enough for some vegetation to take hold on the sand. Above the buried A horizon, the sand continues uninterrupted until the topsoil is reached. Within Layer C are intrusive human burials that were probably interred during the Classic period, when the marae itself was in use and the sacred nature of the site made it
appropriate for funerary purposes. Burials were only encountered in Area 1 and to the east, where the majority of surface architecture is present. From the few glimpses we had of these burials before we covered them up, it was apparent that the skeletons were laid out lengthwise with no preference as to orientation. Their hands were folded across the pelvic region and there was no evidence of burial goods.

Layer B is essentially the sand of Layer C, but more compact and stained darker by renewed growth of vegetation and the topsoil of Layer A. In terms of midden and other cultural material, it is indistinguishable from Layer A. Apart from the thin roots of the grass that covered the ground’s surface, the topsoil of Layer A was undisturbed. The midden began at a depth of two to three centimeters, and continued throughout the layer. Pavement stones of coral and basalt represented the original surface of the marae grounds, which extended as far as the excavation proceeded, and probably farther. This suggests a structure of greater extent than can be mapped without a large-scale clearance of the topsoil. It appears that the area of the marae had never been used for cultivation, and the few European artifacts unearthed are indicative of the 19th century, indicating the abandonment of the site during the early Historic period. The fact that more European objects were not found is understandable in view of the fact that only the valleys of Moerai and Avera contain passes large enough to accommodate ships.

**Radiocarbon Dating**

Seven charcoal samples from Layer D were analyzed for AMS dating, one by Beta Analytic Inc., and six by National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS) at Woods Hole Oceanographic Institute. In addition, two samples of
flying fox bone from Layer D were analyzed by NOSAMS. The charcoal and bone samples were processed using organic combustion to produce CO₂. The charcoal samples were subjected to a series of heated acid-base-acid leaches to remove inorganic carbon and mobile humic/fluvic phases. Collagen was extracted from the bone samples using the EDTA (ethylenediaminetetra-acetic acid) method. The collagen was then combusted and converted to graphite. All results were calibrated using Calib 5.0.1 (based on data in Stuiver et al. 1998; McCormac et al. 2002; McCormac et al. 2004) and OxCal 3.10. To date Layer A, which contained no charcoal, two *Turbo setosus* shell samples from Layer D and two from Layer A were submitted to NOSAMS. These were analyzed by hydrolysis; the samples are directly hydrolyzed with strong acid (H₃PO₄) to convert the carbon to CO₂. The results are presented in Table 4.1.
Table 4.1. Radiocarbon dates from Peva.* Abbreviations: Field No., field number; Lab. No., laboratory number; Prob., probability.

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*Note: All samples with RUR prefix are single pieces of wood charcoal that was found in earth ovens; samples with prefix BAT are flying fox (Pteropus tonganus) bones from midden; samples with prefix TUR are Turbo setosus samples from midden.
Figure 4.11. OxCal 3.10 diagram illustrating the distribution of radiocarbon dates from charcoal and bone samples, Peva Phase I.
NOSAMS performed replicate analyses on four of the charcoal samples (RUR 1-4). The first results are listed in Table 4.1 as RUR 1a-4a and the second as RUR 1b-4b. Samples RUR 2 and RUR 4 showed no significant variation, but samples RUR 1 and RUR 3 are worth discussing. Sample RUR 1 came from the same earth oven as sample RUR 2, yet exhibited an initial date of almost 200 years earlier (890±35 B.P). This was the one truly anomalous charcoal date, which I was tempted to dismiss. However, the replicate analysis yielded a more convincing age of 590±30 B.P., which is far more consistent with sample RUR 2 and the remainder of the charcoal dates. Almost the reverse happened when sample RUR 3 was rerun, whose initial date of 690±25 B.P. was quite consistent with all other samples. The replicate analysis produced an older date of 805±30 B.P., slightly older when compared with the other dates.

The direct dating of the flying fox bone (BAT 1 and BAT 2) must now be addressed, as this is the first time that it has been done for an East Polynesian site. The bones chosen for sampling were the proximal and distal ends of what was probably the same radius, which accounts for the consistent dates (uncalibrated) of 995±35 B.P. and 930±30 B.P., approximately 200-300 years older than most of the charcoal dates from the same deposit and depth. However, that the bones actually date from the 14th century A.D. is very likely, and it is probable that the difference in material sampled has resulted in a predictable gap on the order of around 200 years. Radiocarbon dates on bird and iguana bone (Steadman et al. 2002) have been consistent, although it is not documented how they compare to charcoal taken from the same context. In contrast, radiocarbon dates on rat bone from Archaic period sites in New Zealand have demonstrated a much greater discrepancy (Anderson 1996). These rat bone dates vary widely among
themselves and few correspond to dates taken from charcoal, moa bone, and moa shell from the same stratigraphic context. As Anderson (1996:182) noted, this might have been due to the small size of the rat bones and the higher likelihood of contamination.

The next issue that must be addressed pertains to the results of the *Turbo* shell dating and the implications for the local marine reservoir effect. The average uncalibrated date of all the results from the charcoal samples from Layer D is approximately 685±30 B.P. (rounded), and the average of the two Layer D shell samples is around 1340±30 B.P. (rounded), a difference of 655 years. If the shell dates are calibrated using the nearest available Delta R (45±30 and to 0±0), calculated for the Society Islands (Stuiver et al. 1986), the results are A.D. 982-1070 (Sigma 1) and A.D. 920-1135 (Sigma 2 for sample TUR 3, and A.D. 1154-1258 (Sigma 1) and A.D. 1079-1280 (Sigma 2) for sample TUR 4. These are considerably earlier than the majority of the charcoal dates, and only the latest estimates for sample TUR 4 fall into the probable age range of the site itself. This suggests that the Society Islands Delta R is not well suited to Rurutu. A similar result is documented for Nuku Hiva in the Marquesas (Rolett 1998:Table 3.1), in which a shell sample (CAMS-8,664) gave an uncalibrated date of 1570±30 B.P., about 600 years earlier than an isolated charcoal fragment (CAMS-8,665) from the same depth that yielded an uncalibrated date of 970±70 B.P. It must be noted that the Society Islands Delta R worked well for Anai’o in the southern Cooks (Walter 1998: Table 3.1). The uncalibrated dates ranged from 1015-1075 B.P., and using the Society Islands Delta R, resulted in calibrated dates that mostly fell within the 14th century A.D. These were quite consistent with the overall Archaic nature of the site, taking into account the artifact and faunal assemblages. These variable results highlight
the need for additional comparisons between charcoal and shell dates for the different regions of East Polynesia, as Walter (1998:28) noted. It is unfortunate that no charcoal was found in Layer A of Peva, because the uncalibrated shell dates of 390±35 and 380±30 B.P., while consistent with one another, are too recent for calibration.

Cultural Phases

Layer D represents the initial occupation (Phase I) of Peva's sand dune (Figure 4.12). In terms of dating and artifact typology, it falls directly into the Archaic period of East Polynesia, which lasted from approximately A.D. 1000-1450 (Table 4.2). Regarding the material culture, to be discussed in Chapters 8, 9, and 10, Phase I corresponds precisely with other contemporaneous sites in East Polynesia, most notably those in the southern Cooks such as Anai’o on Ma’uke (Walter 1998), Ureia and Moturakau on Aitutaki (Allen and Steadman 1990; Allen and Schubel 1990), and Tangatatau on Mangaia (Kirch et al. 1995). Layer C was culturally sterile and yielded no charcoal, signaling an intermediary phase during which the sand dune had been abandoned. Layer A and Layer B (Phase II), which contained no charcoal, must be dated by means other than the two shell dates that are too young to be calibrated. Since Rurutu was evangelized in 1821 (Ellis 1969b), an event that resulted in the complete destruction of the island’s marae and an effective end to the traditional religion, it is reasonable to postulate that Uramoa also ceased to be used ceremonially at around that time. (The abundance of traditional Polynesian feasting foods in the Phase II deposit will be discussed in Chapter 5). Shortly after evangelization, population decline concentrated the island’s residents into Moerai and Avera, leaving the other valleys, including Peva, largely abandoned. In addition, very few European artifacts were recovered from the
Phase II deposit (discussed in Chapter 10), all diagnostic of the 19th century. Taking this evidence together, I believe that Phase II may be reliably placed to within the time leading up to, and shortly following, European contact, that is to say, the Classic period of the late 18th century and the early 19th century A.D.

Figure 4.12. Schematic wall profile of Peva, with cultural phases.
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<td>Beta-109019</td>
<td>Green and Weisler 2002: Table 1</td>
</tr>
<tr>
<td><strong>Easter Island</strong></td>
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</tr>
<tr>
<td>Anakena</td>
<td>1120-1420</td>
<td>Beta-47171</td>
<td>Steadman et al. 1994: Table 2</td>
</tr>
<tr>
<td><strong>New Zealand</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Shag River</td>
<td>1301-1374</td>
<td>NZ-7761</td>
<td>Anderson and Smith 1996: Table 7.1</td>
</tr>
<tr>
<td>Wairau Bar</td>
<td>1278-1326</td>
<td>AA-22560</td>
<td>Higham et al. 1999: Table 2</td>
</tr>
</tbody>
</table>

* Estimation based on Allen and Steadman (1990: Figure 5)
Site Geomorphology

Today, Peva Rahi’s sand dune is around 3.1-3.5 m above sea level. The excavation revealed that the summit of the sand dune prior to human occupation was approximately 1-1.5 m lower. Following occupation of the sand dune during the 14th century, the area was completely abandoned. Based upon the radiocarbon dates, Phase I appears to have lasted from the late 13th until the early 15th century A.D., slightly less than 200 years. It is possible that a cyclone was responsible for initially covering the Archaic period site, thus preserving it intact. The beach of Peva can be very windy, allowing for the transportation of sand particles from the exposed fringing reef onto the shore. The sand of Layer C is entirely consistent, and where it is interrupted by the presence of the buried A Horizon, no traces of renewed activity were present. The coast of Peva was reoccupied approximately three centuries later, represented by the marae and related surface structures in the surrounding area. This Classic period level of occupation (Phase II) is represented by the surface remains, and Layers A and B (where present). The marae was constructed atop the new sand dune, using coral stones from the beach.

Based on the very abrupt evangelization of Rurutu in 1821, it is probable that the marae was destroyed and abandoned at this date. Peva was then home to a gradually diminishing population until it was entirely abandoned. The marae area became overgrown and untended, so that by the time of Seabrook’s visit in the early 20th century, almost no surface remains were visible. Adjacent land parcels have since been employed as grazing and agricultural land, but the marae grounds remain undisturbed.
Chapter 5. Mammal, Turtle and Bird Bone

In traditional Polynesia, food signified more than subsistence, and carried with it many social and sacred connotations. As Kirch (1984:29-30) stated, “A concern with food permeated Polynesian life at all levels of the social ladder, and in all social dimensions...This overriding concern with food formed a critical linkage between the material conditions of production - environment, technology, and demography - on the one hand, and the social relations that directed production and distribution on the other. It is a linkage of vital concern in our analysis on technological and social change in Polynesia.” Peva is the first site in the Australs for which a thorough analysis of faunal remains is possible. The conditions of the Peva sand dune resulted in the excellent preservation of abundant bone from both the Archaic and Classic deposits. Over 10,000 bones of nonfish and fish vertebrates were recovered. This large sample allows us to document the subsistence strategies of each time period, thus revealing long-term changes within a single site. Because the stratigraphy of Peva is so simple, with the two deposits separated from one another by a thick layer of sterile beach sand, there is no ambiguity when it comes to interpreting the results. The patterns are therefore quite evident, and offer valuable insight into the economic and sociopolitical dynamics of Rurutu.

Methodology

In order to represent both the Archaic and Classic deposits equally in terms of area, I decided to include only the faunal material from the 33m² of Area 2. Material from Area 1 and the surrounding test-pits was not included for the following reasons:
first, while the Classic deposit was found everywhere, a corresponding Archaic layer was not; secondly, the faunal assemblage from the Phase I Archaic deposit of Area 1 was unusual in that consisted almost entirely of bivalve shell, and the area itself appears to have been used differently than Area 2.

Following the initial sorting of bone, shell, and artifacts, the fishbone was removed and sent to Marshall Weisler for identification using the reference collection of the University of Otago. I then separated the remaining bone into categories. Bones that were whole enough were identified according to family, genus, or species by means of a direct match to a reference skeleton. To ensure accuracy and consistency, Barry Rolett checked all identifications. For fragmentary unidentifiable material, I followed the methodology used in Kirch and Yen (1982) and Rolett (1998). This material was separated into the categories “medium vertebrate” and “medium mammal.” “Medium vertebrate” signifies an animal with a head and body length of approximately three to six feet. The bone in this category was so fragmentary that it was unidentifiable as to whether it belonged to mammal or turtle. “Medium mammal” signifies a mammal in the size range from a dog to a human. The bone in this category was clearly not turtle, and consists primarily of longbone and rib fragments. All ambiguous specimens were classified conservatively as medium vertebrate. This procedure was followed for all bone of both the Archaic and Classic cultural deposits. The bones were then both counted and weighed, and quantified separately. Only NISP (number of identified specimens) values are given. MNI values were not calculated for the nonfish remains, primarily because the size of the aggregate faunal assemblage affects them (Grayson 1984). As Rolett (1998:95) stated, “If, as is often the case, the stratigraphic layers of a site represent long
periods in time, there is little analytic value in assuming that the bones recovered are from a number of individuals that can be accurately estimated.” As both Peva’s Archaic and Classic deposits were treated as single units, both of which represent periods of extended use, calculating MNI values was not performed.

Nonfish Vertebrate Faunal Categories

The domesticated animals present in the Peva assemblage have their origins in Ancestral Polynesian Society (Kirch and Green 2001:129). Terms for pig, dog, and chicken are all attested to in Proto-Polynesian. Domestic animals appear to have formed a relatively minor component of the Polynesian diet, which was dominated by marine resources. The social importance of different food categories cannot be deduced from either archaeology or linguistics. For that, we must rely upon the ethnographic record, which is grounded in the Classic period “endpoint” of traditional East Polynesian culture. For example, the following summary of faunal categories contains four foods that were largely tapu to women and of considerable social value: pig, dog, whale, and porpoise. The presence of such tapus throughout East Polynesia suggests that these restrictions were of considerable antiquity, and may have been linked to the scarcity of certain foods. Oliver (1974:275) wrote, “the most highly esteemed kinds of food generally forbidden to women - pigs, dogs, turtles, albacore, shark, dolphin, whale, porpoise - were among those shortest in supply, either seasonally or year round.” There were many additional restrictions concerning who could eat with whom, food preparation, and hygiene, all of which carried certain spiritual and social connotations. To name but two, men and women did not eat together and women were forbidden to eat food that had been touched or prepared by men (Oliver 1974:224-7). As eating is such a common activity, these
regulations served to reinforce Polynesian social structure on a regular basis. The roles of food and feasting were also very significant to the sociopolitical and economic development of chiefdoms, as chiefs used food resources to pay for such things as wars and public work projects, notably canoes, houses, and monumental architecture. Feasting was also one way in which chiefs could elevate their own mana and out-compete rivals. In some cases, foods and their tapus were in fact instrumental in the collapse of the social systems themselves. A good example of this was the almost overnight evangelization of Rurutu. William Ellis wrote:

...a feast was prepared; turtle, pork, and other kinds of food considered sacred, were dressed, and a number of both women and children sat down, and ate of the prohibited dishes. The priests had declared, that any who should thus offend, would be instantly destroyed by the gods of their ancestors - this was to be the test of their power.

The inhabitants were not uninterested spectators at this feast; and when, afterwards, they saw no one convulsed, or suddenly stricken with death, they arose, hurled their idols from the places they had so long occupied, burnt to the ground three of their sacred dwellings, in which their idols were kept, and, on the same day, proceeded, en masse, to the destruction of their temples. (1969b:399-400)

Let us now turn to each of the nonfish faunal categories represented in the Peva assemblage and explore their significance in Polynesian culture and subsistence.

Domestic pig (Rur. pua’a, Sus scrofa). Pork was a highly prized food in Polynesia, and forbidden to women for the most part (Oliver 1974:275). It was a luxury item, eaten
primarily by high-status individuals. The pig was a vital component of the economic and sociopolitical system throughout much of Polynesia. It was not successfully transferred to either New Zealand or Easter Island. Despite its social importance, pig appears to have been a peripheral food source early on in the development of Polynesian culture. Kirch and Green (2001:129) examined the frequency of domesticated animal remains in Ancestral Polynesian sites in West Polynesia. Chicken is generally the best represented, followed by pig, and finally dog: “the relatively small numbers of pig bones from Ancestral Polynesian sites (in contrast, for example, to their presence in some later Polynesian sites) suggest that pork was not a commonly consumed food at this early time period” (Kirch and Green 2001:129).

The Polynesian variety of pig that existed in pre-contact times were not like those brought by Europeans that became dominant within a few decades. Ellis (1969b:70) wrote that the original pigs, “differed considerably from the present breed, which is a mixture of English and Spanish. They are described as having been smaller than the generality of hogs now are, with long legs, long noses, curly or almost woolly hair, and short erect ears. An animal of this kind is now and then seen, and the people say such were the only hogs formerly in Tahiti. It was also said, that they, unlike all other swine, were wholly averse to the mire.” Joseph Banks (1962:343) described the taste: “Their pork is certainly most excellent tho sometimes too fat.” James Cook (1955:122) was also favorably impressed.

Pigs subsisted by both scavenging and feeding. Concerning Tahiti, Oliver (1974:271) wrote, “The native pigs lived entirely on a vegetable and fruit diet; some of their food was obtained through foraging for roots and fallen fruit and nuts, but they were
also regularly fed by their keepers.” Oliver (1974:272) distinguished three categories of pigs: “domesticated ones with known owners, semidomesticated ones of unknown ownership, and wild, feral ones.” Ellis (1969b:382) commented upon pig husbandry in Tubuai: “Their gardens were unfenced, and the few pigs they had were kept in holes or wide pits four or five feet deep, and fed with bread-fruit and other vegetables.”

Pigs were an integral part of the Polynesian agricultural system, and therefore an important component of the sociopolitical makeup of chiefdoms. As Kirch (1991a:123) wrote, “Agricultural systems notable for intensive pig husbandry, such as Futuna, or the leeward part of Hawai‘i Island at European contact, were also centers of highly intensive agricultural production (valley irrigation and intensive dryfield cultivation, respectively).” On islands where pig is found in the archaeological record but was not present at European contact, such as on Tikopia (Kirch and Yen 1982) and Mangaia (Buck 1944; Kirch et al. 1995), this has been attributed in large part to an overtaxed agricultural system that was unable to support a population of them. The degree of pig husbandry might therefore be reflective of the agricultural potential of an island.

Prior to the present study, the presence of the pig on Rurutu was attested to by the following: oral tradition, the presence of a pig motif in sculpted objects, a single pig tooth discovered in Vitaria, and ethnographic accounts (Vérin 1969:204). During the Classic period, pigs and turtles were considered sacred feast foods on Rurutu (Ellis 1969b:399). Pigs were also traded in exchange for European goods. Ellis (1969b:402) wrote, “A short time before the first European Missionaries visited them, an English ship hove-to off the island, and on the captain’s intimating his wish to obtain pigs and vegetables, the native took off a supply, including a number of large hogs, for which they were promised axes.
in return.” Unfortunately, the Europeans cheated the Rurutuans, an act for which they were almost murdered. Providence prevailed however, and the ship was lost thereafter (Ellis:1969b:402-3).

Domestic dog (Rur. *pore*, *Canis familiaris*). The dog was transferred successfully to most of East Polynesia save Easter Island. Ellis (1969a:72) described Polynesian dogs as follows: “They were of a small or middling size, and appear a kind of terrier breed, but were by no means ferocious; and, excepting their shape and habits, they have few of the characteristics of the English dog: this probably arises from their different food.” The importance of dog as a food source in Polynesia was variable. In Hawai‘i dog husbandry was practiced on a par with pig husbandry. There, dogs were fed from agricultural produce instead of being left to scavenge as they did on most other islands (Titcomb 1969). Concerning Tahiti, Oliver (1974:276) wrote, “Dogs were kept and fattened by the Maohis mainly as a luxury food, for themselves and their gods.” Joseph Banks (1962:343) and James Cook (1955:122) likened the taste of Tahitian dog to English lamb, and attributed this to their vegetarian diet. The importance of dog as a food source in the Australs is unclear. Morrison (1935) did not mention dog consumption on Tubuai. Aitken (1930:38) was told that dog had never been a food source there. Its place on Rurutu in particular is difficult to ascertain, and may have changed considerably in the past two centuries. Stokes (Notes on Rurutu, manuscript) did not comment upon this during his stay on Rurutu in the 1920s. However, in the 1930s Seabrook (1938:94) wrote, “Dogs are raised today for food. All Rurutuans relish dog meat, and attribute the practise to their forefathers.” This was no longer the custom when Vérin (1969:204) excavated on Rurutu in the 1960s and is certainly not the case today. Vérin noted the
difference between the local Rurutuan term for dog, *pore*, and the more frequent Tahitian term *'uri*, but was unable to say whether this represented a linguistic innovation or a linguistic taboo.

Pacific rat (*Rur. 'iore, Rattus exulans*). It has been suggested (Matisoo-Smith and Robins 2004) that because of the large quantities of rat bone found in archaeological midden, the Pacific rat was an intentional introduction into Oceania, perhaps as a food item, but this remains uncertain. Rats did however accompany the Polynesians to every island they settled upon. Oliver (1974:278) described the Pacific rat as “a small brown animal that lived mainly on fruits and vegetables. By all accounts these animals, quite tame and imperturbable, infested the Maohi’s settlements in swarms. The Maohis just as imperturbably, protected their edibles from rats by means of baffles but seemingly made no effort to destroy the rats or drive them away. Unlike some Polynesians, Maohis are said to have abhorred the very idea of eating rats.” In Tahiti, rats were regarded as the shadows of ghosts. Henry (1928:383) wrote, “When it visited people at night and uttered strange sounds with its tongue or scratched the thatch inside the roof of the house until daybreak, it was communicating mysteries and reminiscences of war and times of peace from dead warriors to living men. But when it approached a sick bed articulating strange sounds, it was the shadow of a devouring ghost announcing the near approach of death to the patient.” Rats were actively pursued as a food source in other areas of East Polynesia, such as Mangaia (Buck 1944:247), perhaps in response to the lack of the pig there (Kirch 1994:284-5). On Tubuai, the consumption of the rat was denied (Aitken 1930:38). Similarly about Rurutu, Seabrook (1938:94) wrote, “Rats have always been avoided,”
and it was not listed among the "starvation" foods that the Vitarians fell back upon during times of siege and famine.

Pacific Flying Fox (Pteropodidae *Pteropus tonganus*). The Pacific Flying Fox is among the most widespread of *Pteropus* species and is currently found from the Solomon Islands to the southern Cooks (Flannery 1995:295). Martin (1968) noted that flying foxes were taken to Tahiti in the mid-19th century. Flannery (1995:296) considered that since Polynesians were known to have carried these animals as pets, it is possible that some populations result from intentional introduction. No species of bat exists on Rurutu today. Seabrook (1938:4) noted, "The Cook Islands bat did not reach Rurutu." However, one mandible fragment and four additional bone fragments were recovered from the Peva Phase I Archaic deposit (MNI=1), marking a new easternmost limit for this species (Weisler et al. n. d.). In the southern Cooks, this species still only exists on Rarotonga and Mangaia (Hill 1979). Kirch et al. (1995) noted a drastic reduction over time in the amount of flying fox in the Mangaian sequence, suggesting resource depletion. In a situation strikingly similar to that of Peva, Walter (1998:79) also found a flying fox mandible in the 14th century site of Anai’o on Ma’uke where the species does not currently exist. Flying fox bones have been found on Aitutaki as well (Steadman 1991). As on Rurutu, this might indicate that it had been extirpated there in early prehistoric times. As the Peva bones are the first to be found in the Australs, it is not yet possible to state whether the flying fox was deliberately introduced to Rurutu, or else existed there prior to human arrival. On Tikopia (Kirch and Yen 1982:278) bats were *tapu* and regarded as spirits, and the authors were surprised at finding flying fox remains in the archaeological deposits.
Human (Rur. *ta’ata*, *Homo sapiens*). Human remains in the Archaic and Classic deposits are all unworked teeth. In the Classic deposit, some of these teeth are attached to small fragments of mandible, and might have come from trophy or ancestral skulls around the *marae*, or from burials that had been disturbed when the *marae* was still in use. On Rurutu Stokes (Notes on Rurutu, manuscript, p. 38) was told that skulls of fallen enemy warriors were sent to *marae* to be displayed. The rather large quantity of them (eleven within 33m²) suggests that they were not shed naturally.

Small whale/porpoise (Rur. *to’ora*, Odontoceti). Seabrook (1938) did not mention whales or dolphin as a food source in prehistoric Rurutu. Taaria Walker (2002:21-23), an expert on the past and present traditions of Rurutu, provided a very lively account of mid-20th century Rurutuan whale hunting (*patiara’a to’ora*). In prehistoric times, Morrison (1935:67) noted that on Tubuai, dolphin was *tapu* to women, something common to other areas of Polynesia (Oliver 1974:275). The fringing reef that surrounds Rurutu may have lessened the possibility that the humpback whales (*Megaptera novaeangliae*) that pass by Rurutu could have washed ashore. The whale appears to have been regarded as a supernatural being of sorts. Regarding Tahiti, Henry (1928:389) noted that the whale was the shadow of the god Ta’aroa. Seabrook (1938:170) wrote, “elders…used to warn children against speaking ill of whales --- a whale would destroy the child that did, etc.” Magical whales were also the subjects of at least one myth on Rurutu (Seabrook 1938:153-4).

Bird (Rur. generic *moa*). About Classic period Tahiti, Henry (1928:384) wrote, “Birds were shadows of gods” and described numerous varieties in detail. The only domesticated Polynesian variety of bird was the Red Junglefowl, or chicken (*Gallus*).
The chicken was successfully introduced everywhere in Polynesia save New Zealand. Ellis (1969a:74) described the Polynesian variety: “They are of the same kind as those reared in England; the bodies are smaller, and the legs longer, but this may perhaps have arisen from their not being confined, and seldom fed by the people. Those that are tame usually live upon what they find in the garden, or the fragments of breadfruit, &c. left after the native meal. During the day they seldom wander far from their owner’s dwelling, and at night, either take shelter under the same roof, or roost on the boughs of the trees by which it is overshadowed.” On Tahiti, hens were reared for eating while roosters were reserved for sport-fighting (Oliver 1974:277). Europeans were not generally fond of the taste of these birds. Joseph Banks (1962:343) wrote, “their fowls are not a bit better rather worse maybe than ours at home, often very tough.” James Cook (1955:122) tersely stated, “little can be said in favour of their fowles.” Ellis (1969a:74) also compared them unfavorably with the English variety, and remarked that the wild chickens that were sometimes hunted in the woods were even worse-tasting than the domestic variety.

Today on Rurutu there are few species of sea birds and indigenous land birds (see Chapter 2, Table 2.2), suggesting that, as in other areas of Polynesia (e.g., Steadman 1989; 1995), an extinction event occurred shortly following human settlement. Morrison’s (1935:69) description of duck-hunting in taro patches probably pertains to the one of the indigenous land bird species still extant in the Australs, the Gray Duck (*Anas superciliosa*). Other land bird species appear to have been less likely food sources. The Spotless Crake (*Porzana tabuensis*) is a very small rail that is “elusive and shy” (Pratt et al. 1987:126), and the Pacific Reef-Heron (*Egretta sacra*), is a small bird that nests in
trees and on rock ledges (Pratt et al. 1987:88). The majority of Rurutu’s extant sea birds nests on cliff faces and in trees, to which Seabrook (1938:4) attributed the survival of the Tropicbirds. In Classic-period Polynesia, birds were used primarily for the valuable tail feathers of certain species (Oliver 1974:279). As noted in Chapter 2, the Australs and the southern Cooks were known to Tahiti as the Paroquet Islands, from which parakeet feathers came (Henry 1928:464). Morrison (1935:217-219) described expeditions up the cliff faces of Tahiti for the red tail feathers of Tropicbirds. Men would capture the bird in hand, pluck out the tail feathers, and then release it. He also wrote in detail about how the Man-o’-War, or Frigatebird, was snared for its highly prized black tail feathers, but never eaten. Concerning the significance of feathers, Ellis (1969a:338) wrote, “Throughout Polynesia, the ordinary medium of communicating or extending supernatural powers, was the red feather of a small bird found in many of the islands, and the beautiful long tail-feathers of the tropic, or man-of-war bird. For these feathers the gods were supposed to have a strong predilection; they were the most valuable offerings that could be presented; to them the power or influence of the god was imparted, and through them transferred to the objects to which they might be attached.” About Kuhl’s Lorikeet (the Rimatara lorikeet) Henry (1928:385) wrote, “The vini-‘ura, a whistling parakeet of Rimatara (Austral Islands), of red, yellow, blue, and green plumage, was the shadow of (the god) Ta’aaroa.”

Sea turtle (Rur. ‘ono, Cheloniidae). Vérin (1969:29) noted that the most frequent species of turtle on Rurutu was the Green Sea Turtle (*Chelonia mydas*), making it likely that this is the species represented in the Peva assemblage. During the Classic period, turtle was a *tapu* food of the highest status throughout Polynesia, forbidden to women and reserved
for the elite (e.g., Henry 1928:381; also Ellis 1969b:399; Morrison 1935:67; Seabrook 1938:9; Vérin 1969:273). Regarding Tubuai, Morrison (1935:68) wrote, “The Turtle is also Sacred to the Men and is only Used as Sacrifices or eaten by the Chiefs & Priests.” Morrison (1935:70) further commented that upon the marae “they offer Sacrifices of Men and Turtle. When a sacrifice is to be made all the Males in the district assemble at the Morai...” In Tahitian creation myths, the turtle was the first animal to be born to human beings, followed by the chicken, and then the pig (Henry 1928:381). Oliver (1974:225-6) noted, “Turtle flesh was ordinarily denied not only to females but to all but the holders of highest-ranking kin-Titles, and the most politically powerful chiefs. In this connection, it should be pointed out that turtle flesh was also considered a most appropriate food for the gods.” The universal sacredness of the turtle and its rich iconography throughout Polynesia suggests that this tradition dated back to Ancestral Polynesian Society (Rolett 1986). Kirch and Green (2001:260) suggested that the appearance of the Green Sea Turtle may have been associated with the star-cluster Pleiades. The turtles lay their eggs on the beaches of Polynesian islands from June to September, the season when the Pleiades can be seen in the sky before sunrise. Widespread rituals such as turtle feasts during this time imply a symbolic association between the turtle and the Pleiades that probably had its origin in Ancestral Polynesian Society. Seabrook (1938:169) noted that on Rurutu, one god was incarnated as a turtle.

Morrison (1935:68) observed that on Tubuai, turtles were caught with nets. Emory (1975:216-17) described the Tuamotuan methods of catching turtles, either by diving to the bottom where it was resting and snaring it with an iron hook, or more usually, with the bare hands. Turtles could also be caught on land when they came
ashore to lay their eggs. Concerning turtle remains from Fa‘ahia, Huahine, Leach et al. (1984:189) speculated that “the majority of turtles are most likely to have been taken when emerging from the sea to nest or breed, though some are bound to have been caught in fishing nets.” Fishing and diving methods were also considered. On Rurutu, Peva’s white sand beach is one of the largest and most attractive on the island. The pass through the fringing reef would have made the beach accessible to nesting turtles. They may also have been captured while feeding off of the coral in the shallow waters within the fringing reef itself.

**Interpretation of the Data**

The data are presented first according to bone count (NISP) in Table 5.1 and then according to bone weight in Table 5.2. Bone counts and bone weights are then separately converted into concentration indices for the two stratigraphic layers (Table 5.3, Table 5.4). The concentration indices measure the density of material per cubic meter of cultural deposit, and are useful for inter-site comparison. Finally, the relative frequencies of each species are presented according to both bone count and bone weight (Table 5.5, Table 5.6).

As only diagnostic skeletal elements were used to identify specimens, much of the faunal assemblage could only be classified as unidentifiable medium mammal or medium vertebrate. Most of the medium mammal bone is probably pig, and to a far lesser extent dog and possibly whale or porpoise. Pigs and dogs share diagnostic skeletal elements, so it is likely that the amount of positively identified specimens reflects the proportion of these species among the unidentifiable fragments. From the Archaic to the Classic
deposits, the amount (NISP) of pig jumps from 176 to 534. Similarly, the amount of medium mammal rises from 127 to 533, which is very close in proportion. The amount of dog also stays relatively the same, from an NISP of 3 in Phase I to 2 in Phase II. The concentration indices display the same trends. This supports the conclusion that the majority of medium mammal in both deposits is in fact pig. The category of medium vertebrate contains bone in a very fragmentary condition. Much of this is probably turtle and pig bone that has been broken into pieces too small to be identified.

It should be noted that the majority of identified turtle bones are carapace fragments ranging roughly from two to five centimeters in width. *Chelonia mydas* is one of the largest species of turtle, and can attain lengths of more than 150 cm, and a fully grown adult can weigh over 100 kg. The carapace itself can therefore be quite large, and fragments into many small but easily identifiable pieces. It is therefore possible that turtle is somewhat over-represented in terms of both bone count and bone weight throughout the Peva sequence. However, there is little doubt the turtle was an important food item.
Table 5.1. Vertebrate Remains from Peva (NISP)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>176</td>
<td>534</td>
<td>710</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Rat (Rattus exulans)</td>
<td>237</td>
<td>7</td>
<td>244</td>
</tr>
<tr>
<td>Small whale (Odontoceti)</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Flying fox (Pteropus tonganus)</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Human (Homo sapiens)</td>
<td>2</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Unidentifiable medium mammal*</td>
<td>128</td>
<td>523</td>
<td>651</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>115</td>
<td>7</td>
<td>122</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea turtle (Cheloniidae sp.)</td>
<td>461</td>
<td>533</td>
<td>994</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4461</td>
<td>560</td>
<td>5021</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Unidentifiable medium vertebrate**</td>
<td>780</td>
<td>1741</td>
<td>2521</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All species</td>
<td>6380</td>
<td>3918</td>
<td>10298</td>
</tr>
<tr>
<td>% Fish</td>
<td>69.9</td>
<td>14.3</td>
<td>48.8</td>
</tr>
<tr>
<td>All species (without *, **)</td>
<td>5472</td>
<td>1654</td>
<td>7126</td>
</tr>
</tbody>
</table>

* The majority of this material is probably pig.
** The majority of this material is probably sea turtle.

Table 5.2. Vertebrate Remains from Peva (Weight in grams)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>472.7</td>
<td>1059.0</td>
<td>1531.7</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>1.6</td>
<td>0.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Rat (Rattus exulans)</td>
<td>15.6</td>
<td>1.1</td>
<td>16.7</td>
</tr>
<tr>
<td>Small whale (Odontoceti)</td>
<td>51.9</td>
<td>51.9</td>
<td>103.8</td>
</tr>
<tr>
<td>Flying fox (Pteropus tonganus)</td>
<td>0.6</td>
<td>0.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Human (Homo sapiens)</td>
<td>0.9</td>
<td>15.7</td>
<td>16.6</td>
</tr>
<tr>
<td>Unidentifiable medium mammal*</td>
<td>169.6</td>
<td>787.1</td>
<td>956.7</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td>31.0</td>
<td>9.3</td>
<td>40.3</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea turtle (Cheloniidae sp.)</td>
<td>675.8</td>
<td>888.5</td>
<td>1564.2</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td>1133.1</td>
<td>342.8</td>
<td>1475.8</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidentifiable medium vertebrate**</td>
<td>461.4</td>
<td>1216.3</td>
<td>1677.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3014.1</td>
<td>4320.0</td>
<td>7334.1</td>
</tr>
</tbody>
</table>

* The majority of this material is probably pig.
** The majority of this material is probably sea turtle.
Table 5.3. Concentration Indices of Vertebrate Remains from Peva (Bone Counts)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>26.7</td>
<td>134.8</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Rat (Rattus exulans)</td>
<td>35.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Small whale (Odontoceti)</td>
<td>1.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Flying fox (Pteropus tonganus)</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Human (Homo sapiens)</td>
<td>0.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Unidentifiable medium mammal*</td>
<td>19.4</td>
<td>132.1</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td>17.4</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea turtle (Cheloniidae sp.)</td>
<td>69.8</td>
<td>134.6</td>
</tr>
<tr>
<td>Fish</td>
<td>675.9</td>
<td>141.4</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidentifiable medium vertebrate**</td>
<td>118.2</td>
<td>439.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>966.7</td>
<td>989.4</td>
</tr>
</tbody>
</table>

* The majority of this material is probably pig.
** The majority of this material is probably sea turtle.

