AFTERMATH OF A FEAST:
HUMAN COLONIZATION OF THE SOUTHERN BAHAMIAN ARCHIPELAGO
AND ITS EFFECTS ON THE INDIGENOUS FAUNA

By

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This dissertation explores how a small island in the Bahamian archipelago was initially colonized by humans and documents the consequences to its animal resources. Archaeological investigations at the site of Coralie on Grand Turk in the Turks and Caicos Islands have allowed a re-examination of the relationship between humans and their environment at the all important earliest stage of island settlement. The analysis of faunal remains from different periods in an island's history provides data on shifting subsistence strategies. Most difficult and vital to ascertain are the resources available at the moment of initial human colonization. The Coralie site is the oldest excavated site in the Bahamian archipelago with radiocarbon dates from the first half of the 8th century A.D. It is also the colonization site for this island. Its zooarchaeological material provides the first record for human
utilization of a pristine island fauna, never before subject to human predation. Finds include species unknown to the West Indies and species that are locally extinct. The remains are dramatically different from those in other West Indian archaeological sites.

In addition to tracing changes in subsistence practices over time in these islands, this dissertation looks at how the available resources, and small island life in general, affected human decision making regarding migration, colonization, and the establishment of settlements in this region. The events on Grand Turk are tied to a period of extensive population movements in the West Indies, which occurred at the transition between the Saladoid and Ostionoid periods. The nature of this island and its history of occupation leads into a theoretical discussion of why and how populations moved out of Puerto Rico during the 6th century A.D., and why Grand Turk would have been a desirable place to settle at that time. The results of this study clearly reveal the role resources have in affecting human actions and, concurrently, the role of humans in altering their landscapes.
CHAPTER 1
INTRODUCTION

When an oceanic island is colonized by humans for the first time, the faunal composition of that island begins the process of being irrevocably and dramatically altered. Plentiful animal resources, which can make an island attractive to settlers initially, become increasingly rare through overexploitation, and eventually human survival itself in these isolated environments is threatened. This degenerative process has been charted through the identification of faunal remains from Taino Amerindian sites in the Turks and Caicos Islands, British West Indies (Figure 1), the southernmost set of islands in the Bahamian archipelago.

The site of Coralie (GT-3), on the island of Grand Turk, is the earliest excavated settlement in the southern Bahamian archipelago, with radiocarbon dates from the first half of the 8th century. It is also the initial colonization site for the island, containing evidence of the first contact between human horticulturists and an oceanic island fauna that had been evolving undisturbed for many thousands of years. Though this island is small, dry, and today nearly barren, in the past it was densely populated with an array of terrestrial species that complemented the plentiful marine resources of its extensive banks. Humans harvested isolated, and therefore pristine, populations of birds, reptiles, fishes, marine mammals, and invertebrates. The consequence
Figure 1: Bahamas and Turks and Caicos Islands.

of this meeting for many of the terrestrial species was extinction.

Zooarchaeological remains from Coralie and other Turks and Caicos sites aid in
deciphering the timing of these extinctions, pinpointing some to the pre-
Columbian period. In addition, excavations at later sites in this region show
how, with the animal life diminished, the Amerindians were forced to develop
new technologies to increase the exploitation potential of certain species and
habitats, in order to sustain themselves and the resources they had left.

People have inhabited the West Indies since 6000 B.P., but no
populations had ever ventured into the Bahamian archipelago until the time of
the "Ostonoid expansion," at A.D. 650. This was a period of sudden
migrations of people out of Puerto Rico and into the remaining islands of the
Greater Antilles and the Bahamian archipelago. Cuba and Hispaniola had sustained aceramic populations for thousands of years, but the Bahamas had not. The settlers of Grand Turk found an island that had never been exposed to human activity. Because of this, the resources encountered by the colonizers were initially exceptionally abundant and very different from other Antillean islands. Few archaeological sites from the Early Ostionan time period have been excavated outside of Puerto Rico. This investigation provides insights into Amerindian lifeways during this dynamic, and little known, period in West Indian prehistory.

This is a biological study, but it is also an anthropological study because it investigates insular human behavior. Equal time is spent understanding the human population that first lived in the Turks and Caicos Islands and the animal populations that also lived here before, during, but not in all cases, after the Taino.

The following two chapters provide the historical and environmental context for this study. West Indian prehistoric terminology is introduced and a brief history of research in the Turks and Caicos Islands is outlined. The presentation of previous research in West Indian archaeology exploring diet and migration issues allows this current research to be put in a broader regional and theoretical context. How the environment of the Turks and Caicos Islands has changed over time is presented to inform discussions of habitat use and possible environmental reasons for population migration. Chapter 4 details the project, the strategies for investigation, and the methods used to reconstruct changing faunal distributions. Chapter 5 presents the Amerindian
diet at the Coralie site through the identification of animal species and by exploring the contexts in which the remains were found. This is followed by an extended discussion of the zooarchaeological remains in this and other regional sites (Chapters 6 and 7). Interpretations of habitat use, procurement technologies, and past animal population densities and distributions are presented. Temporal differences in the results are deciphered, first within the sediments of Grand Turk, and second in comparison to later sites in the Turks and Caicos Islands and Bahamas, in order to show how overexploitation had depleted the available subsistence base by the later time period. The issue of West Indian faunal extinctions, and the role humans may have played in the resulting situation is explored.

The final chapter of this dissertation discusses colonization issues in the West Indies, centering on how this first human settlement of the southern Bahamian archipelago was founded. The Coralie site is compared with other Early Ostionoid period sites to show how different the fauna was on an unexploited island, and to reveal how this might have contributed to colonization decisions. Lastly, I discuss the nature of this settlement, the social implications of this isolated island life, and how and why this settlement came to an end. Although this analysis is limited to a single occupational site on a small, isolated island, the findings have implications to more far reaching issues in Caribbean prehistory.

There are no other sites in the West Indies where archaeological deposits have captured such a complete picture of an animal population unadulterated by previous human predation. We see what used to be available in these
environments, and come to realize that in all situations where humans endure, they do so at great cost to the diversity of animal life, which in turn threatens the stability of human settlements in these fragile island habitats.
CHAPTER 2
PREVIOUS RESEARCH

A century of archaeological investigations have been conducted throughout the West Indies and in the Turks and Caicos Islands in an attempt to learn more about the Taino culture. The Amerindians who met Columbus in 1492 were vividly portrayed in historic chronicles of the period. At the time, however, their complex culture was in a state of rapid disintegration. Archaeological excavations are the best vehicle available to decipher the way of life of these island societies before European contact, before this culture disappeared. A brief review is provided here to introduce the prehistoric inhabitants of the West Indies and to present a timeline of the major cultural events of this region. This current study will be put in the broader context of West Indian prehistoric research. The reader will, concurrently, be led to further research done in the Turks and Caicos, diet and migration studies from around the West Indies, and similar cross-cultural studies centering on the phenomenon of island life.

Who are the Taino?

Names for the Amerindians of the West Indies are only known for the contact period. The inhabitants of the Bahamas were referred to as “Lucayans,” which in the native Arawakan language translated as “island men”
The inhabitants of the Greater Antilles were called "Taino" by the Spanish. The "Classic Taino" was the society described at contact who inhabited Hispaniola, Puerto Rico and eastern Cuba. They were different from the Tainos of Jamaica, central Cuba and the Virgin and Leeward Islands only in that the Classic Taino had a greater elaboration in its material culture, and appeared to be the political and economic center of this society (Rouse 1992). The Classic Taino material culture and stratified social organization are found at some sites in the Virgin and Leeward Islands and in the Turks and Caicos region (Faber Morse 1997; Hofman 1993; Peterson and Crock 1999; Sullivan 1981). The Windward Islands of the Lesser Antilles were inhabited by a different group called "Caribs" by the European colonizers. They are today referred to as Island Caribs to distinguish them from mainland tribes. The Island Caribs had the greatest longevity of all the Amerindians of the Caribbean islands. During the 17th and 18th centuries, the French extensively reported on their way of life (Breton 1665; Dutertre 1667; Labat 1742; LaBorde 1704; Rochefort 1665). Examples from Island Carib ethnohistory, as well as Spanish chroniclers' descriptions of the Taino (Columbus 1959; Dunn and Kelley 1989; Fernández Méndez 1976; Las Casas 1951; Martyr 1970; Navarette 1825-37; Oviedo 1959; Pané 1974) will be used throughout this text for comparative purposes.

