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Food and Culture: An Archaeological and Ethnographic Investigation of Shellfish Consumption on Nacula Island, Fiji

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FOOD AND CULTURE: AN ARCHAEOLOGICAL AND ETHNOGRAPHIC INVESTIGATION OF SHELLFISH CONSUMPTION ON NACULA ISLAND, FIJI

By

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Abstract

Shellfish remains from two midden sites in Fiji were analyzed and ethnographic data was collected on the current use of shellfish with reference to dietary preference and the place of shellfish in the overall diet. The frequency of different taxa through fourteen levels of excavation were tabulated. The data shows no dramatic variations, such as over fishing or extinction. On average the overall volume of harvested shellfish, measured by shell weight, increased over time. This may reflect one or several changes, including increases in population, midden use, or shellfish consumption per household. No evidence is found that would indicate periods of disaster beyond isolated incidents of hardship.
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Introduction

Fiji, located in Remote Oceania (Green, 1991), comprises over 300 islands scattered across 1.3 million square km of ocean. Fiji’s main islands are continental in origin and composed of limestone. Some smaller islands are built up from coral; others are the result of volcanic events.

The Yasawa Island Group is located northwest of Viti Levu, Fiji’s main island, in western Fiji. The Yasawa Island Chain is comprised of eight major and many small islands stretched over 80 km of ocean. The islands are of volcanic origin, with the exception of Sawailau (Hunt, Aronson, Cochrane, Field, Humphrey, and Rieth, 1999). Located in the Yasawas, the island of Nacula, located at 16.8833 degrees south, 177.4167 degrees east, is dramatic in appearance with steep grassy hills rising over the heavily cultivated beach flats, surrounded by clear blue water. Located near the equator, Fiji is warm year-round, often reaching highs in the mid-seventies to mid-eighties, Fahrenheit, during the winter months (June-August) with temperatures reaching the triple digits in summer months (December-February), which is also the wet season. Most of the varieties of vegetation growing at lower elevations are cultigens, ranging from arbor-crops to thick blankets of yam greens. At higher elevations there are areas of open grass, often reaching three or more feet in height, and natural forest. Remnants of a fortified village were seen on a survey trip on the hill crests, but today occupation is limited to the beach flats.

Nacula hosts four villages, the largest of which, Nacula Village, is the home of over 200 people and the Tui Drola, the high chief of the tikina, which is comprised of the
middle islands of the Yasawa Chain and has nearly 3,500 inhabitants. Ratu Epeli
Vuetibau, the Tui Drola, hosted us at his eco-resort, Oarsman’s Bay Lodge, and in Nacula Village. He and his spokesman arranged for us to have two local assistants from Nacula Village, which was very near our excavation site, a beach flat called Natia.

The 2002 field season, the first concentrated effort on Nacula Island, was largely exploratory, focusing on surveying, mapping, and test pit excavating. Two test pits were excavated, both yielding midden remains, which made a dietary study possible.

The people of Fiji, according to the classic model, are predominantly Melanesian but share many commonalities with their Polynesian neighbors, and thus serve as a cultural hinge in the Pacific. It should be noted here that food ways and food culture in the Pacific depend largely on island size, population density, and available resources. On islands where malaria is present, food is rarely a limiting factor for population size. Malaria, commonly fatal, limits population instead, and more food is produced than can be consumed by those not afflicted by, or who have survived, disease. Most of Melanesia, to the west of Fiji, has, historically and pre-historically, hosted Malaria, and as a result has had relatively low population densities. However, Fiji, unlike the islands to its west, has never known malaria, due to a large water gap between Vanuatu and the Fijian Islands. In this way it is very much like the Polynesian Islands to the east, which have never hosted Malaria. In a Malaria-free situation population is more likely to be limited by other factors besides disease, such as food, or in some cases warfare or disaster. Because of this fact, Fiji is nearly impossible to classify gastronomically using the classical Melanesian-Micronesian-Polynesian model.
Throughout the history of the Pacific, anthropological and archaeological attention is placed on foods that have a high ceremonial or cultural value and on staples that are eaten in mass and form the basis of the diet (Pollock, 1992). Food often has important and central ceremonial roles in cultures around the world. The Pacific is no different. These ceremonial foods, such as boar, certain yams and fish, and even, at times humans, have fascinated the anthropological community and enjoyed frequent, and in-depth study. Staples, the usually starchy base of every diet, have also been examined in depth; whether they be taro, yam, breadfruit, or some other variety of food. Given their importance, with large areas devoted to their growth and much energy devoted to their production and storage, staples have been studied ethnographically and attention is given to excavated evidence of their consumption, such as tools used in production and storage, or the remains of the food itself.

The foods of the Pacific Ocean cultures that do not fall into the ceremonial or staples categories have been largely uninvestigated. Shellfish consumption does not fit into either the category of ceremonially important food or of major staple. However, judging by the sheer number of shell middens observed and documented over the past century and the frequent accounts of regular reef-harvesting, shellfish is clearly an important part of the Fijian diet.

Shellfish has not been viewed as an important source of food, ceremonially or nutritionally. This is partly due to the fact that shellfish collection is almost exclusively the task of women. Throughout the Pacific, women are associated with low-status objects, places, and even food (Claassen, 1998; O’Day, 2002). Male explorers, clergymen, and anthropologists have limited contact with women in traditional societies
(Goodenough, 2002). Male guests either are not privy to the daily foods collected by women because they are “unsuitable” foods, i.e., lacking in status, to serve to guests, or are played down in importance by their male hosts (Claassen, 1998). It is the intent of my study to partially reconstruct the Fijian shellfish diet based on midden composition and to document changes therein over time, in order to gain some understanding of the importance of shellfish to the Fijian diet and food ways.

**Background**

The shell midden specialist is a rare breed of archaeologist. Most archaeologists pay little attention to the analysis of shell midden, and this contributes to the lack of understanding about how shellfish fit into the diets of many peoples. There are a handful of archaeologists and archaeologically minded paleontologists who have studied and published extensively on shells. These include Julie Stein and Cheryl Claassen. Claassen’s work (Claassen, 1998) on the quantification of shell and dietary reconstruction are vital to this study and will be discussed at a later point. There are several ongoing studies in the Pacific to examine shellfish and their cultural implications. Sharyn Jones O’Day, of the University of Florida, is working in the Lau Islands, Fiji, to examine, archaeologically and ethnographically, animal resource exploitation and the role of women. Additionally, she, Patrick O’Day, and David Steadman, of the Florida Museum of Natural History, are conducting an ongoing study on Nayau, Lau Islands, Fiji, involving shell analysis, providing invaluable comparison material for this study.
Katherine Szabo of the Australian National University is studying the possibility that
shellfish served as the principle protein source for Lapita Peoples.