Table 5.4. Concentration Indices of Vertebrate Remains from Peva (Bone Weights)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>71.6</td>
<td>267.4</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Rat (Rattus exulans)</td>
<td>2.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Small whale (Odontoceti)</td>
<td>7.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Flying fox (Pteropus tonganus)</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Human (Homo sapiens)</td>
<td>0.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Unidentifiable medium mammal*</td>
<td>25.7</td>
<td>198.8</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td>4.7</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea turtle (Cheloniidae sp.)</td>
<td>102.4</td>
<td>224.4</td>
</tr>
<tr>
<td>Fish</td>
<td>142.2</td>
<td>78.6</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidentifiable medium vertebrate**</td>
<td>69.9</td>
<td>307.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>427.3</td>
<td>1083.0</td>
</tr>
</tbody>
</table>

* The majority of this material is probably pig.
** The majority of this material is probably sea turtle.
Table 5.5. Relative Frequency of Nonfish Vertebrate Remains from Peva (Based on Bone Counts)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>17.4</td>
<td>48.8</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Rat (Rattus exulans)</td>
<td>23.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Small whale (Odontoceti)</td>
<td>1.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Flying fox (Pteropus tonganus)</td>
<td>0.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Human (Homo sapiens)</td>
<td>0.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Birds</td>
<td>11.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Reptiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea turtle (Cheloniidae sp.)</td>
<td>45.6</td>
<td>48.7</td>
</tr>
<tr>
<td>Total NISP</td>
<td>1011</td>
<td>1094</td>
</tr>
</tbody>
</table>

Table 5.6. Relative Frequency of Nonfish Vertebrate Remains from Peva (Based on Bone Weights)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>38.8</td>
<td>53.9</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Rat (Rattus exulans)</td>
<td>1.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Small whale (Odontoceti)</td>
<td>4.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Flying fox (Pteropus tonganus)</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Human (Homo sapiens)</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Reptiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea turtle (Cheloniidae sp.)</td>
<td>55.4</td>
<td>45.2</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total weight (g.)</td>
<td>1219.0</td>
<td>1964.6</td>
</tr>
</tbody>
</table>
One of the most striking trends between the Archaic and Classic deposits is the percentage of fish. Table 5.1 demonstrates that in the Archaic deposit (Phase I), fish accounts for over 70% of the total assemblage (NISP). In the Classic deposit (Phase II), fish comprises slightly over 14% percent. As with all differences between the two cultural deposits, this should be interpreted in light of the ceremonial nature of the Classic period marae. It is probable that nonfish foods, mostly pig and turtle, were emphasized during feasting. A similar trend occurs in the site of Hanamiai in the Marquesas, which also underwent a change from being a habitation site in the Archaic period to a ceremonial tohua in the Classic (Rolett 1998:103). One significant trend, to be discussed in more detail in Chapter 7, is that while the total amount of fish changes dramatically from the Archaic to the Classic, the species accounted for do not. The large proportion of fish in the Archaic deposit testifies to the strong maritime-oriented Polynesian subsistence system, in which most protein was derived from fish and shellfish, with hunted and domesticated animals occupying a far smaller role.

Sea turtle represents the most abundant nonfish resource during Peva’s Archaic period, occurring with a relative frequency of approximately 50% based on NISP and bone weight (Table 5.5, Table 5.6). In this Peva differs considerably from other East Polynesian sites such Anai’o (Walter 1998:75), Ureia (Allen and Steadman 1990:32), Tangatatau (Kirch et al. 1995:57), and Hanamiai (Rolett 1998:98). In these other sites turtle is not present in nearly the same frequency. While I believe that the nature of the carapace fragmentation might have resulted in the over-representation of turtle in the faunal assemblage, there is a clear difference between the NISP of Peva’s Archaic phase (461) and that of a site such as Hanamiai (30). In Fa’ahia on Huahine (Leach et al. 167
turtle was also the most abundant remain. On Tikopia (Kirch and Yen 1984:185), turtles were heavily exploited during the earliest cultural phase, and this appears to have impacted the population. The absence of turtle in the succeeding phase can be attributable to both human predation as well as cultural factors (such as tapu). In the final phase of Tikopia turtle becomes abundant again, which was consistent with ethnographic exploitation patterns. A similar sequence might be posited for Rurutu, although intermediary layers between the Archaic and Classic deposits are not present. During the Archaic period, turtle was likely exploited as a convenient food source. This may well have had an impact on the species population. By the Classic period, the turtle population might have replenished itself, in part due to the tapus on this food that were in full force by the late 18th century, and probably much sooner. The abundance of turtle, a food of the highest status, in Peva’s Classic deposit reflects the ceremonial and religious nature of the site to a greater extent even than the considerable amount of pig remains. Its relative frequency is approximately the same in this period as it is in the Archaic (Table 5.5, Table 5.6). In view of the myriad of restrictions surrounding turtle consumption in Classic period Polynesia, it is likely that only high status individuals such as chiefs and priests were participating in the feasts on the marae.

Pig is well represented in Peva’s Archaic deposit, and is especially abundant in the Classic deposit. In both periods, it is a dominant nonfish vertebrate. Peva exhibits a pattern of Archaic period subsistence comparable to those of other islands in East Polynesia. The quantity of pig bone indicates that pig husbandry was already established during this period, although to what extent one cannot say. Archaic sites in East Polynesia tend to show some diversity in this respect. Walter (1998:81) utilized a pig-to-
fish ratio to make inter-site comparisons: “Since fish is universally important in Polynesian island societies, a simple method of comparing the relative significance of pig between sites or through time, is to look at the ratio of pig bone to fish bone in the faunal assemblages. This is done by summing the pig and fish bone NISP values and determining percentage figures. The derived index provides a gross comparative measure but can’t be converted to quantitative statements on consumption patterns.” Figure 5.1 charts the percentages of pig and fish bone counts from the Archaic layers of four sites in East Polynesia for which comparable data are available: Anai’o (Walter 1998) and Tangatatau (Kirch et al. 1995) in the southern Cooks, Hanamiai (Rolett 1998) in the Marquesas, and Peva. Anai’o exhibits the highest pig to fish ratio based on NISP, and also contains few hunted species such as bird and turtle. Walter (1998:81) considered the following possibilities: Anai’o represents a phase of occupation later than the earliest one; or Ma’uke may have been colonized by people who rapidly established pig husbandry, which could have been the case if it was settled from a neighboring island. In addressing the first possibility Walter (1998:81) wrote, “This interpretation could be supported by the paucity of hunted species such as sea birds and flying fox in the assemblage. Some caution is necessary however since there is no reason to automatically assume that island sequences exhibit the same patterns or rates of change in subsistence systems.”
Walter (1998:78-9) proposed that the Anai’o site represents one in which low-intensity pig husbandry was practiced. Based on ethnographic observations, this entails basically tethering a pig or two to a tree and feeding them food scraps. In the case of a litter, the young are allowed to roam free until they are weaned and have grown large enough to be too bothersome to keep around, between the ages of eight and twelve months. At this point they are usually killed, because the major growth spurt is over and they gradually produce less meat. Age estimations on the pig remains from Anai’o correspond to those of Hanamiai (Rolett and Chiu 1994), Fa’ahia (Leach et al. 1984), and Peva (see below). Such casual husbandry can lead rapidly to the development of a feral pig population, thus promoting hunting, which Walter believed was also taking place at Anai’o. A developed agricultural foundation would not have been necessary to maintain a low-intensity husbandry operation, or to account for the relatively high percentage of pig present in the faunal assemblage. Walter (1998:79) wrote, “Even if Anai’o was positioned right at the beginning of the Ma’uke sequence it would only take a few years
for a feral population to develop on the island.” Peva’s Archaic assemblage exhibits a pig to fish ratio lower than that of Anai’o, but higher than those of Hanamiai and Tangatatau. If the unidentified medium mammal bone, which is most likely pig, is factored into the ratio equation of Peva Phase I, the pig percentage rises from 3.3 to 4.9. Based on this, I would suggest a similar low-intensity pig husbandry practice for Peva at this time. During the Archaic period, pig was probably consumed only on occasion.

While we cannot know the social or religious significance of pork during the Archaic, the concepts of mana and tapu were already well established in Ancestral Polynesian Society (Kirch and Green 2001:239-41). It is probable that pork consumption was already regulated during the East Polynesian Archaic, as this custom was so widespread throughout in the late 18th century.

Pig appears with a relative frequency of approximately 50% in the Classic period, based on NISP and bone weight (Table 5.5, Table 5.6). This quantity in the Classic deposit, directly associated with the marae, most likely reflects pork’s status as a feasting food. In contrast, Vérin (1969:204) found only one pig tooth in his excavation of a Vitaria house site with an area of approximately 100 m², although the faunal assemblage was not documented. This discrepancy between two roughly contemporaneous sites is probably due in part to the secular nature of the Vitarian house platform and to the religious nature of the Pevan marae. Vitaria’s problems with food shortages (Chapter 3) because of its lack of taro fields may also have contributed to this. In contrast, Peva’s productive capacity appears to have allowed for considerable pig husbandry to have taken place. For an accurate comparison to be made, one of Vitaria’s marae would have to be excavated.
Identifiable dog bone is present in miniscule quantities in both the Archaic and Classic deposits. The small amount suggests that dog was not emphasized as a food source during the Archaic period. A similarly small quantity was recovered from Anai’o (Walter 1998:79). Dog is also minimally represented in Peva’s Classic deposit, but this might reflect the ceremonial nature of the marae itself and the emphasis on feasting foods such as pig and turtle in such a surrounding. The custom of eating dogs that Seabrook witnessed may have been a later development.

Rat bone is present throughout the Peva sequence, although in far greater quantities in the Archaic period. No bones exhibit signs of charring. Identifiable small whale and/or porpoise is also minimally represented in the Archaic deposit and absent in the Classic deposit.

Bird bone, so far unidentified, is far more prevalent in Peva’s Archaic deposit than in the Classic. This suggests an stronger emphasis on wild terrestrial food sources at that time. Counts of bird bone vary considerably from site to site in the Pacific. Peva’s Archaic period count of 116 (NISP) is considerably less than that of Hanamiai in the Marquesas, where over 500 were found in the early deposits (Rolett 1998). Lower counts were found at Tangatatau (Kirch et al. 1995) and Ureia (Allen and Steadman 1990) in the southern Cooks. Anai’o yielded the fewest, only sixteen, eleven of which were chicken (Walter 1998:75). The rate of bird extinctions appears to have varied among Pacific islands, with size and topography being significant factors.

Age Estimations of Pig Teeth

Rolett and Chiu (1994) successfully used the eruption and wear stages of the three pig molars (M1, M2, M3) to estimate an age profile of the pig population, thus allowing a
tentative reconstruction of the kill-off pattern. Wear stages are designated with letters, with ‘a’ being an unworn molar, ‘b’ being slightly worn, and so forth. I followed the same methodology in analyzing the pig molars of the Peva assemblage. For this I used all pig molars recovered in both excavation areas, Area 1 and Area 2, as well as the surrounding test pits, which significantly increased the sample size of the Classic period assemblage. Determination of wear stages was done together with Barry Rolett, to ensure consistency of judgment between the Hanamiai and Peva assemblages. The first stage of the analysis was to determine the wear stage combinations of the first and second molars in order to ascertain that the pigs of Rurutu exhibited the same range of variability as those of Hanamiai. Three mandible fragments and one maxilla fragment from the Classic period assemblage contained both the first and second molars. In all three mandible fragments, when the first molar (M1) was in wear stage c (see Rolett and Chiu 1994: Figure 1), the second molar (M2) was still a germ. In the maxilla fragment, when the first molar was in wear stage b, the second molar was in wear stage a. These wear stage combinations fall directly within the range of variability demonstrated for the Hanamiai molars (see Rolett and Chiu 1994: Table 4), thus making the same methodology applicable to the Peva assemblage. Table 5.7 summarizes the wear stages of all of the molars from Peva Phase I and Phase II. Table 5.8 and Table 5.9 show the pig molars classified according to age groups.
Table 5.7. Eruption and wear stages for Peva's pig molars

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Cultural phase</th>
<th>Position*</th>
<th>Germ</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>First molar</td>
<td>I</td>
<td>U</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>L</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>U</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>L</td>
<td>13</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td></td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>Second molar</td>
<td>I</td>
<td>U</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>L</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>U</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>L</td>
<td>8</td>
<td>1</td>
<td>4</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Third molar</td>
<td>I</td>
<td>U</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>L</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td>3</td>
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<tr>
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<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>L</td>
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<td></td>
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<td>1</td>
</tr>
<tr>
<td>Subtotal</td>
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<td></td>
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<td></td>
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<td>113</td>
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Table 5.8. Pig molars, Peva Phase I, arranged by age group

<table>
<thead>
<tr>
<th>Age group</th>
<th>Estimated age in months</th>
<th>Tooth and eruption or wear stage</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M1</td>
<td>M1</td>
</tr>
<tr>
<td>Immature</td>
<td>Less than 5-8</td>
<td>1</td>
</tr>
<tr>
<td>Sub-adult</td>
<td>5-8 to 10-14</td>
<td>3</td>
</tr>
<tr>
<td>Young adult</td>
<td>10-14 to 18-26</td>
<td>1</td>
</tr>
<tr>
<td>Mature adult</td>
<td>Older than 18-26</td>
<td>2</td>
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Table 5.9. Pig molars, Peva Phase II, arranged by age group

<table>
<thead>
<tr>
<th>Age group</th>
<th>Estimated age in months</th>
<th>Tooth and eruption or wear stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Germ</td>
<td>a</td>
</tr>
<tr>
<td>Immature</td>
<td>Less than 5-8</td>
<td>22</td>
</tr>
<tr>
<td>Sub-adult</td>
<td>5-8 to 10-14</td>
<td>8</td>
</tr>
<tr>
<td>Young adult</td>
<td>10-14 to 18-26</td>
<td>4</td>
</tr>
<tr>
<td>Mature adult</td>
<td>Older than 18-26</td>
<td>1</td>
</tr>
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</table>
Figure 5.2. Population profile of pigs from Peva Phase I and Phase II, and Hanamiai Phases IV and V (A.D. 1450-1850) (data from Rolett and Chiu 1994: Table 8).
Figure 5.2 illustrates the kill-off patterns from both Peva’s Archaic and Classic period assemblages, and the Classic period assemblage of Hanamiai. There are distinct differences between the Peva Phase I and Phase II assemblages. Only one M1 germ is present in the Archaic assemblage, representing only 4% of immature individuals. On the other hand, there are 20 M1s in the Classic deposit, amounting to 24% of immature individuals. This suggests that during the Classic period, more younger pigs that could not yet breed were killed than during the Archaic. As sub-adults constitute 65% of the Archaic, and 48% of the Classic, it is quite probable that the pigs were allowed to grow more in the Archaic period before they were killed. Approximately the same percentages of young adult molars are represented in both periods, with 22% in the Archaic, and 24% in the Classic. Finally, mature adult molars make up 9% of the Archaic assemblage, and 4% of the Classic. Overall, these figures suggest that pigs were being killed at younger ages during the Classic period than during the Archaic. It is probable that the abundance of pigs during the Classic period made harvesting younger individuals more practical than during the Archaic, when the pig population would presumably have been smaller. This is consistent with the idea of a considerably increased Classic period agricultural foundation that could support large numbers of pigs. The Classic period Hanamiai assemblage provides a further comparison. Overall, it resembles the Peva Phase I Archaic period assemblage. The fact that the pig molars from Hanamiai (as calculated here) all come from Phase IV (A.D. 1450-1800) and Phase V (A.D. 1800-1850), during which the site was a ceremonial tohua, must be kept in mind as well. The small amount of immature individuals (10%) and large percentage of sub-adults (62%) suggest that during the Classic period, pigs in Hanamiai were killed later in life than those in Peva.
Feasting and Wealth

The abundance of feasting foods associated with the marae highlights the importance of the feast itself and its role in the Polynesian sociopolitical system. Goldman defined the feast as:

...eating together in one place as well as the eating together at separate places, but from the common stock and in honor of the same event. Thus we would include under ‘feast’ the distributions of foods to absent guests and the carrying away of foods by present guests...Feasts in Polynesia, as elsewhere, occur at the events of transformation. They mark beginnings, conclusions, and passages in the lives of persons and families, and in the affairs of the broader community. They honor the life cycle - births, baptisms, maturations, betrothals, marriages, and deaths - and the beginnings and terminations of economic and political actions. In the most general sense, the feast brings productivity, itself a phase of movement, into relationship with all social and personal phases of movement. (1970:499)

Unfortunately there are no detailed eyewitness accounts of a feast on Rurutu, but Seabrook (1938:157) wrote: “Celebrations featured by flowers, songs and dancing accompanied victories, peace-treaties, successions of new chiefs, nuptials, births, funerals, attempts to lift the rock Uruurruraupa (a contest of strength), the erection of houses and the baptism of fishing-gear.” He added that wartime celebrations included cannibalism and human sacrifice. It is evident that Rurutu was quite typical in terms of what occasions were accompanied by feasting. Feasting would also have been vital in securing alliances among valleys. Pigs and turtles would have served as impressive
displays of wealth, emphasizing the status of the individual hosting the feast, as well as the productive capacity of the valley. Of the giver of a feast, Goldman wrote:

The donor has the signal honor of acting as initiator. He acts as a mover of goods, as an enlarger of the area within which foods and other produce circulate. As the donor of a feast, he has the chief-like prerogative of assembling an enlarged congregation. As he moves food from the narrow confines of the immediate circle outward into others, or conversely, as he draws food from the outer zones to his own center of redistribution, he is displaying a genuine power to circulate productivity, a power that is, in the Polynesian conception, that of the gods.

(1970:499-500)

Such a display of power was essential in an Open society, in which warfare was endemic, and the threat of another social class to the chiefly authority was never far off. On an island where chiefs fought among themselves for resources such as taro fields, the feast was also a form of competition not unlike warfare. The demonstration of mana that a large feast would provide was especially important in such a fluid social system. If a chief was able to give an impressive feast, it was a visible declaration of his own favor with the ancestral spirits and gods, and signified his worthiness to remain in power. A chief who was able to summon food contributions for a feasting event was far less likely to lose face and status than one who was not. In order to ensure his position, a chief had to command the loyalty of his landowners through generous gifts. Feasting was also the means by which a chief could pay for the labor needed to construct things such as monumental architecture, agricultural terracing, and canoes. By means of placing a tapu upon the feast itself, the elite could further establish their elevated status over those not
allowed to participate (e.g., Thomas 1990:90-1). As documented in Thomas (1990:93), in the Marquesas a *tapu* could be placed upon pigs for a period of years in preparation for a single feast, during which time they could neither be killed nor sold.

In Polynesia, the pig is a well-attested form of specifically male wealth (e.g., Kirch 1994). On Rurutu, this was embedded in artistic symbolism, with the pig used as a motif to decorate objects such as necklaces, bowls, and spear shafts (Buck 1944: Figure 268; Barrow 1972: Plate 186; Barrow 1979: Plates 74, 75). “Pig” units (Figure 5.3 a) were strung onto human hair necklaces (Figure 5.3 b, Figure 5.4) alongside other units such as double balls, representing human testicles, and flared oblong units, probably representing the seats of chiefly authority (Barrow 1972: Plate 192; 1979:68, Plate 74). Of these Barrow wrote:

Necklaces of this type have been conventionally attributed to Mangaia in the Cook Islands. Buck (1944), who noted ten such ivory necklaces with descriptions of the intricate techniques of attachment, contemplated the possibility of diffusion of the type from the nearby Austral Islands. Duff (1969) illustrates two such phallic necklaces that bear positive Austral Island provenience (Tubuai [Tupua’i] and Rurutu), and provides significant reasons for challenging the conventional attribution. The author has long suspected that many of the so-called Mangaian phallic necklaces must have originated in the Austral Islands, but until Duff’s references he had no knowledge of specimens documented to them.

The attached amulets have significance as symbols of chiefly status. The phallic element represents the virility of the chief, the seats his rank, and the pigs his wealth and food. Pigs and seats were present in traditional Austral culture but
absent in Mangaia. The small pigs (commonly but incorrectly referred to as
“dogs”) that occur on these necklaces are sometimes rendered in the form of a
phallus, thus complementing the sexual symbolism. (1972:117, see Plate 186)

Other Austral-like objects with the carved pig motif are documented as coming
from the Marquesas, but this is very likely a question of inexact provenance, although
long-distance trade should not be ruled out (see Buck 1944:441).
Figure 5.3. a: 'Pig' unit from an Austral necklace, length 3 cm (drawn from Barrow 1979:Plate 75; terminology from Buck 1944: Figure 58); b: attachment of necklace ornaments (from Buck 1944: Figure 59).
Figure 5.4. A complete necklace with a single pig unit in the upper right section. This particular necklace sold for $313,750 at a Sotheby’s auction in May 2000, a record price for a piece of Polynesian jewelry (Photo courtesy of Sotheby’s).
The symbolism inherent in the pig motif is significant in terms of its place alongside the other ornaments. The human testicles in combination with the phallic pig most likely represent virility and fertility. This, in conjunction with the chief’s seat, is quite consistent with the concept of the chief as the one responsible for the productivity of the land. That the animal doubles as a phallus suggests a direct connection between male potency, fertility, and the pig. In Classic period Tahiti, Henry (1928:383) wrote, “The boar was a shadow of ‘Oro-tauà (Warrior-at-war) as the man-slaying god; it was ‘Oro-pua’a-mahui (‘Oro-the-pig-revealing-secrets).” This connection between the pig as the shadow of the warrior god ‘Oro is further evidence of the powerful symbolism inherent in the animal. When one gave a feast in which pigs were killed and eaten, it represented not only wealth and the productive capacity of the valley, but a personal masculine power.

**Extinctions**

The most intense period of the exploitation and consequent extirpation of indigenous and endemic resources in East Polynesia appears to have taken place during the Archaic period between A.D. 1000-1300. In the southern Cooks on Mangaia, Tangataatau’s primary period of exploitation ended around A.D. 1300 (Kirch et al. 1995:58). The bird population of Ureia on Aitutaki also appears to have been depleted prior to this time (Allen and Steadman 1990:35). Anai’o on Ma’uke might represent the tail end of the extinction process, for while no extirpated bird species were recovered, bone from the extirpated flying fox was (Walter 1998:75). In the Societies, the avifaunal assemblage from Fa’ahia on Huahine, which dates to the same period, includes numerous extirpated species of birds, coinciding with a high degree of turtle exploitation (Steadman...
1989:183-8). In the Marquesas, extinct species turn up in the greatest numbers from the earliest cultural layers of Hane on Ua Huka, Ha’atuatua on Nuku Hiva, Hanatekua on Hiva Oa, and Hanamiai on Tahuata (Steadman 1989:181-2; Steadman 1995). Based on the most recent results of radiocarbon dating, the early layers of these sites all date to between A.D. 1000-1300 (Rolett and Conte 1995; Rolett 1998; Anderson and Sinoto 2002; Conte and Anderson 2003). All these sites are closely related in terms of their material culture, radiocarbon ages, and faunal assemblages.

While it is clear that by the 14th century A.D. the endemic bird populations of East Polynesian islands were drastically reduced due to human impact, how long this process took is less certain. It is likely that the rate of extinction varied somewhat from island to island, depending on factors such as size, topographic accessibility, and the presence or absence of places of refuge for native birds. On Lifuka Island, Tonga, which is only 11.4 km$^2$, relatively flat (elevation 16 m), and lacks refuge areas such as cliffs, the extinction of native megapodes and iguanas appears to have taken place within the variability range of radiocarbon dates, that is, in less than two hundred years (Steadman et al. 2002). Radiocarbon dates from bones from the later cultural deposits that contained mostly introduced chicken were virtually identical to dates from the bones of the initial habitation deposits that contained primarily extirpated species. On Mangaia, which is larger (52 km$^2$), higher (169 m), and more rugged, the extinction process may have taken longer because of the protection that the makatea cliffs and forest could have offered native species (Kirch et al. 1995; Steadman et al. 2002). The true effect of size and topography is imperfectly known, however, and the capability of the extirpated species themselves to maintain a population should also be considered. A statistical model of
moa extinction in New Zealand, corroborated by radiocarbon dates, suggests that the entire population probably became extinct possibly less than 160 years following human settlement (Holdaway and Jacomb 2000). As a long-lived bird that takes some years to reach reproductive maturity, moa species were unable to breed fast enough to replenish their populations as long as humans preyed on the adults. Finally, we do not know the nature of the pre-human avifaunal populations of Polynesia, which would be essential in order to estimate possible rates of extinction. In the case of the southern Cooks, Walter (1998:76) suggested that, given that the islands were settled more or less at once, extinction rates probably did not vary by more than a few hundred years. Researchers now lean towards a rapid settlement model of East Polynesia as a whole, taking place within two or three centuries, and the record of avifaunal extinctions seems to corroborate this.

As discussed in Chapter 2, Rurutu is a relatively small island (38 km$^2$) with a rather low maximum elevation (389 m). Apart from the makatea cliffs which fringe the island at intervals, the topography is very accessible and there are few areas that cannot be reached easily on foot. The makatea only covers approximately eleven percent of the island, and thus does not afford a great deal of sanctuary. Rurutu’s original vegetation is decimated to an extreme degree, and it possesses few endemic plant species. Given the variables of size and topography, and taking the impoverishment of Rurutu’s vegetation into account, it is reasonable to postulate that its indigenous and endemic animal species faced a very rapid extinction event immediately following human colonization. If the flying fox was indigenous to Rurutu, as it was in the southern Cooks and still is on Rarotonga and Mangaia, then its presence in Peva’s Archaic deposit may bear witness to
its extirpation. This most likely coincided with an overall human-induced extinction event of indigenous and endemic bird species as well, and contemporaneous to the exploitation of other natural resources such as turtle. As bird bone does not feature very prominently in Peva’s Archaic deposit when compared to other food resources, this may reflect the latter stage of the overall extinction event. In sum, I believe that Peva’s Archaic cultural layer represents a period very close to that of initial settlement, probably less than two hundred years. This would also have provided more than enough time to establish a population of pigs on the island, which would then account for its frequency in the same deposit.

Discussion

The early inhabitants of Peva relied primarily upon marine resources, fish being the most important. Other wild, non-fish marine fauna, most notably turtle, were also exploited. At the same time, some degree of animal husbandry was being practiced. Pigs appear to have been an established component of the diet during the Archaic period. Dog is minimally represented, and probably did not constitute a significant source of food until, perhaps, the Classic period and into the 20th century, when Seabrook affirmed that it was popular. By the time of Peva Phase I, the bird and bat populations had already been depleted, although how large these populations were to begin with is impossible to say. Based upon the small size and accessible topography of Rurutu, it is probable that the initial extinction event was very rapid. While Peva Phase I does not likely represent the initial group of settlers, it probably represents a population not far removed in time.
During the Classic period, the feasting grounds of the marae yielded a very different faunal assemblage. This is dominated by pig and turtle, specialty foods that had important ritualistic and social connotations. By the time of the Classic period, despite the island’s small size, Rurutu’s agricultural economy appears to have become productive enough to support a sizeable pig population that was used in feasting, and reflecting a higher degree of political complexity and inter-chieftdom competition. The pig also acquired an important symbolism by this time, representing male potency and productivity. Turtles were another very important feasting food, and the restrictions on its consumption suggest that the marae was a site for high-status individuals only, namely chiefs and priests. This is entirely consistent with Peva Rahi being the seat of the valley’s authority, and the home of the elite. The relatively small amount of fishbone recovered from the Classic deposit is most likely a reflection of the ceremonial nature of the site, rather than an overall de-emphasis on fish as a food source on Rurutu.
Chapter 6. Marine Shell

As a maritime people, Polynesians have been harvesting the invertebrates of island reefs and lagoons for thousands of years. Archaeological investigations and lexical reconstructions of words for a variety of shellfish further confirm the importance of this resource since Ancestral Polynesian Society (Kirch and Green 2001:134, Table 4.3). Indeed in Tahiti, by the late 18th century A.D., some shellfish had taken on spiritual significance as well (see Henry 1928:390-1). Shellfish also provided the raw material for tools, such as ceremonial trumpets, fishhooks, scrapers, and chisels. On islands where basalt was unavailable for adzes, such as in the Tuamotus, the shell of the Giant Clam (Tridacna maxima) served as a substitute (e.g., Emory 1975). While the role of shellfish in Polynesian subsistence has been well documented in sites throughout West and East Polynesia, its importance in the Australs has remained relatively unknown. Peva is the first site with shellfish assemblages from both the Archaic and Classic periods, and thus can serve as a valuable reference point.

Methodology

All shell was recovered from the Peva excavation. Only the shell from Area 2 (33 m²) is included in the analyses, because the Archaic assemblage of Area 1 consisted almost entirely of bivalve. A total of almost 19 kilograms from both Phase I and Phase II was recovered. The shells were sorted and identified using Salvat and Rives’ (1983) guide to Polynesian shells. The shells were then weighed and the concentration indices calculated for each phase. Water-worn shells were not included in the analysis, as they were likely part of the sand dune matrix. Pearlshell is also not included, as it is treated as a raw material for tool manufacture rather than a food source (see Chapter 7). Worked
shell artifacts, namely *Terebra* chisels (see Chapter 10), are also not included. Table 6.1, Figure 6.1, and Figure 6.2 summarize the data from Peva Phase I and Phase II.
Table 6.1. Marine shell from the Peva excavation. Abbreviations: Wt., weight in grams; %, percent; Con. Index, concentration index.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Phase I</th>
<th></th>
<th></th>
<th>Phase II</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Wt. (g.)</td>
<td>%</td>
<td>Con. Index</td>
<td>Rank</td>
<td>Wt. (g.)</td>
<td>%</td>
</tr>
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<td><strong>Gastropods</strong></td>
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<tr>
<td><em>Turbo setosus</em></td>
<td>7421.62</td>
<td>58.33</td>
<td>1124.49</td>
<td>1</td>
<td>3651.46</td>
<td>60.64</td>
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<td><em>Strombus mutabilis</em></td>
<td>1061.32</td>
<td>8.34</td>
<td>160.81</td>
<td>3</td>
<td>17.46</td>
<td>0.29</td>
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<td>621.97</td>
<td>4.89</td>
<td>94.24</td>
<td>4</td>
<td>859.32</td>
<td>14.27</td>
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<td><em>Astraea rhodostoma</em></td>
<td>285.71</td>
<td>2.25</td>
<td>43.29</td>
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<td><em>Conus spp.</em></td>
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<td>31.12</td>
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<td>231.84</td>
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<td><em>Patella flexuosa</em></td>
<td>142.92</td>
<td>1.12</td>
<td>21.65</td>
<td>9</td>
<td>72.93</td>
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<td><em>Cerithium spp.</em></td>
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<td>17.51</td>
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<td>24.79</td>
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<td>3.73</td>
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<td><em>Natica violacea</em></td>
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<td><em>Rhinoclavis sinensis</em></td>
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<td><em>Cantharus undosus</em></td>
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<td>0.70</td>
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<td><em>Drupa ricinus</em></td>
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<td><em>Zierliana oleacea</em></td>
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<td><em>Oliva</em></td>
<td>0.97</td>
<td>0.01</td>
<td>0.15</td>
<td>26</td>
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<td><em>Quovula madreporarum</em></td>
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<td><em>Heliacus</em></td>
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<td><em>Epitonium lirae</em></td>
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<td>0.06</td>
<td>0.15</td>
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<tr>
<td><em>Modulus tectum</em></td>
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<td>4.39</td>
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<td><strong>Bivalves</strong></td>
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<td><em>Chama</em></td>
<td>305.68</td>
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<td>46.32</td>
<td>5</td>
<td>252.76</td>
<td>4.20</td>
</tr>
<tr>
<td><em>Oucinimaeus palatam</em></td>
<td>230.88</td>
<td>1.81</td>
<td>34.98</td>
<td>7</td>
<td>79.77</td>
<td>1.32</td>
</tr>
<tr>
<td><em>Scutacopaia scobinata</em></td>
<td>138.52</td>
<td>1.09</td>
<td>20.99</td>
<td>10</td>
<td>7.19</td>
<td>0.12</td>
</tr>
<tr>
<td><em>Codakia</em></td>
<td>105.84</td>
<td>0.83</td>
<td>16.04</td>
<td>11</td>
<td>31.89</td>
<td>0.53</td>
</tr>
<tr>
<td><em>Arca</em></td>
<td>43.67</td>
<td>0.34</td>
<td>6.62</td>
<td>12</td>
<td>187.74</td>
<td>3.12</td>
</tr>
<tr>
<td><em>Tridacna maxima</em></td>
<td>17.40</td>
<td>0.14</td>
<td>2.64</td>
<td>13</td>
<td>488.06</td>
<td>8.10</td>
</tr>
<tr>
<td><em>Gloriovallum pallium</em></td>
<td>5.23</td>
<td>0.04</td>
<td>0.79</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Isognomon</em></td>
<td>1.41</td>
<td>0.01</td>
<td>0.21</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Nassarius papillosus</em></td>
<td>0.79</td>
<td>0.01</td>
<td>0.12</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cardita variegata</em></td>
<td></td>
<td></td>
<td>0.33</td>
<td>17</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td><strong>Total Bivalves</strong></td>
<td>2695.16</td>
<td>21.18</td>
<td>408.36</td>
<td>1072.95</td>
<td>17.82</td>
<td>270.95</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12724.40</td>
<td>1927.93</td>
<td>6021.96</td>
<td>6021.96</td>
<td>1520.70</td>
<td></td>
</tr>
<tr>
<td><strong>Other shell</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crustacea</strong></td>
<td>27.87</td>
<td></td>
<td>34.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Echinoderm</strong></td>
<td>32.17</td>
<td></td>
<td>20.99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 6.1. Proportion by weight of the top seven shell taxa, Peva Phase I.

Figure 6.2. Proportion by weight of the top seven shell taxa, Peva Phase II.
Interpretation of the Data

As Table 6.1, Figure 6.1, and Figure 6.2 illustrate, the gastropod *Turbo setosus* comprises the majority of shellfish from both Peva Phase I and Phase II. Other species are considerably less represented. About twice as much shell was recovered from Phase I than from Phase II, indicating that shellfish may have been less important in the Classic period than in the Archaic. However, the ceremonial nature of the Classic deposit must be taken into account, and it possible that shellfish may have simply been consumed less at feasting events. Another difference between the Archaic and Classic deposits is the relative paucity of species in the Classic.

Today, shellfish accounts for a very limited component of the Rurutuan diet, so modern parallels cannot be drawn. Only on occasion is *Turbo setosus* gathered for a more traditional meal, and then only as a small side dish. Other invertebrates such as the sea cucumber (*rori*) are also sometimes collected. The relative infrequency of gathering shellfish nowadays reflects the fact that Rurutu is no longer a subsistence economy, as imported foods are readily available at local stores. When Seabrook (1938) was on Rurutu in the 1930s, however, *Turbo* was still an important part of the daily fare. He was visibly impressed by the men who gathered *Turbo*, and gave a vivid description of them:

The tridacna, (*pa'ua*, thrives in lagoons, and is almost missing around Rurutu; but the surf-beaten reefs attract *pupu*, (the *Turbo*: Rurutu is noted for this mollusk. It is the *ma'oa* of Tahiti and the *ariri* of the Cook Islands.

The adductor muscle is the only part of a *Turbo* that is ordinarily eaten, but children and young women scour them off the edge of the reef at almost every low tide, and youthful divers wrest sackfuls from the submerged coral, so there is
hardly a day in the year that is not helped through with some *pupu* morsels; and
many a windfall occurs.

The *pupu* divers and the diving spearmen of Rurutu seldom go down more
than two fathoms, which is a little contemptible in the opinion of neighboring
Islands where lagoon life rewards plunges into holes of three times that depth.
But hardly anything can be more remarkable than the local diver when a strong
surf is driving into the *mato* holes that he decides to comb for shell fish. It is a
sight to look down from the Mato-naa trail when it is shaken and drenched by the
seas that are flying into the fissures below, and in the churn beneath to see a
submerged *pupu* collector treading water. If one of the seas were to catch his
body in parallel alignment with the bristling face of the cliff it would impale him
for all time on the spines of limestone. But the man is always perfectly horizontal
when the horizontal impact of water occurs; he plants a foot on the rock and falls
over into the wave; the rush of water holds him rigidly horizontal. When the
wave relaxes the gargoyle drops from its facade and re-examines the surrounding
swirl and boil; nor can the man be seen to draw breath until his sack has its load.

(1938:104-5)

This description highlights the following points: 1.) *Turbo* was a much more
important part of the diet in the past; and 2.) it was especially abundant, so much so that
the island was known for it. Walker (2002:23) wrote that when whaling was outlawed on
Rurutu, in 1981 the discontented fishermen ravaged the beaches of *Turbo*, severely
depleting the population. In Classic period Tahiti, *Turbo* was one of the few gastropods
that were actually eaten (Oliver 1974:283). According to Henry (1928:391), the shell of
the *Turbo* was also seen to contain magical properties: “The shell of the maoa (*Turbo*) was wrapped in the fronds of the maire (*Polypodium pustulatum*) fern and suspended over a sow in giving birth to its young, to give them health and vigor. It was considered the swine’s god.” The *Turbo* shell was particularly important on islands such as Rurutu, where pearlshell was scarce or nonexistent, as it served as a substitute material for fishhooks (e.g., Vérin 1969). As all of the *Turbo* recovered at Peva from both Phase I and Phase II was unworked, it can be regarded as having been brought to the site as a food source rather than as a raw material.

Other varieties of shellfish do not approach *Turbo* in abundance. The gastropods *Cypraea* spp., *Strombus mutabilis*, and the bivalve *Modiolus auriculatus* are the only other species of which more than 400 g were recovered in either Phase I or Phase II. Little can be said about the food values of the numerous smaller species of shellfish present in the assemblage. Many may have been transported to the site together with coral gravel for paving. The beach of Peva is one of the preferred shell-collecting sites on Rurutu. I have seen collections of unmodified shells in people’s homes that were arranged simply as ornamentation.