Each of these Amerindian groups—the Taino, the Classic Taino, the Lucayans, and the Island Caribs—are recognized archaeologically by a corresponding material culture. For the West Indies, pottery has been the primary means used to decipher separate societies (Rouse 1992). The
Lucayans of the Bahamian archipelago are recognized by a type of locally manufactured pottery called "Palmetto ware," which had burnt, crushed conch shell temper. This ceramic type is established throughout the Bahamian archipelago by the 12th century A.D. There are three major styles of pottery in the Greater Antilles in the Ostionoid period. The initial "Ostionan" sequence is named after the Puerto Rican type site of Punta Ostiones (Rouse 1952). The ware is a plain, thin, often red-slipped ceramic. This style was prominent in the Greater Antilles between the years A.D. 600 and 800. The two other sequential pottery styles that follow the Ostionan are the Meillacan between A.D. 800 and 1200, and the Chican, from 1200 to contact. Though all three are substyles of a single series (the "Ostionoid"), they do not all occur on every island, and there is much overlap in time ranges for each style in different regions (Keegan n.d.). This is evident in the investigations on Grand Turk where Ostionan pottery continued very late, centuries after it ceased to be made in Puerto Rico.

All the Ostionoid series pottery types are manufactured in the Greater Antilles. They are considered trade wares when they occur in the Bahamian archipelago (Cordell 1998). Palmetto ware has not been found on Grand Turk, which based on the evidence to date, suggests that this island was never occupied by the Lucayans. Ostionan style pottery is the only ceramic at the Coralie site. This pottery came to this island with the colonizers and continued to be imported for centuries to follow. Summing up, the site of Coralie is an Early Taino colony which, through its ceramic remains, is classified as an Ostionan Ostionoid site.
Prehistoric Southern Bahamian Archaeology

Archaeological investigations into the prehistory of the Bahamian archipelago have been intermittent to date. Even though the Turks and Caicos Islands form a small part of this archipelago, they have benefited from the interest of a few exceptional researchers. Theodore DeBooy visited the Turks and Caicos in 1912, on behalf of the Heye Museum in New York City, with hopes of documenting Amerindian sites and collecting relics for the museum. He completed the first archaeological survey here, locating 61 open air village sites and cave sites from six of the major islands. Undisturbed Amerindian artifacts were found in some of the caves, and items were purchased from local residents. He reported on or acquired wooden idols, bowls, and dujos (seats), ceramic vessels, stone celts or axes and hafted celts, shell ornaments, and Amerindian petroglyphs (DeBooy 1912, 1913). His ceramic collections from Grand Turk were of Meillacan style pottery only. Chican pottery has not been found on Grand Turk as of yet. Few other investigations ensued in the Turks and Caicos Islands or Bahamas until the 1970s (Granberry 1955).

In 1933-34, Froelich Rainey of Yale University conducted a survey of the Bahamas, visiting the islands of Great Abaco, Eleuthera, Long, and Crooked, among others (reported in Olson 1982). He located a total of 15 Amerindian sites on 11 islands. The most important of these was the Gordon Hill Cave site on Crooked Island. Of the seven caves Rainey visited on Crooked, one contained two Lucayan burials and one, the Gordon Hill cave, had a human occupational deposit. The site contained Palmetto ware, fishing implements,
and hutia and bird bones. This site is important for later biogeographic considerations (see Chapter 7).

In 1978, Shawn Sullivan completed his PhD research in the Caicos Islands focusing on the settlement of Middle Caicos and on modeling resource use for the island (Sullivan 1981). He mapped, collected surface artifacts, and did preliminary subsurface testing at the site of MC-6, which was hypothesized to be a late period Classic Taino “outpost” for the acquisition of salt from a nearby salina. Salt was a valuable Taino trade item. He also completed some excavations at the earlier site of MC-12, which has been subsequently destroyed by construction. Surveys of Middle Caicos to date have uncovered 39 sites. All the radiocarbon dates processed from Middle Caicos post-date A.D. 1000, which is 300 years after Grand Turk was initially settled. In the years preceding European contact, Middle Caicos was the center of the Amerindian population in the Turks and Caicos Islands.

William Keegan also has worked in the Turks and Caicos Islands since 1978. He excavated sites on Pine Cay, Middle Caicos, and Grand Turk, and surveyed nearly all the islands and cays. A focus of his research has been the relationship between the Turks and Caicos Islands and Hispaniola, as evidenced in trade, craft specialization, and population movements (Keegan 1992, 1997a). One issue that generated a great deal of research in these islands was the question of the first landfall of Columbus (Sadler 1997). Grand Turk was one of a few islands vying for the right to claim this position. In addition to historical document research and navigational inquiries, archaeologists sought the Amerindian villages described by Columbus. Sears
and Sullivan (1978) concluded that the very dry environment of the Turks bank precluded Amerindian settlement. However, Keegan discovered the first prehistoric settlement known on Grand Turk—the Governor's Beach site (GT-2). GT-2 is a Meillacan site dating to the 13th century. Activity at this location concentrated on the production of small, red beads from the cherry jewelbox shell (*Chama sarda*) for export (Carlson 1993, 1995). Although this finding did not strengthen the case for Grand Turk as Columbus' landfall, it did begin a period of intensive archaeological research into the prehistory of Grand Turk.

Grand Turk was the site of a different type of first landfall, at least as significant as the arrival of Columbus. It was the arrival of the first Amerindian, the first person to settle in the southern Bahamian islands. This current study of the Coralie site fills in the research gap for the earliest period in the history of the Turks and Caicos Islands, explaining how and why these islands were first settled, and the consequences of that settlement.

Relevant Issues in West Indian Prehistory

Certain basic facts regarding the prehistory of the West Indies, especially which populations migrated where and when, must be presented in order to understand the context of the settlement of Grand Turk. Many theoretical issues surround the study of migrating populations. A brief history of the questions pertinent to migration research in the West Indies will be presented here. I will also introduce the kinds of questions that have been addressed through the study of zooarchaeological remains from this region.
**Aceramic Period**

The West Indies were first settled about 6000 B.P. by people who entered the region by crossing the Caribbean Sea between the Yucatan peninsula and the western tip of Cuba (Rouse 1992; Wilson et al. 1998). These foragers are recognized by their manufacture and use of flaked-stone tools (Pantel 1988). A ground-stone producing culture developed 2000 years later, and may have been the result of a second migration, this time from the South American continent up through the Lesser Antilles to the larger islands. There are both "Lithic" and "Archaic" sites, referring to the first and second migrations, respectively, on the islands of Cuba (Dacal Moure and Rivero de la Calle 1996; Osgood 1942; Rouse 1942), Hispaniola (Veloz Maggiolo and Ortega 1976), Puerto Rico (Rouse and Alegría 1990), the Virgin Islands (Lundberg 1991), and some of the Lesser Antilles, particularly Antigua (Nodine 1987, 1990). To date, no aceramic sites have been identified on either Jamaica or the Bahamian archipelago.

The West Indian Lithic sites exhibit a subsistence strategy of mangrove zone gathering along with the hunting of medium-sized terrestrial fauna (Veloz Maggiolo and Vega 1982). The Archaic sites show a diet of primarily marine gathering (Davis 1982, 1988; Narganes Storde 1991). The extent to which all these aceramic sites (both Lithic and Archaic) represent different cultural groups (Rouse 1992; Veloz Maggiolo and Vega 1982), or differing, perhaps seasonal, procurement strategies among a cohesive culture (Lundberg 1989, 1991) is still unclear.
The Archaic period populations introduced a number of fruit tree species and edible seed species to the region (Newsom 1993), evidently practicing a form of arboriculture and garden tending. The species represented originated from either Mexico or Central America and South America, providing evidence for multiple migration homelands. The first ceramic period migration, the "Saladoid," originated from the Orinoco River basin area of South America.