There has been little previous fieldwork in the Yasawas. Simon Best and Geoff
Irwin performed a brief reconnaissance survey in 1978. The University of Hawai‘i team
led by Terry Hunt began fieldwork in 1990 with a reconnaissance survey and, in
following field seasons, concentrated on early ceramic-bearing deposits and fortified
occupations on Waya Island (Hunt, Aronson, Cochrane, Field, Humphrey, and Rieth,
1999). The project was moved to Nacula Island for the 2002 field season, where the
emphasis was on exploration, surveying, and mapping. The 2002 surveys found several
fortifications and beach flat occupations, which may be excavated in future field seasons.

While there has been no dating from the excavation on Nacula as of yet, there are
established dates for Lapita settlement in western Fiji. While some dates extend as far
back as 3200 BP, more conservative dates place Lapita settlement closer to 2900 BP
(Anderson and Clark, 1999). The Yalobi site, on Waya Island, also located in the
Yasawa Group, yielded dentate stamped sherds, establishing early settlement in the
Yasawa Islands (Anderson and Clark, 1999). Dates and ceramics from the University of
Hawaii team, led by Terry Hunt, also demonstrated nearly 3,000 years of occupation in
the Yasawa Islands (Hunt, Aronson, Cochrane, Field, Humphrey, and Rieth, 1999). Due
to the large amount of both decorated ceramics and plain ware excavated from both
Nacula Island tes: pits and the known early occupation in the area, Nacula Island has
likely been occupied for nearly 3000 years, and the Natia beach flat for much of that
time. However, the time depth of the shell midden analyzed here is still unknown.
Further analysis of the material excavated and chemical dating will provide dates in the future.

Both test units are located on a beach flat near the current Nacula village called Natia. Today, Natia is under cultivation, with some areas set aside as graveyards. However, according to Ratu Dovi, the high chief's (the Tui Drola's) younger brother, the area was historically part of Nacula village, as recent as two-three generations ago. Since that time Nacula Village has gradually shifted in the opposite direction from Natia. The remains of the island's first church are located in the Natia area and there are several large yavu, or house mounds. There is a yavu 182 m north of Test Unit One (TU1) and 150 m north-northeast of Test Unit Two (TU2) that Ratu Dovi said was the house of a sorcerer charged with watching over an old temple. Another large yavu is located 23 m southeast of TU1 and 55 m southeast of TU2, approximately 200 m from the first yavu, that Ratu Dovi reports to be that temple. Our test unit excavations were on land owned by the Ratu's clan; the area was owned, most likely, by the same clan at the time of occupation. Each test unit appeared, at the time of excavation, to be contemporaneous, representing close neighbors.

Methodology

Four parallel transects, labeled A, B, C, and D, were charted perpendicular to the coastline, in hope of finding archaeological features, such as house mounds, and geologic features, like the paleo-beach-dune. Auger sampling was used to explore subterranean
deposits. The auger was used primarily along transect B, and to sample the sites of the test units prior to excavation. The auger turned up ceramics, bone, shell, and pumice.

TU1 was located 182 m from the datum on transect A, which ran inland, perpendicular to the coast (south) from datum A. TU2 was approximately 6 m west of transect A at the 150 m mark from datum A. TU1 and TU2 were approximately 33 m apart. I regret that I have been unable to obtain a suitable map of Nacula Island or the excavation site to include here.

Each test unit was 1 m by 1 m square, and excavated 10 cm at a time until the water table was reached (120 cm-180 cm below the surface). Each level of excavated soil was dry-sieved through 1/8-inch screen. Ceramics, shells, lithics, and bone were assigned category numbers and later partially cleaned, preliminarily identified, sorted, weighed and courted in the field lab.

Four distinct strata were identified in TU1. The first stratum (I) consisted of clay soil containing very little sand. Stratum II was a sandy clay loam, containing some course sand. Stratum III was comprised of loamy sand containing a large percentage of coarse-grain sand. Finally, Stratum IV was also loamy sand, with an even higher percentage of coarse-grain sand than stratum III. Three strata were defined for TU2. Stratum I is defined as sandy clay loam. Stratum IIa is loose sand (loamy) and stratum IIb is defined as sand. The soil of both test units progressed similarly from a fine, granular, slightly plastic, and very-friable soil with small roots, rootlets, and pores as common inclusions to a very fine, structureless, non plastic, and wet soil, with very few inclusions of rootlets and small pores.
In the field lab, artifacts were washed and sorted with like items from the same category, e.g. ceramics sorted together. Ceramics and lithics were packed for shipping and bone and shell were processed at the site. Shell was sorted according to genus and when possible, species. The field school students preformed preliminary identifications of shell in the field from books on hand; the shell was then discarded. Samples of each identified species were selected and photographed (figure 1).

Most of the shell itself was in fairly good shape. Erosion was the prominent taphonomic effect, with some perforation, and a very small amount of encrusted shell occurring as well (Claassen, 1998). Much of the recovered shell was fragmented, either during processing, pre-depositional occurrences, post-depositional processes, or a combination of all three.

The students were unable to identify several species. Several other species were given a classification, after much difficulty. Due to our limited field resources, improvement on identifications was needed. At the end of the field season I sought help at the Academy of Natural Science in Philadelphia, where I was kindly assisted by the Chairman of Malacology and Invertebrate Paleontology, Gary Rosenberg. The Academy of Natural Science houses one of the largest malacological collections in the United States, second only to that of the Smithsonian Institution. Using the photographs taken during the field season Rosenberg was able to refine further the identification of most of the shells already identified and to classify some whose identity was previously unknown to us. Unfortunately, due to the poor quality of several photographs, it was not possible to make certain identifications. The identifications Rosenberg provided are those used for the purposes of this study.
To better understand the excavated shell middens, I turned to ethnographic techniques. Being present in the village I had the opportunity to observe shell usage, observe and participate in shellfish collection, and interview several people about their shellfish consumption.

**Ethnographic Information**

Nacula Village continues to practice a primarily traditional way of life. The economy is still largely subsistence-based, with tourism just now starting to play a more prominent role. The majority of food is grown in traditional swidden gardens and fished from the sea. However, it is now possible to purchase some packaged foods, such as dried ramen-style noodles, tinned meat, and rice in small quantities at one of the two small village stores. Land is still controlled by clans with some emphasis on private use rights. A backpacker resort, Oarsman’s Bay Lodge, is located approximately 2.5 km from Nacula Village. Opened in 2000, Oarsman’s Bay, owned and operated by the high chief and his family, is responsible for the major influx of tourist dollars into the village, which in turn are responsible for current village construction projects such as wiring the village for electricity and installing flush toilets at the nearby island school. Tourists, brought to the village by small cruise vessels, bring additional money into the village by paying for performances of traditional dance and buying hand made souvenirs, such as necklaces and small bits of tapa cloth.