*Inter-site Comparison*

Peva’s shellfish assemblage offers the first reference point of its kind in the Australs. The quantity (over 19 kg) of shellfish recovered from Peva Phase I and II is considerably larger than that of Hanamiai in the Marquesas, which yielded only 8.37 kg and a maximum concentration index of around 290 g/m³ (Rolett 1998:107). Rolett (1998:107) wrote, “The apparently minor role of shellfish in prehistoric Marquesan subsistence is also reflected in the contemporary diet.” Rurutu, on the other hand,
appears to have emphasized shellfish to a greater degree, although far less than other islands such as Tikopia (Kirch and Yen 1982). Collections also exist from sites in the southern Cooks, such Anai’o on Ma’uke (Walter 1998), Moturakau on Aitutaki (Allen 1992b), and Tangatatau on Mangaia (Kirch et al. 1995). Walter (1998:85) compared the Anai’o assemblage to that of Moturakau. He noted that the main difference between the assemblage of a makatea island such as Ma’uke and a non-makatea island with a lagoon such as Aitutaki was the relative abundance of bivalves in the latter. Bivalves formed a much higher component of the midden on Aitutaki than on Ma’uke. He wrote:

Although there is insufficient data from other coral reef islands in the southern Cook Islands to make any conclusive statements, the differences between the Aitutaki and Ma’uke assemblages suggest that it may be possible to predict some distinguishing characteristics of Molluscan assemblages from makatea islands. Such assemblages are likely to display low values for any measure of diversity, a high abundance ranking for Turbo and low rankings for bivalve species. It is in terms of relative ranking of the first four or five taxa that the major differences are likely to show between the raised reef assemblages and those from other island forms. (1998:85-6)

In part, this holds true for the Peva assemblage, in which Turbo is by the highest ranking mollusk. It can be seen in Figure 6.1 and Figure 6.1 that Turbo comprises approximately 60% of the shell midden from both periods, indicating that this species remained the most harvested shellfish from the Archaic to the Classic period. However, in the Archaic period the bivalve Modiolus auriculatus ranks second, and in the Classic Tridacna ranks third, although the weight of the this shell may be tilting the data,
especially considering Seabrook's (1938:104) assertion that *Tridacna* was rare on Rurutu. We can also compare Peva to another assemblage on Rurutu. Chabouis (1965) analyzed the shellfish from Vérin's (1969) excavation in Vitaria and found that *Turbo* comprised 56% of the total weight, which is very close to that of Peva. However, the size and weight of *Turbo* shell is far greater than those of other species, and this tends to skew the data to give the impression that *Turbo* was overwhelmingly the most eaten species of shellfish. Chabouis calculated that whereas only one-fourth of a whole *Turbo* (minus the operculum) is edible, about two-fifths of the weight of a bivalve is edible. Applying these ratios, we obtain the following data:

<table>
<thead>
<tr>
<th>Site and Phase</th>
<th>Total <em>Turbo</em> shell (grams)</th>
<th>Comestible grams of <em>Turbo</em></th>
<th>Total bivalve shell</th>
<th>Comestible grams of bivalve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peva Phase 1</td>
<td>6722.04</td>
<td>1679.55</td>
<td>2695.00</td>
<td>1078.42</td>
</tr>
<tr>
<td>Peva Phase II</td>
<td>3456.97</td>
<td>863.75</td>
<td>1072.95</td>
<td>429.32</td>
</tr>
<tr>
<td>Vitaria</td>
<td>3494.00</td>
<td>873.00</td>
<td>3034.00</td>
<td>1214.00</td>
</tr>
</tbody>
</table>

Taking into account the approximations inherent in such a calculation, Chabouis concluded that bivalve was the more important food source in Vitaria. When applied to the Peva data, the relative importance of *Turbo* to bivalve diminishes, but nevertheless remains dominant. This may reflect a slightly different reef environment in the Peva area than in Vitaria, or it could simply be a difference in sampling. The numbers are not so far apart as to rule out the possibility that bivalves were an equally important food source in some cases. Finally, the ceremonial nature of the Peva Phase II deposit must be factored in, which might account for some of the variation.

This discussion of bivalves brings up an interesting point: the abundance of the bivalve mussel *Modiolus auriculatus* in the Archaic period assemblage and the complete
absence of it in the Classic. This species of bivalve is common on fringing reefs, where the shells can be placed so close together as to form a “veritable pavement” (Salvat and Rives 1983:367). This species is currently rare on Rurutu, and it is possible that this reflects an initial, intense over-exploitation of this particular resource during the Archaic period. I was informed that when eaten, they were boiled en masse in a pot. In Area 1, the midden was almost exclusively comprised of this species. Over 5000 g of it were recovered from the Phase I deposit there, in an area of 15.5 m², compared to 1845 grams from the 33 m² of Area 2. The concentration of it was so dense in some units of Area 1 that the entire Phase I deposit had to be hand-scooped into buckets for screening. In fact, Modiolus auriculatus became the herald of the approaching Phase I deposit throughout the course of placing test pits around the site. The overwhelming domination of this species was the main reason I felt that Area 1 was more indicative of a camp or a temporary cooking area than a habitation site, and thus not adequate to document the Archaic period satisfactorily. This Archaic period exploitation of Modiolus auriculatus may also serve to explain why bivalve shell formed such a minor component of the Classic period Peva deposit when compared to that of Vitaria. If Vitaria, as the oral traditions indicate, was indeed the last valley to have been settled on Rurutu, during the Classic period bivalve may have still been an ample enough food source.

Over-exploitation of Turbo has been suggested for Tangataatau on Mangaia (Kirch et al 1995:59, Figure 9). This has been demonstrated by measuring the diameter of the opercula, which reflects the overall size of the shell (see also Walter 1998:86). In the case of Tangataatau, the opercula from the Archaic layers are in general more than twice the diameter of those from later ones. Walter (1998:86) also measured the opercula from
the different layers of Anai’o, and found a difference in the size distribution. The Archaic Layer 4 included a wider range of size classes than the later Layer 2. Walter interpreted this to reflect the exploitation of two different populations of *Turbo* during the Archaic period. The smaller shells may have been located in an area more sensitive to human predation, thus reflecting the lack of these specimens in the later period. The larger shells, on the other hand, probably came from the algal ridge zone where they are still found today. In order to compare Peva with these assemblages, I measured the diameter at the longest point of all unbroken opercula from Peva Phase I and Phase II. As there were 62 measurable opercula from Phase I, Area 2, and only 16 from Phase II, Area 2, I included all opercula from Phase II that were recovered from Area 1 and surrounding test pits, bringing the Phase II total to 89. Table 6.3 summarizes the data and Figure 6.3 illustrates them according to size classes.
Table 6.3. Numbers and percents of opercula diameters, Peva Phase I and Phase II

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th># Phase I</th>
<th>% Phase I</th>
<th># Phase II</th>
<th>% Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>1</td>
<td>1.61</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>4.84</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>3.23</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1.61</td>
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<td>0.00</td>
</tr>
<tr>
<td>13</td>
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<tr>
<td>17</td>
<td>2</td>
<td>3.23</td>
<td>1</td>
<td>1.12</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>3.23</td>
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<td>0.00</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>1.61</td>
<td>1</td>
<td>1.12</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>3.23</td>
<td>6</td>
<td>6.74</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>1.61</td>
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<td>4.49</td>
</tr>
<tr>
<td>22</td>
<td>0</td>
<td>0.00</td>
<td>5</td>
<td>5.62</td>
</tr>
<tr>
<td>23</td>
<td>3</td>
<td>4.84</td>
<td>4</td>
<td>4.49</td>
</tr>
<tr>
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<td>1</td>
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<td>7</td>
<td>7.87</td>
</tr>
<tr>
<td>25</td>
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<td>4.84</td>
<td>11</td>
<td>12.36</td>
</tr>
<tr>
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<tr>
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<td>5.62</td>
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<tr>
<td>28</td>
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<td>1.61</td>
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<td>4.49</td>
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<tr>
<td>29</td>
<td>1</td>
<td>1.61</td>
<td>6</td>
<td>6.74</td>
</tr>
<tr>
<td>30</td>
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<td>9.68</td>
<td>7</td>
<td>7.87</td>
</tr>
<tr>
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<td>1</td>
<td>1.61</td>
<td>3</td>
<td>3.37</td>
</tr>
<tr>
<td>32</td>
<td>6</td>
<td>9.68</td>
<td>4</td>
<td>4.49</td>
</tr>
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<td>6.74</td>
</tr>
<tr>
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<td>0.00</td>
</tr>
<tr>
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<td>1</td>
<td>1.61</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Totals: 62 100 89 100
Figure 6.3. Distribution of size classes for *Turbo setosus* operculum diameters, Peva Phase I and Phase II.
Figure 6.3 illustrates a trend that is remarkably similar to that of Anai’o (Walter 1998: Figure 8.2). The Peva Phase I specimens display a wider range (8-40 mm) of sizes, including more small specimens under 15 mm. Peva Phase II, on the other hand, has a more restricted range of sizes (17-36 mm) with opercula of around 25 mm constituting almost 40%. Walter’s interpretation of the Anai’o data may be applicable to those of Peva as well. The lack of such smaller specimens in the Phase II assemblage might reflect the over-exploitation of a population of *Turbo* found elsewhere than upon the algal ridge, where *Turbo* is gathered nowadays. However, one other explanation is possible. Taking into account the ceremonial nature of the Phase II deposit, it is conceivable that larger specimens were deliberately selected for feasting occasions. I suggest a similar interpretation concerning the sizes of fish vertebrae in Chapter 7. Walter (1998:86) also called attention to the fact that the size of the Anai’o opercula were larger than those of Moturakau and Mangaia. The opercula of the Peva assemblage are slightly larger even than those of Anai’o (12-34 mm for Layer 4 and 21-34 mm for Layer 2). Walter wrote, “If human predation activity affects the structure of *Turbo* populations, this suggests that the population on which the Anai’o shellfishers were predating had not suffered any sustained impact by human foragers.” The data from Peva suggest a similar conclusion. Rurutu’s encircling fringing reef likely made the over-exploitation of a resource such as *Turbo* difficult. If the population of a given area of the reef yielded less than desirable quantities, one could simply move on in either direction, thus giving the depleted population time to regenerate. Walker’s (2002:23) account of the drastic depopulation of shellfish on Rurutu appears to have been an effort aimed at protesting the banning of whale hunting on the island.
Discussion

Seabrook’s account of the importance of *Turbo setosus* in the daily subsistence of the 1930s is doubtless far closer to that of the prehistoric diet than any modern observations could furnish. Peva’s archaeological assemblage accords well with Seabrook’s account. Most of it was probably gathered while fishing, the primary subsistence activity, was taking place on and around the fringing reef. As I will discuss in Chapter 7, traditional fishing was done mostly in groups, in which shell hunters took part. The similarity of the proportion of *Turbo* in the Peva and Vitaria assemblages suggests that gathering practices were relatively consistent throughout the island. While *Turbo* probably furnished the majority of edible shellfish meat in Peva, bivalve was likely second in importance during the Archaic period. On the other hand, Chabouis’ (1965) analysis of the Vitaria assemblage indicates that bivalve was perhaps a more important food source than *Turbo* there during the Classic period. This may reflect the different functions of the site, or the possibility that Vitaria had been settled later than Peva, thus postponing the depletion of local bivalve populations. It is possible that the number of small *Turbo* opercula present in the Archaic assemblage and absent in the Classic reflects the over-exploitation of a particularly vulnerable habitat zone. However, if this took place, it did not appear to have affected the overall population of *Turbo*, whose large shell sizes remain quite consistent from one period to the other. It is also possible that only larger species were being selected for use upon the *marae* grounds. The striking contrast between the abundance of the bivalve *Modiolus auriculatus* in the Archaic period and its absence in the Classic may also be indicative of over-predation. As this species is quite scarce on Peva’s reef nowadays, such an explanation is conceivable.
Chapter 7. Fishbone

Fishbone constitutes over 70% (NISP) of Peva’s Archaic period vertebrate faunal assemblage, and over 14% of the Classic, for a total of almost 49%. Over 6000 fishbones were recovered from the excavation in total. As on other islands elsewhere in Polynesia, fishing was the mainstay of subsistence on Rurutu, with hunted species and domesticates occupying a significant but lesser component. The Peva fishbone assemblage reveals much about local adaptation to ecological conditions, and directly reflects the importance of Rurutu’s fringing reef as a resource. As Vérin (1969:29) noted, the island’s lack of a lagoon limits the variety of species and constrains the range of viable fishing activities. The lack or extreme rarity of pearlshell for fishhooks in Rurutu’s waters was a further constraint to the Polynesian settlers, who did not have ready access to this resource. The Peva assemblage represents a continuation of the fundamental fishing strategies practiced in Ancestral Polynesian Society, in which there was a strong focus on inshore fishing and mass-catch methods.

Methodology

Marshall Weisler analyzed the fishbone assemblage using the University of Otago’s reference collection, and with the assistance of his student Amy Findlater, whose honor’s thesis was based upon the analyses. The data in this section are adapted from Weisler et al. (n. d.), which includes the full details of the identification. The Otago reference collection contains over 250 specimens in 32 families and 72 genera, and has been described in detail by Walter et al. (1996), and Weisler (2001). This reference collection, which is perhaps the most complete in the world for Pacific fishes, permitted
the analyses to proceed beyond the five distinctive mouth bones (maxilla, premaxilla, dentary, articular, quadrate) and the other “special” bones, by which fishbone assemblages are often sorted (e.g., Leach 1986). The main disadvantage to the five bone method is that it leaves a large portion of the assemblage undescribed (Walter 1998:64). The Peva fishbone assemblage was analyzed in order to identify every bone to both skeletal element and fish taxa. All elements have therefore been taken into consideration. Out of over 6100 bones, 52.03% were identified to element from Peva Phase I and 91.8% from Peva Phase II. Walter (1998:68) noted that one of the problems of the five bone system has been to allow the under-representation of some important fishes, most notably Acanthuridae, Exocoetidae, and Mullidae (see also Rolett 1998:141; Kirch and Yen 1982:291-2). Regarding Exocoetidae, this might be because their remains are fragile. In terms of the Peva assemblage, counting the cleithrum has enabled Exocoetidae to be included in the assemblage, albeit minimally, and has significantly increased the percentage of Acanthuridae.

A total of 21 fish families (Table 7.1) were identified. From the entire assemblage, a total of 29.66% elements were identified according to taxon or higher. Of this, 24.34% percent were from Phase I, and 71.96% from Phase II. Table 7.1 lists the scientific names of the identified families, their common names, and their habitats and feeding behavior.
Table 7.1. Names, habitats, and diets of Peva fish taxa (data from Myers 1991; Tinker 1991)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Common name</th>
<th>Habitat/Feeding Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthuridae</td>
<td>Surgeonfish/Unicornfish</td>
<td>Shallow reefs; diurnal herbivores or planktivores</td>
</tr>
<tr>
<td>Balistidae</td>
<td>Triggerfish</td>
<td>Diurnal carnivores of benthic animals (crustaceans, fishes, etc.)</td>
</tr>
<tr>
<td>Belonidae</td>
<td>Needlefish</td>
<td>Surface dwellers; preys on small fishes</td>
</tr>
<tr>
<td>Carangidae</td>
<td>Jackfish</td>
<td>Open-water strong swimmers; preys on fishes and crustaceans</td>
</tr>
<tr>
<td>Carcharhinidae</td>
<td>Requiem shark</td>
<td>Reef flats and margins, shallows; eats small fishes, cephalopods</td>
</tr>
<tr>
<td>Cirrhitidae</td>
<td>Hawkfish</td>
<td>Perches on coral branches; eats small benthic crustaceans, fishes</td>
</tr>
<tr>
<td>Diodontidae</td>
<td>Porcupinefish</td>
<td>Shallow coastal waters; eats mollusks and crustaceans</td>
</tr>
<tr>
<td>Elasmobranchii</td>
<td>Sharks and rays</td>
<td>Open water predators of smaller fishes</td>
</tr>
<tr>
<td>Exocoetidae</td>
<td>Flyingfish</td>
<td>Open water, surface feeders upon animal and plant foods</td>
</tr>
<tr>
<td>Fistulariidae</td>
<td>Cornetfish</td>
<td>Inhabits open sandy areas; eats small fishes and crustaceans</td>
</tr>
<tr>
<td>Holocentridae</td>
<td>Squirrelfish</td>
<td>Nocturnally active around reef; eats small fishes and crustaceans</td>
</tr>
<tr>
<td>Kuhliidae</td>
<td>Flagtails</td>
<td>Coastal bays, estuaries, lagoons; are good food fishes</td>
</tr>
<tr>
<td>Kyphosidae</td>
<td>Rudderfish</td>
<td>Exposed seaward reefs; omnivorous, eats mainly benthic algae</td>
</tr>
<tr>
<td>Labridae</td>
<td>Wrasses</td>
<td>Diurnal, most are carnivores of benthic invertebrates or fishes</td>
</tr>
<tr>
<td>Lethrinidae</td>
<td>Emperorfish</td>
<td>Most are active at night; feeds mostly on invertebrates</td>
</tr>
<tr>
<td>Lutjanidae</td>
<td>Snapper</td>
<td>Most inhabit shallow shoreline waters; carnivorous</td>
</tr>
<tr>
<td>Mullidae</td>
<td>Goatfish</td>
<td>Benthic feeders of invertebrates; an esteemed food fish</td>
</tr>
<tr>
<td>Scaridae</td>
<td>Parrotfish</td>
<td>Inhabits reef area; grazes on the algal film upon coral rock</td>
</tr>
<tr>
<td>Scombridae</td>
<td>Tuna and mackerel</td>
<td>Can be open water predators, or ones that prey on reef fishes</td>
</tr>
<tr>
<td>Serranidae</td>
<td>Groupers and sea bass</td>
<td>Most live on outer reef slope; eats small fishes and crustaceans</td>
</tr>
<tr>
<td>Tetradontidae</td>
<td>Pufferfish</td>
<td>Shore waters on both sides of reef; eats invertebrates</td>
</tr>
</tbody>
</table>


**Quantification**

Quantification is presented according to NISP (number of identified specimens) and MNI (minimum number of individuals) values. Neither method is without difficulties, however. NISP values have the potential to over-represent a taxon that has a large number of identifiable elements (Walter 1998:65), such as the spines of Porcupinefish (Dionodontidae) or the vertebrae of sharks and rays (Elasmobranchii). This problem is done away with by reporting the raw data that detail the elements being counted. Walter (1998:65) also noted that NISP values can be affected when one considers that different butchering practices apply to different species, in which case the fish parts brought to the site may vary from species to species. To this latter issue there is unfortunately no solution. MNI values are also problematic, primarily because they are directly affected by the size of the aggregate faunal assemblage, as I discussed in Chapter 5. MNI values raise another difficulty in terms of Pacific fish species. Leach (1986:154) noted that in the Pacific, two bones identifiable to the family level might belong to two entirely different genera. However, in order to represent the Peva fishbone assemblage more fully and in ways that would allow inter-site comparison, MNI values were calculated. Taken together with NISP values, MNI values have more potential to be useful (Walter 1998:65). The NISP and MNI percentages for Peva Phase I are presented in Figure 7.1 and Figure 7.2, and for Peva Phase II in Figure 7.3 and Figure 7.4. Full details are presented in Weisler et al. (n. d.)
Figure 7.1. Percentage of taxa by NISP, Peva Phase I (adapted from Weisler et al. n. d.).

Figure 7.2. Percentage of taxa by MNI, Peva Phase I (adapted from Weisler et al. n. d.).
Figure 7.3. Percentage of taxa by NISP, Peva Phase II (adapted from Weisler et al. n. d.).

Figure 7.4. Percentage of taxa by MNI, Peva Phase II (adapted from Weisler et al. n. d.).
One disadvantage to the NISP values is evident in Figure 7.3, where one can see that 307 Elasmobranchii vertebrae constitute 54% of the Phase II assemblage. Elasmobranchii have large numbers of identifiable vertebrae, resulting in their over-representation, much as I discussed regarding turtle carapace in Chapter 5. By presenting the MNI values as well, which is 1 in this case, some of the bias is removed and Elasmobranchii are seen to represent only 6%. If we use MNI to rank the families, in Peva’s Archaic Phase I Scaridae dominate (29%), followed by Serranidae (22%), Acanthuridae (13%), Diodontidae (7%), Labridae (4%), Cirrihitidae (4%), Carangidae (2%), Holocentridae (2%), and Lethrinidae Monotaxis sp. (1%). The fact that only four taxa account for a major component (more than 4%) of the total suggests a highly specialized approach to harvesting fish (e.g., Leach et al. 1984:190). In the Classic period Phase II assemblage Scaridae also dominate (38%), followed by Serranidae (13%), Diodontidae (13%), Carangidae (6%), Elasmobranchii (6%), Holocentridae (6%), Lutjanidae (6%), and Scombridae cf. Gymnosorda sp. (6%). While slightly more diverse in that five taxa each account for 6%, the principal taxa are also Serranidae, Diodontidae, and Carangidae, suggesting that the specialization that began in Phase I continued throughout the Peva sequence.

The main difference between the Archaic (Phase I) and Classic (Phase II) fishbone assemblages is the sheer size. The NISP value for the Archaic is 4461 and for the Classic 560. However, the Classic deposit’s association with the marae complex suggests that the emphasis was on special feasting foods such as pig and turtle, rather than fish. It is with this in mind that the assemblages must be compared. Broadly speaking, there are few differences between the two periods in terms of the primary
exploited species. In both assemblages, Scaridae dominate, followed by Serranidae. The representation of Acanthuridae changes, however. Acanthuridae rank just below Serranidae in the Archaic assemblage but are absent from the Classic. However, the large difference in sample sizes might be one reason for this. Another difference between the two assemblages is the larger quantity of Elasmobranchii vertebrae in the Classic period assemblage. An additional 142 vertebrae and 2 shark teeth were recovered from the Classic deposit of Area 1 and the surrounding test pits, that are not counted in the Area 2 assemblage presented here. It is possible that shark was significant in terms of the religious nature of the site, because it was a *tapu* food in the Societies (Oliver 1974:275), and most likely in the Australs as well. Other species represented in very small quantities in the Peva assemblage also had acquired *tapu* status in Polynesia. Morrison (1935:67) noted that on Tubuai, jackfish (Carangidae), dolphin (Odontoceti), and albacore (Scombridae) were forbidden to women.

**Interpretation of the Data**

The Peva assemblage must be interpreted in terms of the marine environment that lies so close to the site itself. The importance of Rurutu’s fringing reef as a resource cannot be overstated. The waters of Peva in particular are favored by modern fishermen on Rurutu. Peva Rahi is now abandoned, and to the north Peva Iti is home to only two modern houses. Nevertheless, fishermen come from other valleys, mostly Moerai and ‘Auti, to fish in Peva’s waters. There, net fishing is especially predominant. I saw few fishing boats beyond the reef edge, and those came from Moerai. During my stay I also
spent some time snorkeling in the waters of the reef flat, when the water line was high enough to permit, and so was able to observe the reef ecology firsthand.

As a makatea island, Rurutu is similar in many respects to Ma’uke in the southern Cooks. Walter (1998:68-70) defined five ecological zones for Ma’uke, which can be applied to Rurutu as well. From the shore out, these are: the reef flat, the reef edge, the inshore pelagic zone, the inshore benthic zone, and the offshore pelagic zone. These are illustrated in Figure 7.5.

Reef flat. The reef flat is defined as “the intertidal and extreme upper subtidal portion of the reef” (Myers 1991:6). The main difference between Ma’uke and Rurutu is the depth of the reef flat. Walter (1998:70) noted that on Ma’uke this was always very shallow, and his illustration (1998: Figure 6.2) also indicates that the high water line does not exceed a depth of more than 2 m. Peva’s reef flat contains a pass (passe taero). In the area surrounding the pass the water becomes deeper when at high tide, attaining depths of approximately 5 m or more near the reef edge (see Figure 7.6). This area is sandy, with little coral. This is the zone most commonly fished today, primarily with seine nets. Species that frequent it include Acanthuridae, Balistidae, small Carangidae, Diodontidae, Kyphosidae, Mullidae, Scaridae, and Tetradontidae. Fishes from the reef edge and the inshore pelagic and benthic zones also enter the reef flat at high tide. At low tide shellfish such as Turbo and crabs are gathered, as well as sea cucumber.

Reef edge. The reef edge is defined as “The area from the seaward edge of the reef flat to the submarine terrace” (Myers 1991:6). At low tide, when the reef flat is exposed, this is easily accessible on foot. Common species include Acanthuridae, Balistidae, Cirrhitidae,
Fistularidae, Kuhliidae, Mullidae, Scaridae, and Serranidae. The reef edge essentially provides access to inshore pelagic and benthic species as well as those can be taken with a line while standing upon it.

*Inshore pelagic.* This area covers the coral shelf as it slopes downward. On Rurutu, the water attains a depth of 500 m approximately two km offshore. Inshore pelagic fishes include Scombridae, Carangidae, Exocoetidae, and Elasmobranchii. This zone is infrequently fished on Rurutu, because most families do not own a boat. This has almost exclusively become the domain of professional fishermen, who sell their catches for cash.

*Inshore benthic.* The inshore benthic zone is situated beneath the inshore pelagic zone. Fish caught in this zone are primarily small Carangidae and Serranidae, as well as Cirrhitidae, Holocentridae, Lutjanidae, and Scaridae. While these species can be fished from a canoe using hand lines, they can also be caught from upon the reef flat itself.

*Offshore pelagic.* This is the most infrequently fished zone on Rurutu. Species such as Scombridae, which are usually caught by means of trolling, inhabit this zone. By all accounts, supported by the archaeological evidence in this study and Vérin’s (1969), trolling was probably never a major activity on Rurutu. Like the inshore pelagic zone, the offshore zone is also the domain of professional fishermen.
Figure 7.5. The five fishing zones of Rurutu (adapted from Walter 1998: Figure 6.2).

Figure 7.6. Close-up of Peva's fringing reef at high tide, with areas labeled. Note the depth of the water around the pass (Photo courtesy of Yves Gentilhomme).
Exploitation of the Offshore Zones

Both Peva's Archaic and Classic deposits demonstrate an overwhelming emphasis on fishes that inhabit the reef flat and the reef edge, with offshore pelagic species being the least represented. Leach et al. (1984:191) outlined three general categories of fishes in relation to the techniques used to catch them: 1.) Pelagic predatory game fishes such as Scombridae that are known to be attracted by lures and caught by trolling, although they can be caught by other means; 2.) Benthic fishes that feed in deeper water and that are generally taken with a baited hook; and 3.) Lagoon fishes that can be taken by a variety of means, including netting, spearing, and general foraging. These fishes include those that were probably caught as the opportunity arose and not as target fishes. These fishes are generally small components of the overall assemblage.

Out of the 21 taxa identified in the Peva assemblage, only six varieties might occupy the pelagic zone (Belonidae, Carangidae, Carcharhinidae, Elasmobranchii, Exocoetidae, Scombridae), out of which three (Carangidae, Elasmobranchii, and Scombridae) frequent the zone within the reef itself to feed upon smaller fish. Figure 7.1, Figure 7.2, Figure 7.3, and Figure 7.4 illustrate that of these pelagic fishes, only Carangidae and Elasmobranchii constitute enough of a percentage to be visible. The small size of the Carangidae specimens, to be discussed below, suggests that they were taken in the inshore zone. Belonidae are represented by an MNI of 1 for the Archaic assemblage, Scombridae by an MNI of 1 for both the Archaic and Classic, and Carcharhinidae by a single tooth from the Archaic. This small tooth, as well as two others recovered from Area 1 that are not included in the calculations here, are probably from the Reef blacktip shark (Carcharhinus melanopterus), which is the most frequently
encountered shallow water reef shark (Myers 1991:36), and one that I myself saw on several occasions within the reef flat while snorkeling in Peva. I believe that it is very likely that the hundreds of Elasmobranchii vertebrae in the Peva assemblage belong to this shark as well.

On Rurutu, true offshore, deep-water fishing may have been largely restricted to the pursuit of the benthic Oil fish (*Ruvettus*) and the Bermuda Cat fish or Rabbit fish (*Promethichthys prometheus*), none of which has been identified in the Peva assemblage. The large *pi‘i* hook, made from *casuarina*, was used for this sort of fishing (see Figure 7.8.b), similar examples of which are illustrated in Vérin (1969: Figure 90) and Aitken (1930:Plate V). Seabrook (1938:97) wrote that the *Promethichthys prometheus* “are obtainable on dark nights all the year round, and are therefore nearly as important in Rurutu as the flying fish. ‘Au‘a (the Rurutuan name) are taken from certain familiar pockets, (*rua ‘au‘a*), outside of the reef; the best of these holes are two hundred fathoms deep.” I was told by local informants that these deep-sea pockets were not in the waters off Peva. Stokes (Rurutu Fishing Notes, manuscript, p. 2) noted that *Ruvettus* were caught at depths of 900 to 1000 feet, and that the flesh was said to be “very oily and having a purgative effect, but being delicious eating.”

The observation that Exocoetidae (Rur. *marara*, flying fish), a small inshore pelagic species, probably constituted a much larger portion of the Polynesian diet than is represented archaeologically (e.g., Kirch and Yen 1982:291-2; Rolett 1998:141; Walter 1998:68), is probably also true for Rurutu. Seabrook (1938:95) wrote that pursuit of the flying fish “seems to have been practised in Rurutu from time immemorial. Raivavae

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and Tupuiai ignore the marara, Rimatara catches a few, but Rurutu specializes in this particular type of fishing.” Exocoetidae were caught at night in the months of October through March. Boats equipped with torches would row out. The flying fish, attracted to the torchlight and startled by the yelling of the crew, would be taken with what were essentially butterfly nets, called ‘uata (Figure 7.8.e) as they soared past the boat. Based on Seabrook’s account of the abundance of these catches, flying fish appear to be underrepresented in the archaeological record: “The flying fish of Rurutu are unusually large—from ten to fifteen inches in length by fifteen-twenty across the wings; one of them makes a meal. There are meager nights, but ordinarily a boat catches from fifty to a hundred” (Seabrook 1938:95-6).

This method of catching flying fish is almost universal in Polynesia. Buck (1944:231-4) discussed this method for the southern Cooks in considerable detail (see also Walter 1998:69), and Emory (1975:192) documented it for the Tuamotus. The same technique is also described for the Marquesas and also appears to have been of considerable antiquity there (Rolett 1998:128). This method is still practiced today on Rurutu, with little variation save for the modern equipment. Kirch and Green (2001:139) wrote, “Comparative ethnoarchaeological data suggest that this widespread method is also ancient, confirmed by the robust reconstruction of the PPN (Proto Polynesian) term *rama, ‘fish at night with torch (typically of coconut fronds).’ The word is reflected in no less than twenty-nine Polynesian languages ranging from Tonga east to Easter Island.”

Fishing trips such as this would have provided the occasional opportunity to snare predatory pelagic fish. Seabrook (1938:96) wrote, “Tunny, (varu), prey on the flying-fish
and are caught during the same season by trolling in the evening dusk and at dawn. The related albacore (‘a’a’i), is rarely caught in Rurutu; bonitas, (au’opu) stay too far from the shore for a people who will not use sails. And the varu itself may not have been caught formerly since the trolling hook is said to be a modern invention in Rurutu.”

Seabrook (1938:96) further wrote that albacore was rarely caught on Rurutu and that bonito “stay too far from the shore for a people who will not use sails.” Vérin (1969:215) believed that the lure was known to Rurutu in pre-Classic times, and speculated that the luring technique was abandoned because of the rarity and distance of the schools of bonito in the waters of the Australs, and not simply because of the local shortage of pearlshell on Rurutu. As no bonito trolling lures were recovered in either the Archaic or the Classic deposits of Peva, and none were found by Vérin, this observation cannot be tested, but I do agree with it.

Other types of pelagic fish could be taken by line fishing, primarily during the day. Seabrook provided this account of the pursuit of the Black Jack fish (Caranx lugubris), a Carangid that inhabits inshore waters:

The ru’i is the most important of the different cavallas that are obtained in Rurutu. When the tide lowers this fish assembles in groups, (puta’a), which play among rock clusters located about seventy-five fathoms from the reef and eighteen below the surface. The fish are visible at this depth. The bright, sand sea floor around the Austral Islands makes it possible to see fish at a depth of twenty fathoms; (dark soil floors around Rapa and some of the Society Islands are said to stop vision at half this depth). Flattish stones, smaller than those used for ‘a’na
(Promethichthys prometheus) are taken in the canoe. A small steel hook baited with a scrap of the glistening ature fish (a Carangid) is laid between two rocks; the latter are lightly hitched together with a couple of turns of the line. When the hook hovers over the fish, the line is snapped, and the rocks detach. The fisherman watches the sequel. A small version of the wooden crotch hook (see Figure 7.8.b) was formerly used for ru’i fishing, according to informants. Ru’i range from one to three feet in length; Rurutuans usually regard the mature version of this fish as the first prize of the sea. (1938:99)

Scombridae are minimally represented in Peva’s Archaic assemblage, and even less so in the Classic. While Scombridae are often caught by trolling, they can also be taken in nets when they wander inshore to search for prey (Leach et al. 1984:191). Carangidae, which can also be caught in nets in the same way, are represented in both periods in small percentages, and based upon the size of the bones, were diminutive varieties that were probably caught in the inshore zone. The lack of sailing technology apparent to Seabrook was probably the result of Rurutu’s inhabitants realizing that fishing was far more productive and less risky if one did not venture far beyond the fringing reef. Most species could be taken within the reef zone itself, even the pelagic fishes that ventured close to shore to feed upon the smaller reef fishes.

Exploitation of the Reef Zone

Rurutu’s fringing reef provides access on foot to the reef flat, reef edge, and inshore pelagic and benthic zones as well. At low tide one can simply walk to the reef edge and fish off of it using a line. At high tide the area of the reef flat around the pass is deep enough for most species of inshore fish, which can be taken with a net or line. In
both Peva’s Archaic and Classic assemblages, Scaridae dominate, followed next by Serranidae, then Acanthuridae and Diodontidae in varying amounts. These fishes are readily available within the reef zone. Seabrook (1938:102-8) documented the fishing techniques used on Rurutu’s reef zone during the 1930s. Not all methods are in common use today, and some have disappeared entirely. His description is therefore far closer to traditional Rurutuan fishing methods than any modern observations. Many of these fishing techniques are very widespread in East and West Polynesia, suggesting very ancient origins. Kirch and Green (2001: Table 5.3) documented the distribution throughout East and West Polynesia of traditional fishing techniques and gear, and concluded that “these methods are not independent adaptations, but rather are shared retentions of an ancestral set of fishing strategies.” The following is a short summary of the methods Seabrook described.

1. Rod and line casting (maeva). Seabrook (1938:102) observed that by the early 20th century, the beaches of Rurutu had been largely denuded of their boulders for use in the coral plaster industry (for houses). Boulder environments provide the algae that fish such as Acanthuridae feed upon, and thus casting with a rod and line was no longer as profitable in Seabrook’s day as it had once been. The toggle-splint gorge, or maai, was made of casuarina wood (see Figure 7.8.a). Seabrook’s informants told him that pearlshell, tortoise shell, and bone hooks had not been used in antiquity (1938:96). As archaeology has since demonstrated otherwise, the fact that these hooks had been forgotten is quite revealing as to their importance on Rurutu. The casuarina hook, on the other hand, was well known, and was also called mari’i i te toa (the toa trap), and o tari pu’i (eel hook or hanger), because eels (pata) were the main catch with this hook, which
were baited with crayfish or land crabs. Large fish were not often caught thus. Seabrook (1938:98-9) noted that Serranidae were taken with a hand line on bright, moonlit nights, and less frequently during the day.

2. Hand line casting (*tautai pi'i*). Hand lines (*a'o*) were formerly cast from the shore into reef channels that Carangidae, inshore pelagic fish that feed at sunset, frequented at high tide. The end of the line was tied onto sticks planted in the beach that would then become disarranged when a fish took the line. Hand lines could be reinforced against fish teeth with tapa cloth. This emphasizes that even inshore pelagic species were caught without having to venture off of the fringing reef into the open water with a canoe. Carangidae are the predominant inshore pelagic family represented in the Peva assemblage, throughout both the Archaic and Classic deposits. Elasmobranchii, the other predominant pelagic family, also wander into the reef channels at high tide, and could be caught then. The presence of Carangidae and Elasmobranchii in the faunal assemblage is therefore not wholly indicative of canoe use and open sea fishing (see also Rolett 1998:145).

3. Surface spearing. Spearing in general appears to have attained greater popularity about a generation before Seabrook's time, when iron barbs first became available (Seabrook 1938:102). The earlier spear was a plain shaft of *toa*. All of Seabrook's informants agreed that spearing had been unimportant on Rurutu in former times (1938:104). Buck (1944:216) also noted that in the Cooks, fishing with iron-pointed spears grew in popularity at the expense of other methods. When spearing from the surface, the fisherman would walk onto the reef wearing sandals. Scaridae, of which
Seabrook (1938:102) noted that there were ten local species, were the prime target; Mullidae and Carangidae could also be speared.

Nowadays men use a pointed metal rod to spear octopuses. At low tide, the fishermen walk around the reef flat, poking the rod into possible hiding places to drive out the octopus and catch it in hand. This is identical to the technique described for Mangaia (Buck 1944:213-14), where it was the women who did this. The fact that no cowrie shell octopus lures were recovered in Peva’s artifact assemblage leads me to believe that the same method, minus the metal pick, was also practiced in antiquity.

Stokes (Rurutu Fishing Notes, manuscript) documented a variation of surface spearing that he witnessed on the beach of Peva (see Figure 7.7). This technique involved constructing a fish trap made of Hibiscus tree trunks:

...the fishermen had just finished setting up a line of freshly cut purau trees in the basin (see plan). The trees were ten feet high, and were set in mounds of stones at fairly regular intervals. It was explained that the fish had come into the basin with the high tide, and that they would not readily pass out again under the shadow of the waving branches.

The men waited on the beach for about an hour, and then eight of them built, in a rather rapid and loose manner, low walls with blocks of limestone, reaching 6 inches above the sea. These walls they called aua i’a (fish fences). The other six men waited on the beach, and proceeded to the southern end of the pond as the walls were nearing completion, and commenced spearing fish. The walls completely blocked the northern end of the pond except at three places where men
with spears were posted. The intention, it was explained, was to wait until the tide receded, and to spear the fish as they attempted to pass through the openings.

(Rurutu Fishing Notes, manuscript)

Vérin (1969:47, see Figure 8) also commented upon the remains of this built-up section of coral, and marked its location on his map of Peva.
Figure 7.7. John Stokes' field sketch of the fishing trap method he observed at Peva. The original is drawn on a sheet of lined yellow paper. The text reads: "Fishing at Peva, observed, Jan. 4/21. Called Patia te i'a (Spearing fish) and used in connection with the Aua i'a (fish fence)" (Reproduced courtesy of the Bernice P. Bishop Museum Archives).
4. Underwater spearing (tautai peu). In this method, men would dive off the reef edge with their spears, targeting the coral caverns about a fathom below the surface. Fishes such as small Serranidae, Acanthuridae, and Chaetodontidae (butterflyfish), were caught while feeding. The spear used then was a sharpened steel rod. On Tubuai, Aitken (1930:57) noted that underwater spear-fishing depended upon the use of homemade goggles, and he was informed that the practice was a recent introduction from the Tuamotus. Walter (1998:69-70) observed that underwater spear-fishing was currently one of the most important methods used in the inshore benthic zone of Ma’uke. Similar fish are targeted as well, mostly Acanthuridae, Scaridae, Holocentridae, Serranidae, Labridae, and less often, Carangidae. Walter (1998:69-70) also speculated on how the practice might have differed before modern equipment was available: “In prehistory divers probably operated closer to the reef edge than is deemed prudent today, simply because of the difficulty of targeting fish in the deeper water without masks. In this case, the most common target species are likely to have been Acanthuridae followed perhaps by Scarids and Labrids. This is based on the observation that Acanthuridae dominate the catch of divers working along the walls of the harbour passages of Ma’uke and Mitiaro.”