Ceramic Period

The ceramic period history of the West Indies is characterized by two major population movements. The Saladoid period is named for the Venezuelan type site of Saladero (Rouse 1992), where the prototypical white-on-red painted ceramic style was first encountered. The Saladoid series describes the movement of a distinctive pottery style into the West Indies, but the term Saladoid has come to refer to an entire culture and its people. These ceramic bearing people first entered the oceanic islands of the Lesser Antilles about 500 B.C., quickly settling on islands as far northwest as Puerto Rico. The progression abruptly ceased and the Saladoid populations developed in place for the next 1000 years. The next wave of migration began about A.D. 650, and this Ostionoid period (called Post-Saladoid in the Lesser Antilles) continues up until European contact. The Ostionoid people expanded into Jamaica, Hispaniola, Cuba, and the Bahamas.

In discussions of population movements throughout the West Indies, the primary inquiry has revolved around the instigation of these migrations. Population pressure, warfare, the search for new resources, increasing socio-
political complexity, ecological decline, and technological innovations have all been proposed as the impetus for these migrations (Curet 1996; Keegan 1989; Roe 1989; Siegel 1991, 1996). The ethnicity of the migrating populations is still under question. Some scholars propose that multiple migrations occurred during the Saladoid period (Chanlatte Baik 1981; Havisier 1997; Rodríguez 1989; Roe 1989), while others find evidence for a single population movement (Rouse 1989; Siegel 1991). Both scenarios will be discussed in greater detail in Chapter 8.

Other debates have centered around the geographical origins of the Saladoid people (Evans and Meggars 1968; Lathrap 1970; Rouse et al. 1985), and the timing of their migration into the Caribbean (Rouse 1986; Sanoja and Vargas 1983). Discussions later turned to the way in which these populations adapted to their new, island environments, whether applying mainland adaptations to island life with little modification (Keegan 1985; Roe 1989), or approaching the restrictions of islands with adaptive flexibility and opportunistic behavior (Siegel 1991; Watters and Rouse 1989).

Much of the dietary research from the West Indies has focused on the Saladoid period populations. Zooarchaeological studies have been concerned with similarities in subsistence between the Saladoid and their ancestors in the Orinoco basin (Petersen 1997), the amount of marine foods in early Saladoid diets (deFrance 1989; deFrance et al. 1996), how settlement locations reflected inland or marine subsistence orientations (Havisier 1997; Siegel 1992), and what caused the sudden shift in diet between the Saladoid and Ostionoid periods (Carbone 1980; Goodwin 1979; Jones 1985; Keegan 1989; Rainey
1940). More generally, faunal data have been used to answer questions regarding habitat use, resource procurement, animal introductions, and settlement exploitation areas (Keegan 1986; Sullivan 1981; Wing 1993; Wing and Reitz 1982; Wing and Scudder 1983). Issues such as human-caused faunal extinctions and habitat alterations have been dealt with, more from a paleontological point of view to date (Morgan and Woods 1986; Pregill and Olson 1981), but data from archaeological excavations are starting to fill the gap between the pre-human and the historic contexts (Pregill et al. 1994; Steadman et al. 1984). The Early Ostionoid settlement of Grand Turk, with its unadulterated biological component, has provided zooarchaeological data from which to address many of these forementioned questions.

Why Study Islands?

When studying the prehistoric peoples of the West Indies, the background for all the research is the unique environment in which they lived, namely, islands. For much of the West Indies, especially the southern Bahamian archipelago, those islands are very small and limited in their terrestrial resources. Animals and humans that are adapted to island life are different from those on the mainland. Because of this, certain research issues are particular to island studies, regardless of which set of islands and which group of islanders. Investigations with similar theoretical underpinnings to this Grand Turk study, can come from areas very distant from the West Indies. There is a large body of work from researchers focusing in the Pacific and the Mediterranean on the mechanics of colonizations and the predictability of
settlement locations (Cherry 1990; Held 1993; Irwin 1992; Keegan and Diamond 1987). Cross-cultural comparisons will be drawn.

Because this investigation deals with issues of changing animal distributions, it is essentially a biogeographic study. Biogeography, according to Davis (1988), is the “study of geographic distributions of species in historic perspective, using ecological concepts about interspecific relationships.” In other words, it is the study of how organisms interact in time and space. Issues that are encompassed by the study of biogeography include extinctions, changes through time of species distributions, and in the case of island biogeographical studies, colonization. Because of the time period of the first settlement of Grand Turk and the nature of the faunal remains discovered there, these three issues are of primary importance in the interpretation of the early prehistory of this island.

The West Indies, with the exception of Trinidad and Tobago and the ABC Islands (Aruba, Bonaire, and Curaçao), are true “oceanic islands” rather than continental islands. Oceanic islands are “those surrounded by deep water beyond the continental shelf, remaining separate from the continent even during marine regressions of glacial age” (Martin 1984: 355-6). They are geographically closed systems, bounded by the water that surrounds them, making colonization and dispersal events rare. This isolation is one factor that makes oceanic islands such great laboratories for scientific study (Patton 1996; Rosenzweig 1995; Wallace 1880).

The most famous island researcher was Darwin (1839, 1859), whose Galápagos experiences helped lead him to his thesis of independent evolution
after isolation. In 1967, MacArthur and Wilson published their theory of island biogeography. Their attempts to isolate and quantify the variables related to island colonization and subsequent evolution and extinction, initiated decades of further work on island ecosystems (Brown 1971; Case and Cody 1983; Diamond 1969; Lomolino 1984; Rosenzweig 1995; Simberloff and Wilson 1969, 1970).

Petersen and Crock (1999) suggest that certain archaeological research questions are best answered through investigations on very small islands. This is because environmental limitations such as available habitat and resources, and island size, shape, and location, can be carefully isolated and controlled by the researcher, thus elucidating which factors most affect populations. Furthermore, the small island of an island magnifies changes by reducing the number of variables, and provides a manageable data set on an entire ecosystem.

There are other advantages in studying changing faunal distributions on islands rather than on mainlands. Island faunas have a relatively small gene pool, which permits rapid genetic changes to occur. Adaptations unique to island life may include loss of flight, size changes (smaller or larger), loss of wariness and protective coloring, and radiations into specific niches to lessen competition (Case 1978; Diamond 1978; Livezey 1993; McNab 1994; Schonewald-Cox et al. 1983). Because of these factors, there is a profusion of endemic island species—ones that have evolved locally and inhabit only one location and are, therefore, rare to begin with. These island animal populations tend to be stable and enduring, though limited in distribution.
However, they are fragile in the sense that they have no defenses, and changes to these populations can happen very quickly after human colonization occurs. Many island species went extinct before ever being historically described, and are known now only through their skeletal remains (Olson 1982; Olson and James 1982; Pregill et al. 1994; Steadman 1993, 1995; Steadman et al. 1984).

Even though this dissertation is based on an archaeological excavation, many of the same issues dealt with in biogeographical studies will be investigated here. By tracing changes in animal distributions on Grand Turk and through the Turks and Caicos, human-caused faunal extinctions can be pinpointed. This study explores how the Turks and Caicos were colonized, first by certain animal populations and then by humans, documenting the consequences to this environment and the effects of this environment’s decay on its human inhabitants. Building on the work of previous researchers in the Bahamian islands, and particularly the Turks and Caicos, this study presents another perspective on the prehistory of these islands.
CHAPTER 3
THE PHYSICAL LANDSCAPE

The relationship between people and their physical environment is central to this investigation. In order to understand how each affected the other, we must first discuss the geography of this region. Environmental studies look regionally and locally at soils, hydrology, sea level and climate changes, and present and past flora and fauna in order to elucidate an island’s past ecology (Dincauze 1987). The second stage of these inquiries is to study the impact human habitation has on island ecosystems through sediment cores and paleontological and zooarchaeological investigations. By reconstructing the environmental history of this region, and especially Grand Turk, the causes of the changes seen can be pinpointed and we can begin to assess the role of humans in altering the landscape in which we live.

Geography of the Bahamian Archipelago

The British colony of the Turks and Caicos Islands is the southernmost cluster of islands in the geographical Bahamas, located 145 km north of Hispaniola. Though it is politically separate from the Bahamas, the Turks and Caicos are biologically and geologically part of the Bahamian archipelago. The Turks and Caicos Islands are made up of over 40 islands and cays on two,
large, separated banks, of which 500 km$^2$ are dry land (Figure 2). The island of Grand Turk covers only 20 km$^2$ of this.