In order to learn more about prehistoric shellfish consumption, I turned to modern seafood consumption in Nacula Village. In Nacula, as in most of the Pacific, women are
the primary providers of shellfish protein. Thus, I hoped to be able to collect shellfish on
the reef with some of the village women. One afternoon, while enjoying tea as his guest,
I asked Ratu Dovi for his approval and opinion of the project. He immediately and
enthusiastically granted me permission and told me that the village expert on shellfish
was an elderly woman named Maria (figure 2), the chiefs’ aunt.

Conveniently, Maria works at Oarsman’s Bay, serving as the laundress, and had
already befriended me, spending evenings chatting with me around the tanoa, a large
bowl used to make yaqona. In our case a converted red fishing buoy made a durable
tanoa substitute. Like everyone at Oarsman’s Bay, Maria works Monday through
Saturday, from eight or nine in the morning until five in the evening, “Oarsman’s time.”
Oarsman’s Bay has established its own small time zone, being one hour ahead of the rest
of Fiji, including the Nacula village where the Lodge employees all live. This left only
Sunday free for us to go harvest shellfish, but Sunday is a day when no Fijian works
unless it cannot be helped. Ratu Dovi, knowing this, made arrangements for Maria to
take me out on the reef whenever she saw fit. Maria told me that it was important to go
at low tide, when the reef is most exposed and accessible. She also informed me that the
reef in front of the village was no good, due to extensive collection, and that little
collecting was done there any more. Pollution, due to the long term occupation of the
village site may have also played a role, as well as other factors, in the decline of
shellfish near the village. Two days later, at nearly four in the afternoon, Maria sent a
young woman to tell me it was time to go fishing and to come around to the back of the
lodge.
Throwing on a pair of sandals and slathering myself with sunscreen, I went to meet Maria. Maria was outfitted in her plastic "flip-flops," a blue Oarsman Bay work shirt, and a sulu, the cloth wrap that is standard attire for both men and women in Fiji. Maria carried a woven pandanus basket like a backpack, with two pieces of yarn serving as straps, and held two rusty metal pointed rods, the longer of which she handed to me.

I followed Maria out to the beach. Upon reaching the water, Maria asked me if I wanted to walk out on the reef to the end of the bay and around to the small point on the near side. This was the first instruction I received from Maria. With the exception of Ratu Dovi, affectionately called Ratu Poppy by most of the villagers—having been born on Remembrance Day—I was never told to do anything by a Fijian. Instructions were given politely in the form of a question that eventually (often it would take several tries of repeating the question) would produce the right response.

Maria led me nearly two dozen meters from the water line, where the water reached mid-calf, and we followed the shoreline towards the point. After several minutes of walking, with me, eager to find something Maria would deem suitable to collect, poking and prodding at every sizable hole I passed, Maria gestured for me to come over to her. She pointed to a hole, not more than two inches in diameter, with her metal stick and set the pandanus basket down next to us. All I saw was a little opening in the coral but Maria informed me that she had found an octopus, a favorite food in the village, prepared by boiling in coconut cream, which I was to learn more about later.

Maria took her probe, pushed it into the hole, and started working to extract the octopus. Soon, purple tentacles began to wind their way up the stick and the water became dark with ink. Maria then gestured for my stick and worked to break the coral
that formed the edges of the octopus’ lair, in order to widen the hole. The tentacles then began to work their way up Maria’s arm. More of the octopus was produced by using both sticks to work the octopus, which she pulled free of her arm every few seconds. Finally, Maria held up an octopus several hundred times larger than the opening of the hole from which it came. Still working to keep the tentacles off her arms, and being careful to avoid the animal’s beak, Maria handed me my stick and began to use her own stick to beat the octopus in the head with strong whacks to the eye areas. She then turned to me, while holding out the still twitching octopus, and indicated that I should do the same. I hit the animal several times with my metal stick. Once the octopus stopped moving Maria hit it several more times, seemingly for good measure, stuck it in her basket, flashed me a proud smile, and laughingly said, “Uro,” a word used commonly, in fact nearly exclusively, as a sexual joke in the village, literally meaning juicy or succulent.

We then continued towards the point. Every so often I would find something that looked like something from the middens I had been working with, and I would ask Maria if we should take it. Her response was close to the same each time. She would either say, “It is up to you. You take it?”—which meant I had found nothing of interest—or, “It is good. Is it small? Its up to you, you want to take it?”—my indication that the edible species I had found was too small and that I should put it back.

Prying the small shells loose was surprisingly easy. I could simply push many of the gastropods off the coral or rocks with my fingers, although a few proved more difficult, requiring the use of my stick to force them off their strongholds. Still empty-handed I followed Maria to the point, which turned out to have the remains of a stone-
walled fish pond coming straight off the tip and curving away from the bay. Maria called to me again; this time she had found not an octopus, but a giant clam, Tridacna sp. Using my stick and working at the base of the shell for several minutes, I managed to loosen the clam, listening carefully to Maria’s cautions to keep my fingers clear of the mouth of the clam. I picked it up and handed it to Maria. She smiled, handed it right back to me and gestured for me to put it in the basket on her back.

Moving along, I followed the fishpond wall and soon discovered a Tridacna sp. of my own, slightly larger than the last. Prying it loose I brought it over to Maria, who gladly put it in the basket. Each time we collected something new, I asked her how she would prepare it. Without answering me, Maria would ask if I liked it, and if I ever had tried it, and then said, “You will taste it.” Then she would tell me how it would be prepared, although the answer given for each food was nearly the same: boiling the shellfish and then eat them in coconut cream with a little salt, and onion if she had it. As we went along we collected seagrapes (Caulerpa sp.), a bright green seaweed that grows in networks across the sandy areas and has round offshoots covered in tiny grape-like protuberances. They too are made into a coconut cream soup, with salt and, when served to me, little bits of onion and tomatoes.

In total we collected three Tridacna sp. four Lambis lambis, one of which, instead of housing its original gastropod occupant was the home to a crab, one Cypraeidae, five Nerita, six Trochus, one shell from the conus family and seven shells, of the same species, belonging to the turbo family.

Maria also collected many small shells, primarily in the Cypraeidae family, not largely represented in the excavated midden materials. She uses these to the make
jewelry she sells to tourists. Whole shells, such as the occupied *Lambis lambis* we collected, are sold to tourists as souvenirs. Maria explained that the shell would be soaked in fresh water, which would cause the crab to come out, leaving the shell behind. The shell-dwelling crab disappeared into the kitchen with the rest of our catch.

The giant clam shells are also sold to tourists as home decorations or, when filled with sand, are used for ashtrays. *Tridacna* are also used throughout the village as yard decorations. More commonly they were placed at the base of plant to emphasize its beauty.