5. Nighttime spearing (tau rama). This method was practiced at night as the tide receded from the reef flat. An assistant would hold a torch to startle the fish, which the fisherman would then spear. In such a way octopuses, sea crayfish, Diodontidae, and less often, Mullidae were caught (Seabrook 1938:103).

6. Hand fishing (tautai tati). This refers to the simple practice of grabbing fish from the water using the bare hands. Seabrook (1938:105) wrote, “Old Rurutuans
practised this *tati* in their youth and state that there were individuals in the generation before them who specialized at it. The fish were driven into rock-crannies and seized. The shape of the fish was important; some were easy to grip, some difficult.”

7. Netting (*'upe'a*, see Figure 7.8f). According to Seabrook (1938:105), netting had always been practiced on the reefs of Rurutu and Rimatara. Aitken (1930:56) noted that on Tubuai, fish nets were rarely used (in the early 20th century), but “that in former times the art of net making was well known, and that nets were in general use” (1930:59). Seabrook’s description of net fishing on Rurutu is worth quoting in full, as it applies equally well to the modern method:

At high tide the reef platform is submerged and the fish are dispersed over it; when the tide rises or falls the crevices in the reef produce eddies that cause the fish to run in localized areas. The net captain, (*'oa noa*), knows every reef channel and the way in which the fish behave in regard to it. A group of young men will operate a net together, and comb a single beach—Unau (Unaa), say—­their leader having made a specialty of that reef. Each member of this group is a diving spearman however, and a *pupu* (*Turbo setosus*) hunter, and therefore familiar with every boulder, pocket, and crevice on the Unau reef from Vitaria to Moerai.

When the tide begins to lower, and it is calculated that the fish have schooled together within a certain area on the reef, the net captain and an assistant will steal along the outer fringe of the platform and plant their net in the south of the channel, (*va’a’a’a’*), that the fish use when changing tides lead them to and from

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the open sea. The captain signals and the other members of the party, (ordinarily three or more, who have been previously stationed at intervals along the beach, or else at possible side-exits to the fish pocket), converge toward the net, thumping the reef-floor with long staves as they run. This driving of the fish used to be called “pue’u te i’a”, now it is “parara”. The fish snag in the meshes of the net. (1938:106)

Seabrook (1938:106) noted that earlier generations were especially adept at catching Mullidae by angling, which in his day were caught mostly at night using nets.

8. Leaf sweeps (rao ‘ere). This is the “great sweep” employed to supply a large quantity of fish for a special feast. This technique is well known throughout Polynesia (e.g., Buck 1944:220). Aitken (1930:59) described the same method for Tubuai, where up to 200 people might take part. Coconut fronds made up a drag net over 150 fathoms long, which was strung along the outer edge of the reef and brought to shore in a crescent formation, gathering the fish within its folds. Seabrook (1938:107) observed that up to 1000 fish could be caught, but that this sweep was known to deplete the fish population, and thus was only used a couple of times a year.

9. Hand-dip nets (‘upe’a ramarama, see Figure 7.8h). According to Seabrook (1938:107-8), the dip net was “occasionally employed to catch ‘sardines’ --- oma, (young mullet), maimai, - young moraoa (Hepatus)...and other smelt that are apt to swarm on the reef during the winter months.”

10. Netting with poison (‘ora). Fish poison was made from the crushed leaves of *Tephrosia piscatoria* (‘ora pa). The poison would drive the fish into small to ‘o to ‘o nets
(Figure 7.8.g). Another type of poison was made from grated *Barringtonia* nuts and was scattered over the side of a canoe, and then the drugged and dead fish would float to the surface. Seabrook (1938:108) wrote, “This practise is believed to be even more pernicious that the *rau ere* sweep; recent years have not produced a fete warranting the 'ora.” Buck (1944:216) also noted that the people of the Cook Islands were aware of how wasteful this method was and so used it rarely. Based on its widespread distribution as well as lexical reconstruction, fish poisoning appears to have been a very ancient method (Kirch and Green 2001:139). On Rurutu fish poisoning is today strictly forbidden (Walker 2002:39).

11. Traps (*'ina'i*). This method appears to have vanished on Rurutu in the 19th century. Seabrook (1938:108) noted that according to the recollections of the older generation, eels, octopuses, and crabs used to be caught with “eel pots” (*ina'i*). These were baskets around three feet high that resembled a beehive, which were lowered into the reef channels at dusk and pulled out at dawn. The *ina'i* trap is also thoroughly described and illustrated for the southern Cooks in Buck (see Figure 7.8c, d), where the eel was also the principal catch.
maai / marii toa
showing the toggle movement

pi'i

'ina'i trap, Ma'uke

c

'ina'i trap, Atiu
d

'uata

'upe'a
to'o to'o
g

'upe'a tamarama

h

Figure 7.8. Traditional Cook-Australs fishing gear. a,b,c,d,e,f,g after Seabrook (1938, reproduced courtesy of the Bernice P. Bishop Museum Archives): Figures 6, 7; c,d after Buck (1944: Figures 139, 140).
Most of these traditional fishing techniques are still in use today. However, Rurutu is no longer the subsistence economy that it had been in the early 20th century and people rely far less on fishing. All of the equipment used today is of course modern. The methods that seem to have disappeared altogether are: the leaf sweep, fish poisoning, and fish traps, the latter being already extinct in Seabrook’s day. Netting is now predominant, and a few hours’ work can reap dozens of fish.

Based upon the fishbone assemblage of Peva’s Archaic and Classic periods, it appears that the reef zone was always the area most exploited. Scaridae, of which the majority were probably taken with nets and spearing, dominate in both phases. Serranidae, which are next in frequency, could have been caught by angling off the reef edge, or by diving and spearing. Acanthuridae were probably caught by spearing or netting. Diodontidae were probably speared while foraging. Other species, which represent small percentages of both periods, could have all been caught in the inshore zone with nets, spears, or other opportunistic methods.

Overall, it seems that the early residents of Peva recognized the reef zone as a primary resource, and did not emphasize offshore fishing. This is precisely the situation today. This interpretation agrees with the artifact assemblage, which contains few fishhooks, none of which are ideal for catching pelagic species. No rotating hooks were found, which are used to catch bottom feeders in the benthic zone. Similarly, no trolling lure shanks or points were found, which would have been used to snare offshore pelagic species. The fishhooks are all small jabbing hooks, which would probably have been used with a rod and line to fish from the reef edge. As Walter (1998:71) wrote...
concerning Anai’o, “This type of fishing is likely to account for most of the Serranids in the assemblage.” It is probable that netting, which is the predominant method today on Rurutu, was also so at the beginning of the cultural sequence. Only one stone anchor weight was recovered from Peva Phase I (see Chapter 7). No net sinkers were recovered either at Peva, or at Anai’o (Walter 1998:71). Walter believed that this negative evidence agreed with the faunal assemblage, in which species likely to have been caught with a net ranked low. This is in accord with the fact that Ma’uke’s reef flat is generally too shallow to be productive with respect to this method (1998:70). In the case of Peva, whose assemblage is dominated by species such as Scaridae, which are taken most often by net nowadays, I am inclined not to take the absence of net sinkers as an indication of lack of net fishing.

This emphasis on inshore fishing appears to date back to Ancestral Polynesian Society. It has been previously documented by Kirch and Dye’s (1979) ethnoarchaeological study on Niuatoputapu. They found that the reef flat and reef edge were the most intensively exploited zones. In terms of catching methods, the majority of fish were taken with seine nets and nighttime spear-fishing. Based upon the archaeological midden, they concluded that ancient catching methods were probably just as diversified as modern ones. Angling was a minor component that was used for Carangidae and Lutjanidae. Based on similar fishbone assemblages from other ancient Polynesian sites, Kirch and Green (2001:134) wrote, “Ancestral Polynesian fishermen targeted a range of inshore microhabitats including fringing reefs, lagoons, and the immediate over-reef benthic habitat, but ventured out to the open sea more rarely.”
Analysis of Fishbone Sizes

Fishes that belong to the same family, and are grouped accordingly in the faunal analysis, can inhabit different marine environments. This can have implications for the catching methods used. Rolett (1998: Figure 6.1) classified these fishes (Carangidae, Serranidae, Lutjanidae, Sphyraenidae, Scombridae) into three basic groups (small, medium, large) according to the size of the dentary and/or premaxillary. Based on ethnographic observations, larger specimens tended to be caught in the offshore zones, small ones in inshore zones, and medium-sized ones in either. This is useful in analyzing the bones from the Peva assemblage. Figure 7.9 illustrates representative dentaries and premaxillaries from Carangidae, Serranidae, Lutjanidae, and Scombridae. It can be seen that of the few examples that are present in the Peva assemblages, no Carangidae specimen exceeds the medium size range. The presence of only medium and small individuals suggests that the small ones were probably taken inshore, and the medium ones either inshore or offshore. Large specimens of these fishes are normally targeted specifically when the fishermen set out into the deeper offshore waters. Similarly, only two specimens of Serranidae are large, 60 specimens were classified as medium, and 44 as small. The small individuals were almost certainly caught in the inshore zone, and the medium ones either inshore or offshore. The medium Serranidae were more likely caught in the inshore zone when they swam in to feed during the evening, as Leach et al. discussed (1984:191). In addition, the few Lutjanidae specimens present in the Peva assemblage are small, suggesting that they were caught in the inshore zone as well. Scombridae may either have been caught offshore, or else when they had come into coastal waters to feed on the smaller fishes there.
Carangidae

Serranidae

Lutjanidae

Scombridae

Figure 7.9. Representative fish bones from the Peva assemblages. The size ranges of these specimens are useful in distinguishing between fishes that belong to the same family yet inhabit different marine zones.
Another useful measurement is the size of the fish vertebrae (excluding Elasmobranchii), as demonstrated in Rolett (1998: Figure 6.2). This gives an overall impression of the size ranges of the fishes being caught. Figure 7.10 illustrates these trends from Peva Phase I and Phase II. It can be seen immediately that the trend is very different from that of Hanamiai. In the Archaic Phase I assemblage of Hanamiai, there is a much wider range of sizes represented, including many more large specimens. In the Classic period Phase IV assemblage of Hanamiai, there is a high concentration of smaller vertebrae and few larger specimens. Peva, on the other hand, exhibits an almost opposite trend. It is in the Phase I Archaic assemblage that most of the smaller specimens are found, with the majority being between only 3-4 mm in diameter. This is additional evidence for a focus on inshore fishing. In the Classic period Phase II assemblage, there is a much wider variety of sizes represented, although the sample size is much smaller. Although the frequency of fish families does not differ considerably from one period to the other, the size of the individual fishes does. The interpretation offered here is that during the Classic period larger fish were being selected, specifically for the feasting that took place upon the marae. Fishes were still caught in the inshore zones, but a conscious effort was perhaps made to bring only the more impressive examples to the feasts. This interpretation is supported by the data of the Turbo opercula discussed in Chapter 6, in which larger specimens dominate in the Classic period assemblage, while the Archaic exhibits a much wider variety of size ranges.
Figure 7.10. Size distribution of fish vertebrae from Peva Phase I and Phase II. Measurements record the maximum diameter of the vertebral centrum.
Inter-site Comparison

The Peva assemblage is informative when compared to others that have been reported for Polynesia. The most immediately relevant assemblage comes from the ‘are ‘arioi in Vitaria,\(^6\) which was examined by Leach and Intoh (1984). While smaller, this Classic period assemblage resembles that of Peva. Scaridae dominate (25%), followed by Serranidae (14.3%), Diodontidae (14.3%), Elasmobranchii (10.7%), Carangidae (7.1%), Labridae (7.1%), and then Anguillidae, Muraenidae, Holocentridae, Scombridae, Lutjanidae, and Acanthuridae (3.6% each). The Vitaria assemblage is interesting because Anguillidae (eels) are represented, something not present in the Peva assemblage. Based on this comparison, it seems that there was an island-wide emphasis on inshore species on Rurutu. The fact that Elasmobranchii are also well represented in the Vitaria assemblage lends support to the notion that shark was a tapu food on Rurutu, restricted for ceremonial occasions, such as probably took place upon the ‘are ‘arioi.

Moving northwest into the southern Cooks, the next islands with documented assemblages are Ma’uke (Walter 1998), Aitutaki (Allen 1992), and Mangaia (Kirch et al. 1995). Peva is most similar to Aitutaki, where Scaridae dominate, followed by Serranidae, Acanthuridae, Diodontidae, and Labridae. On Ma’uke Scaridae are relatively insignificant compared to Serranidae, the most prevalent taxon (Walter 1998). Mangaia’s assemblage is unique as brackish water fishes (Eleotrididae and Anguillidae) comprise over 22% of the assemblage. Scaridae are scarce (Kirch et al. 1995; Butler 2001). Leach et al. (1994:11) remarked on the lack of Scaridae in both Mangaia and Ma’uke. Walter

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\(^6\) This assemblage was not excavated by Pierre Vérin, and nothing else pertaining to this excavation has been published, and no information is available regarding how the assemblage was recovered, in terms of screening or otherwise.
(1998:72) addressed this disparity as well. Scaridae are a favored catch where available in Polynesia. Scaridae are herbivorous fish that feed on coral algae. They will not as a rule take a hook, and they are most frequently caught using either spearing or netting. As Leach and Davidson (1988:18-19) noted, Scaridae are an abundant fish, easy to catch, and fishing for them is guaranteed to succeed: “On the other hand, baited line fishing, such as is appropriate to the groper/cod family, requires somewhat more initiative and skill in deeper water, is more adventurous, and is not always guaranteed to produce a lot of fish.”

On Aitutaki, Scaridae are far more accessible than they are on either Ma’uke or Mangaia. Fishermen can catch them in the sheltered lagoons using seine nets, or along the fringing reefs using diving and spearing or dip nets. Walter (1998:72) wrote, “On Ma’uke and Mangaia, the reef flat is too shallow for many parrotfish to be caught in nets, and the outer reef face, where Scarids are active, is relatively inaccessible.” While Scaridae are abundant on Ma’uke, it is difficult to catch them under such conditions, and Walter emphasized the importance of taking local ecological factors into account. In the case of Rurutu, these fish are caught in large quantities in the waters of the sheltered reef flat, which are deeper than those of Ma’uke. This emphasis on Scaridae and net fishing is therefore largely a result of the environment. In the Marquesas, where coral reefs are far scarcer, Scaridae formed a relatively unimportant component of the fishing diet (Leach et al. 1997:59-60).

A final point can be made regarding the importance of net fishing. Leach et al. (1984:191, see also Leach and Davidson 1988:19) wrote, “The relative importance of
netting and baited line fishing may be assessed by comparing the number of scarids with those of the Epinephelidae (i.e. Serranidae) family.” Table 7.2 summarizes the results from Leach et al. (1984), Leach and Intoh (1984), and Peva. All Rurutuan assemblages stand out as being overwhelmingly net fishing oriented.

Table 7.2. Comparison of relative numbers (MNI) of Scaridae and Serranidae (after Leach et al. 1984: Table 7).

<table>
<thead>
<tr>
<th>Assemblage</th>
<th>Serranidae</th>
<th>Scaridae</th>
<th>Ratio</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kapingamarangi</td>
<td>231</td>
<td>231</td>
<td>1.00</td>
<td>Baited hook oriented</td>
</tr>
<tr>
<td>Huahine</td>
<td>33</td>
<td>51</td>
<td>0.65</td>
<td>Net oriented</td>
</tr>
<tr>
<td>Nukuoro</td>
<td>62</td>
<td>95</td>
<td>0.65</td>
<td>Net oriented</td>
</tr>
<tr>
<td>Palau</td>
<td>134</td>
<td>817</td>
<td>0.16</td>
<td>Net oriented</td>
</tr>
<tr>
<td>Peva Phase I</td>
<td>28</td>
<td>38</td>
<td>0.73</td>
<td>Net oriented</td>
</tr>
<tr>
<td>Peva Phase II</td>
<td>2</td>
<td>6</td>
<td>0.33</td>
<td>Net oriented</td>
</tr>
<tr>
<td>Vitaria</td>
<td>2</td>
<td>7</td>
<td>0.57</td>
<td>Net oriented</td>
</tr>
</tbody>
</table>

**Discussion**

Peva’s fishbone assemblage demonstrates a reliance on inshore fishing. The majority of fishes, including the pelagic Scombridae and Elasmobranchii, could have been taken in inshore waters, either from a stationary canoe, or perhaps even by line casting from the reef edge itself. The medium and small size of the mouth bones of the Carangidae, Lutjanidae, and Serranidae in the Peva assemblage suggests that many of these fishes were caught in the inshore zones in an opportunistic manner. Vitaria’s (Leach and Intoh 1984) fishbone assemblage suggests that a similar pattern of exploitation was also being practiced in that district during the Classic period. This implies that the marine environment of Peva was similar enough to that of Vitaria to result in very comparable assemblages. Rurutu’s fringing reef encircles the entire island, thus providing each district with a very similar shoreline. The early 20th century catching
methods recorded by Seabrook (1938) have parallels throughout East Polynesia, suggesting that they had their roots dating far back in time. The advantage of the fringing reef would have been immediately apparent to the settlers of Rurutu. The ease with which inshore fish could be caught may have rapidly made offshore pelagic fishing an unnecessarily costly endeavor. Trolling may have been abandoned as early as the Archaic period, and remained absent until the European era. The canoe technology that offshore fishing requires may have suffered as a consequence, and perhaps contributed to an overall decline in long-distance voyaging.

Based on Archaic period fishbone assemblages from other sites in the southern Cooks, it is apparent that the Polynesian settlers adapted very quickly to the different marine environments they were confronted with. This is probably one reason that not all of the Archaic fishhook types known from the Marquesas have yet been found in the southern Cooks and Australs. Similarly, the trolling lures common in the Marquesas have not been recorded for these regions, and they may have been dropped from the Archaic kit during a relatively early phase of colonization. Rurutu was perhaps an extreme example of this, where no rotating fishhooks have yet been found, hooks that were used for catching deeper water fish such as benthic and epipelagic predators (Walter 1998:45). This will be discussed in more detail in the next chapter, and will emerge as a very strong link between the fishbone assemblage and the artifact assemblage.
Chapter 8. Fishing Gear

As we have seen in Chapter 7, the fishbone assemblage of Peva is reflective of inshore fishing. While some fishes were caught by angling, the majority were probably taken with nets and other methods such as spearing. In addition, the paucity of fishes typically caught by offshore trolling suggests that the prehistoric inhabitants of Peva relied primarily upon low-risk, high-yield fishing strategies. It is therefore not surprising that Peva’s artifact assemblage contains few fishhooks, none of which are suitable for intensive offshore fishing. The absence of trolling lures is likewise to be expected. However, while the Peva excavation uncovered few fishhooks, they fit well into the array of East Polynesian Archaic fishhook types. The Peva assemblage is instructive because it demonstrates how, under certain environmental conditions, some elements of a common tool set can be dropped at an early stage of cultural development when there is no need of them.

The Archaic East Polynesian Fishhook Assemblage

I have emphasized already in Chapter 1 that the East Polynesian Archaic kit is characterized by diversity. The origins of the Archaic East Polynesian fishhook types are difficult to see in West Polynesian assemblages. The wide variety of styles appears to have developed within East Polynesia. In contrast, in West Polynesia there is a very limited variety of forms. Allen (1992a:186) attributed this in part to the fact that large quantities of pearlshell (*Pinctata margaritifera*), the preferred material for fishhooks, are scarce in West Polynesia. Most West Polynesian fishhooks are made from the brittle, locally-available *Turbo setosus*, also found throughout East Polynesia. As a
manufacturing material, the gastropod’s shape restricts the variety of forms one can obtain from it. The rounded shell permits only naturally circular portions to be sawn off, which can then be modified in a very limited manner. It is possible that this restriction on raw material was one reason why West Polynesia exhibits such a limited range of forms. Another important factor is the range of fishing strategies. As discussed in Chapter 7, Kirch and Dye (1979) demonstrated that in West Polynesia, angling with one-piece fishhooks was not a major component of fishing, because exploiting the reef flat and reef edge with nets and spears was far more productive.

These environmental factors help to explain the efflorescence of varieties once East Polynesia was colonized. In East Polynesia pearlshell can be very abundant, especially in sheltered lagoons such as on the atolls of the Tuamotus, and in protected bays. Pearlshell, a bivalve, has wide, thick and flat halves of superior resiliency. The flat and thick portions can be fashioned into a much wider variety of hook forms, and when polished, its gleam serves to attract fish. Therefore the Polynesians could have afforded to experiment with this material, resulting in the wide array of forms that are found in Archaic sites (Kirch 1984:89).

Pearlshell, however, is unevenly distributed in East Polynesia, and many islands have limited access to it. Nevertheless, the nature of the Archaic period as one of interaction and voyaging would have allowed this raw material to circulate. The presence of pearlshell in Archaic strata on islands where it is either very limited or non-existent suggests that it had either been imported, or else that a small local supply was used up. In addition, where there was little or no natural pearlshell and importation was severely
limited if not impossible (e.g., Easter Island, Pitcairn, New Zealand), the Polynesian settlers were compelled to find substitutes. In Hawai‘i and New Zealand, bone was the material resorted to (Sinoto 1995:152). Similarly, stone was used on Easter Island, and wood on Rapa. With the decline of long-distance voyaging beginning in the 15th century A.D., islands that only had supplies of *Isognomon* or *Turbo* shell used them instead. On Rurutu, the use of any shell or bone as a material for making fishhooks did not survive as a memory into the 20th century. Seabrook (1938:96) wrote, “Pearl-shell, tortoise-shell and bone hooks are strongly denied to the old era,” and that the only fishhooks were made of *casuarina* wood. Indeed, no bone hooks have yet been found on Rurutu, and there are comparatively few shell examples as well.

In the southern Cooks, on Aitutaki, Mangaia, and Ma’uke, pearlshell fishhooks dominate in the Archaic strata, and local *Turbo* shell hooks in the later strata (Allen 1992a:192-3; 2002:199; Kirch et al. 1995:52; Walter and Campbell 1996:54; Walter 1998:100). This probably indicates a decline in inter-island exchange and possibly also the depletion of local pearlshell populations. The diminishment of pearlshell fishhooks over time is one of the archaeological lines of evidence that inter-island and inter-archipelago communication declined after A.D. 1450. The ratio of pearlshell to *Turbo* fishhooks can therefore reflect a site’s relative age. Rurutu, whose lack of a lagoon either prohibits the presence of a pearlshell population or else restricts it very severely, exhibits a pattern similar to that of the southern Cooks. The Vitaria fishhook assemblage, which consists mainly of *Turbo* hooks with several unfinished pearlshell examples (see Vérin 1969:216) illustrates this. Figure 8.1 (adapted from Walter and Campbell 1996: Figure 4) compares the percentage ratios of pearlshell and *Turbo* shell fishhooks from sites in the
southern Cooks and Rurutu. The Peva Phase I assemblage, which contains no worked *Turbo*, fits the pattern of an Archaic East Polynesian site. No fishhooks or manufacturing debitage were recovered from the Classic period Phase II marae deposits, where fishhook making probably did not occur due to the specialized ceremonial nature of the site. However, Vitaria’s (Vérin 1969) fishhook assemblage can serve as a Classic period example in its stead.

<table>
<thead>
<tr>
<th>Island</th>
<th>Site</th>
<th>Date range</th>
<th>Pearlshell</th>
<th><em>Turbo</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rurutu</td>
<td>Vitaria</td>
<td>200 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitiaro</td>
<td>Paraoa Layer 2</td>
<td>400 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangaia</td>
<td>Tangatatau Zones 5-8</td>
<td>600-300 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aitutaki</td>
<td>Moturakau B, Zones A-C</td>
<td>200 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aitutaki</td>
<td>Moturakau B, Zones F-H</td>
<td>700-600 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aitutaki</td>
<td>Moturakau A, Zones B-D</td>
<td>700-600 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aitutaki</td>
<td>Moturakau B, Zones D-E</td>
<td>600-400 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ma’u‘ake</td>
<td>Anai’o Layer 4</td>
<td>640 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangaia</td>
<td>Tangatatau Zones 2-4</td>
<td>1000-600 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aitutaki</td>
<td>Moturakau A, Zones G-J</td>
<td>1000-800 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rurutu</td>
<td>Peva Phase I</td>
<td>700-600 B.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aitutaki</td>
<td>Moturakau A, Zones E-F</td>
<td>700-600 B.P.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 8.1. Ratios of pearlshell to *Turbo* in the southern Cooks and Rurutu (after Walter and Campbell 1996: Figure 4).

Classification of Fishhook Types

While the material used for fishhooks often differs between the Archaic (pearlshell) and Classic (*Turbo* or other) periods, the shapes of the hooks themselves are even more indicative of chronology. There are two widely-used typologies for Polynesian fishhooks, one specifically tailored for Hawai‘i (Emory et al. 1959; Sinoto 1991), and the other for the Marquesas (Suggs 1961). Nowadays researchers working with Archaic East Polynesian assemblages often refer to East Polynesian fishhook types using Suggs’ classification system (e.g., Walter 1996, 1998; Rolett 1998). Suggs’
Marquesan types are now known for Archaic sites throughout East Polynesia, although there are far more specimens from the Marquesas than elsewhere. Further sub-categorizing of specific features such as the head or point can be done using Emory et al. (1959), or Allen (1996).

Fishhook Terminology

The fishhook terminology used here is in standard use (Figure 8.2).

![Fishhook Terminology Diagram](image)

Figure 8.2. Fishhook terminology (Head types after Sinoto 1991: Figure 13).

Before examining the Archaic fishhook assemblage in more detail, we can make a more general distinction between one-piece fishhooks. East Polynesian fishhooks, and indeed fishhooks in general, are most readily classified into two basic types: jabbing and rotating (Sinoto 1991:85-6). Commercial fishhook manufacturers refer to these as “J” hooks and “C” or “Circle” hooks, respectively, and for obvious reasons. A jabbing hook is one in which the shank and point leg are either parallel or diverging so that a line drawn from one end cannot intersect with the other (see Figure 8.2). Some varieties of jabbing hooks have slightly incurved points. The hook works as follows: the point jabs into the fish’s mouth, and the line must be pulled quickly and steadily upward so that the straight point cannot slip out. It works best in waters where the fisherman can see the
feeding activity of the fish, such as when he is standing in shallow water or on a reef (Walter 1998:45). As soon as the fish bites, the fisherman can yank the fish out the water and fling it straight onto the shore, as the momentum detaches the fish from the hook. Modern fishhook manufacturers recommend that one choose a “J” hook to match the target fish’s mouth and jaw, as the hook tends to lodge itself inside the mouth. Needless to say, modern metal hooks are barbed, so that slippage cannot easily occur. A rotating hook is one in which either the shank, point, or both, are curved or angled inward so that a line drawn from the point will intersect in space with one drawn from the shaft. Rotating hooks are suited to catching larger fishes that inhabit deeper waters, and can hang free from canoes on dropped lines (Walter 1998:45). When a fish bites this type of hook, it turns away to “kill” and crush the bait, causing the hook to rotate away from the angle of the fish’s mouth and fix itself in its lip. Because of the curvature of the hook, the fish cannot easily slip off. The fisherman needs this advantage because he has to pull the line up through deep water, and he cannot see the fish as it thrashes about. Fishhook manufacturers advise that when choosing a Circle hook, the size should match the target fish’s lip, which is where the hook snags, while allowing room for the bait. The size of the gap between the point and the shank is critical, for the narrower it is, the more difficult it is both to bait and to remove from the fish’s mouth. The basic mechanical processes of jabbing and rotating fishhooks is naturally more critical when the hooks are not barbed and cannot snag the fish so easily, as was the case in East Polynesia.

It must be noted that while most of the following types are so far exclusive to the Archaic, some are not. These distinctions will be discussed in turn. To simplify this discussion, fishhooks from Hawai‘i and New Zealand are not included, because they
differ considerably from those of central East Polynesia. The following descriptions are those of Suggs (1961) as adapted and expanded upon by Rolett (1998). (Note: the following illustrations are modified from Rolett (1998: Figure 7.1) and are not here presented according to scale. See references for original drawings to scale and artifact provenience.)

<table>
<thead>
<tr>
<th>Hook Type:</th>
<th>Jabbing (plain)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features:</td>
<td>Straight shank, U-shaped bend, straight point</td>
</tr>
<tr>
<td>Distribution:</td>
<td>Marquesas, Societies, southern Cooks, Australs</td>
</tr>
<tr>
<td>Chronological</td>
<td>Appears in small numbers in Archaic assemblages, and dominates in Classic ones</td>
</tr>
<tr>
<td>Significance:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hook Type:</th>
<th>Jabbing (open)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features:</td>
<td>Straight shank, U-shaped bend, point angled away from shank</td>
</tr>
<tr>
<td>Distribution:</td>
<td>Marquesas</td>
</tr>
<tr>
<td>Chronological</td>
<td></td>
</tr>
<tr>
<td>Significance:</td>
<td>Appears in small numbers in Archaic assemblages, and dominates in Classic ones</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hook Type:</th>
<th>Barrel-Shank Jabbing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features:</td>
<td>Straight shank with a thick, round cross section.</td>
</tr>
<tr>
<td>Distribution:</td>
<td>Marquesas</td>
</tr>
<tr>
<td>Chronological</td>
<td>Archaic</td>
</tr>
<tr>
<td>Significance:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hook Type:</th>
<th>V-bend Jabbing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features:</td>
<td>Slightly incurved shank, V-shaped bend, outward angled point</td>
</tr>
<tr>
<td>Distribution:</td>
<td>Marquesas</td>
</tr>
<tr>
<td>Chronological</td>
<td></td>
</tr>
<tr>
<td>Significance:</td>
<td>One example in Archaic assemblage (Hanamiai, Rolett 1998:151), none in Classic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hook Type:</th>
<th>Heavy Shank Jabbing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features:</td>
<td>Large hook, wide shank and point, flat cross section.</td>
</tr>
<tr>
<td>Distribution:</td>
<td>Marquesas</td>
</tr>
<tr>
<td>Chronological</td>
<td></td>
</tr>
<tr>
<td>Significance:</td>
<td>Uncertain</td>
</tr>
</tbody>
</table>
Hook Type: **Acute Recurved Point**  
Features: Leg and shank roughly equal length, acutely incurved point  
Distribution: Marquesas, southern Cooks, Australs  
Chronological Significance: Present, with variations, throughout Archaic and Classic periods  

Hook Type: **Y-Bend**  
Features: Long, pointed extension of bend, optional inner shank barb  
Distribution: Marquesas  
Chronological Significance: Very few examples, uncertain  

Hook Type: **Wiggly Shank**  
Features: Shank has abrupt angles or irregular curves  
Distribution: Marquesas, Mangareva, Australs  
Chronological Significance: Archaic  

Hook Type: **Angular Shank**  
Features: Shank has angle or pronounced curve, slightly incurved point  
Distribution: Marquesas, southern Cooks  
Chronological Significance: Few examples, all in Archaic context  

Hook Type: **Bent Upper Shank**  
Features: Pronounced bend, straight lower shank, broad-angled or U-shaped bend  
Distribution: Marquesas  
Chronological Significance: Few examples, all in Archaic context, and might be a variation of Angular Shank variety  

Note: This hook is sold by modern fishhook manufacturers as a 60 Degree Jig Hook, because of the angle of the shaft bend  

Hook Type: **Obtuse Recurved Point**  
Features: Inwardly-angled point tip, angled or rounded bend, straight or incurved shank.  
Distribution: Marquesas, southern Cooks  
Chronological Significance: Archaic  

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Hook Type: Rotating
Features: Curved shank, circular bend, incurved leg and point
Distribution: Marquesas, Societies, southern Cooks, Australs
Chronological Significance: Archaic

Hook Type: Circular
Features: More circular than the Rotating hook, but may be part of that category
Distribution: Marquesas, Societies, southern Cooks, Australs
Chronological Significance: Archaic
Note: This form most resembles the “C” or Circle hook sold nowadays

Hook Type: Curved Shank
Features: Forward-curving shank, narrow bend, point directed back toward head
Distribution: Marquesas, Societies, southern Cooks, Australs
Chronological Significance: Archaic

Hook Type: Narrow Bend Curved Shank
Features: Narrower bend than the Curved Shank variety
Distribution: Marquesas
Chronological Significance: Uncertain, Archaic or post-Archaic
We are now in a position to examine and compare different Archaic and Classic assemblages. Figure 8.3 illustrates both a typical Archaic and Classic fishhook assemblage from the Marquesas (Hane).

![Figure 8.3. Fishhook assemblage of Hane (compiled from Sinoto 1970: Figures 1, 2, 6).](image)

What first strikes the eye is the variety of forms in the Archaic assemblage and the lack thereof in the Classic, which is exclusively made up of smaller jabbing hooks, presumably intended for inshore fishing. The presence of rotating hooks in Archaic assemblages is suggestive of an early emphasis on offshore fishing. In Classic deposits, jabbing hooks tend to dominate, implying that inshore fishes had probably become the preferred prey. Such an assemblage is typical for the Marquesas, and the fishbone assemblage from Hanamiai (Rolett 1998:177-81) supports this hypothesis that inshore fishing became more prevalent through time. In the Archaic deposits, when rotating hooks were being used, larger offshore prey were more common in the fishbone assemblage. The Marquesan Archaic was characterized not only by diverse fishhook
types, but by diverse catches as well. In contrast, in the Classic deposits, the jabbing hooks were accompanied by smaller fishes belonging to inshore families.

As the Archaic period was a time when ideas and materials were being exchanged, it should come as no surprise that so many types of fishhooks were shared throughout East Polynesia. Such is indeed the case, as Figure 8.4 shows. In this illustration, examples from throughout the central region of the Societies, Australs, southern Cooks, and Mangareva have been selected to highlight the diversity of forms, which nearly matches that found in the Marquesas.

![Figure 8.4. Archaic and Classic fishhooks from assorted central East Polynesian sites (Top Row: Aitutaki, after Allen 2002: Figure 3; Rurutu, after Vérin 1969: Figures 78, 79; Tubuai, after Buck 1938a: Figure 52; Borabora, after Sinoto 1967: Figure 7; Tahiti, after Joppien and Smith 1985-7:1.99A; Bottom Row: Aitutaki, after Allen 1992a:Pl. III, 2002: Figure 3; Ma’uke (after Walter 1998: Figures 4.2, 4.3; Tubuai, after Eddowes 1998: Figure 9; Huahine, after Sinoto 1979: Figure 4).]
The Archaic period fishhooks are mostly identical to the Marquesan examples and are easily classified according to Suggs’ system (e.g., Walter 1998). While there are some Archaic Marquesan types that have not yet been found in these areas, that is possibly due to the relatively smaller sample size when compared to Marquesan assemblages. Despite this, we can see a familiar pattern. The situation in the Marquesas has its parallel in other regions of central East Polynesia: a very diverse Archaic fishhook assemblage in which rotating varieties are well represented, and sometimes dominant, and a Classic period assemblage largely limited to jabbing forms. One must note that the Classic period assemblage from the more centrally located archipelagos is quite distinct from that of the Marquesas. Apart from the fact that many such fishhooks are made from Turbo (such as the examples illustrated from Aitutaki and Rurutu), we must draw our attention to other aspects of the fishhooks in order to perceive additional distinctions between the Archaic and Classic forms.

Sinoto (1962) and later Green (1971b) used the large collection of excavated Hawaiian fishhooks to examine change through time. The most significant trait was found to be the form of the head, to which the line was lashed. The knobbed head (see Figure 8.2), which has been reduced in such a way as to form a protrusion to which the line can be affixed, only becomes predominant in later periods. Conversely, the simple notched head exhibits the opposite tendency, tending to dominate in the Archaic strata and gradually giving way to the knobbed variety. Allen (1996) examined the knobbed head’s distribution in order to determine if the trait appeared to be a functional one, in which case it should quickly replace the older technology as superior, or a stylistic one, in which case a slower, more random trend would appear. The knobbed head type (Aitutaki
Class 613) followed the pattern of a stylistic trait, indicating that its distribution may have been due to interaction. Allen (1996:114) found that the knobbed variety appeared on Aitutaki by around A.D. 1400, and in Hawai‘i after A.D. 1350. However, Walter (1998:46) considered that head types are in fact relevant as to how the line is lashed and how the hook hangs in the water. In any case, even if the stylistic or functional aspects of the head remain questionable, there does seem to be a temporal trend from notched to knobbed forms.

The length ratio of the leg to the shank may be also be a chronological indicator, although the results are inconclusive (e.g., Allen 1996:114; Walter 1998:46).

Nevertheless, some trends do seem to occur. Among early specimens the point leg is either equal in length or slightly shorter than the shank, whereas in later ones, including ethnographic examples, the length of the point leg is more often equal to or greater than the shank (Weisler and Green 2001:422-423). This is evident in the Classic period fishhooks of the Acute Recurved Point variety illustrated in Figure 8.4.

The Peva Assemblage

Only the Peva Phase I deposit yielded any fishhooks, all of which are pearlshell, which were either imported to the island, or else the remnant of a small local supply. While Turbo setosus was abundant in the Peva Phase I midden, none of it had been cut or worked in any way. This suggests that the inhabitants of Peva did not experience a sufficient need for fishhooks either to import large quantities of pearlshell, or to resort to Turbo. This is not surprising considering the relative ease and convenience of inshore net fishing. The Peva assemblage includes only one complete acute recurved point fishhook,
one preform of this variety, one jabbing hook with a broken tip, and four nondiagnostic broken hook fragments (Figure 8.5). Overall, the Peva fishhook assemblage resembles those from the southern Cooks such as Ma’uke and Aitutaki far more than it does those of the Archaic Marquesan assemblages. This is most likely due to environmental factors, for nearly the full range of Archaic styles visible in the Marquesas have been found on Tubuai (see Eddowes 1998).