The Bahamas platform is a 6100 m thick layer of precipitated limestone (Sealey 1985), which includes part of northern Cuba and the southern tip of the peninsula of Florida. It began forming 150 million years ago (MYA), through a combination of sedimentation in shallow water (about 1 cm in 500 years) and subsidence, and has a stationary geologic history. The Greater and Lesser Antilles, rather, are a complex and dynamic mix of volcanism, plate tectonics and carbonate sedimentation (Donnelly 1989). Less than 10% of the Bahamian platform (11,400 km$^2$) is above water today (Morgan 1989), consisting mainly of shallow banks, with deep channels separating portions of the platform. About 80 MYA, the southeastern bank began to break up into
many small banks divided by these deep water troughs (Schlager and Ginsburg 1981).

During the ice ages, changing sea levels alternately exposed and submerged these banks. In the exposed cycles, easterly trade winds blew the sediments into dunes, and higher, fossilized, sand dune ridges formed on the windward side of the islands (Doran 1955). These windward ridges average 30 m in elevation with the highest point in the Bahamas being on a 63 m high Cat Island ridge. The highest point on the Turks and Caicos bank is 48 m above sea level (Flamingo Hill, East Caicos). The windward ridgeline on Grand Turk peaks at 32 m above sea level (Bahamas Ministry of Education 1985).

The topography of Grand Turk, which corresponds to most southern Bahamian islands, consists of a sandy leeward beach, a rocky windward coast, inland salt water lagoons edged by mangrove vegetation, and inland salt flats, or "salinas," which produce sea salt in the summer months. The dry-adapted vegetation is denser on the eastern side of the island. Its terrain consists of a consecutive series of diminishing dunes, which run perpendicular to the trade wind direction, leading toward the leeward side of the island (Macpherson 1975). The trade winds blow continuously east-southeast at an average of 26 km per hour (Sealey 1985). The lithification process is rapid in this region. It is not unusual to find Amerindian and historic period conch shell refuse buried in the beachrock. The fact that the topography of these islands changes quickly must be considered when assessing prehistoric settlement patterns.

The north half of this island is dominated by a large, inland lagoon called North Creek, with the Coralie site (GT-3) located on its northwest shore,
about ½ km from the mouth (Figure 3). A few dune ridges to the west is the Turks bank with its shallow coral reef environment extending ½ km from shore. The bank edge then drops off to the Turks Island Passage, 36 km wide and up to 2500 m deep, which separates the Turks bank from the more extensive Caicos bank. The Coralie site location provided easy access to many habitats including mangrove, inland lagoon, tidal flats, rocky shore, sea grass beds, coral reefs, deep water, and inland scrublands, which could all be

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Figure 3: Grand Turk with Archaeological Site Locations.
exploited for their animal inhabitants. The only other Amerindian settlement known on this island, GT-2, is located on the leeward shore of the southern half of this island.

**Sea Level Change**

Because the islands of this archipelago are so flat, even a slight change in sea level can radically alter the amount of exposed land. At the end of the final glacial advance, approximately 18,000 years ago, sea level was 120 m lower than today (Fairbanks 1989). Modern land formations can give clues to fluctuating sea levels in the past. Blue holes are formed in dry, low sea level cycles, with the depth of a blue hole equaling the amount of sea level drop (Gascoyne et al. 1979). Another indicator of a lower sea level is submerged beach rock slabs, such as are seen off the island of Bimini (Richards 1988). Periods of higher than present sea level occurred during interglacials. The entire Bahamian archipelago has been submerged multiple times in the past, most recently at 65,000 B.P. (Bloom 1983; Imbrie et al. 1983; Pregill and Olson 1981). Physical evidence of elevated sea levels can be seen today in exposed fossil corals and beach platforms now high and dry, and by uplifted coastal notches once eroded by the action of the sea (Neumann and Moore 1975).

About 3800 B.P., corresponding with the beginning of the Archaic Amerindian period in the West Indies, sea level was as much as 7 m lower than today (Lighty et al. 1982; Tanner 1991; Watters et al. 1992). Because of this, it is probable that many Aceramic period sites are currently inundated. The waters rose steadily, reaching present day levels by A.D. 200 (Fairbanks 1989).
Small sea level fluctuations in recent times have influenced settlement decisions at Coralie. Tanner (1991) reports broad-scale changes interpreted from beach ridge data in the Gulf of Mexico, noting a sea level drop between A.D. 450 and 750. The depth of the drop is not reported. In central Polynesia at this same time, A.D. 500, sea levels were beginning to lower from a sustained period of up to 1 m higher than present (Lepofsky et al. 1996). Work in southwest Florida has produced some fine-scale results of sea level changes for this period (Walker et al. 1995). There, sea level dropped from a peak at A.D. 400 to a low of 50 cm below present at A.D. 600 (see Figure 4). These figures are specific to Florida, and the exact levels of change are not known for the Caribbean. In general, it is possible to say that sea level was high in the

Figure 4: Sea Level Fluctuations Recorded for Florida. Data from Walker et al. 1995.
Saladoid, then dropped substantially in the Early Ostionoid. The affects of these varying sea levels and accompanying climate changes during the Late Saladoid have yet to be truly measured and understood as a possible factor in the disintegration of the Saladoid culture.

Excavations at the Coralie site provide evidence for a lower sea level when Grand Turk was first occupied in A.D. 700. The deepest deposits in the site are below the present-day water table, and some early period features and artifacts were altered by exposure to water. At minimum, a 50 cm sea level difference is necessary for this settlement to have been on dry land.

By A.D. 900, the center of activity at Coralie had moved away from North Creek and atop the next dune to the west. Carbone states (1980) that sea level began to rise again about A.D. 900, after some time spent below present levels, and rose until stabilizing at A.D. 1200. This period, known as the "Medieval optimum," was a time of relatively quick sea level rise. According to Tanner (1991), the waters rose by 1.5 m. Recent investigations on Guadeloupe (Delpuech et al. 1999) use evidence of coastal transformations to confirm a sea level rise that began slowly sometime after A.D. 600 and accelerated another 1.8 m after A.D. 1000.

Further evidence pointing to a change in sea level, and changes in the habitat surrounding the site comes from land snails. There are over 100 species of land snail in the West Indies (Emerson and Jacobson 1976) and some are specific to certain environments. A fine mesh sample was taken near the base (80 cmbs) of the earliest 8th century occupation, in a unit closest to the mangrove edge of North Creek. It contained hundreds of very tiny land
snails of the species *Truncatella pulchella* (Beautiful Truncatella). These creatures grow to a maximum length of 5 mm and would not have been discovered but for the fine mesh sampling. *Truncatella pulchella* is not a mangrove related species. It prefers shady, humid crevices above the high tide mark, and usually lives in the rotted leaf matter below sea grape trees (Emerson and Jacobson 1976). The provenience where this sample was taken is saturated by the present-day water table. The presence of this small land snail confirms that this provenience was once much drier. Sea grape trees are a coastal plant usually occupying the frontal zone nearest the sea, sharing the space with cocoplum, manchineel and sandburr (Correll and Correll 1982). Because of the trade winds, these islands tend to grow, or migrate, toward the leeshore. In the 8th century, the settlement may have been closer to the leeward coast of the island, with the mangrove edge of North Creek farther to the east. The site was certainly on higher and drier ground than it is today.

**Climate**

The transition between the Pleistocene and the Holocene, from 12,000 to 10,000 B.P., marked great ecological change. How much these changes directly caused massive animal extinctions is an ongoing debate (Martin and Klein 1984; Martin and Steadman 1999), and will be addressed in greater detail in Chapter 7. The temperature of the oceans rose by four degrees centigrade between 13,700 and 12,000 B.P., and sea levels began to rise (Lynts and Judd 1971). The climate, which was dry at the beginning of this cycle, experienced a wet phase between 7000 and 4000 B.P. (van der Hammen 1974).
Sediment cores taken in southwest Haiti (Hodell et al. 1991) show a general return to aridity during the last 3,200 years, with the most extreme aridity occurring in Late Saladoid times; a slightly wetter period occurred in the Post-Saladoid times. These data are in contrast to the increasingly dry conditions seen in the Yucatan Peninsula during the second half of the millennium (Curtis et al. 1996; Hodell et al. 1995). Data from multiple sites in this region showed that the dry interval continued from A.D. 280 through 1080 and pinpointed multiple drought events in that period. The first of several major droughts identified was dated to A.D. 585 \( \pm \) 50 years. The authors state that this was the "driest interval of the last 3500 years" (Curtis et al. 1996:45).