Maria and I spent nearly two hours on the reef. Upon returning to the lodge, I asked if I could lay out our catch for some photographs, and Maria gladly agreed. Many villagers I met were eager to be photographed, often politely asking to be my subject. Most commonly, I was approached by women wanting photos taken of their children or grandchildren, asking for a copy to be sent back to the village once they were developed. I took several pictures of Maria with and without our catch, and several close-up shots of the catch (figure 3).

As I sat down for dinner that night the assistant manager of Oarsman’s Bay came over to me and congratulated me on the octopus. He said I would try it. I was a little perplexed by his invitation. Maria had taken everything we caught to the back of the lodge and told me that when it was ready she would bring me some. I had hoped to watch its preparation, but she disappeared into the kitchen, and that was the end of it. I wondered whether she had given the octopus to the assistant manager, but some sleuthing soon led me to another discovery. Lisa Humphrey, one of the field school instructors, is a university of Hawaii Ph.D. candidate currently finishing her ethnographic dissertation.
based on Waya Island. She explained that in Nacula everyone has a totem food. For some it is a particular type of fish, for others breadfruit or taro, and for this man it was octopus. If the person whose totem food is being prepared or consumed is present others ask their permission before that totem food is consumed. The man was actually looking out for me, by seeing that I followed village protocol and did not unknowingly offend anyone. By granting me his permission before I was given the chance not to ask for it, he effectively camouflaged my ignorance.

About halfway through dinner, Merioni, one of the women who served as a waitress, brought me two small bowls of coconut cream soup. One contained the seagrapes-onion-tomato mixture, the other, bits of chewy seafood, some of which I recognized as octopus, but others I thought might have been the various shellfish we had collected, but could not identify in the soup. When I asked Merioni the ingredients she asked me if I liked octopus, and on hearing me say that both soups were delicious went back into the kitchen.

After my shellfish-collecting trip with Maria I started to ponder what she had said about the reef in front of the village being no good anymore and the current state of the shellfish diet in Nacula village. Traveling nearly every day to and from the village by boat, I only once saw two women, together with several children, looking for shellfish on the reef. Several days after our fishing adventure, I asked Maria how much shellfish is eaten in Nacula Village these days.

Our conversation revealed that comparatively little shellfish in consumed in the village now, due to a combination of factors. The reef near the village is largely exhausted, meaning that women would have to walk some distance in order to collect.
Shellfish, while not disliked, is not popular enough to warrant the trek to where the
collecting is still good. This is compounded by the relative wealth in the village and the
ability to buy food, especially proteins, like tinned beef and ham. As mentioned above,
population is rarely limited by food in Fiji. Shellfish, on the whole, is not a disfavored
food, resorted to only in lean times, although there are favorite species and others that are
not as well liked. Shellfish is, however, not as popular as pork, fish, beef, chicken, duck,
or even octopus, due in part to the time and effort needed for acquisition, and then
preparation. It appears that the introduction of convenience foods has led to a decline in
the consumption of shellfish, a non-ceremonial food of moderate popularity.

Many more of the village women are working, either at the lodge, or on another
island, which means the women simply are not present or, in Maria’s case, have
insufficient time to go collecting. Older women, who collected in their youth, may no
longer be able to negotiate the reef as well as they once could, and therefore have given
up shellfishing (Claassen, 1998). As Maria mentioned, this is compounded by the fact
that the better collecting is harder to get to, decreasing the motivation and increasing the
energy output required to harvest shellfish.

Although there is a decline in shellfish consumption, the decline has not yet
reached the level where knowledge is lost. Our work was of great interest to the village
residents, who supported our project enthusiastically. While we were sorting shell in the
field lab at Oarsman’s Bay, it was not uncommon for some of the villagers who work at
the lodge, both men and women, to sit down and help us sort. Most of the Fijians
recognized the shells and would quickly group like specimens together, commonly
working much faster than the field school students who were not familiar with the
species, unlike the Fijians. These temporary helpers were one generation younger than Maria, with the exception of Charlotte, a twelve-year-old girl. Although the names for the shellfish were common knowledge amongst the villagers, they were not useful for classification purposes in this study. Several species, not necessarily from even the same genus, would be grouped together under one name, much as in English, with what are commonly referred to as “clams.” Even Charlotte, two generations younger than Maria, had a clear understanding of the shellfish we were sorting, and was quite helpful. When asked, Charlotte did admit that she did not like shellfish very much. Then again, when I was twelve neither did I.

I asked Bill, a young man hired as one of our field guides, if he liked shellfish, and which ones were better than others. He said he liked shellfish, but not as much as fish, which he eats nearly every day. Out of the types we discussed, he preferred the medium clams, such as the large Anadara antiquata. He said the flavor is the same as the little clams, such as Aactodea, but they are meatier, and thus better, although they are harder to find. Bill also prefers the medium sized clams to the large/giant clams (Tridacna), whose flavor is sometimes weak and whose texture, he said, is chewy, like that of many snails (aquatic gastropoda). Bill said that the little snails (like Nerita plicata and Turbo cinereus) are good in coconut cream, and that he eats them, but he would rather have clams, or octopus prepared the same way.

One evening Lisa Humphrey, one other field school student, and I were invited to attend the celebration of the first haircut of the chief’s spokesman’s granddaughter. The first haircut is one of the first rights of passage for girls in parts of Fiji. On Nacula this occurs around the age of four. This celebration was marking another occasion as well,
the first collecting of firewood by a young boy, near the same age. These two occasions are culturally equivalent in Fiji. The feast was laid out in two places, outside on mats near the family home, and on the mats inside the house where guests of honor were seated.

I was seated inside the house near the end of the mat, adjacent to the other field school student and opposite the school’s headmistress. Also seated in the house was Humphrey, the pastor of the church, Ratu Dovi, the chief’s spokesman, and another man, possibly the girl’s father. The young boy and girl were seated, in ceremonial clothes, at the far end of the mat, in the position of head of the table. The girl’s grandfather gave a short address, the Ratu said a few words, as did the pastor, who also offered a prayer, all in Nacula dialect. The honor of cutting the hair is given to the girl’s aunts. The hair was cut, and the young boy praised. Candy and some small toys were given to the children, and then we were encouraged to eat in celebration of the double occasion.

Each dish was served in copious amounts. We were offered roasted taro, cassava, and white yam, roasted red snapper with coconut cream, and another variety of fish I did not recognize, that had been fried. There was duck cooked in a curry sauce, chicken boiled in its own broth, ramen-style-noodle soup with pieces of sausage, and a pig that had been butchered that morning and cooked the entire day in the lovo, or earthen oven. Papaya, or pawpaw as it is sometimes known, was also served. To drink, there was water and a fruit-flavored drink made from a powdered mix.