Figure 8.5. Fishhooks and fragments, Peva Phase I. a: Acute recurved point (ON1-E10-12); b: Acute recurved point preform (ON1-D12-13); c: Jabbing hook (ON1-D11-10); d-f: Non-diagnostic fragments (ON1-D13-19, ON1-C14-10, ON1-C15-12); g: Non-diagnostic shank (ON1-F12-10).

The acute recurved point is one of the most widely distributed varieties in East Polynesia, and continued to be in use for centuries, with some modifications. However, this style is rare in assemblages from the Marquesas, and usually occurs in the later deposits, when small jabbing hooks are the dominant type (e.g., Rolett 1998: Figure 7.9). Small jabbing hooks can be attached to a line and bamboo rod, and are suited to catching Serranidae, which are relatively common in the Peva fishbone assemblage (see also Walter 1998:45). The Peva example (Figure 8.5.a) shows the simple notched head type characteristic of the Archaic period. The preform (Figure 8.5.b) also suggests simple notching. Likewise, the non-diagnostic jabbing hook (Figure 8.5c) has a notched head.
The shank/point ratio (Table 8.1) for both acute recurved point examples shows a virtual one-to-one ratio, consistent with Weisler and Green's (2001:422-423) observations on Archaic fishhooks.

Table 8.1. Shank/point ratios of the two acute recurved point fishhooks (in mm).

<table>
<thead>
<tr>
<th>Fishhook specimen</th>
<th>Shank length</th>
<th>Point length</th>
<th>Width</th>
<th>Shank/point ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished</td>
<td>17</td>
<td>16</td>
<td>12</td>
<td>1.06</td>
</tr>
<tr>
<td>Preform</td>
<td>23</td>
<td>22</td>
<td>20</td>
<td>1.05</td>
</tr>
</tbody>
</table>

**Fishhook Manufacturing Tools**

*Files and Abraders*

Coral files were used for cutting and shaping fishhooks. They are made from dead, clean, bleached pebble coral found on the shore (Suggs 1961:119). The pebble is split to remove wedges, which were then abraded on stones to achieve the desired shape. While files recovered archaeologically in sites throughout East Polynesia tend to exhibit some distinct temporal patterns, the results are ambiguous. Suggs (1961:117-122) classified *Porites* coral files into five sub-types, but Sinoto (1996:137) and Rolett (1998:215-6) pointed out that such a classification is problematic because the shape of the files changes through use. Other sites exhibit different trends. In Hanamiai (Rolett 1998:27-19), sea urchin spine abraders were more common than coral files in the early layers, whereas the opposite was true in the later ones. The distribution of coral files in Archaic East Polynesian sites has been charted by Walter (1996:Table 1) and Weisler and Green (2001:427-8).
One *Porites* coral file and one branch coral (*Acropora*) file were recovered from the Archaic deposit of Peva (Figure 8.6). Using Suggs’ (1961:118) classification system, the Peva *Porites* example is of the “long triangular type” and using Sinoto’s (1996:137), it is the “Hawaiian-Marquesas Type.” Sinoto (1996:137) noted that this form was found in the earlier strata of Hane, and in the later ones changed to a non-triangular form called the “Henderson” variety. The branch coral file from Peva’s Archaic deposit is long and narrow, and tapers to a point. The use wear on one side of the tip suggests filing. One echinoderm spine abrader was recovered from the Archaic deposit as well (Figure 8.6c). Abraders made from the spine of the slate-pencil sea urchin (*Heterocentrotus mammillantus* L.) were used primarily for fishhook manufacture. The Peva specimen shows use wear on the distal end that mostly runs parallel along its length on one side, as well as some horizontal use wear along the tip on the other side. The fact that only three manufacturing tools were recovered supports the notion that fishhook making, and therefore angling, were not emphasized at Peva. The ratio of manufacturing tools to fishhooks appears to be roughly consistent from site to site. Anai’o, for example, yielded a total of 18 coral abrading tools and 41 fishhooks, for a ratio of approximately 1:2 (Walter 1998:Table 4.1). At Moturakau (Allen and Schubel 1990:277), four files were found and 19 hooks, for a ratio of around 1:4. Peva’s three files and six fishhooks give a ratio of 1:2.
Debitage

Analysis of fishhook debitage is useful in determining manufacturing techniques, which varied in East Polynesia, and has been used to trace potential relationships between island groups (Sinoto 1967). In manufacturing a fishhook, the ideal part of the pearlshell to be used is the thickest portion, which is the central area of the valve, while the thinner margins could be used for the smaller-sized hooks (Suggs 1961:85). This piece was then cut with pieces of other shell (Banks 1962:363). The exterior laminate was removed by grinding with Porites coral files or stones. Then, the external outline of the hook was chipped or cut with coral or stone saws. The rough edges were then smoothed until the outline was complete. The interior of the tab could be removed by either drilling one or
more holes and punching it out, or else by a process of filing, chipping, or notching (see Sinoto 1967:353-3). The hook could then be polished. Joseph Banks (1962:363), who watched Tahitians making them, described the whole process as taking less than fifteen minutes.

In terms of manufacturing technique, the method of removing the interior of the tab exhibits the most variety in East Polynesia. Filing and notching was common in the Marquesas, the Societies, and Hawai’i (Sinoto 1967:353; 1995:152). Fishhook blanks in the Marquesan assemblages of Ha’atuatua (Suggs 1961: Figure 26), Hane (Sinoto 1967: Figure 6) and Hanamiai (Rolett 1998: Figure 7.11) demonstrate the prevalence of this technique. Drilling was also used in the Marquesas, however, albeit scarcely. Rolett and Conte (1995:218) wrote, “Filing is not well-suited, however, to roughing out the interior contours of hooks with curved shanks. This work was apparently accomplished through drilling a series of juxtaposed holes...” (see Rolett and Conte 1995: Figure 13 for such an example). In the Peva assemblage and that of Anai’o (Walter 1998: Figures 4.5, 4.6), all the tabs are drilled. Figure 8.7 illustrates the pieces of cut shell debitage from Peva’s Archaic deposit. There are two hook tabs with drilling (Figure 8.7.a-b), as well as two additional fragments with drilling marks (Figure 8.7.c-d). These, as well as the unfinished acute recurved point fishhook (Figure 8.5.b), indicate that drilling was the prevalent method used. In addition, two hook tabs were found (Figure 8.7.e-f), 12 pieces of pearlshell debitage that exhibit signs of sawing, and two pieces of cut shell of a different variety (probably Isognomon).
Figure 8.7. Fishhook manufacturing debitage, Peva Phase I. a-b: Broken and drilled hook tabs (ON1-D14-10, ON1-C14-12); c-d: Drilled pieces (ON1-D15-20, ON1-E14-17); e-f: Fishhook tabs (ON1-D14-12, ON1-B15-5); g-m: Cut pearlshell (ON1-E15-9, ON1-D13-13, ON1-F10-9, ON1-C12-10, ON1-G14-11, ON1-G15-8, ON1-D11-9); n-o: Cut shell, probably Isognomon (ON1-E11-11, ON1-B13-15).
Sinkers

One grooved stone sinker (Figure 8.8.a) was recovered from the Archaic deposit, from a test pit (Y6/7). The coral example (Figure 8.8.b) is a surface find from Peva and thus most likely from the Classic period or after. A similar transition for the use of stone to coral as a raw material is also seen in poi pounders (see Chapter 10). Weights such as the stone example here were probably used to hold a canoe stationary outside the fringing reef, while the men inside it angled.

Figure 8.8. a: Stone sinker, Peva Phase I (ON1-Y6-1); b: Coral sinker, Peva surface find.
Discussion

Peva’s emphasis upon inshore fishing, primarily net fishing, is evident in both the fishbone assemblage and the artifact assemblage. The fishbone assemblage from Peva’s Archaic deposit suggests that offshore fishing, for large benthic and pelagic species, was not practiced often. Fishes such as tuna (Scombridae) that are often caught with trolling lures, constitute a very small percentage of the fishbone. The lack of trolling lures in the artifact assemblage is additional evidence that this activity was not common. The inhabitants of Rurutu during the Archaic period were most likely aware of the variety of fishhooks that existed on other islands in central East Polynesia. For example, neighboring Tubuai (Eddowes 1998) possessed not only a lagoon with a pearlshell population, but the full variety of Archaic style fishhooks as well. The Peva stone tool assemblage (Chapter 9) indicates that Rurutu possessed a most of the Archaic adze forms. The lack of a comparably diverse fishhook assemblage most likely reflects a conscious choice, and not a type of “founder effect” through which only a small sample was transmitted. My interpretation is that the inhabitants of Peva were fully aware of the most advantageous fishing strategies regarding the fringing reef, of which angling would have been a very small component. The dominance of Scaridae in the fishbone assemblage reflects an emphasis on net fishing, spearing, poisoning, and other techniques, as these fishes generally do not take hooks and are mostly caught by other means. Serranidae, most of which are medium and small specimens in the Peva assemblage, could have been angled or trapped in nets. The Anai’o site on Ma’uke (Walter 1998) exhibits a different trend. There, as discussed in Chapter 7, the reef flat is
too shallow to make fishing for Scaridae advantageous. However, angling for Serranidae is evident not only in the dominance of those fishes in the faunal assemblage but in the abundance and variety of fishing gear recovered compared to Peva. Fishing on Rurutu probably did not change much through time, as the fishbone assemblages from both Peva and Vitaria have indicated. Similarly, the fishhook assemblage from Vitaria (Vérin 1969) is composed primarily of small jabbing hooks, suitable for catching inshore fishes. Overall, Rurutu represents a very early adaptation to particular environmental conditions that made the maintenance of the full variety of Archaic fishhook forms unnecessary.
Chapter 9. Adzes and Stone Tools

The artifact assemblage of Peva is overwhelmingly dominated by lithics, including adzes, preforms, and other stone tools. Over 2000 flakes were recovered from the Peva Phase I deposit, and this, in conjunction with the amount of adzes in various stages of manufacture, strongly supports my interpretation of the site as one in which adze making was a primary activity during the Archaic period. This is especially useful, because it allows us to see which of the Archaic adze forms were being manufactured on Rurutu. As we have seen in the fishhook assemblage, most of the diagnostic Archaic forms were dropped from Peva’s artifact inventory already by the 14th century A.D. In the previous chapter, I have argued that this was primarily due to the presence of Rurutu’s encircling fringing reef and the consequent ease of inshore net fishing as opposed to angling. In contrast, Peva’s Archaic adze assemblage exhibits nearly the full array of diagnostic Archaic forms, which in turn supports the notion that the Australs were in communication with other island groups, and that the absence of many fishhook types in Peva was not accidental. The Classic period Phase II deposit, associated with the marae, yielded far fewer flakes, less than 300, and only a handful of stone tools. This is not surprising, considering the ceremonial nature of the site, on which tool making was probably not a major activity. However, the Classic period assemblage is supplemented by surface finds from Peva and thus permits us to reconstruct the sequence of adze typology as it applies to Rurutu in particular, and to central East Polynesia in general.
The Polynesian Adze

Adzes are among the most distinctive Polynesian artifacts. They were the primarily woodworking tools, and came in wide variety of distinctive shapes and sizes. While mainly utilitarian, adzes could also be prestige or ritual items, important in exchange. As personal tools, adzes were possessors of mana, and therefore magical items of power. In additional to personal ornaments, adzes have been found as burial goods in Wairau Bar, New Zealand (Duff 1956), and Maupiti in the Societies (Emory and Sinoto 1964), which leaves their place in spiritual life beyond doubt. For archaeologists, adzes constitute the single most important tool in terms of Polynesian material culture. In the absence of pottery, adzes are the closest thing that can be classified to reveal patterns of change through space and time. The basic migration routes that adze typology helped to establish is still adhered to in its fundamental outlines (e.g., Kirch 2000:245). Adze morphology is therefore a very important tool for understanding relationships between island groups.

In order to place the following discussion on the proper footing, it must first be admitted that very little can be said for certain about the function and manner of different types of adzes, although experimentation (e.g., Best 1977) has offered some intriguing possibilities for future study. The missionary John Davies’ (Davies and Darling 1851:277-8) Tahitian-English dictionary lists the following types of to'i (his spellings follow): toimato - stone adze, a felling adze; toipauru - an adze that “stands ill on its helve (handle)”; toipeue - a broad carpenter’s adze; toiraufaino an adze “mentioned in the legend of Hiro”; and toitama - a finishing adze, used for clearing, cleansing and finishing the work. For the southern Cooks, Buck (1944:381) listed the terms toki tamaki (war
adze), *toki kai’kaa* (weapon adze), and *toki-a-Rori* (adze-of-Rori, which was the name of a skilled carver). There were also adzes for ceremonial use that were hafted to highly decorated handles and pedestals, which were used in a variety of ceremonies, such as peacemaking (Buck 1944:379-387). Adzes also featured in legends, and often bore their own personal names (Buck 1944:444). It is likely that there were many other varieties of adzes throughout East Polynesia, but these sample terms indicate that how Polynesians thought of adzes is very different from how archaeologists do. How exactly an adze was made is also uncertain, although there are good explanations gleaned from observation and inquiry (Stokes 1930:130-159), and analysis of adze blanks, preforms, and debitage (e.g., Suggs 1961; Leach 1981; Leach and Leach 1980). We must accept that there is much we do not understand regarding function, mechanics, and stylistic choices. With this in mind, the adze remains the most important Polynesian item of material culture we possess and a vital clue towards understanding relationships between areas. In the past decade the geochemical sourcing of adzes has given archaeologists empirical proof of exchange (e.g., Weisler 1997), while classifying the stylistic differences has been a subject of research for far longer.

*Adze Classification Systems*

While the need to examine and classify adzes is almost universally recognized, the establishment of a single system that all researchers are content with has been problematic. The groundwork for adze terminology was set forth early in the 20th century (Buck et al. 1930). For West Polynesia, the dominant system still in use is Buck’s (1930) Samoan adze classification, later modified and expanded by Green and Davidson (1969). In order to examine wider Polynesian trends, Duff (1959) established a system for all
East Polynesian types based on Skinner’s (1938) typology of New Zealand examples. Some researchers, however, felt that local variation was too great to utilize such a universal system. For example, Suggs (1961) did not find Duff’s system suitable for Marquesan adzes and employed a specific Marquesan system with Marquesan terminology (see also Linton 1923, 1925). In terms of classifying Marquesan adzes, Suggs’ terminology remains very useful and is still employed (e.g., Rolett 1998). Emory (1968) developed a different classification system based on the cross section, and came to many of the conclusions that Duff had regarding trends through time. Notwithstanding, local systems were still being experimented with and Sinoto and McCoy (1975) used an entirely new classification for the adzes found in Fa’ahia/Vaito’otia. This serves to give a general overview of the confusion that can arise when comparing adzes from one site to another. Nowadays, researchers generally employ a combination of systems, often giving the Duff type when applicable. Because two systems rarely correspond one-to-one, determining what kind of adze is being discussed in a particular reference can be very difficult, especially when it is not illustrated. For example, the Duff Type 4 is a reverse triangular adze. In Emory’s terminology, the same sort of adze can be called triangular (not reverse triangular), subtriangular, or possibly even quadrangular, depending upon the acuteness of the angles.

In Duff’s system the larger amount of specific types has the advantage of immediately allowing one to identify and envision the specific kind of adze mentioned in most cases. For this reason I have chosen to use Duff’s system. Many of Duff’s types are actually very localized forms, such as Type IE, peculiar to Rapa (Duff 1956: Figure 34), and several others that are specific to New Zealand. Emory’s (1968:153) objection 264
to Duff's system was that it "has the disadvantage of not conveying an idea of the form of the adz, and if the numbered types are numerous, or differ for different areas, or are revised, the burden of remembering to what forms they refer is greatly increased." As to the first point, while a number/letter system does not express the form, a basic familiarity with the types easily overcomes this drawback. While there are many Duff types, few are encountered regularly, and at no single site are all types ever present. While it is certainly true that there is local variation, it is rarely drastic enough to make classifying the adze into one of the basic six categories problematic. Finally, Duff's system has not been revised in almost half a century, since Figueroa and Sanchez (1965) added a handful of new sub-types.

In examining the Archaic kit of East Polynesia, we are simply attempting to determine which adze forms were most commonly in use, and which were not so. Emory and Duff were with both concerned with identifying a specific region in East Polynesia as a dispersal center for migrations, as well as along what routes colonization of other regions followed, and when. They used adze typology as a means of establishing the outlines of these dispersals, and despite their different classification systems, came to many of the same conclusions. Research nowadays, primarily into exchange and the regional homeland, has confirmed empirically that there was long distance interaction during the Archaic period. The idea of a specific dispersal center, be it the Societies or the Marquesas, has therefore been replaced by the idea of multiple interacting archipelagos, which maintained cultural similarity through contact, hence the regional homeland. This relatively new vision of the Archaic period perfectly complements the conclusions that have already been drawn by examining the similarities in material
culture. In this section I shall describe the Archaic adze types that we are concerned with in order to define the Archaic period as one of frequent interaction, with shared innovations. Following this, I shall discuss the principal development that marked the change between the Archaic and the Classic periods.

Adze Terminology

The terminology used here to describe an adze follows that of Duff (1956:146), in conjunction with the illustrations in Figure 9.1:

The adze is described from the point of view of an observer holding at arm’s length a hafted adze, with cutting edge downwards and haft pointing away from him. The surface immediately under his gaze is the ‘face’ or ‘front’, the opposite surface carrying the bevel, is the ‘back’ or ‘base’, the ‘sides’ are surfaces connecting the two. The ‘face’ of the adze is further divided into two regions, the upper end, concealed by the lashing, is called the ‘butt’, the lower portion visible the ‘blade’. The end surface of the ‘butt’ is termed the ‘poll’. When the lashing is removed it is seen that the ‘butt’ is often converted into a lashing ‘grip’ or ‘tang’ by the reduction of its upper and lateral surfaces below the plane of the ‘blade’ and ‘sides’. (1956:146)

The adzes are here illustrated from three views, going from left to right: first the front of the adze followed by the cross section, then the adze is rolled onto the left side, and finally onto its back.
Figure 9.1. Adze terminology (adapted from Figueroa and Sanchez 1965: Figure 44; Bayman 2003: Figure 7.3).
The East Polynesian Archaic Adze Kit

The principal characteristics used to define an adze are the presence or absence of a tang, the cross section, and the orientation of the cutting edge. The Polynesian adze kit appears to have developed from an earlier Lapita tradition in island Melanesia (Green 1974:264), and developed its own distinctive character once West Polynesia was settled. Quadrangular and reverse triangular cross sections (apex up) were added to the convex Melanesian types. The West Polynesian adze kit remained remarkably conservative over the past 2000 years, changing relatively little. In contrast, the East Polynesian adze kit was remarkably innovative. As Green (1974:265) noted, Polynesian adzes followed a pattern very similar to that of Polynesian languages, among which East Polynesian subgroups were far more innovative than their West Polynesian ancestors. From the available evidence, the East Polynesian adze kit has its roots in that of 2nd-3rd century A.D. Samoa (Green 1974:265). Basic untanged adzes with a reverse triangular cross section (apex up) are one of the oldest Polynesian forms, preceding the cultural differentiation between West and East Polynesia. Once in East Polynesia, three basic innovations took place: 1.) the development of the triangular cross section (apex down); 2.) the development of a much thicker-bodied quadrangular form; and 3.) the development of a wide variety of grip modifications (tangs) for lashing (Green 1971:36; 1974:265). Interestingly, apex-down cross sections are also present in Southeast Asian adze types, a fact that led Duff (1970) to conclude that the East Polynesian types were ultimately influenced by Southeast Asia. This hypothesis is now largely dismissed as unnecessary, and independent innovation is favored instead (e.g., Green 1974).
The following descriptions are intended as a guide toward interpreting the context of Peva’s Archaic adze assemblage. While not all Archaic adze types are present, the most common ones are, and this discussion focuses on these. For fuller and more detailed descriptions of adze types the reader is referred to Duff (1956, 1970). The adzes are here described as follows: first, a general overview of the Duff Type (number), followed by a more detailed description and discussion of the sub-types present in the Peva assemblage. Each of these is accompanied by a diagram of a complete ‘archetypal’ example, and finally the Peva specimens are illustrated and discussed.

Type 1: Tanged Quadrangular Adzes

The Duff Type 1 adze is characterized by a roughly quadrangular cross section and a tang. The presence of a tang is the main characteristic that distinguishes Type 1 adzes from Type 2. Only one variety of Type 1 is without a tang, Type 1F, also known in Marquesan terminology as a’a (Duff 1959:131). Only one variety of Type 1 adzes is present in the Peva assemblage, Type 1A.
Figure 9.2. Type 1A with lugs (modified from Duff 1974: Figure 59).
Type 1A is a quadrangular tanged adze (Figure 9.2), and the most important of the “Moa-hunter” forms (Duff 1956:146). The tang is produced by the reduction of the front. 1As are normally large, and come in two varieties, one with a plain tang and one with raised poll lugs. The lugs provide an extra grip for lashing, and are a specialized form. Duff (1959:129) wrote, “Although the variety is rare in the Society Islands its distribution suggests that it originated there and was dispersed along two main routes:-

(i) Through Australs to Ra’ivavae and Rapa.

(ii) Through Lower (Southern) Cooks to Northern Cooks, New Zealand and Chathams.”

The basic Type 1A form occurs throughout East Polynesia and was a long lasting form. However, it has no equivalent in West Polynesia (Green 1971:34). The lugged variety appears to have a more limited distribution, occurring from a hypothetical dispersal point in the Societies into the Australs, the Cooks, the South Island of New Zealand, and the Chathams. Duff (1956:151) hypothesized that the lugged variety was brought by the earlier colonizers of New Zealand to the South Island, where it had more time to establish itself as a type before moving on to the North Island, where the variety without lugs dominates.

Type 1A is the predominant Hawaiian form (Duff 1956:155) and is so prevalent that Linton (1923) classified it as the “Hawaiian” type. This is in accord with the settlement of Hawai‘i taking place during the Archaic period, before other, later types became fashionable in central East Polynesia. Type 2A and Type 4A adzes are also present in Hawaiian assemblages (see Kirch 1985: Figures 46, 58), but it is Type 1A that
persisted as the dominant form throughout prehistory into the Classic period, being widely distributed throughout central East Polynesia. Type 1A’s presence as far as the atoll of Rakahanga in the northern Cooks (Buck 1932:141) suggests that its widespread presence was probably due to long-distance trade. A specimen without lugs was found on the surface in Mangareva, and its geochemical signature revealed it to be from the Societies (Weisler and Green 2002:419). Examples of this adze type were also collected in the Tuamotus (Emory 1975), which also probably originated in the Societies. Seabrook collected an example of a Type 1A on the uninhabited Austral atoll of Maria, which he later gave to Donald Marshall, who deposited it in the Peabody Essex Museum (Marshall 1954).

Figure 9.3. Butt of Duff Type 1A adze with lugs on poll, Peva Phase I (ON1-G10-2).
The Peva example (Figure 9.3) is the butt end of a Type 1A with clearly visible lugs. It is the only specimen of its kind in the assemblage, and has been pecked. This adze is one of the examples that geochemical sourcing (discussed below) has determined to be of local origin, so it is evident that the Rurutuan craftsmen of the Archaic period were completely familiar with this adze type.

*Type 2: Untanged Quadrangular Adzes*

In Duff's system, Type 2 adzes are described as untanged, with a quadrangular cross section, and a front equal to or wider than the back. Type 2 adzes are the ones that most closely resemble West Polynesian varieties. These adzes encompass a wide range of variability, including Archaic plano-convex forms (typically classified as Type 2B). The distribution of this simple adze type is universal. Type 2 adzes are the most prevalent variety in Archaic East Polynesian and West Polynesian sites. The Peva assemblage contains two varieties of Type 2 adzes: Type 2A, and Type 2C.
Type 2A is an untanged quadrangular adze with a front that is wider than the back (Figure 9.4). Figueroa and Sanchez (1965:171) wrote, “The front is rarely equal to and usually wider than the back, and the cross section, usually quadrangular, it occasionally irregular or sub-triangular.” Type 2A also tends to be thin between the front and back (Duff 1956:161), and this small size prevents it from having a tang. Type 2A comprises the most numerous single group at Wairau Bar (Duff 1956:161), and is very common in assemblages throughout East Polynesia. Duff (1959:151) considered this type to predate the more specialized Type 1A. He (1956:163) speculated as to the relationship between Type 2A and 1A: “It is an open question whether to regard 2A as the prototype of 1A, the
type from which the latter evolved or developed, or whether to regard it as the logical
degeneration from 1A when the latter became too small.” Type 2A corresponds to the
West Polynesian Samoan Type 4a (Buck 1930:345). Into the Type 2A category must be
placed the Marquesan quadrangular adze type that Suggs (1961:107) termed Mouaka (see
Rolett 1993:Table 3). Green (1971:30) noted that Type 2A occurs in Lapita contexts
bordering Polynesia between 500 and 1000 B.C., and then in later Tongan and Samoan
assemblages. In West Polynesia it was not numerically important until it reached East
Polynesia. Green was of the opinion that this type, together with Type 2C (see below)
were components of the East Polynesian ancestral adze kit.

Peva Archaic assemblage contains 25 examples of adzes, mostly broken preforms,
that can only be classified as Type 2s, because they are too thin to accept a tang, and are
most likely 2As (Figures 9.5-9.12). The only whole and finished example (Figure 9.12.b)
is from Peva’s Classic deposit, which contains an additional preform fragment (Figure
9.12.a). In addition, two refurbished adzes with traces of the original polished surface
were recovered from Peva’s Archaic deposit (Figure 9.13). Although the original type
cannot be determined with certainty, the size and shape of the cross sections suggest that
they were originally Type 2 adzes. Type 2A is unquestionably the most prevalent adze
type in the Peva assemblage, thus conforming to patterns seen throughout Archaic East
Polynesian sites. The Type 2A, probably because of its unspecialized nature, remained in
use into the Classic period. Vérin (1969:177) also found two fragments of Type 2 adzes
on Rurutu. Additional non-diagnostic preform fragments from Peva that might also have
been intended for 2As are illustrated in Figure 9.14.
Figure 9.5. Type 2A adze preforms, Peva Phase I (a: ON1-F14-11; b: ON1-E11-7; c: ON1-M7-1).
Figure 9.6. Type 2A adze fragments and preform fragments, Peva Phase 1. a-b: Finished (polished) adze fragments (ONI-B13-8, ONI-D13-15); c-d: Broken preforms (ONI-E15-9, ONI-E10-9).
Figure 9.7. Type 2A preforms, Peva Phase 1 (a: ON1-E11-4; b: ON1-G12-12; c: ON1-B15-2).
Figure 9.8. Type 2A preforms, Peva Phase I (a: ON1-D15-5; b: ON1-G14-6).
Figure 9.9. Type 2A preform butt fragments, Peva Phase 1 (a: ON1-F14-14; b: ON1-D15-2; c: ON1-D10-1; d: ON1-C15-1).
Figure 9.10. Possible Type 2A preform fragments, middle section, Peva Phase I (a: ON1-E12-11; b: ON1-F12-22; c: ON1-F13-4; d: ON1-D11-6a; e: ON1-D13-16).
Figure 9.11. Probable Type 2A adze preform fragments, Peva Phase I (a: ON1-M8-1; b: ON1-G12-3; c: ON1-B13-17; d: ON1-C15-13).
Figure 9.12. Type 2A adzes, Peva Phase II. a: adze preform fragment (ON1-E15-21); b: complete Type 2A adze (ON1-A15-1).
Figure 9.13. Refurbished adzes with traces of polish, Peva Phase I (a: ON1-M5-1; b: ON1-D10-3).
Figure 9.14. Non-diagnostic adze preform fragments, Peva Phase I (a: ON1-E15-13; b: ON1-A15-73; c: ON1-B13-16; d: ON1-D13-5; e: D13-4).
Figure 9.15. Type 2C (modified from Duff 1959: Figure 3).

Type 2C (Figure 9.15) is an untanged quadrangular adze with a back that is wider than the front, the reverse of Type 2A. This adze type is significant when it occurs in East Polynesia because it is one of the most prevalent varieties found in West Polynesia, known as the Buck Samoan Type I (Buck 1930:348), later subdivided into Types I and IX (Green and Davidson 1969). Green (1971:28) noted that it is the most common Samoan form, occurring most prominently in the later part of the sequence, flourishing from around 100 B.C. to 300 A.D. Its origins are far more ancient, however, occurring in Fijian Lapita contexts around 1000 B.C. and in other Austronesian pottery contexts along the coast of New Guinea (for its distribution in East and West Polynesia see Green 1971: Figure 2). Duff (1956:168) stated, "It is well called the Samoan Type, because it comprises over ninety per cent of all adzes recorded from Samoa, and is found in a range
of groups peripheral to Samoa, spread by a not very ancient diffusion to islands, many of which are without native stone.” At the time of Duff’s writing, this adze form was virtually unknown in East Polynesian collections (mostly museum ones) except from New Zealand (South Island), and Pitcairn. Duff (1956:168) speculated upon the development of this adze type, which has further consequences on the development of Type 4 adzes (below):

The important point is not that it is rare in these marginal Eastern Polynesian areas, but that it is found at all. The great range of adze varieties in marginal outposts reminds us that at its earliest point Polynesian adze culture comprised a variety of types, most of which managed to reach remote areas such as Pitcairn and New Zealand, but of which only one was arbitrarily chosen in each center of modification, and elaborated to the exclusion of all others. The development of Variety C in Samoa illustrates the point. To craftsmen making a variety of adzes of quadrangular section, it was a natural variation to shape certain blades in such a fashion that the back was wider than the front. The cross-section thus became sub-rectangular, from the deliberate reduction of the sides to slope inwards from a broad base to a narrower face. The purpose would be to decrease the width of the blade, but to increase its entering capacity. This description represents in fact Variety C. By further increasing the depth of the blade, and thus decreasing the width of the face, the result would be the ‘hog-back’, Type 4 (see below), largely favored in Eastern and particularly in marginal groups. Variety C on the other hand ‘took on’ at an early period in Samoa, and gradually spread from there to influence most accessible neighboring groups...The age of the variety may be
inferred indirectly from its presence in such remote eastern outposts as New Zealand and Pitcairn, and in New Zealand from its presence at Wairau. (1956:168)

Only one example of a Type 2C adze was recovered from Peva’s Archaic deposit, a beautiful finished and unbroken specimen (Figure 9.16). It is worth noting that this was the first artifact recovered in the excavation, and was found in Area 1. Two examples of Type 2Cs were also recovered from Moturakau on Aitutaki in the southern Cooks, dating from the late-13th to the mid-15th centuries A.D. (Allen 1992b:299-300), and contemporaneous with Peva Phase I. Allen (1992b:300) wrote that the specimens, “suggest potential interaction between the southern Cook Islands and Samoa. Notably, the two Moturakau specimens appear to be non-local basalt(s).” Because the Peva specimen is small and in such pristine condition, I opted not to perform WD-XRF (destructive) geochemical analysis on it. The stone however, does not appear (at sight) different from local varieties in terms of color and grain.
Figure 9.16. Type 2C adze, Peva Phase I (ON1-L5-1).
**Type 4: Reverse Triangular Adzes**

In a reverse triangular adze the *front* of the adze culminates in a cutting edge. That is, when holding the hafted adze handle-up the apex is pointing upwards. The edge can be sharp or slightly rounded. Type 4 encompasses both tanged and untanged varieties. The triangular adze appears to be a Polynesian innovation, originating in West Polynesia (Green 1971:31-2; 1974:261). Type 4 adzes are relatively common in Archaic East Polynesian assemblages. They are well adapted for hollowing out a canoe (Best 1977), and continued to be in use into the Classic period, albeit in a slightly modified form. The Peva Phase I assemblage contains two varieties of Type 4 adzes, Type 4A, and Type 4E, as well as nondiagnostic Type 4 specimens.
Figure 9.17. Type 4A (after Duff 1974: Figure 57).
Type 4A is a reverse triangular tanged adze (Figure 9.17). They are usually thick and the cross section can vary to trapezoidal (Figueroa and Sanchez 1965:171). This type of adze is typically regarded as an East Polynesian invention, but reverse triangular adzes with distinctly reduced butts, i.e., tangs, are known from Samoa (e.g., Kikuchi 1963: Figure 48), Fiji (Green 1971:37), and Tonga (Poulsen 1968:87). As we began to see earlier, Duff (1956:168) hypothesized that the Type 4 adze was a development from the Samoan Type 2C:

The genesis of this type has been referred to in discussing Type 2, Variety C, where variation on the theme of the normal quadrangular adze produced the narrow-fronted ‘Samoan’ adze, with sub-rectangular section. By pursuing this modification to its extreme, that is by increasing the slope and height of the sides, so that the front became virtually a ridge, terminating in the narrowest cutting edge, Type 4 was produced. The functional object would be to decrease the width of the cutting edge, but to increase its entering power. Popularly known as ‘hog-backed’ the type is widely spread in Polynesia and reflects obviously a specialized purpose, although its distribution cannot be explained in terms of that purpose. (1956:177-8)

Type 4 adzes are one of the three (1A, 2A, 4A) most prevalent groups in “Moa-hunter” (i.e., Archaic) deposits, second only to 2A (Duff 1956:180). Type 4A is the characteristic New Zealand form, and is typically a large adze. This adze type is common throughout East Polynesia, and is equivalent to the Koma adze in the Marquesan typology (Suggs 1961). The Peva Archaic example (Figure 9.18) is a broken butt fragment. The surface is ground, and the stone is a fine-grained black basalt. WD-XRF
sourcing (discussed below) has revealed it to be of local Rurutuan origin. Figure 9.19 is a preform of a Type 4A blade that most likely broke when the tang was being fashioned. Figure 9.20.a might also be the blade of a Type 4A preform that had broken then, and Figure 9.20.b is possibly the broken tanged end of a Type 4A.

Figure 9.18. Butt fragment of Duff Type 4A adze, Peva Phase I (ON1-D12-1).

Figure 9.19. Type 4 adze preform, possibly intended to be a 4E, or else the blade of a 4A, Peva Phase I (ON1-F10-6).
Figure 9.20. Broken Type 4 adzes, Peva Phase I. a: Reassembled blade portion (top half ON1-F12-2, bottom half ON1-G10-6); b-c: Preforms, possibly Type 4A tangs (ON1-C12-20, ON1-F14-14).
Figure 9.21. Type 4E (after Duff 1959: Figure 6).
Type 4E is an untanged reverse triangular adze (Figure 9.21), and is distinguished from Type 4A by the absence of a tang. Duff (1968:125) assigned Type 4E to the Archaic period, which he called “Proto-East Polynesian” and representative of “one of the oldest Polynesian cultural traits” based on its distribution and its resemblance to Samoan adzes, and known as the Buck Samoan Type VII (Buck 1930: 351). This variety begins in Samoan contexts slightly later than Type 2C, and is contemporaneous with it from around 0 A.D. to 300 (Green 1971: Figure 2). Duff (1959:137) believed that 4E was second in age only to Type 2, and a “Polynesian elaboration on an ancestral theme, diffused through the Society Islands.” Green (1971:31) noted that while some examples are found in Fiji, the adze was probably a result of interaction and exchange from Samoa. Green (1971:32) considered it likely that Type 4E was a Samoan innovation, to which the tang was later added, thus forming the Type 4A. One Peva Phase I example is a preform that matches the Type 4E admirably (Figure 9.22).
The Transition to Classic Period Adze Forms

As the discussion above has demonstrated, the Archaic East Polynesian adze kit was a diverse one, whose roots in West Polynesian examples are often quite clear. The connection between West and East Polynesian adze varieties is thus far more visible than between artifacts such as fishhooks, as noted in Chapter 8. As during the Archaic period interaction was occurring between island groups, the majority of Archaic adze types spread throughout East Polynesia, as was the case with fishhook types. With the post-A.D. 1450 decline in communication, variety decreased dramatically, culminating in the use of far fewer fishhook and adze types. The Classic period forms that were prevalent in the more remote areas of Polynesia such as New Zealand, the Marquesas, and Hawai‘i,
naturally differed from those in the epicenter of the Societies, Australs, and southern Cooks. For example, in New Zealand the prevalent Classic period adze type is 2B, in Hawai‘i 1A, and in the Marquesas 4A or Koma. In the epicenter, however, where communication was still occurring following the end of the Archaic period, one adze type superceded all others. While the Archaic types 1A, 2A, and 4A were still being manufactured, they occur in far smaller percentages in Classic period collections, while the overwhelmingly predominant adze form is the triangular Type 3.