Both these studies indicate that the Late Saladoid period was characterized by extremely arid conditions, but there is conflicting data on how long this dry period lasted. Hodell et al. (1995) explain the 300 year difference for peak drought conditions in these two regions by noting a possible dating error in the Haiti study. This may be the case, but it is interesting that the Mayan civilization collapsed during the peak of the drought in their region, and the Saladoid culture collapsed 300 years earlier, also during possible peak drought conditions. The timing of these arid cycles may not have been regionally consistent. A study of sediment cores taken from mangrove habitats on the island of Grenada (McAndrews 1996) identified a vegetation change between A.D. 450 and 950, possibly indicating a dry interval at this time and corroborating data from the Yucatan. Further work may resolve these issues.
Nevertheless, arid conditions during the Late Saladoid surely contributed to the cultural changes of the time.

In regard to Grand Turk, it is nearly impossible to imagine a settlement here over 1000 years ago if it were any drier than it is today. Currently, there are no fresh water sources on the island. Average rainfall, with records dating back to 1955, is 575 mm annually, but it can range between 300 and 1125 mm (Bahamas, Meteorological Office 1997). The rainfall comes in definite seasons, with October to December providing 44% of the annual precipitation and February to April only 13%. The driest month is March and the wettest is November. There is a rainfall gradient between the northern and southern islands of the Bahamas, with Abaco receiving ca. 1550 mm, annually—three times that of Grand Turk (Little et al. 1977). Because of high temperatures, low rainfall and constant, drying winds, the evapotranspiration rate today on Grand Turk is 1500 to 1875 mm annually—three times greater than the amount of rain received (Sealey 1985). A richer vegetative state in the past could have somewhat mitigated this imbalance.

It is because of this evapotranspiration effect that plentiful, high quality salt forms along the edges of interior salinas. For most of its recorded history, Grand Turk's livelihood depended on the salt trade (Sadler 1997). Sullivan (1981) speculated that salt collection was the reason for the settlement of the largest and most elaborate site on Middle Caicos (MC-6). The role of salt in prehistoric times on Grand Turk is difficult to ascertain from archaeological remains, but it was surely a utilized and valued resource.
Soils

The islands in the Bahamian chain are formed from precipitating calcium carbonate, corals or algae. Bahamian soils are sandy and stony sediments with little humic content. The primary mineral constituents of these soils are calcite, salt and trace amounts of aragonite. At Coralie, the soil matrix is 98% sand, and 2% silt and clay with broken shell inclusions (Hardman et al. 1998; Scudder 1997). Grain size of the sand is variable with 90% falling within the small or medium categories. The beach sands below the site contained the coarsest grains. The buried anthropogenic horizon contained evidence of the Amerindian settlement. Hardman et al. (1998:13) concluded this horizon was an “essentially stable surface for an extended period of time.”

Mann (1986) has hypothesized that the source of all the non-calcareous soil components in the Bahamas are a result of aolian deposited dust, blown over from the deserts of North Africa. The locally manufactured Lucayan pottery, Palmetto ware, was fashioned from these occasional deposits of red, clayey soil called "Bahamas red loam." The poor quality of the clay deposits is reflected in the friable, coarse nature of the locally made pottery. There are no such clay deposits on Grand Turk.

The soils of these drier, southern islands are not rich, but nevertheless are adequate for root crop agriculture, especially the cultivation of manioc, the staple food of the Taino. On Grand Turk, planting of root crops was possible on the elevated and well drained series of beach ridges. Even though the
matrix is nearly all sand, manioc could flourish in this environment as long as it was planted in correct relationship with the infrequent rains (Lee 1980).

Flora and Fauna

The plant communities can be divided into two broad subdivisions—‘whitelands’ and ‘blacklands’ (Campbell 1978). Pioneering whiteland species such as palmetto, seagrape, and the introduced Casuarina pine live in a soil of lime and white sand. Other whiteland species include cacti, buttonwood, and bay cedar. Coppice vegetation dominates the blacklands with species such as pine, mahogany, mastic, fig, and lignum vitae (Correll and Correll 1982). Pine tree (*Pinus caribaea*) monocultures cover much of the northern Bahamas, and the occasional southern island such as Pine Cay in the Turks and Caicos Islands (Henry 1974). Pine Cay can support pine vegetation because of a geologic anomaly that traps a fresh water lens below this island (Iverson 1979). Before the Bahamian hardwood forests were cut by initial European settlers, a variety of “fine madera, mahogany, cedar and pine...fit for building of vessels” (Craton 1962:111) reportedly covered these islands. These harvested vegetative communities were never able to reestablish themselves. Today, the flora of Grand Turk is all low dry-adapted scrub species.

Through the identification of charcoal remains, the types of trees and shrubs inhabiting Grand Turk over 1000 years ago can be reconstructed. From the Coralie site, paleobotanist Lee Newsom identified wild lime (cf. *Zanthoxylum* sp.), palm (Palmaceae), buttonwood (*Conocarpus erectus*), black torch (*Erithalis fruticosa*), ironwood (cf. *Krugiodendron ferreum*), and remains
from the bittersweet family (Celastraceae). All these taxa (especially palm and wild lime) are associated with dry environments and are relatively fast growing trees, which normally exhibit wide growth rings. These particular charcoal samples showed variably sized growth rings, further suggesting dry or occasional drought conditions. This is some corroborating evidence for the proposition of a continued dry climate up to A.D. 1000 in these islands.

Today the most abundant tree near the site is black mangrove (*Avicennia germinans*), a common Amerindian fuelwood (Newsom 1993). Buttonwood, rather than black mangrove, appear in these samples and may indicate a less swampy environment in this area in the past. The wild lime and bittersweet family specimens identified at Coralie have also been identified at sites in the Lesser Antilles and the Virgin Islands. Palms (Palmaceae) are one of the most widespread plant families found in West Indian archaeological sites. Parts of the palm are edible and these trees were probably tended from Saladoid times. Ironwood appears in a West Indian archaeological site for the first time at Coralie. A dyewood tree (*Andira* sp.) was identified from a historic context, although it is not certain whether it is a native or introduced species. It does not grow on Grand Turk today. These botanical samples, which came mainly from early period deposits, provide no evidence to suggest that Grand Turk ever sustained a heavily vegetated hardwood environment.

All of the various species of flora and fauna in the Bahamian archipelago are Late Quaternary period colonizers (Pregill and Olson 1981). However, the Greater Antilles have a long history of animal evolution beginning as early as the Eocene period (55 MYA) (Morgan and Woods 1986). The fauna reached the
islands of the Caribbean via overwater dispersal, originating from South or Central America (Darlington 1938; Simpson 1956). Because of adaptive radiation after arrival, all of the various island species could have evolved from very few colonization episodes (Morgan and Woods 1986). When the Great Bahama bank was exposed during the last glaciation, the distance to the Cuban landmass was only 12 km (Franz et al. 1996). This accounts for the Cuban origin of much of the Bahamian flora and fauna (Buden 1981; Correll and Correll 1982; Franz et al. 1996; Morgan 1989). Except for modern introductions, North America has been the source of few animals to the nearby Bahamas. Vast tracts of plant and animal habitat were lost in the Bahamas as sea level rose at the Pleistocene/Holocene boundary (Pregill and Olson 1981). Radical environmental changes such as these certainly effected the distribution of Bahamian faunas over time.