As this was an occasion of great importance to the family, only high status-foods were served. In order for a feast to be a success, the right types of foods must be served, and in great quantities (Pollock, 1992). This feast was undoubtedly a success and the
food was all delicious. Looking about at the high status foods that surrounded me, I could not help but notice the absence of shellfish.

The Midden Data

A complete list of recognized classifications of shellfish recovered from the two test units can be found in table 1. The taxa identified are similar to those found in shell middens analyzed elsewhere, not only in Fiji (O’Day, O’Day, and Steadman, 2003), but much of the central Pacific (Hunt and Kirch, 1997). There is some variety in the species within a single genus. Several species in our data set present problems in their identification, such as what is categorized as Chitonidae in table 1. A research decision must be made about Turbo crassus. Both shells and operculi were recovered and identified, but these two elements represent only one animal. A greater amount of the shell was recovered than operculi, and therefore shell, not operculi, will be used in analysis. There is no doubt that a number of the same elements are present, but it is not clear if they are Chitonidae or some other animal. Another case of questionable identity is with the species classified as Bursa or Morula, where there is a great likelihood that the counts and weights contain both Bursa and Morula.

Quantities are broken up into stratigraphic order units; each unit represents an area of the test unit 10 cm deep, starting at the surface. Stratigraphic order unit 1, for example is from the surface to 10 cm deep. Stratigraphic unit 11 is from 100 cm below the surface to 110 cm below the surface. Both the water table and sterile beach sand containing natural shell were reached by 140 cm deep. The natural shell was classified as
such by the field crew at the time of excavation, due to its size, wear, and apparent lack of processing.

The quantification used for this analysis is shell weight, in itself problematic, as described below, but more reliable than MNI (minimum number of individuals). MNI cannot be used in this study due to time limitations in the field lab. Processing time towards the end of the field season was insufficient to measure each whole shell and count the number of identified fragments. Instead, whole shells were counted together with the fragments and one total was recorded. The entire classification group for that category number was weighed in one sum. Several of the shell groups that have no recorded number of whole shells, needed for MNI, make up a great bulk of the shell processed, such as *Nerita plicata*. The NISP (number of identified specimens) is counted for each of the classified taxa, but for the purposes of dietary reconstruction, NISP is not as helpful as shell weight.

Shell weight is not without its problems, as mentioned above. During the cleaning process, mud and dirt were removed from the outside of all the shells. The dirt on the inside of pelecypoda, or bivalves, was easily removed, either with a finger or a brush. Often the mud would fall out simply by swirling the shell around in the bucket of water used for washing. Gastropods, on the other hand, were difficult to clean. The dirt and mud were removed from the outside of the shell, and some mud was removed from the opening of the shell cavity. The mud inside the gastropod shells was difficult to remove, and would have taken more time than the lab crew had to remove it. Since the excavation soil itself was moist at the surface and became wetter at we approached the
water table, the soil inside the gastropod shells was heavy with water. In addition, when
the shells were washed in buckets of water the soil inside the shells turned to thick mud.

The resultant mud, being heavy, leads to a bias in shell weight in favor of
gastropoda. To compensate for this bias a correction was made by experimental means.
To calculate a correction factor, gastropod shells (Table 2) of similar classification to
those of the midden were weighed dry. Soils and water were then mixed to produce a
thick mud of the same, or nearly the same, consistency of the mud clogging the gastropod
shells. The shells were filled with this mud, their outsides were wiped clean, and they
were reweighed. The percent difference was then calculated. Shell packed with mud and
dirt weighed, on average, 132 percent of the weight of clean dry shell. To apply the
correction factor $x$, being the corrected weight for clean dry shell, was solved for in the
equation $132x = 160w$, where $w$ is the weight of the shell recovered. Gastropods,
originally representing 19.570 kg of shell, dropped to 14.826 after correcting for mud and
dirt.

36.821 kg. of shell were excavated in total from both TU1 and Tu2. After the
gastropods were run through the correction total shell weight, for both test units, dropped
to 32.068 kg. of shell. For the purpose of analysis the data sets were kept separate for
each test unit, and also for pelecypoda and for gastropoda (Tables 3.1, 3.2, 3.3, and 3.4).
TU1 yielded 8.796 kg of shell and TU2 yielded 23.272 kg of shell. Gastropods account
for 14.826 kg of the total shell weight, after the correction factor was applied, and
bivalves represent the remaining 17.242 kg. Examining the distributions of shells proved
difficult, but some interesting information did emerge.
There are ten species that comprise the bulk of the shell excavated, each being present in more than 1.000 kg in the two units, combined. These are, in rank order from greatest amount present to smallest amount present, by weight: *Anadara antiquata, Turbo cinereus, Nerita plicata, Periglypta, Atactodeo, Gafirarium tumidum, Trochus (linne tubiferus), Trocus niloticus, Plonaxis sucatus,* and *Turbo crassus.* An attempt was made to find both biological and ecological information on the above specie. Information on their seasonality, niche within the reef system, toxicity, and growth patters would be helpful when analyzing collection and consumption patters. Most of the literature was devoted to classification and geographic range of the species. More in depth information was illusive, and would not only enrich a study such as this one, but would prove interesting, and much needed research in its own right.

Comparing the data to that of O'Day, O'Day, and Steadman (O'Day, O'Day, and Steadman, 2003) proved helpful. I was kindly given permission to site their unpublished work and copies of both papers and databases for comparative purposes. O'Day, O'Day, and Steadman analyzed the shell from twelve sited, and processed much more shell than this study deals with. Larger samples are always at an advantage, making the O'Day, O'Day, and Steadman study very strong. The rank order of species, from largest amount present to least amount present, determined by shell weight of the O'Day, O'Day, and Steadman study is as follows, from largest to smallest: *Turbo spp., Turbo setosis, Strombus spp., Conus spp., Strombus gibberulus, Cypraea spp., Nerita spp., Modiolus auriculatus, Ataciodea striata,* and *Trochus spp.* With great commonality in the species identified in general, *Atactodea, Trochus, Nerita,* and *Turbo* occur both in both top ten classifications recovered.
There is some difference between classifications in the O'Day, O'Day, and Steadman study, when compared to this study, that are, undoubtedly due to the difference in sample size, location, the identifiers of the species.

Species diversity measures prove helpful when trying to understand diet. While shell weight will allow for a basic understanding of how much shellfish was being consumed, and identifying the species present allows one to know what types of shells are present, species diversity illustrates how varied the shellfish diet was for a given period of time, and how the diet composition changed over time. Species diversity is derived by taking the number of species present in a given level of the excavation and dividing that by the weight of shell for that same level of excavation, to account for how much shell if present. The resulting number is the species diversity measure. The higher the number, the more diverse, and possibly less specialized, the assemblage.