*Type 3: Triangular Adzes*

The back, not the front, constitutes the cutting edge in a triangular adze, the opposite of Type 4s. The angles are sharply defined on Type 3s and the adzes are generally thick. This type is heavily represented around the Societies, but less so in the peripheral areas such as Hawai‘i, New Zealand, and Pitcairn. Duff (1959:143) attributed this to the Type 3 being a more recent development that failed to reach the marginal areas. Some of the earliest documented examples of incipiently-tanged Type 3 adzes in East Polynesia come from the Archaic site of Maupiti (Emory and Sinoto 1964:156). Duff (1956:170) saw the development of the triangular adze as a “natural transition from adzes of quadrangular section (Type 1). Thus in most Polynesian quadrangular adzes, the front is wider than the back, the sides sloping downwards and inwards toward the base. Increase this tendency so that the back becomes narrower and narrower, finally a median ridge formed by the sides meeting, and the result is the adze of triangular section, apex downwards. This is the type par excellence of the Society, Cook, and upper Austral Islands, and its emergence may be regarded as the last great fashion change of adzes that took place in Polynesia.” Of the Maupiti specimens Emory and Sinoto (1964:156) wrote,
“These appear among the archaic adzes of Wairau. A few occur in Hawaii but with a more marked tang, indicating a later phase. This form would seem to be the precursor of the most common Tahitian adze form, which is definitely triangular in cross-section and has a well-defined tang.” The Classic deposit of Peva contained few artifacts, and only one poor example of a Type 3A adze. Surface finds from Peva, however, contain more examples, and its prevalence in the Vitaria assemblage (Vérim 1969) makes a discussion of this adze type necessary.
Figure 9.23. Type 3A (after Duff 1974: Figure 66).
Type 3A is a tanged adze with a triangular cross section, apex down (Figure 9.23). The butt is reduced on the back and sides to produce the tang. It must be again noted that 3A had its origins in the Archaic period, as an example from the Maupiti burials demonstrates (Emory and Sinoto 1964; Emory 1969). The fact that it reached New Zealand, albeit in small quantities, indicates that its roots can be traced back to the Archaic period, when it was still a new form (Duff 1956:140-1, 170). This suggests that New Zealand was settled before Type 3A adzes had achieved their later popularity in the epicenter of the Societies, Australs, and southern Cooks. Type 3A never reached Easter Island, possibly before this adze type was even developed. Type 3A was most popular in central East Polynesia, namely the Societies, Australs, southern Cooks, and Tuamotus (Duff 1959:131). Type 3A constituted approximately 50% of the surface collections from Maupiti. In the southern Cooks, Type 3 adzes constituted over 90% of the collection in the Bishop Museum (Buck 1944:135-176) and were the standard type there (Buck 1927; Duff 1968). Type 3 adzes also constituted the majority for Tubuai (Stokes 1930a). Type 3A was likely imported ready-made into the Tuamotus (Emory 1975). The Peva examples of 3A are all surface finds. Duff (1959:135) observed that in the areas that had the triangular adze, Type 2A became increasingly scarce and he hypothesized that the triangular form rapidly replaced it. There appears to be additional variation in the Type 3A itself. Stokes (1930a:154) found that the examples from the Australs west of Tubuai resemble those of the southern Cooks more than those of the Societies, whereas the adzes of Ra’ivavae inclined toward the varieties found in the Societies. Type 3As from the Societies tend to have sharper angles and flatter plane faces than those of the Cooks, whose angles are less defined and whose plane faces are more convex. Duff
(1969:128) wrote that 3A seems to stray more and more from the Cook island standard as one moved east through the Australs, until its non-occurrence in Rapa to the south.

Duff's (1956) hypothesis regarding the development of the Type 3A adze from the ancestral Type 1A is well illustrated in Figure 9.24. This adze, which was collected in the Tuamotus, is almost a cross between a Type 1A and a Type 3A, with a cross section that is tending strongly toward a triangular shape.
Figure 9.24. Modified Type 1A adze from Nukutavake, Tuamotus (adapted from Emory 1975: Figure 85.a).
Figure 9.24 illustrates selected surface finds from Peva that Pierre Atai, the landowner of Peva Rahi, has collected over the years. They can serve as representative examples of this Classic period adze, and can be compared with the examples illustrated in Vérin (1969). Figure 9.25.c is an unclassified Type 3 adze, similar to a specimen from Ra’ivavae illustrated in Figueroa and Sanchez (1965: Figure 68.b). Figure 9.26 illustrates the Type 3A adze preform recovered from the Peva Phase II deposit. As can be seen, it is very crude and rather small, but still retains the basic characteristics of the type.
Figure 9.25. Type 3 adzes from Peva Surface collection. a-b: Type 3A; c: Unclassified Type 3.
Discussion of Adze Types

The Archaic East Polynesian adze kit tends to resemble West Polynesian assemblages in that untanged Type 2 adzes dominate. Type 2A, rather than the Samoan Type 2C, is most prominent in Archaic East Polynesian assemblages. The reverse triangular Type 4A adze, whose origins in West Polynesia are clear, achieved prominence and perfection in East Polynesia. In contrast, the tanged quadrangular Type 1 adzes appear to have developed only once East Polynesia was settled. It is possible that the tang was first applied to the reverse triangular adze, and then later adapted to quadrangular adzes. The tang appears to have been an experiment of sorts in West Polynesia, sporadically attempted, and one which never achieved prominence. The deliberate reduction of the butt to facilitate lashing seems to have been aimed only at the
Type 4A variety. There is no evidence for sustained development of the tang, and its abandonment in West Polynesia may have been due to the difficulty of creating it. Suggs (1961:113) discussed this in terms of the production of Type 4A Koma adzes: “that this step demanded an excellent control of both tools and material is attested by the fact that almost all incomplete adzes of this type had been broken at this point in the process of manufacture. The reduction of the front was achieved by flaking directed from both sides at an angle oblique to the long axis of the adze. A slight miscalculation of strength was enough to crack the adze blank cleanly through the body.”

Duff (1956:144) hypothesized a basic diffusion of the Archaic adze types from the Societies during early settlement. Nowadays continued interaction is favored over simple diffusion to explain the similarity of material culture throughout Archaic East Polynesia. The distribution of these distinctive adze forms are informative in this respect. The three predominant Archaic New Zealand types are 2A, 4A, and 1A (in order of frequency), while during the Classic period it was the untanged, simple Type 2B (rounded and thicker than Type 2A). Easter Island’s Classic forms are all untanged variations of Types 2, 3, and 4, with 2A being the most prominent (Figueroa and Sanchez 1965:177). Type 2A’s Classic period distribution appears to have grown out of the Archaic East Polynesian adze tradition before Type 3A came into prominence in the epicenter. While a true tang is absent in Easter Island examples, some specimens have a groove at one end which would served the same purpose. Hawai‘i was settled with a fully-developed tanged quadrangular form (1A). In the Marquesas, Type 4A (or Koma) became the most common adze type in the Classic period: “Adzes of other types seldom occur at the later sites, especially in the Classic period architectural complexes” (Suggs 307
1961:111). Suggs (1961:112) attributed its rise in popularity to an increase in woodworking, which required fine, narrow-bitted tools, and this adze was also suitable for cutting tufa rock, which was used to dress the facades of monumental architecture. The Tuamotus received the adze types that were common to the epicenter of the Societies, Australs, and southern Cooks (Emory 1975:100).

The discovery of the Maupiti burial ground (Emory and Sinoto 1964) was especially important in terms of adze studies. Emory and Sinoto (1964) discussed the adze forms from Maupiti as follows:

All six adze forms excavated at Maupiti have appeared in one or another of the collections of adzes we have examined from the Society Islands and the Marquesas, but as we have said, they are of very rare occurrence. This in itself is an indication of archaicness. Caches of adzes intermediate in form between the Maupiti adzes and the historic forms in the Society Islands have been recorded by Bishop Museum personnel. They strongly suggest that the historic forms have evolved from such forms as were encountered in the Maupiti burial ground.

These early adzes exhibit unsettledness in forms and a wider range than the later adzes. At the early stage, the shaping of a tang or leaving an adze untanged appears to have been optional. Evidently one chose to have a quadrangular adze with rounded edges, or with the face less wide, as wide, or wider than the base, or the adze might be inverted-triangular or inverted sub-triangular in cross-section. In place of all these forms the Tahitians seem to have ended up with an adze of

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7 This terminology is the reverse of Duff's.
inverted-triangular (∨) cross-section. However the Maupiti adze of upright-triangular (△) cross-section continued to historic times unchanged except for the butt ending in an upward turned point. (1964:157; see Figure 9.27 below).

The techniques used to make adzes may be another means for tracing relationships between regions. In his study of Classic period adzes (mainly 3A) from Tubuai, Stokes (1930a:139) concluded that finishing an adze by pecking was a technique prevalent in the Societies, Australs, Cooks, Easter Island, and New Zealand, with the greatest focus being in central East Polynesia. On the other hand, this technique was very rare in Hawai‘i, Samoa, Pitcairn, Tonga, and the Marquesas. Suggs (1961:114) agreed with this observation, as most Marquesan adzes were ground without prior pecking. Stokes postulated that this might indicate cultural affinity, but the issue of what kind of process works best on what kind of material is still very open to question. Bellwood (1970:98) noted that that the distribution of pecking might be entirely due to independent development rather than diffusion, as both the type of cross section desired and the
material influenced the manufacturing process. Cleghorn (1984:411) wrote, “I have found through experimentation that it requires much less effort to shape a water-worn basalt cobble by pecking than by flaking; the rounded contours make the flaking of tough basalt difficult. Thus, if water-worn cobbles are the dominant form of material associated with the pecking technique, then the form of the raw material might be used as an explanation for the distribution of this manufacturing technique.” In sum, much more data and experimentation are required in this area before any definite conclusions can be drawn.

The reasons for the changes in adze types from the Archaic forms to the Classic are a matter of speculation, but should be addressed here nonetheless. There are many variables to take into account, such as the type and quality of available material, technological innovation, and function. Unfortunately there has been little research done into experimentation with different adze types, but Best’s (1977) study indicates that it is an avenue that should be explored. Best set out to determine why New Zealand shifted from the Archaic adze Types 1A and 4A to the Classic period Type 2B. He experimented by cutting wood with a hafted Type 1A and two Type 2Bs. He determined that the angle of penetration between the Type 1A and Type 2B was very different. Type 1A and Type 4A both have the butt reduced to produce the tang. The angle of penetration into the wood was low, resulting in a deep, shaving cut. Best (1977:312) hypothesized that the reduced butt served to protect the lashing as the adze scraped against the wood during the follow-through. The Type 1A, he concluded, was probably
used for slicing evenly in and out of wood, ideal for a canoe-making tool, as would have been the Type 4A, although he did not experiment with one. The Type 2Bs, however, with their unprotected lashings and higher angle of penetration, appear to have been designed for chopping, something which a Type 1A would be unsuited for. Best’s basic conclusion was that the Archaic adzes were designed for hollowing out canoes, and the Classic period adzes for chopping down trees. Regarding New Zealand, Best discussed two Archaic adzes with remarkable pedigrees that deserve special mention:

Of interest here are the two archaic adzes that have survived as sacred objects to their owners. On display at the Auckland Museum is Iriperi, an adze from the Gisborne area, although traditionally from the Bay of Plenty. Typologically closest to a 4A, it has a history of 20 generations, and was used for initiating work on important canoes. The other adze, Te Toki a te Maataariki, is a 1A from the Waikato area, and is said to have been in the possession of the Arikis of Taimui for at least 18 generations. During this time it has been used for tapu symbolic action, such as taking the first and last chips from an important canoe or ridgepole, and was probably last used in the 1880s. Oral traditions state that even 18 generations ago the adze was referred to as “The gift from the ancestors.” (1977:331)

These examples demonstrate not only the spiritual significance of adzes for the Polynesians who used them, but also some of the functional use the Archaic varieties were associated with. Just as the Archaic Types 1A and 4A were used for building

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8 Interestingly Best (1977:314) found that the stressed placed on the Type 1A adze sets it up for being broken in half, which is exactly how the Peva specimen is broken.
canoes, the Classic period adzes were used for forest clearing, and reduction of timber for houses and fortifications. This transition reflects a shift away from maritime resources toward more intensive land clearing for agricultural purposes. This transition from Archaic to Classic forms reflects important overall trends: the general population shift away from the coast toward the inlands; an accompanying decline in canoe manufacture; and increasing deforestation associated with a growing population and a need for agricultural terrain. Best's conclusions fit very neatly into the growing picture that archaeologists are in the process of refining, especially in terms of voyaging and interaction. While we must be cautious in accepting the conclusions of Best's experiments with only three adzes, the hypothesis is an intriguing one, and there is no doubt that the standard Type 3A adze that became so popular in central East Polynesia would have made a very unsuitable tool for hollowing out a canoe. Stokes (1930a:144) considered that 3A adzes were strong for their length and some may have been used for felling trees, as an adze that is circular or deep in cross section is more suitable for heavy work than a wide and thin one. In his review of Polynesian adze studies, Cleghorn (1984:413) summarized the strengths and weaknesses of Best's (1977) work: “Best must be commended on the originality of his study. He is the first Polynesian scholar to primarily treat adzes as functional tools of prehistoric people, rather than as typological tools of contemporary prehistorians. There are a number of problems, however, with some of Best’s assumptions and methodologies that weaken the results of his study.” The first difficulty that Cleghorn found was that Best treated the striking angle to be constant from one adze to another, while in fact this can be changed according to how the
adze is hafted, and how it is handled in practice. The major drawback that Cleghorn found is as follows:

A more critical problem involves Best’s functional interpretations for two formal adze types (Duff Types 1A and 2B). His interpretations are extended to include all adzes of these types. Implicit is the assumption that the angle of the bevel relates to the adze’s function. When these adze types were defined (Duff 1945, 1956, 1959) the bevel angle was not used as a distinguishing criterion. There is probably considerable variation in this angle, which could relate to the function of the adze. If this is the case, then Best’s all-inclusive interpretations would be invalid. This matter requires additional work. (1984:413)

In conclusion, while Best’s (1977) hypotheses are extremely intriguing, Cleghorn’s (1984) criticisms are valid in addressing potential weakness in them, as well as in Duff’s classification scheme. However, the importance of the Type 1A and 4A as canoe-building adzes may well be reflected in their distribution in collections from the Tuamotus (Emory 1975: Table 2). Out of 38 adzes, only 12 are Type 3A, 17 are Type 4A, and 12 are Type 1, mostly 1A.9 When we keep in mind the fact that Tuamotuans were canoe-builders employed in the Societies during the Classic period (see Rolett 1998:259), the prevalence of Type 4A and Type 1A adzes in collections from the Tuamotus becomes understandable. The seafaring Tuamotuans would have had far more use for canoe-building tools than for tree-felling tools such as the Type 3A.

9 Emory (1975) employed his own terminology in describing these adzes, which is different than that of Duff. The adzes in question were examined by myself, Yoshihiko Sinoto, Barry Rolett, and Marshall Weisler at the Bishop Museum for use in a future study.
Other Stone Tools

Peva’s Archaic deposit was also rich in terms of stone tools other than adzes and preforms. The Classic deposit was less so, but nevertheless yielded several examples. While the majority of these other tools consists of retouched flakes, some can be classified more specifically as blades, choppers, cores, hammerstones, and scrapers. Tools such as these are non-diagnostic in terms of culture phase, but demonstrate a wide range of variability. The degree and technique of flake modification, for example, differs considerably from one example to the next.

Hammerstones

A hammerstone is typically made from a hard, smooth beach pebble (Suggs 1961:122). The average size is small, with a narrow edge in order to allow for greater precision in striking. Two hammerstones were recovered from Peva’s Archaic deposit, as well as a broken finished adze that had been reused as a hammerstone (Figure 9.28). The presence of these manufacturing tools is consistent with the interpretation of the Archaic stratum as one in which stone tool-manufacturing was an important activity.
Figure 9.28.  a-b: Hammerstones, Peva Phase I (ON1-E13-1; ON1-E11-3); c: Polished broken adze reused as a hammerstone (ON1-G13-5).
Choppers

A chopper is defined as a unifacially or bifacially trimmed cleaver, made from a pebble or a rock slab, and can be rectangular, rounded, or triangular, with steep cutting edges. One Peva example (Figure 9.29.b) came from the Archaic deposit and the second (Figure 9.29.a) from the Classic. A similar chopper from Vitaria is illustrated in Vérin (1969: Figure 70). Expedient tools such as these would have been useful, for example, for butchering a carcass.

Cores

A core is a stone off of which flakes have been struck. It is identified by the presence of multiple striking platforms and negative flake scars. One such core was recovered from Peva’s Classic deposit (Figure 9.29.c).
Figure 9.29. a: Bifacial chopper, Peva Phase II (ON1-C11-8); b: Unifacial chopper, Peva Phase I (ON1-G15-7); c: Core, Peva Phase II (ON1-E14-5).
Scrapers

As Suggs (1961:123) noted, the term “scraping tool” is very general, because they were mostly made from handy flakes, and not much effort was made to modify them. Their uses cannot therefore be defined. The tool illustrated in Figure 9.30 is loosely categorized as a scraper tool, but this identification is by no means definitive. In some respects it resembles a coconut grater. Of course the possibility that it is a very crude adze preform cannot be overlooked either.

Figure 9.30. “Scraper” tool, Peva Phase I (ON1-C15-6).
Blades

A blade is defined as a flake that is at least twice as long as wide (Smith et al. 1996:77). Six blades and blade portions without additional retouch were recovered from Peva Phase I (Figure 9.31), as well as six blades with additional retouch (Figure 9.32). Figure 9.32.c is especially noteworthy. Formed from the corner of a piece of dike stone, the upper portion has been modified into a type of pointed gouge, while the “handle” has been serrated with deep grooves.
Figure 9.31. Blades and blade fragments without retouch, Peva Phase I (a: ON1-C12-12; b: ON1-D12-11; c: ON1-E11-8; d: ON1-D10-9; e: ON1-E12-10; f: ON1-D13-12).
Figure 9.32. Blades with retouch, Peva Phase I (a: ON1-G10-7; b: ON1-E15-7; c: ON1-D15-4; d: ON1-B13-43; e: ON1-D12-12; g: ON1-F13-1).
Retouched Flakes

52 flakes with evidence of retouch were recovered from Peva’s Archaic deposit (Figures 9.32-9.36). These expedient tools form only a small fraction of the total amount of lithic debitage recovered from the Archaic deposit, which contained over 2000 flakes. As Suggs (1961:126) wrote, “Stone flakes were used for scraping and cutting on every Polynesian island on which there was suitable stone to make adzes. The usefulness of these by-products of adze making could not have been overlooked anywhere.” Figure 9.33 illustrates flakes that have been unilaterally retouched, and the remaining figures all illustrate flakes that have been bilaterally retouched. Figure 9.37 illustrates the four largest retouched flake tools from the assemblage.
Figure 9.34. Bilaterally retouched flakes, Peva Phase I (a: ON1-D11-13; b: ON1-D11-7; c: ON1-E11-5; d: ON1-C14-2; e: ON1-A14-3; f: ON1-D10-6; g: ON1-D14-4; h: ON1-F14-25; i: ON1-G14-2).
Figure 9.35. Bilaterally retouched flakes, Peva Phase I (a: ONI-C12-28; b: ONI-F10-13; c: ONI-A4-10; d: ONI-G13-11; e: ONI-E11-12; f: ONI-E13-8; g: ONI-G13-13; h: ONI-E12-14; i: ONI-D13-8; j: ONI-A15-14; k: ONI-G13-16; l: ONI-G13-12; m: ONI-A14-16; n: ONI-D12-7; o: ONI-D11-1; p: ONI-F10-12).

325
Figure 9.36. Bilaterally retouched flakes, Peva Phase I (a: ON1-F10-2; b: ON1-F10-16; c: ON1-F10-14; d: ON1-E14-10; e: ON1-G15-1; f: ON1-G13-14; g: ON1-G10-3; h: ON1-E14-12; i: ON1-F12-12; j: ON1-G13-15; k: ON1-B15-8; l: ON1-F14-16; m: ON1-G14-2).
Figure 9.37. Large bilaterally retouched flakes, Peva Phase I (a: ON1-A14-17; b: ON1-C14-1; c: ON1-E11-6; d: ON1-G10-5).
Adze flakes

Only three adze flakes, i.e., with polish, were recovered from Peva’s Archaic deposit (Figure 9.38.a-c). This paucity of flakes from finished adzes suggests that the majority of adzes was being produced on-site, with far fewer finished examples being brought in from elsewhere. These flakes exhibit no signs of additional modification.

Flakes with Polish

Two Peva Phase I flakes demonstrated use retouch in the form of polished edges (Figure 9.38e-f).

Indeterminate Objects

Figure 9.39 and Figure 9.40 illustrate a set of objects and modified pieces of basalt whose form is too indeterminate to make any sort of identification desirable, although they may be very rough preforms.
Figure 9.38. a-c: Adze flakes with polished surfaces, Peva Phase I (ON1-M2-7, ON1:B12-12, ON1-F10-15); e-f: Flakes with polished surfaces, Peva Phase I (ON1-F14-10, ON1-E10-8).
Figure 9.39. Indeterminate fragments, Peva Phase I (a: ON1-B13-18; b: ON1-G12-4; c: ON1-F13-10; d: ON1-C15-4).
Debitage

1801 flakes were recovered from the Archaic deposit of Area 2 and 262 from Area 1. For the purposes of this discussion, only Area 2 will be discussed. As Table 9.1 demonstrates, the majority of flakes are between 1.5 and 4.5 cm at their maximum diameter. In the Archaic deposit, the distribution of debitage is densest in the center of Area 2, gradually thinning out toward the edges of the excavation area (Figure 9.41). In general, this area was the richest in terms of recovery of other artifacts and midden as well. In the Classic deposit, the flake distribution is roughly even, never exceeding more than 50 flakes/m². This was also consistent with the even distribution of midden throughout the Classic deposit of Area 2.

Table 9.1. Debitage profile, Peva Phase I and II

<table>
<thead>
<tr>
<th>Flake size</th>
<th>1.5 - 3 cm</th>
<th>3 - 4.5 cm</th>
<th>4.5 - 6 cm</th>
<th>6 - 8.5 cm</th>
<th>8.5 - 10 cm</th>
<th>&lt; 10 cm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>759</td>
<td>679</td>
<td>260</td>
<td>96</td>
<td>6</td>
<td>1</td>
<td>1801</td>
</tr>
<tr>
<td>Phase II</td>
<td>67</td>
<td>87</td>
<td>57</td>
<td>43</td>
<td>7</td>
<td>1</td>
<td>262</td>
</tr>
</tbody>
</table>
The variability in the size of the flakes from the Archaic deposit suggests the finishing phase of tool manufacture, when the rough preforms were brought from quarries to be shaped into their final forms. The number of adze preforms present in the Archaic assemblage supports this interpretation, as does the relative paucity of finished adzes. Geochemical sourcing, to be discussed below, has revealed that the debitage flakes sampled match those of the sampled adzes, preforms, and other tools. The variety of chemical signatures present among the debitage flakes indicates that at least six different types of basalt were being experimented with on-site. In contrast, the smaller quantity of larger flakes in the Classic deposit suggests a different type of activity, associated with the quick manufacture of expedient tools, perhaps of the chopper or scraper variety, which would have been useful during feasting occasions. The lack of
variability in the geochemistry of debitage supports this interpretation, as does the site’s function as a marae during the Classic period. Finally, the relative paucity of stone tools recovered from the Classic deposit is also in accord with these conclusions.

**Geochemical Sourcing**

Currently, the most successful method for tracing stone tool material to its geological place of origin is wavelength x-ray fluorescence (WD-XRF). WD-XRF determines the weight percentages of the ten major elements in addition to trace elements. Artifacts made from volcanic stone have the unique chemical signature of their geological source. While comparative artifact typologies such as adze classification are helpful in noting similarities between island groups (Sinoto 1996), chemical sourcing is the only empirical indicator for long-distance exchange (Weisler 1997, 1998). The regional homeland model is largely founded upon this evidence of interaction during the period of A.D. 1000-1450. While much geochemical sourcing of artifacts has been done in the southern Cooks, Mangareva, and the Marquesas, there has none for the Australs (Allen and Johnson 1997:129; Weisler and Sinton 1997:187; Weisler 1998:526, 528; Weisler and Green 2001:433). This lack has proven to be a serious gap when one takes the Australs’ position in the epicenter of East Polynesia into consideration.

The centrally-located archipelagos of the Societies, Australs, and southern Cooks are of particular importance to the regional homeland model. Irwin’s (1992:197-8) mutual accessibility model demonstrated that they form one of the most cohesive units in East Polynesia. The southern Cooks especially have attracted considerable attention in terms of communication. While nowhere near as impoverished in terms of rock sources
as the Tuamotus, many islands in the southern Cooks are so drastically weathered that basalt had to be imported (Sheppard et al. 1997:86; Walter and Sheppard 2001:396). While adzes from local basalt were circulated, several adzes are of unknown exotic origin (Sheppard et al. 1997:105). As Weisler and Sinton (1997:181) speculated, the fine-grained basalt artifacts found in the southern Cooks were most likely imported from the closest island groups, namely the Australs, the Societies, and Samoa. Although the highest-quality adzes found in the southern Cooks are a few examples from Samoa (Sheppard et al. 1997:102, 105), the distance to this source is considerable, between 630 and 820 sea miles away. The Societies and Australs are conceivably more convenient targets at 400 and 300 sea miles distance, respectively (Irwin 1992:85). The Australs may have been a potential nearby source of basalt for archipelagos such as the southern Cooks and the Tuamotus. The Australs are geologically younger and possess more recent exposed lava flows of fine-grained basalt suitable for tool manufacture. It is possible that the Australs supplied basalt to the southern Cooks and other archipelagos, but without enough chemical signatures of Austral basalt we cannot be certain. In order to provide a context for current research regarding long-distance exchange, a number of reference points in the Australs are needed.

As I noted in Chapter 2, the Australs have been of great interest to geologists for decades. Consequently, there is a small database of XRF analyses for the Australs, primarily for Rurutu and Tubuai (e.g., Duncan and McDougall 1976; Dupuy et al. 1988; Dupuy et al. 1989; Chauvel et al. 1997; Maury et al. 2000). However, much of this data is of marginal use to archaeologists because critical information such as exact provenance is often missing. This highlights the need for specific, archaeologically-directed
collections and analyses. Concerning Rurutu, Vérin's (1969) collection of preforms suggested that adzes were being manufactured locally in Vitaria. Rolett et al. (2005:3) visited the known adze workshops in Vitaria, where they collected preforms, flakes, and cores from areas containing lithic scatters. The WD-XRF data from these artifacts were compared to geological samples of rock taken from nearby boulders eroding from out of the slope. The geochemical signatures of the artifacts and those of the geological samples were very consistent and nearly identical to one another, suggesting that Vitaria was home to at least one adze quarry. A series of ethnographically-collected adzes from Ra’ivavae and Tubuai from the Peabody Essex Museum were also sampled. Two of the Ra’ivavae adzes bear signatures nearly identical with that of the Vitaria quarry, which will be discussed in further detail below. Altogether, the available published data allows us to classify the material of the Peva assemblage.

Methodology

Peva is the one valley on Rurutu in which there are no natural outcrops of basalt (Figure 9.42). The only basalt in the valley is in the form of river cobbles. The wide range of adzes and flake tools in Peva’s Archaic assemblage was therefore of special interest, since blanks had to be collected from sources elsewhere to the site and worked. Fortunately, Rurutu is a small island and obtaining basalt from other valleys would not have been physically difficult. The Peva lithic material is visually distinguishable into very distinct types, based on factors such as color, grain size, and the presence of phenoliths. An initial sample of ten artifacts was selected for the WD-XRF analysis of major elements in order to gain a basic understanding of the degree of variability present. The samples selected were taken from the widest array to determine the number of...
different sources present, both local and potentially exotic. Samples from three broken finished adzes were taken because they may have been manufactured off-site and brought there later. These included the Type 1A and the Type 4A adzes, as it seemed to me that if any adzes may have been imported to Rurutu from elsewhere, these were among the likeliest candidates. The fact that they were already broken also contributed to this decision. Other specimens were chosen based on the appearance of the rock and variety of form. All analyses were performed at the University of Hawai‘i Department of Geology and Geophysics under the supervision of John Sinton. John Sinton and his wife Joanna Sinton taught me to drill, crush, and powder the samples, which I then turned over to their own technicians to be fused into the glass pellets necessary for WD-XRF analysis. John Sinton and I then compared the data from Peva to the published data in Duncan and McDougal (1976), Dupuy et al (1988, 1989), Maury et al. (2000: Table 1, see Table 9.3 and Table 9.4 below) and Rolett et al. (2005, see Table 9.4 below).

Following this initial series of analyses, an additional 20 pieces of flake debitage were selected from the Archaic and Classic deposits. This was done to determine both major and trace elements for the different clusters, and also to gain an understanding as to which specific sources appeared to have been exploited most. The types of artifacts sampled are summarized in Table 9.2.
Table 9.2. Peva artifacts selected for geochemical analysis.

<table>
<thead>
<tr>
<th>Artifact</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished adzes</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Adze preforms</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Choppers</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Non-diagnostic stone tool (n. d.)</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Large flake debitage</td>
<td>15</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td><strong>6</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

**Distribution of Known Geological Samples**

We can begin by examining the distribution of what is known about the different basalts of Rurutu. As discussed in Chapter 2, Rurutu is composed of two entirely distinct volcanic events, one approximately 12 million years old, and the second around one to two million years old. The younger flows distributed around the island are composed primarily of hawaiites, with some basanites. Previous geochemical source work (e.g., Maury et al. 2000) has demonstrated that these younger flows are quite distinct from one another. Figure 9.42 illustrates the younger lava flows on Rurutu as well as the specific locations from which most of the geological samples summarized in Table 9.3 and Table 9.4 were taken.
Figure 9.42. Distribution of young lava flows and provenance of samples from Maury et al. (2000).
### Table 9.3. Basanites from Rurutu. Data from Maury et al. (2000: Table 1)

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>RR 28</th>
<th>RR 29</th>
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<td>15.00</td>
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</tr>
<tr>
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<td>0.00</td>
<td>0.53</td>
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<td>Total</td>
<td>99.79</td>
<td>99.00</td>
<td>99.63</td>
<td>99.00</td>
</tr>
</tbody>
</table>

### Table 9.4. Hawaiites from Rurutu. Data from Maury et al. (2000: Table 1), Chauvel et al. (1997: Table 2), and Rolett et al. (2005). Note: RR designated samples from Maury et al. (2000) are rounded numbers, except for those samples also documented in Chauvel et al. (1997: Table 2). Samples Unaa 2 (a flake) and Unaa 3 (a geological sample) are from Rolett et al. (2005: Table 2).

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>RR 05</th>
<th>RR 07</th>
<th>RR 08</th>
<th>RR 13</th>
<th>Vit Av*</th>
<th>RR 20b</th>
<th>RR 27</th>
<th>RR 33</th>
<th>RR 69</th>
<th>Unaa 2</th>
<th>Unaa 3</th>
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<td>SiO₂</td>
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<td>3.00</td>
<td>3.00</td>
<td>3.08</td>
<td>3.10</td>
<td>3.40</td>
<td>3.00</td>
<td>4.00</td>
<td>3.57</td>
<td>3.52</td>
</tr>
<tr>
<td>Al₂O₃</td>
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<td>15.00</td>
<td>15.00</td>
<td>16.00</td>
<td>15.90</td>
<td>15.00</td>
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<td>16.00</td>
<td>15.00</td>
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</tr>
<tr>
<td>Fe₂O₃</td>
<td>15.00</td>
<td>16.00</td>
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<td>15.00</td>
<td>14.76</td>
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<td>15.80</td>
<td>15.00</td>
<td>15.00</td>
<td>15.45</td>
<td>15.65</td>
</tr>
<tr>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.23</td>
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<tr>
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<td>6.00</td>
<td>6.00</td>
<td>4.57</td>
<td>4.56</td>
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<tr>
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<td>9.00</td>
<td>9.00</td>
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<td>7.04</td>
<td>7.65</td>
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<td>5.00</td>
<td>5.00</td>
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<td>5.00</td>
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<td>4.64</td>
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<td>2.00</td>
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<td>1.62</td>
<td>1.77</td>
<td>1.73</td>
<td>1.00</td>
<td>1.00</td>
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<td>1.48</td>
</tr>
<tr>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.08</td>
<td>1.47</td>
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<td>1.00</td>
<td>1.00</td>
<td>0.91</td>
<td>0.90</td>
</tr>
<tr>
<td>LOI</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.37</td>
<td>0.47</td>
<td>0.00</td>
<td>0.00</td>
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<td>n.d.</td>
</tr>
<tr>
<td>Total</td>
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<td>99.00</td>
<td>100.00</td>
<td>100.00</td>
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<td>99.33</td>
<td>100.00</td>
<td>100.00</td>
<td>100.15</td>
<td>100.15</td>
</tr>
</tbody>
</table>

* Average of Vitaria geological samples from Rolett et al. (2005: Table 2).
The Peva Assemblage

We are now in a position to examine the geochemical composition of the Peva samples and the arrange the data into clusters. The samples from the Peva assemblage fall into four main clusters, mainly of hawaiite composition, plus two others, which are essentially basanites. Cluster 1 (Table 9.5, Table 9.6) is a group of hawaiites that is characterized by a lower percentage of MgO (average 4.03%) than any geological samples yet obtained from Rurutu (see Chauvel et al. 1997: Table 2; Dupuy et al. 1998: Table 1; Maury et al. 2000: Table 1). The one exception is a single flake documented in Rolett et al. (2005: Table 2, specimen no. 24), which clearly does not fall into Cluster 1. Another unique characteristic of Cluster 1 is the relatively high P₂O₅ (average 2.02%), almost twice as much as that of the other clusters. Taken together, the MgO and P₂O₅ values in particular distinguish it from all the other clusters. The rock of Cluster 1 is the darkest of the Peva lithic material with a low LOI (loss of water upon ignition at 900°C), and is very fine-grained. There are no satisfactory matches to the documented geological samples in Table 9.4, so the precise location of this source remains unknown. Most of the percentages of the other major elements are relatively close to those found in the other Rurutu hawaiite clusters. In addition, as Cluster 1 contains one finished adze, one preform, two non-diagnostic stone tools, and three debitage flakes, it is likely that it is a local unknown source on Rurutu rather than an imported one, in which case we might expect to find mainly finished adzes.
Table 9.5. Percentages of major elements for Cluster 1. Abbreviations: n. d., non-diagnostic stone tool; Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

<table>
<thead>
<tr>
<th>Artifact Type:</th>
<th>Adze 4A</th>
<th>Preform</th>
<th>n. d.</th>
<th>n. d.</th>
<th>Flake</th>
<th>Flake</th>
<th>Flake</th>
</tr>
</thead>
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<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Artifact no.:</td>
<td>D12-1</td>
<td>G13-5</td>
<td>F12-8</td>
<td>F13-10</td>
<td>E12-5</td>
<td>L7-1</td>
<td>M5-8</td>
</tr>
<tr>
<td>(ON1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SiO₂</td>
<td>45.86</td>
<td>45.12</td>
<td>45.66</td>
<td>44.97</td>
<td>45.00</td>
<td>44.99</td>
<td>46.10</td>
</tr>
<tr>
<td>TiO₂</td>
<td>2.87</td>
<td>2.88</td>
<td>2.86</td>
<td>2.86</td>
<td>2.84</td>
<td>2.89</td>
<td>2.60</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>15.84</td>
<td>15.42</td>
<td>15.60</td>
<td>15.28</td>
<td>15.31</td>
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<tr>
<td>MnO</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td>MgO</td>
<td>4.02</td>
<td>4.13</td>
<td>3.99</td>
<td>4.01</td>
<td>4.05</td>
<td>4.12</td>
<td>3.91</td>
</tr>
<tr>
<td>CaO</td>
<td>8.16</td>
<td>7.88</td>
<td>7.81</td>
<td>7.83</td>
<td>7.89</td>
<td>7.89</td>
<td>7.51</td>
</tr>
<tr>
<td>Na₂O</td>
<td>5.18</td>
<td>5.26</td>
<td>5.25</td>
<td>5.44</td>
<td>6.04</td>
<td>5.86</td>
<td>5.99</td>
</tr>
<tr>
<td>K₂O</td>
<td>1.79</td>
<td>1.82</td>
<td>1.90</td>
<td>1.82</td>
<td>1.88</td>
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<tr>
<td>LoI</td>
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<td>0.44</td>
<td>-0.11</td>
<td>-0.35</td>
<td>-0.11</td>
<td>0.27</td>
<td>1.11</td>
</tr>
<tr>
<td>Total</td>
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<td>99.63</td>
<td>100.15</td>
<td>99.43</td>
<td>100.14</td>
<td>100.15</td>
<td>100.06</td>
</tr>
</tbody>
</table>

*The high LoI suggests that this sample was altered during the heating process.*

Table 9.6. Percentages of trace elements for Cluster 1 debitage flakes, Peva Phase I. Abbreviations: Av., Average; St. Dev., Standard deviation.