The following environmental characteristics of the Turks and Caicos Islands are important to keep in mind. The islands were formed of precipitated limestone; there is no local source of metamorphic or igneous rock. All the landmasses in the Turks and Caicos complex are low in elevation and small in area; the largest, Middle Caicos, is only 120 km². Because of this, terrestrial habitats are not diverse. The climate is hot and very dry, the vegetation stunted and drought resistant. The land itself here is fluid with dunes rising anew in the west, ridges eroding in the east, and beach rock forming under foot. Due to its lack of elevation, slight changes in sea level had the potential to radically alter the amount of exposed land. Hurricane-grade storms, which constantly endanger the region, could restructure the island overnight and
threaten populations of land animals with extinction. Fluctuations in rainfall and temperature could compromise the ability of the island to support human life, regardless of the richness of the food base, because fresh water sources may disappear. Amerindian settlement on Grand Turk must have been a tenuous proposition.
CHAPTER 4
THE PROJECT: STRATEGIES AND METHODS

This chapter provides a chronology of all the work done at the Coralie site, both in the field and in the lab. Explanations are provided for how the faunal assemblage was reconstructed and what methods were used to document changes in that assemblage over time. Investigating the faunal remains of this site was my primary contribution to this project. Other researchers have completed work on separate aspects of this study (Cordell 1998; Gubrium 1998; Hardman et al. 1998; Harris 1996; Keegan 1997a, 1997b; Scudder 1997). Some of the broader goals of this extensive project will be presented in this chapter.

Team Composition

Explorations at the Coralie site were instigated and led by William Keegan, Curator of Caribbean Archaeology at the Florida Museum of Natural History in Gainesville, Florida. His work was in collaboration with many specialists and volunteers. Brian Riggs, the manager of the Turks and Caicos National Museum on Grand Turk, provided a year-round presence on the island and handled all the unexpected developments with the site. I oversaw the excavations and the analysis of the remains. Lee Newsom from Southern Illinois University at Carbondale did the archaeobotanical work at the site.
Several researchers from the Florida Museum of Natural History contributed their expertise to specialized studies. Sylvia Scudder collected and analyzed soil samples. Irvy Quitmyer examined land snails from the vicinity of the site. Ann Cordell did petrographic analyses of the ceramic remains. Elise LeCompte supervised an excavation of waterlogged sediments on the banks of North Creek. Mary Collins, of the Soil and Water Sciences Department of the University of Florida, undertook pedological investigations at the site. All the work was accomplished, through the assistance of some 100 volunteers who provided over 10,000 person hours of labor in the excavation phase of this study alone.

Excavation Chronology

Because the site is deeply buried, it went unnoticed by surface surveys and remained relatively undisturbed until its discovery in 1991. The property where the site is located was one of many plots of land being sectioned off and cleared for development in this tract by land owner Andrew Newlands. A dense, low brush covers this entire area, so surface visibility was minimal. The plot was being cleared by hand of this vegetation when Brian Riggs visited to check for any indication of Amerindian sites. He noted surface finds of pottery and burnt conch shell debris.

As the Turks and Caicos has legislation to protect antiquities such as archaeological sites, William Keegan was asked to complete an archaeological impact statement. In February, 1992, he and Barbara Toomey shovel tested this area. A total of 35 test pits defined the sites' boundaries and determined
varying deposit densities within the settlement. Judging by the vast amount of turtle bone found in these test pits, the initial reaction was that this site was a sea turtle butchering area. Charcoal from one of these test pits produced what was, at the time, the earliest radiocarbon date for the region—ca. A.D. 900 (1120 +/- 120 B.P., corrected and calibrated).

In 1994, a water pipe was laid east/west, bisecting the site. A small trench was dug by hand about 20 cm wide and 50 cm deep. Again, Brian Riggs was there to note what was disturbed. He bagged the artifacts found with fairly precise horizontal and vertical provenience. This preliminary, make-shift trench was used, in association with the test pit data, in deciding where to plot the first excavation units when Keegan returned in January of 1995.

Multiple excavation seasons were carried out between 1995 and 1997 in affiliation with the Earthwatch organization (Keegan 1996). During the month of January, 1995, two teams of 15 volunteers each worked at both the Coralie site and GT-2. The next two seasons were spent entirely at Coralie. In January and February of 1996, three teams of 10 volunteers each worked for a total of six weeks. The final year of 1997 had three teams again of 10 volunteers each for six weeks in January and February. These three concentrated periods of excavation provided the data for this faunal study. Soon after the significance of this site was determined, the Turks and Caicos government acquired the land from the developer and is currently holding it in trust as a site of national historical importance.

A few remote sensing survey techniques were utilized to help determine the layout of the site and where units should be placed. In May of 1995,
Keegan spent one week completing an electromagnetic survey of the site area. He determined that this technology was not conducive to the nature of the soils and would not be helpful in meeting his goals.

A second attempt at subsurface survey employed a ground penetrating radar system. Mary Collins and two of her graduate students spent one week in January 1996 completing this radar survey and doing soil studies in the area of the site. The unconsolidated sand of this locale provided a good matrix for sending the radar signal, and features within the site did show up on the visual printouts. Our excavations were used to test the effectiveness of this technique. Unfortunately, the water table itself provided the strongest radar signal and detecting other inclusions in the sands proved difficult.

Figure 5 depicts the region surrounding the site. The settlement boundaries are sketched and general geography is shown. This is a small site running northeast/southwest for 160 m with a maximum width of 40 m. The mangrove fringed edge of North Creek is 45 m from the eastern edge of the site today. The ocean is 300 m to the west across a series of small dune ridges. Also shown on this map is a small wooden dock on the North Creek shore. It was 10 m east of this dock, in the peat sediments under North Creek, that the most spectacular artifact associated with the Coralie site was found.

In 1996, Captain Bob Gascoine was deepening a channel between this dock and his anchored live-aboard dive boat when he pulled a piece of wood out of the muck below his feet. To his astonishment he recognized it to be a complete, one-piece canoe paddle. What is more, it was a Taino artifact (Figure 6), clearly associated with the Coralie site. He contacted the Turks and Caicos
Figure 5: Northern Tip of Grand Turk Showing Site Location.

National Museum and Brian Riggs immediately, and plans were made to conserve the find. The wood was tentatively identified by Lee Newsom as bullwood (*Pera bumeliifolia*), a native to Cuba, Hispaniola, and the northern Bahamas. This species is not known from the Turks and Caicos Islands today. The paddle may have been carved in Hispaniola and lost after working its way to Grand Turk along with the inhabitants of the Coralie site. The wood was radiocarbon dated and provided a calibrated age range (at 2 sigma) of A.D. 995-1125, late in the occupation. This suggests that people sailed between Hispaniola and the Turks and Caicos Islands multiple times during the
occupation. The paddle was carved from a single piece of wood. It is 135 cm long. The pointed blade section is 85 cm long. It has a crosspiece at the top of
the shaft. This paddle is nearly identical to one found on Mores Island (Little Bahama Bank) in 1913 by DeBooy (1913: Fig. 1). Las Casas, a chronicler of the contact period, described these paddles "like long handled bakers' shovels, but sharp" (in Olazagasti 1997:133).

In response to this find, investigations were carried out in the sediments below North Creek in the area where the paddle was discovered. Conditions were apparently excellent for the preservation of wood, fiber, and other perishable materials in these waterlogged strata. Elise LeCompte spent two weeks in January of 1997 exploring the area but no other Amerindian period artifacts were found.

Field Procedures

The Earthwatch teams excavated 271 m³ of sediment. Most units were 2 by 2 m blocks laid out in a single long trench that paralleled the creek, with perpendicular extensions opened up east of this main trench (see Figure 7). The average depth of each unit was 1 m, which coincided approximately with the water table. Datum readings came from a single permanent transit station. These numbers have been converted so that they describe a generalized below ground surface measurement. This is possible because the site's surface is nearly flat. The datum readings give an idea of the depth below surface as well as an accurate across site system for recording relative depths. Though the unit size may seem large, much of the material was mapped in situ as it was uncovered; 126 field maps were made. Most units contained feature material (either hearths or midden deposits), which was excavated, bagged, and
catalogued separately from the surrounding matrix. These techniques allowed sufficient control over the horizontal provenience of the artifacts.