The smaller of the test units, TU1, in terms of shell recovered, has a species diversity (figure 4.1) of .031 at the surface and .025 at the bottom of the test pit. It is the least diverse at level 4, with a diversity measure of .008, and the highest at level 11 at .070. The diversity of level one rises and falls. To find the cause for the changes would require further research. The species diversity of TU2 (figure 4.2) is much more cut and dry. The bottom of the excavation had a species diversity measure of .120 where the surface level has a species diversity level of only .003. While there are two dramatic spikes of low diversity, located at levels 10 and 12, there is a strong trend towards a less diverse assemblage as time progressed. This might represent specialization and the refinement of palate, or a decrease in availability of many early favorites. More research is required to better understand the factors that influence diversity measures.
In order to better understand what the shell being evaluated means the derived measure of meat weight is used. The amount of meat represented by the midden shell is calculated by solving for y in the formula $0.92(\log x) - 1.16 = \log y$ for gastropods and by solving for y in the equation $0.68(\log x) + 0.02 = \log y$ for bivalves, where x is the recovered shell weight in both equations (Reitz, Quitmyer, Hale, Scudder, and Wing, 1987). Considering the correction factor for the weight of the recovered gastropod shell, 1.704 kg of meat are represented in TU1 and 4.251 kg of meat are represented by the shell recovered from TU2, for a total of 5.955 kg of shellfish meat represented by the excavation.

While using an equation, such as the one listed above, can prove helpful, it also has its problems. Although studies using this, or similar, equations to estimate meat weight have reported success, never has a blind study been preformed, where a live sample of known meat weight is used to estimate the meat weight of an excavated sample. Because the same equation is used for all bivalves, and another for all gastropods, there is no accounting for the differences in meat yield for different species within those two families. It does, however make comparisons between the consumption of bivalves and gastropods possible. In the case of Nacula Island, gastropods represent 4.511 kg of meat and bivalves represent .973 kg of meat.

Discussion

A fisherman’s luck changes from day to day when line or net fishing. Shellfish is a reliable source of protein, but not inexhaustible. Shellfish serve more as a wild crop
than as a catch, since they are harvested rather than hunted. While little attention is paid to shellfish in both ethnographic and archaeological studies of food ways in the Pacific, the fact that shellfish is important to the lives of Pacific islanders can not be ignored. This is not to say there are not changes in shellfish availability and consumption. Fluctuations in shell midden composition which reflect changes in the amount of shellfish consumed can be a sign of many things, only some of which are dependent on human harvest.

For the purposes of this study I address only gastronomic preference and the relationship between behavior and midden composition. There are certainly other variables affecting midden composition. Many varieties of shellfish are seasonal and available or edible only during certain times of the year, even in tropical climates. This is especially true in areas where freshwater shellfish, river kai, are harvested (Pollock, 1992). Environmental changes, such as a change in ocean temperature, reef structure or composition, shoreline, and ocean levels can have dramatic effects on shellfish populations, limiting the varieties available for harvest (Stein, 1992). For this reason, shell midden analysis can be a powerful tool for paleoenvironmental reconstruction. Predation also affects shellfish population, as does the relationship of competitive species, or species that fill the same niche. Specific events can also have effects on mollusk populations, as is illustrated in David Kobluk’s and Mary Lysenko’s study on the effects of hurricanes on cryptic reef mollusks in Fiji (Kobluck and Lysenko, 1993). However, the recovery time for disastrous events, just as typhoon, is likely too short to be represented in most middens, although not all. To address these issues in shellfish and their consumption in Fiji a long term study would be required.
There are many ways that behavior can influence the midden assemblage. The most obvious determining factor for midden composition at an occupation site is selection for species, size, and quality (as opposed to a beach site, where unwanted and disliked species may be dumped, rather than transported to the occupation). A midden may fall out of use for a time, or a household may deposit shells in more than one location, resulting in an altered archaeological pattern.

Famine, or the lack of other food sources, especially protein foods, may result in a relative increase in the amount of shellfish consumed in a given period of time. After a large storm, fish hauls may drop dramatically for a period of time. During this period shellfish consumption may rise, although shellfish too are affected by storms (Kobluk and Lysenko, 1993). Rapa Nui, also called Easter Island, is an interesting case study for famine-related shellfish consumption (Bahn and Flenley, 1992). As the society began to experience collapse, trees became scarce and canoes were therefore difficult to build. Those that were built were, as reported by westerners who came into early contact with the Rapa Nui inhabitants, patched together, leaky, and not seaworthy. During this same period, a favorite variety of shellfish, Cypraea (Cypraeidae), became overexploited. The use of Nerita, a less liked variety of seafood, then increased as the availability of Cypraea fell off. Nerita then, too, became exploited (Bahn and Flenley, 1992). This pattern is not present in the Nacula middens. In TU1 the amount of Nerita present gradually increased, and then, slightly fell again. Cypraea, although not present in all of the levels, does not experience as much fluctuation. In TU2 there is an increase in both Nerita and Cypraea. More data would be needed to compare these changes to the fishing patterns, beginning with an analysis of fish consumption and fishing behavior.
The reverse may also be true; when fish hauls are high shellfish consumption may drop. A study designed to compare the relative nutritional values represented by fish bone and shell would make it possible to better understand the relationship between fishing and shellfish collecting, provided fish bone could be recovered. Fish bone is soft and quickly biodegrades, resulting in a poor recovery rate in tropical climates like those of Fiji, but if fish bone has preserved, flotation recovery, which we did not utilize on Nacula, would be necessary to recover it.

The nutrition of seafood must be addressed. Shellfish are almost as high in protein as most fish, when meat weight is compared one-to-one (Szabo, 2003; Nutritional Analysis Tool 2.0). They also contain high levels of omega-3, the same fatty acid fish is praised for. Shellfish, however, contains many more trace elements than fish, and is higher in both vitamins and minerals (Szabo, 2003; Nutritional Analysis Tool 2.0). Past arguments of shellfish being of low nutritional value have no true basis. There have been arguments in the past that shellfish is not, alone, an adequate source of protein, but all of my research into the matter shows otherwise.

A note should be made here about the importance of shellfish, as well as of other marine resources, to voyaging people. As Pacific Islanders settled new islands they brought with them everything they would eventually need in the form of stock, seed, saplings, and cuttings. Many of these plants and animals took years before they become established, while others needed only one growing season before they bore. During lean times, shellfish, which would have been bountiful off unpopulated shores, provided much needed protein. Natural resources were heavily exploited by new arrivals. The Maori of New Zealand hunted the moa, a large flightless bird, to extinction within as few as 160
years, or fewer, depending on the original colony size and destruction of the moa habitat (Holdaway and Jacomb, 2000). During excavations on Tikopia the first levels of human occupation contained the remnants of more marine resources than later levels, including shells of much larger size (Kirch and Yen, 1982).