<table>
<thead>
<tr>
<th>Artifact no.:</th>
<th>E12-5</th>
<th>L7-1</th>
<th>M5-8</th>
<th>Av.</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ON1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nb</td>
<td>121.24</td>
<td>119.59</td>
<td>134.80</td>
<td>125.21</td>
<td>6.81</td>
</tr>
<tr>
<td>Zr</td>
<td>523.20</td>
<td>513.53</td>
<td>576.46</td>
<td>537.73</td>
<td>27.67</td>
</tr>
<tr>
<td>Y</td>
<td>47.73</td>
<td>46.60</td>
<td>48.33</td>
<td>47.55</td>
<td>0.72</td>
</tr>
<tr>
<td>Sr</td>
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<td>1479.89</td>
<td>1592.12</td>
<td>1532.16</td>
<td>46.14</td>
</tr>
<tr>
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<td>-1.94</td>
<td>-1.90</td>
<td>-1.93</td>
<td>0.02</td>
</tr>
<tr>
<td>Rb</td>
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<td>52.40</td>
<td>54.06</td>
<td>52.00</td>
<td>1.86</td>
</tr>
<tr>
<td>Th</td>
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<td>10.32</td>
<td>12.10</td>
<td>11.34</td>
<td>0.75</td>
</tr>
<tr>
<td>Pb</td>
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<td>4.09</td>
<td>6.66</td>
<td>5.12</td>
<td>1.11</td>
</tr>
<tr>
<td>Co</td>
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<td>26.69</td>
<td>34.84</td>
<td>28.52</td>
<td>4.60</td>
</tr>
<tr>
<td>Mn</td>
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</tr>
<tr>
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<td>-2.96</td>
<td>-2.94</td>
<td>-2.95</td>
<td>0.01</td>
</tr>
<tr>
<td>V</td>
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<td>92.61</td>
<td>67.24</td>
<td>84.20</td>
<td>11.99</td>
</tr>
<tr>
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<td>518.76</td>
<td>589.19</td>
<td>544.64</td>
<td>31.64</td>
</tr>
<tr>
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<td>6.91</td>
<td>6.74</td>
<td>6.93</td>
<td>0.16</td>
</tr>
<tr>
<td>Zn</td>
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<td>153.99</td>
<td>178.69</td>
<td>167.10</td>
<td>10.14</td>
</tr>
<tr>
<td>Ni</td>
<td>6.32</td>
<td>10.88</td>
<td>7.71</td>
<td>8.30</td>
<td>1.91</td>
</tr>
</tbody>
</table>
Cluster 2 (Table 9.7, Table 9.8) is comprised of examples most similar to specimen RR 05 (Maury et al. 2000: Table 1), a 1.1 Ma lava from the northwest of ‘Auti, the source of basalt that is closest to the Peva site itself. Cluster 2 contains crude, non-diagnostic Archaic period stone tools and Classic period flake debitage. The basalt is considerably lighter in color than that of Cluster 1 and is quite porous. It can be distinguished from all other rock types visually. The majority of the Classic period flake debitage is clearly of this material, while it is minimally represented in the Phase I assemblage.
Table 9.7. Percentages of major elements for Cluster 2. Abbreviations: n. d., non-diagnostic stone tool; Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

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<th>II</th>
<th>II</th>
<th>II</th>
<th>II</th>
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<td>43.78</td>
<td>43.15</td>
<td>43.47</td>
<td>43.83</td>
</tr>
<tr>
<td>TiO₂</td>
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<td>3.22</td>
<td>3.24</td>
<td>3.26</td>
<td>3.23</td>
<td>3.28</td>
<td>3.28</td>
</tr>
<tr>
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<td>14.87</td>
<td>14.79</td>
<td>15.24</td>
<td>14.91</td>
<td>14.74</td>
<td>14.85</td>
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<td>0.24</td>
<td>0.23</td>
<td>0.23</td>
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<tr>
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<td>6.23</td>
<td>6.09</td>
<td>6.17</td>
<td>6.13</td>
<td>6.12</td>
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<tr>
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<td>8.67</td>
<td>8.65</td>
<td>8.64</td>
<td>8.69</td>
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<td>5.08</td>
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<td>4.75</td>
</tr>
<tr>
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<td>1.46</td>
<td>1.57</td>
<td>1.52</td>
<td>1.54</td>
<td>1.51</td>
</tr>
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<td>1.44</td>
<td>1.43</td>
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</tr>
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<td>100.52</td>
<td>99.64</td>
<td>99.82</td>
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</tr>
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</table>

Table 9.8. Percentages of trace elements for Cluster 2 debitage flakes, Peva Phase II. Abbreviations: Av., Average; St. Dev., Standard deviation.

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<th></th>
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<td>1291.78</td>
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<td>-1.95</td>
<td>-1.94</td>
<td>-1.95</td>
<td>-1.95</td>
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<tr>
<td>Rb</td>
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<td>36.73</td>
<td>35.55</td>
<td>36.68</td>
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</tr>
<tr>
<td>Th</td>
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<td>7.29</td>
<td>8.60</td>
<td>8.09</td>
<td>0.95</td>
</tr>
<tr>
<td>Pb</td>
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<td>3.47</td>
<td>3.09</td>
<td>3.81</td>
<td>3.75</td>
<td>0.66</td>
</tr>
<tr>
<td>Co</td>
<td>38.98</td>
<td>35.45</td>
<td>35.72</td>
<td>38.91</td>
<td>37.27</td>
<td>1.94</td>
</tr>
<tr>
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<td>1644.96</td>
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</tr>
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<td>27.41</td>
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</tr>
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<td>156.42</td>
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<tr>
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<td>464.21</td>
<td>445.48</td>
<td>16.54</td>
</tr>
<tr>
<td>Sc</td>
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<td>11.17</td>
<td>10.58</td>
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<td>0.81</td>
</tr>
<tr>
<td>Zn</td>
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<td>145.63</td>
<td>150.73</td>
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</tr>
<tr>
<td>Ni</td>
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<td>68.93</td>
<td>66.52</td>
<td>69.30</td>
<td>68.51</td>
<td>1.33</td>
</tr>
</tbody>
</table>
Cluster 3 (Table 9.9, Table 9.10), represented by one non-diagnostic tool from the Archaic deposit and three debitage flakes, is a good match with the artifact and geological samples taken from the Vitaria adze quarry by Rolett et al. (2005), and to sample RR 13, also from Vitaria (Maury et al. 2000: Table 1). Two Classic period adzes collected in Ra’ivavae from the Peabody Essex Museum (E-36496, E-36497, in Rolett et al. 2005: Table 3) match up almost identically to the Vitaria material, suggesting that the adzes were manufactured in Rurutu and exported to Ra’ivavae at some point. Rolett et al. (2005:4) wrote, “Rurutu likely supplied adzes that were exchanged throughout the Australs and possibly beyond, such as to the Cook Islands, where fine-quality basalt is notably scarce.”
Table 9.9. Percentages of major elements for Cluster 3, Peva Phase I. Abbreviations: n. d., non-diagnostic stone tool; Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>SiO₂</td>
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<td>3.09</td>
<td>0.07</td>
<td>3.08</td>
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<tr>
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<td>0.07</td>
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</tr>
<tr>
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<td>7.10</td>
<td>7.11</td>
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<td>7.09</td>
<td>0.06</td>
<td>7.04</td>
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<td>5.57</td>
<td>0.32</td>
<td>5.45</td>
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<tr>
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<td>1.59</td>
<td>1.61</td>
<td>1.60</td>
<td>0.00</td>
<td>1.62</td>
</tr>
<tr>
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<td>1.10</td>
<td>1.06</td>
<td>1.08</td>
<td>1.09</td>
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<td>1.08</td>
</tr>
<tr>
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<td>0.65</td>
<td>n.d.</td>
</tr>
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<td>99.99</td>
<td>100.53</td>
<td>100.16</td>
<td>0.43</td>
<td>100.11</td>
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</table>

* documented in Rolett et al. (2005: Table 2)

Table 9.10. Percentages of trace elements for Cluster 3 debitage flakes, Peva Phase I. Abbreviations: Av., Average; St. Dev., Standard deviation.

<table>
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<th></th>
</tr>
</thead>
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<td>413.09</td>
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<td>-1.91</td>
<td>-1.91</td>
<td>-1.91</td>
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<td>Rb</td>
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<td>9.28</td>
<td>8.41</td>
<td>8.96</td>
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<td>114.05</td>
<td>110.56</td>
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</tr>
<tr>
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<td>424.61</td>
<td>436.35</td>
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<td>9.75</td>
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<tr>
<td>Zn</td>
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<td>145.25</td>
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<td>Ni</td>
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<td>11.31</td>
<td>12.75</td>
<td>12.79</td>
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</tr>
</tbody>
</table>
Cluster 4 (Table 9.11, Table 9.12) is represented only by flake debitage from the Archaic deposit. These samples match well with known values from a geological specimen from Unaa (Rolett et al. 2005: Table 2). Unaa is closer to Peva than Vitaria, and therefore a more convenient source. This material is quite similar in appearance and grain size to that of Cluster 3 (Vitaria). It is likely that a high percentage of the Archaic period flake debitage belongs in this cluster.
Table 9.11. Percentages of major elements for Cluster 4 debitage flakes, Peva Phase I. Abbreviations: Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

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<tr>
<th>Artifact no.: (ON1)</th>
<th>D12-2</th>
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<th>K1-8</th>
<th>E12-4</th>
<th>E12-9</th>
<th>M5-16</th>
<th>M15-13</th>
<th>Av.</th>
<th>St. Dev.</th>
<th>Unaa sample*</th>
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<td>45.49</td>
<td>44.76</td>
<td>44.54</td>
<td>45.06</td>
<td>0.42</td>
<td>45.31</td>
</tr>
<tr>
<td>TiO₂</td>
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<td>3.57</td>
<td>3.60</td>
<td>3.53</td>
<td>3.56</td>
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<tr>
<td>Al₂O₃</td>
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<td>15.45</td>
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<td>15.31</td>
<td>15.43</td>
<td>15.31</td>
<td>15.21</td>
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</tr>
<tr>
<td>Fe₂O₃</td>
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<td>15.43</td>
<td>15.50</td>
<td>15.59</td>
<td>15.46</td>
<td>15.52</td>
<td>15.59</td>
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<td>0.06</td>
<td>15.65</td>
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<tr>
<td>MnO</td>
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<td>0.21</td>
<td>0.22</td>
<td>0.21</td>
<td>0.21</td>
<td>0.21</td>
<td>0.21</td>
<td>0.00</td>
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</tr>
<tr>
<td>MgO</td>
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<td>5.51</td>
<td>5.32</td>
<td>5.51</td>
<td>5.36</td>
<td>5.23</td>
<td>5.43</td>
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<tr>
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<td>7.52</td>
<td>7.51</td>
<td>7.56</td>
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<td>7.83</td>
<td>7.61</td>
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<td>1.45</td>
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<td>1.48</td>
<td>1.46</td>
<td>0.03</td>
<td>1.48</td>
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<td>P₂O₅</td>
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<td>0.85</td>
<td>0.88</td>
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<td>0.86</td>
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<td>99.95</td>
<td>99.95</td>
<td>0.68</td>
<td>100.15</td>
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</table>

* geological sample documented in Rolett et al. (2005: Table 2)

Table 9.12. Percentages of trace elements for Cluster 4 debitage flakes. Abbreviations: Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

<table>
<thead>
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<tbody>
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<td>83.98</td>
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<td>84.89</td>
<td>83.50</td>
<td>83.98</td>
<td>1.08</td>
</tr>
<tr>
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<td>360.19</td>
<td>362.93</td>
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<td>39.28</td>
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<td>-1.93</td>
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<td>31.93</td>
<td>31.20</td>
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<tr>
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<td>6.92</td>
<td>7.87</td>
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<td>7.84</td>
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<td>7.47</td>
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<td>4.10</td>
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<td>34.30</td>
<td>39.77</td>
<td>32.54</td>
<td>37.43</td>
<td>33.90</td>
<td>34.63</td>
<td>2.95</td>
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<tr>
<td>Mn</td>
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<td>1520.60</td>
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<td>1516.46</td>
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<td>-3.00</td>
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<td>-2.99</td>
<td>-2.99</td>
<td>-2.95</td>
<td>-2.99</td>
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<td>133.80</td>
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<td>135.74</td>
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<td>14.88</td>
<td>12.89</td>
<td>13.40</td>
<td>15.00</td>
<td>1.64</td>
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</table>
In addition to these four clusters of hawaiites, there are two distinct varieties of basanites. Basanites only occur on Rurutu in a narrow region between Mt. Manureva and Moerai in the north, along the central spine of south central Rurutu, and in the south near Naairoa. The first type, Basanite 1 (Table 9.13, Table 9.14) contains two specimens, including the Archaic Type 1A adze and a Phase I debitage flake. This composition most closely resembles samples RR 30 and RR 58 (Maury et al. 2000) from the Naairoa region on the south end of the island, which have similar TiO$_2$ and Fe$_2$O$_3$ values. While the two Peva samples are not identical to each other, they are more alike to one another than to the other cluster of basanites present in the assemblage. The geochemistry of one Classic period adze collected in Ra’ivavae from the Peabody Essex Museum (E-33006, in Rolett et al. 2005: Table 3) is remarkably similar to this basanite, especially to the flake sample E12-1. This may indicate that the adze, or at least the raw material, came originally from Rurutu and was exported to Ra’ivavae.
Table 9.13. Percentages of major elements for Basanite 1. Abbreviations: Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

<table>
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<th>Phase</th>
<th>Artifact Type</th>
<th>Artifact no.: (ON1)</th>
<th>SiO₂</th>
<th>TiO₂</th>
<th>Al₂O₃</th>
<th>Fe₂O₃</th>
<th>MnO</th>
<th>MgO</th>
<th>CaO</th>
<th>Na₂O</th>
<th>K₂O</th>
<th>P₂O₅</th>
<th>LOI</th>
<th>Total</th>
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<td>G10-12</td>
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<td>4.19</td>
<td>15.28</td>
<td>17.09</td>
<td>0.22</td>
<td>6.30</td>
<td>7.93</td>
<td>4.20</td>
<td>1.65</td>
<td>1.27</td>
<td>0.53</td>
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<td>8.10</td>
<td>4.69</td>
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<td>1.28</td>
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<td>14.75</td>
<td>17.14</td>
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<td>6.36</td>
<td>8.00</td>
<td>4.66</td>
<td>1.69</td>
<td>1.27</td>
<td>0.64</td>
<td>100.04</td>
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<tr>
<td></td>
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<td>6.33</td>
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<td>0.37</td>
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<td>7.96</td>
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<td>1.64</td>
<td>1.25</td>
<td>n.d.</td>
<td>99.69</td>
</tr>
</tbody>
</table>

* documented in Rolett et al. (2005: Table 3)

Table 9.14. Percentages of trace elements for Basanite 1 debitage flakes, Peva Phase I, and Ra'ivavae adze.

<table>
<thead>
<tr>
<th>Artifact Type</th>
<th>Artifact no.: (ON1)</th>
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<th>Flake</th>
<th>Ra'ivavae adze*</th>
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<td>E12-1</td>
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<td>105.56</td>
<td>110.00</td>
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<td>Y</td>
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<td>39.98</td>
<td>39.00</td>
</tr>
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<td>E12-1</td>
<td>1105.59</td>
<td>1095.19</td>
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</tr>
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<td>-1.98</td>
<td>-2.00</td>
</tr>
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<td>4.09</td>
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</tr>
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<td>193.51</td>
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<td>410.29</td>
<td>414.31</td>
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<td>12.97</td>
<td>4.00</td>
</tr>
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<td>Ni</td>
<td>E12-1</td>
<td>41.75</td>
<td>42.87</td>
<td>48.00</td>
</tr>
</tbody>
</table>

* documented in Rolett et al. (2005: Table 3)
The second type of basanite, Basanite 2 (Table 9.15, Table 9.16) contains the specimen G12-2, the largest of the Type 2A preforms. This is a low-SiO₂ basanite that matches reasonably well with sample RR 28 (Maury et al. 2000: Table 1) taken from the central spine of the island. Most notably, the MgO and CaO are higher than the basanites in the group Basanite 1, and the Fe₂O₃ and P₂O₅ are lower. Another Classic period adze collected in Ra’ivavae from the Peabody Essex Museum (E-33006, in Rolett et al. 2005: Table 3) is a good match with this basanite. Out of the seven adzes from Ra’ivavae sampled in Rolett et al. (2005: Table 3), four appear to be excellent matches with Rurutu material.
Table 9.15. Percentages of major elements for Basanite 2. Abbreviations: Flake, debitage flake; Av., Average; St. Dev., Standard deviation.

<table>
<thead>
<tr>
<th>Artifacts</th>
<th>Phase:</th>
<th>Artifact Type:</th>
<th>Flake</th>
<th>Preform</th>
<th>Flakes</th>
<th>Ra’ivavae adze*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Artifacts no.: (ONI)</td>
<td>G12-2</td>
<td>M5-2</td>
<td>Av.</td>
<td>St. Dev.</td>
</tr>
<tr>
<td>SiO₂</td>
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<td>41.97</td>
<td>41.86</td>
<td>0.16</td>
<td>41.50</td>
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<tr>
<td>TiO₂</td>
<td>4.46</td>
<td>4.48</td>
<td>4.47</td>
<td>0.01</td>
<td>4.43</td>
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<tr>
<td>Al₂O₃</td>
<td>15.32</td>
<td>15.16</td>
<td>15.24</td>
<td>0.11</td>
<td>15.14</td>
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</tr>
<tr>
<td>Fe₂O₃</td>
<td>16.20</td>
<td>16.17</td>
<td>16.19</td>
<td>0.02</td>
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</tr>
<tr>
<td>MnO</td>
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</tr>
<tr>
<td>MgO</td>
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<td>7.45</td>
<td>7.32</td>
<td>0.19</td>
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<tr>
<td>CaO</td>
<td>8.61</td>
<td>8.66</td>
<td>8.64</td>
<td>0.04</td>
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<tr>
<td>Na₂O</td>
<td>3.68</td>
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<td>3.98</td>
<td>0.42</td>
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<td></td>
</tr>
<tr>
<td>K₂O</td>
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<td>1.65</td>
<td>1.63</td>
<td>0.03</td>
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</tr>
<tr>
<td>P₂O₅</td>
<td>0.94</td>
<td>0.95</td>
<td>0.95</td>
<td>0.01</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>LOI</td>
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<td>0.07</td>
<td>0.08</td>
<td>0.01</td>
<td>100.06</td>
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<tr>
<td>Total</td>
<td>99.92</td>
<td>100.95</td>
<td>100.44</td>
<td>0.73</td>
<td>99.69</td>
<td></td>
</tr>
</tbody>
</table>

* documented in Rolett et al. (2005: Table 3)

Table 9.16. Percentages of trace elements for Basanite 2 debitage flake, Peva Phase I, and Ra’ivavae adze.

<table>
<thead>
<tr>
<th>Artifacts</th>
<th>Artifacts no.: (ONI)</th>
<th>Artifact Type:</th>
<th>Flake</th>
<th>Ra’ivavae adze*</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M5-2</td>
<td></td>
<td>E-36512</td>
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</tr>
<tr>
<td>Nb</td>
<td>88.34</td>
<td>97.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zr</td>
<td>366.53</td>
<td>357.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>35.93</td>
<td>35.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sr</td>
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<td>954.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>-1.97</td>
<td>-2.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rb</td>
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<td></td>
</tr>
<tr>
<td>Th</td>
<td>5.29</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pb</td>
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<td></td>
</tr>
<tr>
<td>Co</td>
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<td></td>
</tr>
<tr>
<td>Mn</td>
<td>1451.09</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cr</td>
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<td>11.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>248.47</td>
<td>248.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ba</td>
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<td></td>
</tr>
<tr>
<td>Sc</td>
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<td>19.00</td>
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<tr>
<td>Zn</td>
<td>143.47</td>
<td>130.00</td>
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</tr>
<tr>
<td>Ni</td>
<td>69.36</td>
<td>79.00</td>
<td></td>
<td></td>
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</tbody>
</table>

* documented in Rolett et al. (2005: Table 3)
The differences between the clusters are most notable when graphed according to the percentages of selected elements. These are illustrated in (Figure 9.42, Figure 9.42, and Figure 9.44). Figure 9.42, which compares the percentages of MgO and K₂O, illustrates the uniqueness of Cluster 1. We can then go further and compare the K₂O percentage to two additional elements, P₂O₅ and TiO₂ (Figure 9.44, Figure 9.45) to see how the clusters differ from one another in additional ways.
Figure 9.43. Cluster breakdown according to MgO and K₂O. Key: Cluster 1, Unknown, probably local source; Cluster 2, Northwest of ‘Auti; Cluster 3, Vitaria; Cluster 4, Unaa; Basanite 1, Naairoa; Basanite 2, Central spine.
Figure 9.44. Cluster breakdown according to K$_2$O and P$_2$O$_5$. Key: Cluster 1, Unknown, probably local source; Cluster 2, Northwest of ‘Auti; Cluster 3, Vitaria; Cluster 4, Unaa; Basanite 1, Naairoa; Basanite 2, Central spine.
Figure 9.45. Cluster breakdown according to K<sub>2</sub>O and TiO<sub>2</sub>. Key: Cluster 1, Unknown, probably local source; Cluster 2, Northwest of ‘Auti; Cluster 3, Vitaria; Cluster 4, Unaa; Basanite 1, Naairoa; Basanite 2, Central spine.
The inhabitants of Peva were exploiting at least six different sources of rock during the Archaic period. The most surprising result of the Peva analyses is the fact that few examples came from the Vitaria quarry, although the inhabitants of Peva knew of and exploited it during the Archaic period. The Classic period flake debitage, on the other hand, is all from the most nearby source to the south. I believe that the lack of other sources among the Classic period debitage is most easily explained in terms of site function. When adze manufacturing was an important activity during the Archaic period, a wide variety of basalts were being used and experimented with. During the Classic period, when tool making was probably not emphasized upon the marae grounds, the most convenient local stone was sufficient to produce expedient items such as a simple chopper. In order to learn what material Classic period adzes found in Peva were being made of, sampling of existing collections of adzes found in Peva would be necessary. As this would involve destructive analysis of these artifacts, it is highly unlikely that the owners would agree to such a procedure, which I feel is entirely understandable. It was for this reason that I chose not to analyze the complete Type 2A recovered from the Classic deposit (ON1-A15-1), because it is in excellent condition and I did not think that the information it might have provided merited destructive analysis.

During the Classic period, Peva would have had no trouble in obtaining basalt from other valleys. Although, as discussed in Chapter 3, there was a fierce rivalry between Peva and Vitaria, this may not have precluded all exchange. During the Classic period, Vitaria was still actively producing adzes, as demonstrated by the large quantity of preforms documented in Véris (1969), as well as by the two adzes collected on
Ra’ivavae documented in Rolett et al. (2005). Unaa was also a potential source, and closer than Vitaria. As Seabrook (1938) noted, the allegiance of Unaa tended to shift between Vitaria and the southern chiefdoms located in Moerai and Peva. In addition, sources to the south of Peva were readily available, including the basanites that may have been exported to Ra’ivavae. The southern valleys were, according to Seabrook (1938), in allegiance with Peva for the most part, so obtaining material from them would not have been problematic. Based upon the fact that exposed boulders were being quarried in Vitaria and Unaa, it is possible that the rock in most of the other types of basalt present in the Peva assemblage was being obtained in a similar fashion. However, I believe that the crude material of Cluster 2 from the most nearby source just south of Peva, comes from river cobbles. These hypotheses merit testing.

**Discussion**

The Archaic Peva adze assemblage clearly demonstrates that the inhabitants of Rurutu were familiar with most, if not all, of the diagnostic types that characterized this period. Geochemical sourcing has revealed that the distinctive Types 1A and 4A, for example, were manufactured locally of Rurutu basalt. While it is unlikely that further analyses of the Peva assemblage will reveal any exotic basalt, the array of adze types is indicative of ongoing interaction among the central East Polynesia island groups, where these Archaic forms dispersed. This lends support to the notion of the Archaic period as one of two-way voyaging, in which the Australs indeed took part. Rurutu appeared to be quite self-sufficient in that it did not need to import basalt from other islands, but still chose to maintain the variety of Archaic forms. The array of flake debitage from the
Archaic deposit suggests that at least five different sources of tool quality basalt were being exploited. Based on the size of the flake debitage, larger, rougher preforms were being brought into Peva for working. This is indicative of an early period of experimentation with different materials. In contrast, the Classic period flake debitage primarily comes from the nearby ‘Auti source. However, we must keep in mind that adze manufacturing was probably not a major activity upon the marae grounds. The Classic period flake debitage is therefore not indicate of an adze manufactory, but rather of an area in which available flakes were occasionally used as expedient tools. Finally, the evidence that the Australs were communicating among themselves is quite convincing. The samples documented in Rolett et al. (2005) and in the present study suggest that there was exchange occurring between Rurutu and Ra’ivavae, probably as late as during the Classic period. Further analyses of Austral adzes and geological sources will be invaluable in this respect.
Chapter 10. Other Artifacts

This final chapter documenting the artifact assemblage from Peva includes objects that are both practical and decorative that could not have been incorporated into the previous discussions. As we have seen in Chapters 8 and 9, the transition from the Archaic period to the Classic period is apparent in much of the material culture. In some of the following objects, we can see additional evidence of the East Polynesian Archaic kit, lending support to the concept of a regional homeland in which ideas and objects were exchanged. In others, the efflorescence of a uniquely Austral island culture is clear, one that had its origins in a common East Polynesian ancestry but that had become quite distinct after centuries of independent development.

Utilitarian Objects

Terebra Shell Chisels

Three Terebra shell chisels were recovered from Peva’s Archaic deposit (Figure 10.1.a-c). These have been found in Archaic assemblages elsewhere in the epicenter of Polynesia, at Anai’o (Walter 1998: Figure 4.7) and Ureia (Allen and Steadman 1990:Table 4) in the southern Cooks, and at Fa’ahia/Vaito’oia (Sinoto and McCoy 1975:159) and Vaihi in the Societies (Semah et al. 1978:29, Plate 11). Vérin also found an example on Rurutu in the rockshelter site Ana Eva in Narui (Vérin 1969:195). Terebra chisels were probably used for woodworking, and were made either by chipping off the whorl, which is sharp and would cut the thumb during use, or else by cutting the body near the base and smoothing it (Sinoto and McCoy 1975:159). Terebra chisels
have a long track record in both West and East Polynesian tool kits, being prominent in surface finds in the Societies (Sinoto and McCoy 1975:159). The most complete example from Peva (Figure 10.1.a) has the whorl chipped off, but does not exhibit any additional smoothing.

Worked Turtle Carapace

One piece of cut turtle carapace was recovered from the Archaic deposit (Figure 10.1.d). It is broken, and its original function cannot be deduced. It may be a fragment of a bone spatula or scraper such as the one illustrated from Hanamiai in Rolett (1998:221, Figure 9.12). Another possibility is that it was a bone plaque of some sort.
Figure 10.1. Miscellaneous tools, Peva Phase I. a-c: Terebra shell chisels (ON1-F16-31, ON1-D10-15, ON1-D14-10); d: Worked turtle carapace (ON1-E11-9).
Worked Mammal Bone

Six pieces of worked mammal bone, probably pig, were recovered from Peva’s Archaic deposit (Figure 10.2). What these were intended to be, if anything, is impossible to detect from their form. However, Figure 10.2.d and Figure 10.2.e have the appearance of rudimentary reels.
Figure 10.2. Worked mammal bone, Peva Phase I (a: ON1-D12-9; b: ON1-E13-18; c: ON1-D10-8; d: ON1-F16-25, ON1-G10-8, ON1-C13-4)
Poi Pounders

Poi pounders are not found in Archaic strata in East Polynesia, only appearing in later sites and deposits (Sinoto 1979:122-3). In Samoa, breadfruit was pounded using another breadfruit with a stick inserted into it as a handle (Buck 1930:112). The presence of stone, and later coral pounders in East Polynesia is to some extent indicative of agricultural expansion and the widespread use of starch staples for poi such as taro and breadfruit. Poi pounders were not, however, universal throughout East Polynesia, being absent in Easter Island. Nor was taro or sweet potato pounded in New Zealand, although similar instruments were used to flax fiber (Buck 1944:417). In terms of typology (Figure 10.3), Buck (1944:418-20) found styles from the southern Cooks and Australs to be very similar. Tahitian examples tend to be more ornate, with wide, flaring heads and multiple ridges. Examples from the Marquesas are more rounded, and the head is sometimes carved with a tiki face. Hawaiian types are generally rounded and knobbed, with additional forms being unique to Kauai (Barrow 1972:41). Pounders appear to have moved among islands beginning at least as early as the missionary period, making the determination of provenance problematic (Buck 1944:420). Emory (1975:19-21) illustrated poi pounders collected in the Tuamotus that resemble forms from the southern Cooks, Australs, and Societies, most of which were likely imported there.

Figure 10.3. Pounder types from selected areas of East Polynesia (modified from Buck 1944: Figure 258)
Two coral poi pounders are documented as surface finds from Peva (Figure 10.4). Both are of a generic style and show no particularly Austral traits. Figure 10.4.a is similar to many documented in Vérin (1969: Figures 93, 94, 95). Figure 10.4.b is a far cruder example, and exhibits little modification or effort. According to Seabrook (1938:112), on Rurutu the ancient method was to use a basalt or limestone pounder with a basalt pounding-slab. Coral pounders appear to have been a later development, and were used with wooden slabs. These were in use during William Ellis’ visit to Rurutu, as he obtained one there (Ellis 1969a:191). Both varieties are illustrated in Vérin (1969:234-40). The examples collected by Vérin (1969) are mostly coral, with fewer made of stone. Some of these exhibit the head type noted for Mangaia and the Australs in Figure 10.3. The coral ones exhibit an interesting variety, as some are very crude and not greatly modified from the natural shape of the coral, while others are very thoroughly worked and imitate the form of the stone examples. Coral pounders are easier to fashion than ones made of basalt, and it is likely that they date from the missionary period when stone crafting declined (Buck 1944:418).
Figure 10.4. Coral poi pounders found in Peva Rahi. a: Flared type; b: Crude, minimally modified example.
Ornaments

*Archaic Period (Peva Phase I)*

Ornaments are among the rarest artifacts recovered in East Polynesian assemblages. Walter (1998:47) noted that such high-status items are often found with burials (such as Wairau Bar in New Zealand and Maupiti in the Societies), so that their absence or scarcity in many sites is not necessarily significant. One broken serrated pearlshell ornament was recovered from Peva’s Archaic deposit (Figure 10.5.a). Serrated pearlshell objects are mostly in the form of discs, such as were found in Ha’atuatua (Suggs 1961: Figure 35). Discs such as these are widely distributed in Archaic period sites (Walter 1996:Table 1). Ultimately they may have formed elements of necklaces such as the Classic period Tahitian example illustrated in Figure 10.6. As the Peva example is broken, there is no way of telling if the missing end had a hole drilled through it for attachment. Its serration resembles a broken portion of an ornament found at Ha’atuatua (in Sinoto 1970: Figure 7f). It is also similar to an object from Vitaria illustrated in Vérin (1969: Figure 88). Another possible pearlshell ornament from Peva’s Archaic stratum is a small, drilled piece (Figure 10.5.b). While this may also have been an unfinished fishhook, it would have been an exceptionally small and frail one. If it was intended to be an ornament, it may have been something akin to the shouldered pendants illustrated in Sinoto (1996: Plate 1). In the Peva example, three holes were drilled into one side in order to produce one larger hole on the other.
Figure 10.5. Pearlshell ornaments. a: Serrated pearlshell pendant, Peva Phase I (ON1-D13-18); b: Drilled pearlshell fragment, Peva Phase I (ON1-C5-12); c: Pearlshell ornament fragments, Peva Phase II (ON1-M7-02).
Figure 10.6. A late 18th/early 19th century Tahitian pearlshell necklace with serrated discs (Photo courtesy of Mauna Kea Galleries).
Classic Period (Peva Phase II)

The Classic deposit yielded two ornaments, both from Area 1; fragments of a pearlshell disc (Figure 10.5.c), which may have been an ornament sewn onto a garment or else part of a fly whisk, and an anthropomorphic bone tiki pendant (Figure 10.7). The pearlshell disc appears to have been of the type described by Morrison (1935:69-70). An example of this type of ornament from Rurutu is illustrated in Barrow (1979:Plate 74). Vérin (1969: Figure 88) found a similar fragment in Vitaria. This type of ornament was a large, smooth-edged disc with perforations, and does not appear in Archaic assemblages. It thus seems to have been a later development. Similar discs of perforated pearlshell were used to make breast ornaments such as illustrated in Buck (1944:439). Human hair cordage was the normal means of attachment to a garment of tapa cloth. Buck (1944:438) reported such items from burial caves in Atiu and Ma’uke in the southern Cooks, so its occurrence in the marae deposit of Peva is not surprising. It may have once been associated with one of the many burials in the area, although there was no visible evidence of grave goods. A high-status item such as this was especially rare considering the likely need to import the pearlshell, which in the Classic period was probably used strictly for ornaments on Rurutu (Vérin 1969:169). Vérin (1969:169, 211) speculated that adzes and feathers for headdresses were items that may have been traded in exchange.

The second ornament (Figure 10.7) is a bone tiki pendant, drilled through the head. To my knowledge, it is the only one of its kind anywhere. The material appears to be whale ivory, and it may have been one of a series of necklace units. The design is
similar to ethnographic collections of Austral art as illustrated in Barrow (1979:49-69).
The Peva example is more abstract and simplified than the figures that adorn published
fly whisk handles (Barrow 1979: Plate 56; see also the examples in Rose 1979).
However, it is useful to compare the Peva pendant with the figures carved on the rims of
fly whisks (Figure 10.8). The chevron motif is one of the distinguishing features of
Austral carving, the centers of which were Rurutu and Ra’ivavae (Barrow 1979:53).
Classic period art of the Australs is in general very similar to that of the southern Cooks,
where angular geometrical patterns were very popular.

Figure 10.7. Bone Tiki Pendant, Peva Phase II (ON1-L17-1). Height 3 cm.
Unfortunately there are not enough examples of art from the Australs to make a thorough comparison possible. Barrow (1979:54) wrote, “The iconography of the Australs is little known, nor are its meanings understood. The few wooden images that survived destruction by converts to Christianity suggest a once rich range of image types.” Complex imagery abounds in the few pieces of Austral art that have come down to us. There are abstract, double-bodied “Janus” figures (Barrow 1979: Plate 52), pigs (as discussed in Chapter 5), and pieces of outstanding complexity such as the statue of the god A’a that was taken to Raiatea as a trophy of the evangelization of Rurutu in 1821 (Barrow 1979: Plates 57, 58). The figurines that emerge from the god’s body clearly have meanings that cannot be guessed at with any degree of certainty, and the hollow body contained smaller images, now lost (Barrow 1972:113). Unfortunately, the Austral tiki tradition is not nearly as familiar as that of the Marquesas. Stone tikis have only been found on Ra’ivavae (Barrow 1979: Plates 61, 63). Stone carving was rarely practiced in the southern Cooks (Buck 1944:401), but it was frequent in the Societies. It is conceivable that the Societies had more of an influence on eastern Ra’ivavae than on Rurutu and Tubuai, which may have shared their woodcarving tradition with the southern
Cooks. The year of Rurutu’s evangelization (1821) probably saw most, if not all, of its statuary destroyed.

Miscellaneous

Conch Shell Trumpet

One complete and functional Triton (*Charonia tritonis*) conch shell trumpet (*pū*) was recovered from the Phase II deposit. It was found face down, directly beneath a paving stone, buried in the surface of Layer C. It appears to have been deliberately cached beneath the pavement. The Triton shell is typically found in deep waters outside the coral reef (Salvat and Rives 1983:306), and I was told that such shells were very rarely found on Rurutu. The spiritual importance of this item in Classic period East Polynesia is well attested. Henry (1928:391) wrote, “All univalves called *pūpū* were shadows of the gods, notably the trumpet shell, which was a herald of ‘Oro.” Of his visit to Tubuai James Cook (1967:185) wrote, “One man in the Canoes continued to blow a conch most part of the time they were near us, what this might mean I cannot say, but I never found it the messinger of Peace.” William Anderson, Cook’s surgeon, remarked, “One of them kept blowing a large Conch shell with a reed near two feet long fix’d to it, at first with a continued tone of the same kind but he afterwards converted it into a kind of musical instrument, continually repeating two or three notes with the same strength” (in Cook 1967:970). Ellis (1969a:196-7) also noted that in Tahiti, a bamboo tube three feet long was inserted into the mouth hole of the Triton, so that it could be blown into while held on high during a procession to the *marae*, when warriors went into battle, or for various other important occasions. Henry (1928:156-7) documented that chiefs and
priests in Tahiti used such trumpets in processions and to make announcements. Buck (1944:269-70) described this type of trumpet in the southern Cooks, and illustrated two similar examples collected by the London Missionary Society, one of which was probably a sacred trumpet, and a gift from the king of Mangaia (1944:Figure 167). As in the Societies, on Mangaia the sacred Triton shell was considered to be the symbol of a deity, in this case Rongo, the principal god of the island, and was kept inside the god house of the *marae* (Buck 1944:367). The king is said to have used it to summon warriors together in the god’s name. The sound issuing from the trumpet was considered the voice of Rongo himself (Buck 1944:464). This type of instrument was probably used in Ancestral Polynesian Society as well, as the term for it is evident in the Proto-Polynesian language. However, such an artifact has not yet been recovered from a site in West Polynesia (Kirch and Green 2001:191-3). The Peva example was almost certainly a sacred trumpet associated with the *marae*. This might explain why someone would bury it. Considering the circumstances surrounding Rurutu’s evangelization, I offer a guess that someone, probably a priest, hid the trumpet beneath the pavement when he heard that the objects of Rurutu’s *marae* were being destroyed.
Ochre

Eight fragments (lumps from 15-35 mm) of red ochre were recovered from the Archaic deposit, scattered in the eight northern units of Area 2 (D10, D11-G10, G11). Red ochre is the soft, earthy form of hematite. Red was a sacred color throughout Polynesia, and in New Zealand, red ochre was valued for painting wooden objects, and mixed with fish oil for body painting (McGovern-Wilson et al. 1996:178). Red ochre has previously been found at Shag River in New Zealand, in much larger quantities (McGovern-Wilson et al. 1996:178-80). Ochre is also known from early sites in Samoa, where it could have been used for coloring the slip on pottery and dying tapa cloth (Green 1974:269).
European Artifacts

Few European artifacts were found at Peva, all from the first few centimeters of the Phase II Classic deposits. There are fragments of handblown broken glass, and one piece of copper sheeting. The copper came from the sheathing European vessels used to protect the wood from the dreaded Teredo worm (shipworm), a bivalve mollusk that uses its greatly reduced shell to bore into wood. The square nail holes indicate that it came from a ship built before round nails came into use in the 19th century. Given the impossibility of a large ship mooring at Peva, it is likely to have originated in the accessible bay of Moerai. The glass might also have originated there, and due to the characteristic opaqueness of the fragments, it is likely that they also date from the 19th century.
Figure 10.10. Copper sheathing with square nail hole, Peva Phase II (ON1-L8-1).
Discussion

The artifacts discussed in this chapter conform to the pattern of stylistic changes that distinguish the East Polynesian Archaic from the Classic period. The Peva assemblage demonstrates that the Australs did indeed share in the Archaic material culture of East Polynesia. The homogeneity of this material culture is reflective of this period as one during which interaction was taking place between island groups. Had the island been settled by one-way voyages followed by isolation, we would expect to observe a pronounced “founder effect” in the material culture, which is visible in the more marginal areas of East Polynesia. For example, serrated pearlshell ornaments have not yet been found in early Hawaiian assemblages (see Walter 1996). It is likely that the full array of styles was transported throughout the centrally-located islands in a gradual process of continuous settlement.