The site is buried by a sand layer, which grades from 25 to 65 cm deep as it nears North Creek. This overburden (Zone 1) was mostly sterile but contained some 19th and 20th century historic materials. At the turn of the

Figure 7: Excavation Units at the Coralie Site.
In the 19th century, this tract of land supported a coconut palm plantation for a short time. The only surface indication of a historic occupation is a broken down stone wall that cuts diagonally across the site toward the northwest. In some of the units, historic remains do lie atop the Amerindian deposits. Excavations identified a few intrusive features from the historic period—four historic post-molds, one reinforced post-hole constructed from coral and rock, and two examples of wood. The woods preserved because they went deep enough to have been saturated from constant contact with the water table. One piece was an old fence post, the other a tree root; both began at 35 cmbs (centimeters below surface). Other than these examples, there was very little mixing of the two contexts. Careful excavation mitigated most contamination. There was no evidence of tilled soil or other activities that would destroy the integrity of the prehistoric deposits.

The overburden was removed by shovel and screened. However, after it was determined how consistently deep the Amerindian deposits were, and how sterile this layer was, this material was discarded without further investigation. Zone 2 is the dark, anthropogenic soil that comprises the site. It varies in thickness between 10 and 40 cm. It is one uniform stratum, which was removed carefully in 10 cm levels with trowel and brush. The soil was full of fragile bone, so the excavations proceeded cautiously. All matrix was dry sifted through ¼" mesh, with 10-liter soil samples taken from features, representative zones, and any areas with noticeably denser animal bone inclusions to be used for fine mesh faunal analysis. It was determined at the beginning of these excavations, through testing with various mesh sizes, that ¼" mesh would
propel expedient excavations while at the same time recovering most of the bone material in the site. Separate soil samples for analysis of macro and microbotanical remains and mineralogical content were also collected.

Lab Procedures

Many of the field specimens were processed simultaneously on Grand Turk while excavations continued. Shell remains were washed, sorted, identified to species, and analyzed. Lab analysis procedures included recording shell weights, counting the number of specimens for each species (abbreviated NISP), and calculating an MNI (minimum number of individuals) measurement, which estimates how many individuals of each species are represented by the remains. This is done by counting a unique anatomical constituent for each species. For example, for invertebrates with univalve shells, the spire of the shell was counted. With clams and other bivalves, the number of left and right hinges were counted, and the larger number was used to calculate the MNI. However, simply counting the number of hinges and dividing that number in half produced the same result. Measurements were sometimes taken for use in allometric formulas, which can calculate individual animal sizes. This technique is just beginning to be used for invertebrates in the Caribbean area (Wing 1998). Any secondary use of the shells was noted and shell tools were described in detail. All food shell debris was discarded after analysis. The shell tools have been curated either with the Turks and Caicos National Museum or the Florida Museum of Natural History. Other tool forms were found made from coral and local and imported stone. These were
similarly analyzed and curated. Pottery and bone were transported to
Gainesville for analysis. Pottery is not abundant in this site, perhaps because
every vessel and griddle (which make up 10% of the collection) had to be
imported from the Greater Antilles. The total amount of pottery excavated was
only 1423 sherds, weighing 63 kg. If pottery distributions were averaged
across the site, each 1 m³ would have produced only seven sherds.
Furthermore, 39% of these sherds were smaller than 2 cm across. Very little
could be done in terms of vessel shape reconstruction because of the high
breakage and eroded nature of this collection. The pottery from this site is
wholly unremarkable, yet typically Ostionan. Only 2% displayed any
decoration, not including red-slippering. The finely made "redware" comprised
27% of the sample; 45% was plainware. The remaining sherds possessed an
exterior only "self slip" (Rice 1987).

Further results from the pottery analysis can be found in two studies by
researchers from the University of Florida. The entire collection of pottery was
incorporated into a Master's thesis on the Ostionan pottery style by Gubrium
(1998), who described the assemblage and confirmed its Ostionan associations.
Using thin-sectioned sherds from Coralie, Cordell (1998) identified three paste
types along with three surface treatment types, and made correlations between
them. She further traced these paste types to ones from Hispaniola as part of a
larger study to locate the source areas for imported pottery in this region.

The bone remains were not washed, rather, they were laid out to air dry
and brushed clean when necessary. Much of the initial sorting process was
completed in the field. Thousands of sea turtle shell fragments came from each
provenience. These were often crushed into very small pieces. Time was not spent counting the fragments under 2 cm in diameter in proveniences with ample turtle remains; these were only weighed. In calculating the NISP for turtle, only the internal skeleton and some of the individual carapace and plastron bones were counted. So this number is a gross underestimation (perhaps 90% went uncounted) of the number of turtles bones in the site. No attempt was made to estimate the number of uncounted turtle bone fragments through sampling. Similarly, there were very large samples of burnt, broken conch shell. Many proveniences of conch were laboriously counted and weighed, so the total NISP for conch is an estimation calculated from sampling. The NISP for fish remains is underestimated somewhat (less than 10%) because some proveniences of unidentifiable fish fragments were not counted, only weighed. These imprecise methods had no impact on the dietary calculations where MNI is customarily used.

Every provenience had 100% recovery of bone in the ¼" screen. All these remains were used in the calculation of these results. In addition to this, fine screen samples were analyzed to understand what portion of the remains, and the diet, was missed in the ¼" screens. The fine mesh samples came from 10 proveniences and totaled 106 liters of matrix. The soil was processed through nested geologic screens of 4 mm, 2 mm, and 1 mm mesh to recover all the smaller faunal remains. The 4 mm and 2 mm screen sizes provided nearly all of the bone material. Very little was recovered in the 1 mm mesh.

In a sampling experiment from the site of Trants, Montserrat, Reitz (1994) found that through the use of 2 mm mesh, the amount of bone
recovered in the sample doubled, although the number of individuals (MNI) remained the same. This was also the result with the fine mesh samples from Coralie. No new MNI was found but because there were so many mostly unidentifiable bone scraps, the NISP was raised substantially. The ¼" mesh samples provided an accurate reflection of the deposited remains, which is not the case at many later West Indian sites.

The bone sample recovered from Coralie is particularly large when compared with other Caribbean sites. In order to compare faunal results between sites, the samples should ideally be of similar size, and be sieved through the same mesh diameter. For many studies in the Caribbean this level of comparability does not exist. For a sample to provide a reasonably complete picture of the faunal remains at a site, 200 MNI must be collected from a minimum of 1400 bones (Wing and Brown 1979). Many sites fall short of this requirement.

The largest biosamples have come from the extensive Saladoid and Post-Saladoid sites of Maisabel, Puerto Rico (deFrance 1989), Sugar Factory Pier, St. Kitts (Wing and Scudder 1980), Tutu, St. Thomas (Righter n.d.), and Golden Rock, St. Eustatius (Versteeg and Schinkel 1992). Each has over 500 MNI and over 10,000 NISP for the vertebrate remains alone. The Coralie sample had 963 MNI and over 30,000 NISP (not including all the broken turtle shell fragments). This is comparable to the sites previously mentioned in sample size, if not in overall site size. These four sites all had different sampling strategies than those used at Coralie, but as long as the results truly represent what was in the ground, the data sets can be compared with reasonably
accurate conclusions. Unfortunately there are no other comparatively large faunal samples from sites in the Bahamian archipelago, or from any other Ostionan period sites. What data are available will be discussed in Chapters 7 and 8.

**Methods of Faunal Identification and Diet Reconstruction**

The sorted, faunal materials were identified to the lowest taxon by comparing elements in the sample with those contained in the zooarchaeology, ornithology and herpetology comparative collections at the Florida Museum of Natural History. MNI was counted for all taxa based on the most numerous element, taking into consideration any differences in the size of paired elements (Wing and Brown 1979). For example, all the right humeri of the sea turtles were counted, then any individuals that did not fall into the size range dictated by the humeri were added to the total. These included two hatchlings and two very large turtles, larger than any of the recovered humeri. For iguanas, left ilia were counted, considering only gross size differences. The estimate of the number of individual tortoises was based on the number and the size of plastra. Fish MNI was determined by counting the most common single element for each taxon. This was most often an atlas or in the case of the parrotfish, a pharyngeal grinding plate. It is very difficult to estimate MNI for shark because of the nature of their remains, namely numerous teeth and vertebrae. A very conservative estimate was made by looking at great size differences in vertebrae and noting the amount of temporal or spatial distance between specimens. Because the number of bird remains found were few,
usually only one or two of each taxon, location of the remains was primarily used in assigning MNI. The most abundant element was counted in the more populous bird species.