Some shells from edible species have other uses beyond food. The Tridacna spp. are used as decorations throughout the village. These giant clam shells are placed, on each, at the base, of decorative bushes that are planted along walkways in the village and around yard perimeters. They also may be used as bowls and scoops. Many of these shells are not disposed of for many years. Many Tridacna spp. are harvested, but few fragments were found in the midden. Based on the ethnographic information gathered from the village, this should be expected, because these shells have represented more than food. Their secondary uses prevent them from being discarded. Evidence of shell tools is common, especially Tridacna spp. adzes, which are found in many island groups throughout the Pacific (O’Day, O’Day, and Steadman, 2003; Kirch and Yen, 1982).

Additionally, the lack of lithics found during the field work on Nacula would lead me to believe that perhaps shell was used in place of stone for tools. It was common throughout the pacific island to incorporate shells into tools, in addition to or instead of stone. Traditional fishhooks often utilized shell material. Shells were used for digging out, chopping, cutting, and scraping food. A large clam shell, like the Anadara antiquata, was used like a utility knife. This also may account for an absence of whole shells of certain species. Being used as a tool, the shell is not discarded until it is broken, sometime rendering it unidentifiable.
White cowrie shells, belonging to the *Cypraeidae* family, are a sign of high status and reserved for those of chiefly families. They decorate the tanoa in the chief’s house, and are tied onto the rafters. Because of their high status and use as ornamentation it would be rare to find such a shell in a midden deposit that was not extremely damaged in Fiji.

Beyond breakage, which may be the result of taphonomic processes, processing for consumption, or secondary utilization as a tool, there was no evidence noted of cooking or of the shells being worked when the shells were processed in the field lab. This could be due, in part, to the short rapid boil that was the only cooking technique described to me for shellfish. A very quick boil may have a less visible effect on a shell, especially an eroded archaeological shell.

A case has been made (Szabo, 2002) that shellfish played a much larger role than previously thought by archaeologists. This claim is based largely on the lack of fish bone recovered from Lapita-age excavation sites. Flotation, an effective means of recovering fish bone, is not used as a standard means of recovery, but even with the lack of flotation the number of fish bones recovered is incredibly small, especially when compared to the amount of shell recovered. One difference could be composition; fish bone is often small and relatively soft, whereas shell tends to be much stronger, and preserves much better. Fish bone is often consumed, either by humans or animals, and shell, usually, is not. Much of this bone may be consumed with the meat or often quickly biodegrades in tropical climates (Marshall, 1987). Fish scraps may also be fed to domesticated animals, such as pigs and dogs, and, due to their soft and small nature, effectively digested, or partially digested, biodegrading further after final deposition.
A study conducted by Andrew Jones (Wheeler and Jones, 1989) shows how fish bone only survives consumption in small amounts, especially where pigs, dogs, and rats are present, such as in Fiji. A man eating an entire 24 cm herring passed only 15 bones, only 2 of which were identifiable. A dog was fed a 27 cm herring and a 32 cm haddock only failed to eat 6 bones, and then only passed 38, 19 of which were identifiable. A pig was fed a 26 cm herring and a 36 cm mackerel, and passed only 18 bones, 4 of which could be identified. Three rats were given a 15 cm herring and a 12 cm plaice and no bones were recovered at all. 71 bones fragments were recovered from the experiment in which 1.115 kg of gutted fish were consumed. While this study shows a dramatic decrease in the number of bones consumed this alone would not account for the lack of fish bones in archaeological sites. Even when combined with other taphonomic processes digestion of fish bone does not explain its absence at archaeological sites. Jones’s study took place in less than two weeks, and 71 fish bones, or fragments thereof, were recovered. It is not uncommon in the pacific for an excavation, representing hundred of years of continuous occupation to yield fewer than 100 samples (NISP). Only 47 fish bones were recovered from Natunuku, in Fiji, but near 60 kg of shell was analyzed (Szabo, 2003). Fish is consumed daily in large quantities on Nacula, and yet our excavation yielded almost no fish bones at all.

Knowing the amount of meat represented by the midden shell alone is not enough to determine how important shellfish was nationally. Shellfish, even within the same species, but in different areas, differ dramatically in both caloric value and protein content (Claassen, 1998). It would take a great deal more research to fully understand the nutritional role shellfish play in the Fijian diet.
Not all of the shell recovered was necessarily from consumed shellfish. As Claassen points out (Claassen, 1998) many shellfish are used as bait for other food, such as larger fish and octopus. While most of the shells we recovered were recognized as food by the Fijians we were working with, this does not exclude their use as bait. This is especially the case since shellfish is not considered a high-status food, but could be used to catch foods that are more highly coveted. The social value of shellfish is such that using it for bait is not considered a waste.

**Conclusion**

Shellfish is an important resource throughout the Pacific. It serves as a source of protein, a means by which to acquire other food (bait), as many common tools, and as symbolic or ornamental items. Although shellfish was largely ignored by both cultural anthropologists and archaeologists in the past, the important roles shellfish play are being illuminated for the first time by the numerous recent studies on shellfish consumption.

While the prehistoric relationship between shellfish, other protein sources, and the Fijian diet are still largely unknown, in modern Nacula shellfish is a liked, but not overly popular, part of the regular diet. Shellfish must be recognized as an important marine resource to coastal people, especially on islands where no big game animals, save large game-fish, are present and domesticated forms of protein are limited. Mollusks provide a reliable and nutritious source of protein, vitamins, and minerals, that require little energy and specialization to procure. While I am far from an expert, after only one day of training on the reef I learned enough to feed myself in a pinch, if need be.
Despite the general increase in shell deposited over time there is no convincing evidence for famine or an over-dependence on shellfish resources, nor was there any recognizable sign of disaster. Over exploitation, however, is evident today in the scarcity of shellfish on the reef in front of the village.

Classification proved difficult, partially due to field conditions, partially due to the lack of accessible resources. More information is needed on shellfish biology per individual specie, and a better understanding of the science of malacology would aid a study such as this in the future, which I feel will eventually come about as anthropology melds with other disciplines for better understanding. Studies utilizing shellfish to understand food ways, paleo-environments, and other aspects are becoming more and more common. Archaeologists are beginning to recognize the importance of shellfish, and mollusks are no longer played down as often as they had been in previous decades.

As archaeological exploration and ethnographic investigation continues throughout Fiji, and the entire Pacific region, more knowledge and insight will be gained with each midden site excavated and shellfish dish tasted. With the help of future ethnographic and archaeological studies, a better understanding of subsistence behavior and food culture in Fiji may be obtained.
Acknowledgements

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References Cited

Anderson, Atholl and Clark, Geoffrey

Bahn, Paul and Flenley, John
1992 *Easter Island Earth Island.* Thames and Hudson

Claassen, Sheryl
1998 *Shells.* Cambridge University Press, United Kingdom

Goodenough, Ward H.
2002 Live interview regarding women in the field of anthropology.