The later, Classic period artifacts indicate other trends. The first is a continuity of the homogeneity of certain artifacts throughout central East Polynesia. The pearlshell ornament from Phase II is an object typical of the time throughout the archipelagos. The lack of local pearlshell on Rurutu makes it probable that such a high-status item was imported from another island, such as Tubuai, where there is pearlshell. Another possibility is that it came from the Societies or Tuamotus, as a gift or exchange item. As the Australs and southern Cooks were known in Tahiti for their feathers, some degree of continued trade is probable. This homogeneity of Classic period artifacts was also visible in the fishhook and adze assemblages discussed previously. The Societies, Australs, and southern Cooks shared the later jabbing fishhooks and the characteristic Type 3A adzes.
However, despite these similarities, the Australs were unique. In terms of material culture, this was manifested in their fine carving, of which the small tiki pendant from Peva is but one example. Items that were most probably manufactured by Austral artisans were collected in the Societies, and probably in the southern Cooks as well (Barrow 1979; Rose 1979; Buck 1944). The accoutrements of the Rurutuans whom Joseph Banks and James Cook saw in 1769 impressed them considerably. The Australs were known centers of carving and tapa cloth manufacture (Barrow 1979:54). Why these islands excelled in craftsmanship is another matter. The southern Cooks also produced magnificent specimens of woodcarving, much of which stylistically resembles material from the Australs. Mangaia, for example, was renowned for its ceremonial adzes. The level of detail inherent in carving from the Australs and the southern Cooks is remarkable when one compares them to the simplicity of many wooden objects from the Societies (see Barrow 1979). As Barrow (1977:93) pointed out, it is unfortunate that no one recorded information regarding the craftsmen in these archipelagos. It is possible that the fluid social structure inherent in Open societies, such as were found in the Australs and southern Cooks, may have contributed to the development of art there. The Marquesas, another Open society, also produced exceedingly beautiful works of art. Based on lexical reconstruction, the social class of craftsmen can be traced back to Ancestral Polynesian Society (Kirch and Green 2001:224), together with other important titles such as warrior and navigator. The competition for status in Open societies may have been one factor in spurring the artistic endeavors of their craftsmen.
Chapter 11. Conclusions

The Peva excavation provides us with a valuable reference point in East Polynesia. The deposition of a vast coastal sand dune has resulted in the excellent preservation of two intact and distinct cultural deposits. The earliest layer, Phase I, corresponds directly to the East Polynesian Archaic period, which spanned ca. A.D. 1000-1450. As the first site of its kind in the Australs, Peva has revealed that this archipelago shared many of the traits common in East Polynesia during that period. Similarities with other Archaic sites in the southern Cooks, Societies, Gambiers, Marquesas, and New Zealand support the notion of this period as one of continued two-way voyaging, which allowed for the exchange of ideas that led to the largely homogenous material culture. This tends to strengthen the hypothesis that the Australs were part of the voyaging spheres of which early East Polynesia was composed, and suggests that exploration and settlement were a continuous, involving multiple two-way voyages, especially in the epicenter concentrated around the Societies.

Peva’s Classic deposit, separated from Archaic by an uninterrupted layer of sterile sand, is also significant to our understanding of East Polynesian prehistory. The differences between the two periods are unambiguous, and point to agricultural intensification, increased sociopolitical complexity, and the efflorescence of a uniquely Austral culture by the late 18th century. In addition to change through time, the Classic deposit, which is associated with a marae, offers us insight into the ceremonial activities that took place in traditional Polynesian society, what implications these have for our understanding of the “endpoint” of this culture, and the processes that led up to it. As
there is so little ethnographic evidence for the Australs of the Classic period, the data from Peva are especially useful. In this chapter, I summarize the phases of Peva’s occupation and then relate them to the broader issues surrounding East Polynesian prehistory.

**Peva Phase I (ca. 1280-1410 A.D.)**

The habitation site on Peva Rahi’s sand dune was first occupied during the late 13th A.D, and was inhabited until around the early 15th century. Like Moera and Avera, Peva is an ideal valley for human habitation in every respect. The fringing reef offered its settlers a rich array of shellfish and fish that could be captured without even venturing out to sea in a canoe. The pass in the reef, one of the few on the island, was also advantageous, allowing canoes to leave the confines of the valley if desired. Prior to modern road construction, Peva was only accessible from the sea or from inland roads, because the *makatea* cliffs that flank the valley interrupt the coastal plain. The reef pass was also beneficial because it provided an entrance for pelagic species of fish that came inshore to feed; these highly prized fishes could then be caught within the confines of the fringing reef itself. Turtles could also swim through and lay their eggs on the white sand beach, providing the inhabitants of the valley with yet another easily accessible resource. Turning away from the sea, the valley floor was a rich and fertile swampland. The *makatea* cliffs served to trap the fertile alluvial soils within the valley. It would have been an easy matter to plant taro directly into the swampy land, with no need at first for the more complicated irrigation ditches that would follow. Perennial streams provided fresh water, and the abundant rainfall made drought a very unlikely hazard. The
conditions of the northern half of Peva, Peva Iti, were just as well suited for dryland agriculture as those of Peva Rahi were for wetland agriculture. The land rises in a gentle slope from sea level until the facing cliff. This land, much of which is covered today by farms, would have been ideal for dryland crops such as sweet potato and yams. The fertile soils near the coast throughout Peva could have quickly been transformed into anthropogenic gardens consisting of such cultigens as breadfruit trees, sugarcane, and Tahitian chestnut, to name but a few.

During the early period of settlement, there would probably have been abundant terrestrial protein sources as well. Ground-nesting seabirds and landbirds, very few of which are today found on Rurutu, could have provided the inhabitants with very convenient food. The flying fox, a mammal whose distribution was previously thought to extend no farther east than the southern Cooks, may have been a well-established species on Rurutu, and possibly on the other Austral islands as well, or else it may have been transported intentionally like the pig, dog, and chicken. Only future archaeological investigation can confirm the true prehistoric extent of this species. Human predation clearly impacted the native avifauna on Rurutu, for by the time of Peva Phase I, it appears that birds had already been reduced to a very small component of the diet. How large the pristine population was is impossible to say, but if Rurutu followed a pattern similar to that of other islands in Polynesia, there was probably a much larger and more varied bird population prior to human settlement. Rurutu is relatively small with an elevation that is quite modest compared to other high islands. Apart from the makatea escarpments, there are few areas of the island that cannot be reached on foot with little effort. This would
have made Rurutu especially vulnerable to rapid deforestation following the firing of the native vegetation for agricultural purposes. These forests, the habitats of endemic and indigenous species of flora and fauna, could have been quickly eliminated. Today, Rurutu possesses few if any areas of undisturbed vegetation. That this was true in the past is revealed in the accounts of people such as Joseph Banks, who found the barrenness of the island so remarkable that he commented upon it in no uncertain terms.

Despite the presence of these other protein sources, the inhabitants of Peva during the Archaic period subsisted primarily on fish. Most of the fishes that were consumed during this time were inshore species that could most easily and abundantly be caught with nets, spearing, poisoning, and other methods that did not require angling. The paucity of fishing gear recovered from the Archaic deposit suggests that already during this early era, angling was only a minor component of fishing. The fact that no rotating hooks or trolling lures were found is also indicative of a focus on the inshore waters and the reef zone. It must have been clear to Rurutu’s early settlers that there was little need to venture out beyond the fringing reef. This is significant, because during the Archaic period seafaring was still an important part of East Polynesian culture. The convenience of Rurutu’s fringing reef may have contributed to a diminished canoe use early on. Fishing strategies that had been practiced in Ancestral Polynesian Society, most notably net fishing, were the more productive means to harvest the sea. Many of the techniques outlined by Seabrook (1938), such as poisoning and fishing by torchlight were probably also used. Nevertheless, the manufacture of jabbing fishhooks, very similar to examples from the neighboring southern Cooks, was taking place on-site. Fishhooks in various
stages of completion were found, in addition coral and sea urchin spines. Pearlshell, a resource that is either extremely scarce or perhaps nonexistent in Rurutu’s waters, is present in small quantities in the Archaic deposit. If this was imported from another island, it was not done so in large quantities. This probably reflects the lack of need for angling gear more than the inability to import pearlshell. *Turbo* shell abounds in the Archaic deposit’s midden, yet none of it is worked. If the inhabitants of Peva had needed angling gear and for some reason could not import pearlshell, *Turbo* shell would have been an acceptable substitute for the manufacture of the small, simple jarring hooks that they were making from pearlshell. The fact remains that of the multitude of Archaic East Polynesian fishhook varieties, the inhabitants of Peva settled early upon only a fraction thereof. This stands in sharp contrast to Ma’uke (Walter 1998) where pearlshell was also not locally available. There, the reef flat is too shallow to make net fishing advantageous, forcing the inhabitants to rely upon angling and to import pearlshell for fishhook manufacture. This accounts for the number and variety of fishhooks recovered from Anai’o.

Other marine resources such as shellfish and turtle were exploited during the Archaic period. The abundance of turtle in the Archaic deposit suggests that it was intensively harvested, but its presence in even larger quantities in the Classic period indicates that the turtle population remained, possibly through the imposition of *tapu* restrictions. The significance of the turtle in Ancestral Polynesian Society makes it likely that this might have occurred early on in Rurutu’s prehistory. While it is uncertain if over-exploitation of turtle did in fact occur during the Archaic period, there is tentative
evidence for the depletion of other marine resources. There is some indication that the bivalve *Modiolus auriculatus* may have been diminished during this time as well, and perhaps also some of the populations of small *Turbo setosus*.

Although the early inhabitants of Peva were clearly subsisting primarily on protein from marine resources, they already had an established population of domesticated animals. Of these, the pig was the most prominent in the faunal assemblage. Dogs appeared to have played a minor role in subsistence, if any, as did chicken, if present among the bird bones. As the *tapu* on pig was so widespread in Polynesia during the Classic period, this custom probably had its roots farther back in time, perhaps as early as Ancestral Polynesian Society. It is likely that pig was consumed only on occasion, and by the highest-status individuals. These restrictions on certain foods reached their apex centuries later, when the Polynesian chiefdoms were at their most stratified and complex.

The quantity of lithic debitage recovered from the Archaic deposit suggests that the manufacture of stone tools was one of the more prevalent activities. The craftsmen of Peva were well versed in many, if not all, of the Archaic adze types in use throughout East Polynesian during that time. Most of the adzes made at Peva, finished and unfinished, are Duff Type 2As. This simple, untanged adze was the most widespread form in East Polynesia, and was also well known in West Polynesia. Another type characteristic of Peva is the Duff Type 4 reverse triangular adze in both tanged and untanged forms. This too had its origin in West Polynesia and was a widespread Archaic adze type. The presence of one Duff Type 2C adze, the most common Samoan type, is
additional evidence for the link between archipelagos during the Archaic period. The presence of this adze type in Moturakau (Allen 1992b), a contemporary site in the southern Cooks, adds support to this notion. One example of a Duff Type 1A with poll lugs is a further link to other island groups, and may perhaps be called the first truly East Polynesian adze form. As these adzes were all made from local basalt, and thus certainly manufactured on Rurutu, this demonstrates that the artisans of Peva were entirely familiar with the many varieties included in the Archaic adze kit. The diversity of these adze types at Peva is additional evidence for the ongoing sharing of ideas between islands. This reinforces the conclusion that the relative paucity of fishhook types at Peva was an intentional abandonment and not the result of a founder effect.

The concentration on adze making possibly reflects other activities, such as woodworking, that were probably occurring at the same time. The presence of the larger adze types, namely the Type 4 and Type 1A, suitable for hollowing out a tree trunk for a canoe (Best 1977), is in agreement with the nature of the Archaic period as one during which seafaring was common. The smaller, finer adzes such as the Type 2As could have been used for more detailed carving and finishing work, including ornamentation. Terebra shell chisels would also have been suitable for fine woodcarving. The abundance of retouched flake tools may have been employed for a wide variety of activities such as food preparation and other uses.

That so much adze making was occurring at a habitation site in Peva is interesting considering the lack of basalt in the valley. The only basalt in Peva is in the form of river cobbles, and the inhabitants were forced to gather the material from elsewhere on the
As Rurutu is relatively small and accessible, this would not have been a great obstacle. What is significant is that the inhabitants had already located all available sources of tool-quality basalt by the period under discussion. This would have involved intensive exploration of the island, for at least one rock type identified among the Peva material is from a source unknown to modern geologists. At least six different sources of basalt were being tapped, with some of the best quality material located a short distance to the south of Peva, just north of ‘Auti. Quarries in Unaa, Vitaria, and in the southern end of the island were also exploited and experimented with.

**Peva Phase II (ca. 18th century A.D.-1821)**

Peva Phase II corresponds to the Classic period of East Polynesia. During this time the majority of Peva’s inhabitants occupied the valley interior, constructing their houses along the slopes that overlooked the taro fields. Large, oval-ended houses like those of Vitaria were also built in Peva, and could house a large family group of about 20 people. Land was owned and managed by kin groups whose loyalty was to the valley itself, which was in turn presided over by a chief. The landscape of Rurutu had been entirely modified by this point. Deforestation has denuded the mountainous interior of the island, groves of anthropogenic forests and gardens covered the coastal plains and lower mountain slopes, and a network of irrigated taro pondfields occupied the valley floors.

Agricultural intensification would have developed alongside population growth. Rurutu, though a relatively small island, possesses large areas of natural swampland that are hemmed in between the mountainous interior and the coastal makatea cliffs. These
were then converted into pondfields that were productive enough to sustain an expanded population. The agricultural base, which consisted also of the dryland crops sweet potato, yam, and breadfruit, was also sufficient to maintain a population of pigs. This stands in sharp contrast to Mangaia, another *makatea* island in the southern Cooks whose landmass, though larger than Rurutu’s, had less natural swampland for taro. Although Rurutu’s original vegetation had been almost completely destroyed, the island’s wealth was in the alluvial basins. As erosion negatively affected the agricultural potential of the mountain slopes that had lost their forest cover, the soils had washed down into the valley floors and enriched them.

In terms of subsistence, fish probably continued to be the dominant protein source into this time, although this is not reflected in the Classic period faunal assemblage. More prestigious foods such as pig and turtle were likely emphasized on the feasting grounds of the *marae*, whereas fish and shellfish, while present, played a much smaller role. The types of fish caught are significant, however, because they occur in virtually the same proportions as those from the Archaic deposit. This suggests that the overall fishing strategies had not changed significantly over the centuries, and that the fringing reef was still able to provide food. However, it appears that in general, larger fishes and larger specimens of *Turbo setosus* were being eaten upon the *marae* ground. This may have been due to the intentional selection of more impressive specimens suitable for special occasions. The fishhook technology of Rurutu does not appear to have changed very much from the Archaic to the Classic period. One-piece *Turbo* specimens excavated from Vitaria (Vérin 1969) exhibit characteristically late-period knobbed heads, but
otherwise they are not very different in form from the Archaic Peva examples, with small jabbing hooks comprising the majority of examples. It is probable that net fishing and other non-angling strategies continued to provide the majority of catches in Peva. One change in the fishbone assemblage between the Archaic and Classic assemblages should be noted. Elasmobranchii vertebrae, most probably shark, which are minimally represented in the Archaic assemblage, occur in the Classic in much larger quantities. Although it is not possible to determine the MNI (minimum number of individuals), the fact that shark was also a *tapu* food during the Classic period should not be overlooked.

The presence of *tapu* foods upon the *marae* is indicative of a more stratified and complex sociopolitical system than existed during the Archaic period. The restrictions that probably had their origins in Ancestral Polynesian Society had become the cornerstones of life. The *marae* was constructed in Peva Rahi, the seat of the chiefs and the elite of Peva. Access to the *marae* and feasting was probably highly regulated. Feasting allowed chiefs to display their own wealth in order to win and secure allegiances, and acted as a form of competition between valleys (e.g., Thomas 1990). In an Open society such as Rurutu, the constant reaffirmation of the chief’s potency and *mana* would have been essential to maintain social equilibrium and to prevent another class such as the priests from gaining more control. In the Marquesas, the elaboration of monumental religious architecture during the Classic period has been taken to reflect the growing power of the priestly class (e.g., Suggs 1961), which is also evident in the Australs. If we consider the *marae* Uramoa together with the restricted foods that were being consumed upon it, the status of the priests becomes more evident.
The material culture of the Classic period was quite distinct from the Archaic. Surface finds from Peva are virtually identical to those excavated from Vitaria, and to ethnographically collected specimens from the Societies and southern Cooks. The untanged Type 2A adze, the most frequent Archaic variety, had become one of the less common adzes. The triangular Type 3A adze, characteristic of the Societies, Australs, and southern Cooks, had become the predominant form. This might represent changes in adze use, if it was the case that the Archaic Types 1A and 4E were indeed canoe-building adzes (Best 1977), an activity to which the 3A is unsuited. It is possible that the Type 3A was a tree-felling tool that became increasingly utilized, as population growth required that more land be cleared for agriculture. As fewer large canoes were being constructed and the populations looked inland rather than out to sea, the tool kit might have changed accordingly.

Other aspects of the Classic period material culture changed as well. Round pearlshell discs, drilled through for attachment onto clothing, became fashionable during this time. On Rurutu, where pearlshell was probably not found, the presence of such an ornament suggests a high-status item, perhaps acquired through trade or gift-giving with another island. The conch shell trumpet from Peva is another item that was common throughout East Polynesia during the Classic period. This type of shell, rare in Rurutu’s waters, may also have been imported from another island. Fine woodcarving, another later development that reached its apex in the Australs, is evident in the tiki pendant from Peva’s Classic period assemblage.
From museum collections, we know something about the perishable items of Classic period Austral material culture such as tapa cloth, feathered headdresses, and woodcarvings. Elaborately decorated clothing and accessories characterized the Australs during the Classic period. The craftsmanship of these items impressed early visitors such as Joseph Banks and James Cook enough to write about them, despite having seen them so briefly and under such conditions. The presence of many of these items, such as the beautifully carved flywhisks, in the Societies where early visitors collected them indicates that they were prized items in central East Polynesia. It is probable that they were either exported from the Australs or else that craftsmen from the Australs were living and carving in the Societies. While we are fortunate to have some ethnographic examples of woodcarving from this period, the loss of the divine images in the advent of evangelization must be felt all the more acutely. The few tantalizing examples still extant offer only the smallest sample of what was probably the crowning glory of Austral craftsmanship.

**Implications for the Prehistory of East Polynesia**

Peva’s Archaic period assemblage has significant implications for the regional homeland model and the colonization of East Polynesia. Both radiocarbon dating and material culture place it alongside Archaic sites in the southern Cooks and Societies. This supports the notion of a settlement process so rapid that it is currently impossible to determine which, if any, archipelago in the region was first colonized. Archaic East Polynesian culture appears to have developed within East Polynesia itself over a period of a few centuries following separation from West Polynesia. This unique culture was
probably being shared among the archipelagos during a period when long-distance voyaging was taking place with enough frequency to ensure the even distribution of certain diagnostic traits.

*Post-settlement Voyaging*

A major contribution of the Peva investigation pertains to the nature of Archaic period interaction and the decline of long-distance voyaging that ultimately might have brought that era to an end. Finney (1994; see also Kirch 1988; Walter 1996) addressed this issue, and postulated that some regions may have given up this sort of voyaging because the costs were too high. Voyaging canoes were huge capital investments and required skilled navigators. In addition, there was some degree of risk involved in these undertakings, which could last for months or years. During the early period of settlement such voyages may have been necessary in order to ensure that a given island possessed the full array of cultigens and domesticates, and other items essential for long-term survival: “Once, however, all the islands had been settled and the new communities were well established, once local resources had been located to ensure self-sufficiency, and once the sweet potato and other valuable cultivated plants had been distributed, there would seem to have been little in the way of material needs to keep long-range voyaging alive” (Finney 1994:302). In many respects Rurutu appears to follow this model quite well. WD-XRF analyses of Peva’s basalt artifacts have revealed that Rurutu was probably not importing this raw material because the quality of the local stone was sufficiently fine. This self-reliance suggests that when interaction and trade was not essential or economical, an island may have opted against voyaging. Whether or not
adzes found on other islands outside the Australs will match Rurutu’s geochemical signatures is an open question. Another line of evidence that indicates a lack of intensive trade is the paucity of pearlshell in the Archaic deposit. Few fishhooks, with little variety of form, were recovered. This is directly related to the nature of the island itself, and specifically reflects the bounty of the surrounding fringing reef. Angling was likely not thought of as economical in comparison to other mass-catching methods, and thus the highly varied Archaic fishhook assemblage was largely unnecessary.

Rurutu appears to have willingly given up the manufacture of voyaging canoes, perhaps at a very early stage. Weisler (1994) postulated that on Mangareva, timber depletion had been a major factor in the loss of canoe technology, leading to the abandonment of the more remote outposts on Pitcairn and Henderson. Rolett (2002) suggested that the overall decline in long-distance voyaging in central East Polynesia might have been due to political changes in the Societies. Increased hostility between chiefdoms there might have redirected the use of timber toward war canoes and thus limited its export to other, less-forested islands, which would then have had difficulty in obtaining the necessary raw materials. Rurutu was certainly heavily deforested by the time of European contact, although it is not possible to say if this was a factor that contributed to the decline of long-distance voyaging. Finney (1994:302-3) also took into account other, non-economical motives for voyaging, which was such a strong part of Polynesian culture: “Voyages made for what we might class as religious, romantic, or adventurous purposes may not have left material traces broad and prominent enough to be noticed by the archaeologists of our era, but this does not mean that they were
unimportant to the people involved, or above all, as some have claimed, that they never took place.”

Classic Period Voyaging

In the Classic period, Tahiti stood as the trade hub of central East Polynesia. Tahiti imported pearlshell from the Tuamotus, and Maupiti may have been its major source of basalt (Oliver 1974:138). The Tuamotus looked to Tahiti as their primary source of adzes and canoes. Oliver (1974:214) noted that while expeditions originating from Tahiti toward the Tuamotus occurred, the Tuamotuans probably did most of the voyaging, because the resource-poor atolls virtually compelled them to rely upon other islands for important goods. This may have been responsible for maintaining a relative homogeneity of the Society-Austral-southern Cook material culture into the Classic period. During the early 19th century and probably earlier, in Tahiti Tuamotuans were hired to build canoes on account of their expertise (Moerenhout 1837:159). This situation would have been akin to the trade network of the Vitiaz Strait (Harding 1967). The Vitiaz Strait network extended 180 miles long and 60 miles wide between New Guinea and New Britain. It was remarkable because it was a system kept active by only several hundred adult males of the small Siassi islands on the west end of the network. There is very little soil on Siassi, so vegetables and wood had to be imported. While their prime objective for voyaging was to obtain pigs, which they could not easily rear themselves, the Siassi traders, outfitted with 30-55 foot, two-masted, single outrigger canoes and crews of five to six men, would ply as much as two tons of cargo up and down the Vitiaz Strait, visiting all the communities around twice per year. The Siassi
produced mats and coconuts, and their system would involve a first stop to exchange them for pots, which would then be exchanged in the next port for wooden bowls, and so forth until the necessary objects were acquired that could be traded for pigs. In the Vitiaz network, some objects were made for export only, such as pots, wooden bowls, and bows and arrows. The Siassi would cultivate a large “kinship” network of trading partners, complete with strict codes of conduct. While their neighbors regarded the Siassi as hucksters and freeloaders, they tolerated them because they encouraged long-distance trade. In a similar way, the Tuamotuans were instrumental in circulating material culture between the Societies and Tuamotus. Some degree of voyaging directly between the Australs, southern Cooks, and Societies seems also quite likely, although probably less frequent. The large degree of similarities in material culture shared between these archipelagos in the Classic period (Buck 1944) has already been discussed at some length (see Chapter 3). The likelihood that many items manufactured in the Australs or by Austral artisans that were later collected in Tahiti or the southern Cooks is further evidence that some degree of contact persisted. We should take note of the portrait that John Webber, the official painter on Cook’s third and last voyage, drew of a Rurutuan (Figure 11.1). As Barrow (1979: Figure 5) wrote, “John Webber never visited Rurutu, so he must have met and sketched this Rurutuan in the Society Islands.” Morrison’s (1935:72-4) accounts of accidental voyages between Tubuai and the Societies must also be taken into account.
Figure 11.1. John Webber's pencil and watercolor sketch of a Rurutuan man, most likely drawn in Tahiti (after Barrow 1979: Figure 5).
Geochemical sourcing done on the Peva lithic assemblage also provides evidence that adzes were being exchanged among the Australs. Two adzes collected on Ra’ivavae and housed in the Peabody Essex Museum (documented in Rolett et al. 2005) are very close to samples of basanites from Rurutu (Chapter 9). An additional two adzes from the same collection are excellent matches to the Vitaria quarry, further confirming that adzes were being exchanged between the islands. The presence of imported adzes on Ra’ivavae is especially interesting when we take into consideration Tupaia’s statement to James Cook that Ra’ivavae was exporting adzes to Raiatea in the Societies (documented in Finney 1994:289). Further work into the exchange relations between the Australs is clearly needed in order to expand the growing picture of Classic period interaction.

The Emergence of Rurutuan Culture

We are now in a position to examine how Rurutu, and the Australs in general, came into their own as a distinct cultural entity. This process of transformation from a common Ancestral Polynesian Society into diverse Classic period chiefdoms took approximately 1000 years throughout East Polynesia. In highly simplified terms, some key factors that shaped the differential development of the Polynesian chiefdoms include the environmental conditions of the islands, human responses to these conditions, and the possibilities and restrictions that ensued. The Ancestral Polynesian sociopolitical system was also instrumental, as it was fluid enough to allow for the advancement of different social classes. In the case of the Australs, by the time Europeans first arrived at the end of the 18th century, they were confronted with a rather unique culture. The islanders lived in a state of almost constant warfare. The Rurutuans who met James Cook’s ship were so
hostile and aggressive that no landing was attempted. The next major confrontation between Europeans and the people of the Australs took place over a decade later, when the *Bounty* mutineers attempted to establish a colony on Tubuai, an endeavor that ended in futile bloodshed. Fortunately James Morrison (1935) recorded invaluable observations. Most significantly, he noted that the priests of Tubuai were nearly equal in standing to the chiefs. This still held true some 30 years later, when the missionary William Ellis (1969a, 1969b) witnessed the twilight of the traditional Austral religion.

Based on these few observations from reliable sources, it is quite clear that the Australs can be classified as an Open society (Goldman 1970), in which the power of the chief had declined to the benefit of another social group. In other cases of Open societies, most notably Mangaia and Easter Island, the warrior class had risen in response to the chiefly decline in authority. In the Marquesas and the Australs, however, it was the priestly class that prospered. What makes the Australs interesting and unique is that while a different route had been taken, the end result was similar. Environmental stress is widely acknowledged as an important variable in the development of island polities. This stress can take on different forms. On Mangaia the lack of sufficient agricultural land, in part due to human deforestation and the degradation that ensued, precipitated an ongoing cycle of warfare aimed at territorial annexation (Kirch 1994). When a strong enough conqueror emerged, he assumed the paramount chieftainship over the entire island. Demographic pressure was clearly one vital factor in encouraging the use of irrigated taro lands wherever possible, for on Mangaia the missionaries recorded one of the highest population densities found in central Polynesia (Kirch 1994:287). The extirpation of the
pig on Mangaia, an event that took place on Tikopia as well (Kirch and Yen 1982), was likely linked to an inadequate agricultural surplus. The use of the rat as a food item is another indicator of food shortage, including a possibly impoverished marine environment as well (Kirch 1994:284-5).

Regarding the Marquesas, “devolution” is thought to have occurred in large part because of unstable environmental conditions in which droughts and famine were a serious problem for a society that depended so heavily upon breadfruit (Thomas 1990; Rolett 1998). Disasters such as these would have weakened the chief’s hold upon his authority, as he would have been perceived to no longer have influence over the productivity of the land. In response to this open window of power, the priestly class of prophets (tau’a) rose to fill the void. While the above explanations are quite convincing for Mangaia and the Marquesas, they do not apply in the same manner to the Australs. How then did the Australs “devolve” into an Open society? Attempting to answer such a question always involves much speculation, and the following explanation must be regarded as tentative.

In the first place, let us reexamine the basic environmental conditions of the Australs and how they differ from other Polynesian archipelagos. The Australs have the smallest total landmass of any archipelago in Polynesia save for the Pitcairn group. The largest island, Tubuai (45 km$^2$), is smaller than the most diminutive islands of the Marquesas such as Tahuata (50 km$^2$). Rurutu, at 38 km$^2$ is slightly over a tenth of the size of Nuku Hiva (330 km$^2$). The surface area of the Australs is therefore extremely circumscribed in comparison to other Polynesian islands. Regarding Rurutu, another
important factor is the encircling fringing reef. This encouraged a focus on inshore fishing that made the manufacture of canoes less necessary for subsistence, and may have discouraged post-settlement voyaging as well. The reef, which has few passes, also prevented access by sea to most of the valleys, making canoe transport largely impractical. Rurutu’s makatea cliffs provided further geographical boundaries between valleys along the coast. These cliffs also served to trap large expanses of fertile swampland between the mountainous interior and the coast. These wetlands, ideal for taro cultivation, led to the emphasis of large-scale pondfield agriculture. The southerly climate of the Australs provides ample rainfall, making hazards such as drought a negligible possibly. This ability to produce great quantities of food on a regular basis allowed for subsequent population growth. In sum, a typical Austral island is small yet contains great agricultural potential. An island in the southern Cooks such as Mangaia, while larger than Rurutu, possessed only around a third of comparable agricultural land. The Austral environment was therefore advantageous in that it could support a substantial population, but disadvantageous because there is limited surface area.

Upon these small yet fruitful islands population growth would have been considerable. Social measures against this, such as infanticide, were apparently not practiced (Morrison 1935:65). The social system, based on primogeniture, only permitted the eldest son to inherit land. Younger siblings were forced to become subordinate or to found their own ramage (Seabrook 1938). On an island with little surface area, small valleys, and a large population, this system of inheritance could have served to aggravate tensions between kinship groups and chiefdoms. The semi-legendary
first chief of Vitaria, Amaiterai, was the younger son of a Tubuaian chief, who began his mercenary wanderings in search of the power that he could not inherit. If we do not dismiss the oral and genealogical traditions out of hand, Amaiterai settled in Vitaria, the only uninhabited district left on Rurutu, in around the 15th century A.D., suggesting that population growth was quite rapid and the entire island had been claimed within four or five centuries of initial colonization.

Into this mixture of a highly productive agricultural foundation and a growing population we have to factor in the inequality of valleys. Rurutu’s valleys are not evenly provided with the same amounts of land that contain the potential for pondfield irrigation. The principal valleys of Moerai, Avera, and Peva possess the majority of it. This allowed the chiefs of these valleys to exert influence over their smaller neighbors, forming a system of alliances. In addition, the smaller valleys in the south of the island fought among themselves, probably over limited taro land. Finally, on Rurutu there is Vitaria, the dry district without permanent water that was settled because there was no place else left on Rurutu. The situation then becomes one in which there is a distinct dichotomy between the wet and the dry (Kirch 1994). Vitaria, compelled to rely upon breadfruit and stolen or traded taro, became an archetypal aggressive and expansionist chiefdom. It encouraged population growth and the influx of immigrants from neighboring Unaa, and developed an elite caste of ‘arioi warriors with which it could attack and subdue other valleys. Over a period of a few centuries, Vitaria became powerful enough to defeat its archrival Peva and to settle in the wet, taro-rich valleys it had so long coveted.
Having addressed the issue of ongoing warfare, how can we then explain why the chiefly class of the Australs ended up sharing a good deal of its authority with the priests? Unfortunately, we are hampered in this effort by the extreme paucity of ethnographic accounts, and by the rapid evangelization of the Australs in the 1820s. However, there are some clues available. Seabrook (1938) wrote at some length concerning the 'ara‘ia priests of Rurutu and how influential they were in planning and encouraging warfare in Vaiteria. This appears to be an example of how the ambition of a given social class is instrumental in shaping the culture (Goldman 1970). As successful counselors of warfare, these priests might have been regarded as possessors of strong mana and therefore worthy of respect and reward. The situation on Rurutu may have had its parallels on the other Austral islands, for on Tubuai the high status of the priests was the same (Morrison 1935). What is certain is that on Ra‘ivavae and even more so on Rapa, warfare had progressed to the point where fortifications became necessary to protect the taro lands.

The Peva investigation provides independent lines of evidence in support of these explanations. To begin with, Rurutu’s self-sufficiency probably served to encourage isolation beginning in the Archaic period. The island was entirely self-sufficient in terms of basalt, and pearlshell was not essential for the inshore fishing strategies that were dominant. The fringing reef, as both a barrier and a resource, would also have disinclined intensive canoe use. Based on the Archaic period faunal assemblage, Peva already supported a population of domestic pigs. By the time of the Classic period, two very relevant trends become evident. First, the valley had become entirely cultivated, with
taro pondfields covering the valley floor of Peva Rahi, home to the elite, and dryland fields on the slopes of Peva Iti. The abundance of pig in the faunal assemblage of this time indicates that feasting was taking place upon the *marae* grounds, and suggests that the valley itself was productive enough to support a sizeable pig population. This is in direct contrast to Classic period Mangaia, where the pig population was probably intentionally extirpated centuries before, due to the high cost of feeding it. The quantity of pig recovered in Peva also stands in opposition to Vitaria. Vérim (1969) found only a single pig tooth in the excavation of an entire house platform approximately 30 m in length. While this was a secular, and not a ceremonial structure, it still remains a miniscule amount when compared to Peva’s early, Archaic period faunal assemblage when the site was a habitation area and not a *marae*. The presence of these feasting foods and the large number of immature pigs in the Classic period Peva assemblage also suggest that competitive feasting, in which one chief tried to outdo another in terms of generosity and extravagance, was taking place. Feasting in this sense was a form of competition not unlike or unrelated to, warfare (e.g., Thomas 1990).

The existence of the *marae* Uramoa in conjunction with large quantities of elite foods such as pig and turtle also supports the notion that by the Classic period, priests had become members of the elite. The size of the *marae* grounds, which extend beyond the boundaries that are visible on the surface, suggests a structure of considerable importance to the valley. Its central location on the coast and opposite the prime fishing grounds is additional evidence of the *marae*’s role in the valley. Finally, its part in the oral tradition
not only of Rurutu, but also of the Australs, as the first marae founded on Rurutu by the legendary (or semi-legendary) Tupaia, should not be ignored.

In sum, the interpretation offered here regarding the Australs’ “devolution” into an Open society is that the islands were in a way too fertile for their small size. The heavy deforestation that occurred on these islands, most notably on Rurutu, decreased the productive capacity of the hill slopes, but also enriched the swampy valley floors with alluvial runoff. The high yield of wetland taro encouraged population growth and rapid expansion, so that by around 500 B.P. every fertile valley on the island had been claimed. These wetlands were capable of feeding the large population, but the uneven distribution of them from valley to valley encouraged hostile conflict. This is especially evident in the case of Vitaria, the last district on Rurutu to have been settled. This lone dry chiefdom turned to predatory expansion to feed its own large population, and ultimately succeeded in conquering its richer neighbors.

A final point relevant to this discussion of Open societies concerns the evangelization of the Australs. Goldman (1970:20) wrote, “The Open system is more strongly military and political than religious, and stability in it must be maintained more directly by the exercise of secular powers.” Let us recall Seabrook’s (1938:190) definition of the ‘ara’ia of Rurutu as “The semi-secular official who directed warfare and the crafts.” Certainly the role of these priests in the oral traditions was emphasized as that of a war counselor rather than a religious leader. Morrison’s (1935) account of the priests on Tubuai is similar in this respect, in that the priests were advising the chiefs not to associate with the newly arrived foreigners. William Ellis’ (1969a, 1969b) eyewitness
account of Rurutu's evangelization is also very descriptive and illustrates how tenuous the priests' hold on the people's faith was. As discussed in Chapter 3, when one of the priests pretended to have become possessed by the god, and thus to have become the god himself, one of the Christian converts from Raiatea simply grabbed him and started to wrestle him, in an apparently mocking effort to shake out the spirit. When the priests warned the populace of the consequences should they break tapu and allow women and children to eat pork and turtle, they were paid little heed. The people just watched the feast, curious and naturally apprehensive as to the outcome. When nothing befell, the onlookers were instantly convinced that the priests' religion was false. They then proceeded to burn and destroy their own marae and idols, which had been sacred for centuries. While such dramatic events did not occur on the other islands of the Australs, they all converted very rapidly, eager to abandon their old religion in which they seemed to have had little use. Tubuai, for example, did not even require a firsthand demonstration. Ellis (1969:384) wrote, "the Tubuaians heard more ample details of the change that had taken place in the adjacent island of Rurutu, as well as in the Society Islands - that the inhabitants had renounced their idolatry, and erected places for the worship of the true God - and determined to follow their example." While we cannot dismiss the possibility that Ellis' account might contain some bias, the fact that the Australs were evangelized so quickly and easily is incontrovertible. This rapid conversion to a new and alien religion strongly suggests that the priests of the Australs were regarded more as secular leaders than as religious ones. This is in agreement with Goldman's definition of an Open society, and offers an important insight into a remarkable historical event. In addition, perhaps the latent sociopolitical structure was so
fluid that the change to Christianity did not seem very pronounced. From Ellis' account, neither the chiefs nor the priests appear to have had much say in the matter one way or another, as the general population had decided for itself.

In advancing these hypotheses, I have tried not to give primacy to either environmental or social factors regarding the development of island culture, but rather to emphasize the ongoing dialectic between them. Variables such as island size, productive capacity, population, and status rivalry must all be taken into consideration, while at the same time we must realize that they interacted among themselves in ways much more complex than we are able to detect. The present study is intended as an effort toward understanding the efflorescence of a culture for which there is little documentation. While the Australs shared much in common with other East Polynesian archipelagos that dated back to a common heritage, by the late 18th century they had developed a very unique character. This is what inspired scholars such as F. Alan Seabrook, John Stokes, Robert Aitken, Frank Stimson, and Donald Marshall to go to the Australs in the 20th century to record as much as possible of cultures that had been marginalized in Polynesian studies. This is also what prompted Pierre Vérin to uncover the forgotten prehistory of Rurutu, and through his example, myself.
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