Green, R.C.
1991 *Near and remote Oceania - Disestablishing 'Melanesia' in culture history.* In A.
Pawley, *Man and a Half: Essays in Honour of Ralph Bulmer:* 491-502, Auckland:
Polynesian Society

Holdaway, R., and Jacomb, C.
2000 *Rapid Extinction of the Moas (Aves: Dinornithiformes): Model, Test, and
Implications,* Science 287: 2250-2254

Hunt, Terry L., Aronson, Karen F., Cochrane, Ethan E., Field, Julie S., Humphrey, Lisa,
Rieth, Timothy S.
Domodomo, a Scholarly Journal of the Fiji Museum 12(2):5-43

Hunt, Terry L. and Kirch, Patrick V.
1999 *The Historical Ecology of Ofu Island, American Samoa, 3000 B.P. to the Present.*
In Hunt, Terry L. and Kirch, Patrick V., *Historical Ecology in the Pacific Islands:
Prehistoric Environmental and Landscape Change:* 105-123, Yale University Press, New
Haven

Kirch, Patrick V. and Yen, D. E.
1982 *Tikopia. The Prehistory and Ecology of a Polynesian Outlier.* B.P. Bishop

Kobluk, David R. and Lysenko, Mary A.
1993 *Hurricane effects on shallow-water cryptic reef mollusks, Fiji Islands.* Journal
of Paleontology 67(5):798-816
Marshall, Y

O'Day, Sharyn

O'Day, Sharyn, Patrick O'Day, and David Steadman
2003  *Defining the Lau Context: Recent Findings on Naya, Lau Islands, Fiji.*  Submitted for review to New Zealand Journal of Archaeology

Pollock, Nancy J.
1992  *These Roots Remain: Food Habits in Islands of the Central and Eastern Pacific since Western Contact.*  The institute for Polynesian Studies, Laie

Reitz, Elizabeth J., Quitmyer, Ivy R., Hale, H. Stephen, Scudder, Sylvia J., and Wing, Elizabeth S.

Stein, Julie K.

Szabo, Katherine
2002  *Personal electronic correspondence*

Wheeler, Alwyne and Jones, Andrew K. G.
Tables

Table 1

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<thead>
<tr>
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<tr>
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<td>Gafrarium tumidum</td>
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<td>Atactodeo</td>
<td>Lambis lambis</td>
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<td>Limpet (Stiphonariidae 3)</td>
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<td>Lucinidae</td>
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<td>Cymatium nicobaricum</td>
<td>Turbo operculi (crasus)</td>
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<td>Cypraeidae</td>
<td>Vasum turbinellus</td>
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Table 1: Complete list of shellfish present in the Nacula excavation, 2002. Preliminary classification performed by the 2002 University of Hawaii Pacific Prehistory Field School Students, final classification identification by Gary Rosenberg, Academy of Natural Science, and Kelila Jaffe.

Table 2

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<th>shell type</th>
<th>+ % difference</th>
<th># of shells</th>
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Table 2: Number of each classification of shell used in the calculation of the gastropod-shell weight correction factor (132%).
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Table 3.1: Gastropods of Test Unit Two (TU2), shell weight, corrected shell weight (-32%), and estimated meat weight.
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*Unidentified Bivalve Fragments

Table 3.2: Bivalves of Test Unit Two (TU2), shell weight and estimated meat weight.
| Classification | Category Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | Total | W/Correction | Meat Weight |
|----------------|----------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|-------------|------------|
| Cypriidae       |                | 4 | 30| 20| 2  | 90 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |268     |202          |91          |
| Alys cylindrical |                | 2 | 2 | 2 | 2  | 2  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 2     |1            |1           |
| Strombus mutabilis |              | 21| 5 | 20 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |46     |48          |24          |
| Vasa turbinateus |                | 50|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |70     |36          |20          |
| Nerita picata   |                | 15| 40| 175|42 | 85 | 55 | 20 | 32 | 28 | 28 | 37 | 19 | 40 | 610|462 |462 |196 |462 |462 |196 |117     |83          |43          |
| Plumaria cucurbita |              | 5 | 10| 5  | 42 | 9  | 6  | 5  | 3  | 1  | 2  | 25 | 3  | 117|72  |0   |0   |0   |0   |0   |0   |0       |0           |0           |
| Conus sanquirrensis |            | 4 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |4       |3           |2           |
| Trochus (tine tubiferus) |          | 90| 20| 85 |223 |107 |31 | 5  | 320| 8  | 92 | 10 | 122|1113|843 |340 |340 |340 |340 |340 |340 |1113   |843         |340         |
| Conus           |                | 0 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |0       |0           |0           |
| Lamis lamius   |                | 20| 24 |47 |100 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |117     |148         |67          |
| Strombus globarius |             | 3 | 17 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |11       |27          |11          |
| Bursa or Monis |                | 6 | 5  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |7       |5           |3           |
| Pseudovertegus aluco |           | 23|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |23       |17          |10          |
| Cymatium muralinum |              | 5 | 23 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |7       |5           |2           |
| Turbo cinereus  |                | 18| 80 |340|100 |88 | 77 |67 | 18 | 7  |21 | 14 |19 | 20 | 869|658 |658 |658 |658 |658 |658 |271     |138         |138         |
| Tucos nitidus   |                | 90| 30 |120 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |56       |317         |138         |
| Columbarium     |                | 0 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |0       |0           |0           |
| Cerithium nodosum |               | 10| 8  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |7       |10          |4           |
| Turbo crassus   |                | 110|30 |100 |230 |32 | 12 |35 | 23 |42 | 40 |0  | 662|502|211 |211 |211 |211 |211 |211 |211 |662     |502         |211         |
| Unidentified Gastropod |          | 96| 60 |140| 70 | 60 | 54 | 31 |11 | 26 |13 | 117|195|349|502 |447 |190 |190 |190 |190 |190 |190     |3808       |1362        |

Table 3.3: Gastropod of Test Unit One (TU1), shell weight, corrected shell weight (.32%), and estimated meat weight.
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</table>

*Unidentified Bivalve Fragments

Table 3.4: Bivalves of Test Unit One (TU1), shell weight and estimated meat weight.
Figure 1: Example of archaeological shell photography used for identification purposes.
Figure 2: Maria, the principal informant, posing with an octopus and a *Lambis lambis*.
Figure 3: The total, minus the octopus, of food stuffs collected on the shellfishing expedition. Note the crab, which is not eaten, but will instead be used as fishing bait.