After determining the number of individuals of each taxon the next step was to estimate how much meat these individuals contributed to the Taino diet. There are multiple ways to do this. One is the use of allometric conversions (Reitz and Cordier 1983; Wing and Brown 1979). Relevant measurements were recorded on the well preserved elements from each species (Morales and Rosenlund 1979 for fish; Driesch 1976 for bird and mammals) for use in this type of formula. This technique worked best with the fish remains. By measuring the anterior diameter of the centrum of the vertebrae, then inserting that number in the following formula (Wing and Scudder 1980:204), the live weight of a fish can be determined.

\[
\log y = 2.047 \log x + 1.162
\]

\((x=\text{centrum diameter in millimeters})\)
\((y=\text{body weight of fish in grams})\)

When allometry was not possible, a "proportional method" was used instead, where the size of individuals was estimated by likening the bones with remains of individuals in a comparative skeletal collection. Finally, if no method could provide an actual meat weight based on the bone size, then an averaged species weight was used. This was the case with birds, invertebrates, and most of the rock iguana remains. Even so, juvenile bones were taken into consideration when estimating the total meat weight provided by each species.
All bone modifications were noted; this includes evidence of burning or butchering. Recording the extent of epiphyseal fusion of the long bones allowed an estimation of the age of death for some species. For the two species represented by many individuals and thousands of bones, namely green turtle and rock iguana, calculations on the recovered vs. expected number and percentage of bones provided information on possible butchering techniques, field processing evidence, and deposition practices.

Sometimes assumptions must be made when identifying species based on comparisons with complete modern skeletons. This was the case in working with so many sea turtle remains. Elements such as mandibles are very diagnostic to species but others, such as carapace and plastron fragments, are not. Those bones that were identifiable to species because of unique anatomical structure, were all, with one exception, believed to be *Chelonia mydas*, the green turtle. So, it was an extrapolation to say that nearly all of the bones in the site are green turtle, but it is based on skeletal observations, and the fact that green turtle is the preferred eating turtle among the world's populations.

Being familiar with the current animal inhabitants of the terrestrial and marine environments of the Turks and Caicos was helpful in narrowing down possible species identifications, particularly within the fishes. An additional aid was a survey of underwater resources of Grand Turk completed by ichthyologists George Burgess of the Florida Museum of Natural History and David Snyder of Continental Shelf Consultants, Jupiter, Florida (Burgess and Snyder 1995). Current inhabitants may or may not reflect zooarchaeological
Current inhabitants may or may not reflect zooarchaeological findings, but this type of information is what informs us about changes in ecosystems.

Because I worked with the Coralie site bones for multiple years and learned what would be expected in the sample, only a very small percentage of the remains were unidentifiable (UID), meaning not even identifiable to class. According to Wing and Brown (1979), the average UID vertebrate remains in a sample is 23%, but it ranges widely. At Golden Rock, St. Eustatius, 58% of the bones were UID (Versteeg and Schinkel 1992). At Coralie, only 6.5% of the remains were not identified to at least fish, bird, sea turtle, or reptile. I am quite certain that these remains are mostly crushed bone fragments of sea turtle, but based on their individual merits, they were classified UID.

All of these methods were combined to arrive at a reconstruction of the diet consumed at this site. Situations that could bias the findings (Wing 1989) were considered at all phases of the inquiry, and minimized as much as possible. Poor bone preservation, resulting from acidic soils, is the most common bias. The sandy soils within this site contain a high density of shell inclusions. These shells, especially the burnt conch shell, release calcium carbonate into the sandy soil matrix, increasing the preservation of delicate materials, including bone. Proximity to the water table and indications that the site was at one time inundated can have a negative effect on preservation. This is most evident in some of the pottery remains which are, in certain deposits, very friable (21% of the sample was considerably eroded and crumbly). However, this had little effect on the bone remains. Overall, the preservation at this site was excellent.
Other biases that can skew the subsistence picture include field processing of certain species away from the site, and carrying raw materials into the site for a secondary use. Here, only the data on conch remains may have been influenced by these processes. Techniques of recovery and analysis can severely bias the results. At Coralie, I supervised all excavations and performed the faunal analysis for each year’s work, resulting in consistent and cumulative results.

The collection of bone from Coralie is catalogued and housed at the Florida Museum of Natural History. All the bird, tortoise, and large rock iguana remains are accessioned along with the entire sample from the 1995 season. The fish, sea turtle, and smaller rock iguana remains from the other two seasons were primarily analyzed in the field and in most cases discarded after analysis. The pottery, stone pieces, shell tools, beads, and pendants all remain in the Turks and Caicos at the National Museum on Grand Turk.

Temporal Controls

An essential part of this study was to trace changes in the faunal assemblage over time. The site does not contain deep, continuous, stratigraphic deposits, yet it was possible to pinpoint time ranges for different areas of the site, using a combination of horizontal and vertical stratigraphy and radiocarbon dating.

Table 1 presents the radiocarbon chronology for this site, while Figure 8 shows the general location of each of the dated samples. The three charcoal samples taken from the easternmost units provided the earliest dates, from the
<table>
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<tr>
<th>Laboratory Number</th>
<th>Provenience</th>
<th>Context</th>
<th>Material &amp; Wood Type</th>
<th>Age - B.P. (with C¹⁴/C¹³ correction)</th>
<th>cal. AD Intercept</th>
<th>Calibrated Age Range (2 sigma)</th>
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<tr>
<td>Beta-80911</td>
<td>110N 110E FS #81 92-93.5 cmbd</td>
<td>Ash lens Area 10</td>
<td>Charcoal Wild Lime</td>
<td>1280 +/- 60 AD 710</td>
<td>AD 650-885</td>
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<td>100N 108E FS #168 78-90 cmbd</td>
<td>Midden Feature 23</td>
<td>Shell*</td>
<td>1170 +/- 60 AD 770</td>
<td>AD 665-905</td>
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<tr>
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<td>Hearth Feature 25</td>
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<td>1230 +/- 60 AD 790</td>
<td>AD 670-970</td>
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<td>124N 100E FS #35 47-62 cmbd</td>
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<td>1160 +/- 60 AD 885</td>
<td>AD 720-1105</td>
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<td>Beta-61151</td>
<td>ca. 120N 110E Test pit (1992) 50-60 cmbd</td>
<td>Zone 2</td>
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<td>1120 +/- 120 AD 895-939</td>
<td>AD 650-1160</td>
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<td>Beta-114924</td>
<td>148N 104E FS #353 70-80 cmbd</td>
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<td>1120 +/- 50 AD 960</td>
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<td>930 +/- 60 AD 1020</td>
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<td>Tree root</td>
<td>Wood Andira</td>
<td>Modern</td>
<td></td>
<td></td>
</tr>
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</table>

Dates processed at the Beta Analytic Radiocarbon Dating Laboratory, Miami, FL. Calibrations according to Stuiver et al. (1993).

*Shell dates adjusted for local reservoir effect.
Figure 8: Locations and Time Periods of Radiocarbon Samples.
early to late 8th century. Excavations were usually stopped by the water table at about 100 cmbs, yet soil tests revealed turtle bone occurring as deep as 110 cmbs in one of the easternmost units. The earliest radiocarbon date (intercept A.D. 710) came from 93 cmbs. The very deepest deposits, below the water table, have not been radiocarbon dated. It is possible that the site was first settled before the 8th century. The main trench, approximately 10 m to the west of the area with the earliest dates, sampled a distance of 90 m running parallel to the creek edge. Radiocarbon dates calculated from samples along this trench produced five intercept dates ranging between A.D. 885 and A.D. 1170. These dates become steadily later as the excavations move south.

Stratigraphic considerations further refine the above chronology. Figure 9 is a simplified profile map designed to show the east/west slope of the site. Zone 2 was the original ground surface during the Amerindian occupation. It slopes down from the west toward the creek, so the overburden layer varies in thickness. As well as deepening toward the creek, this discolored horizon lightens and thins, at points to 10 cm.

Most of this sites' features came from within the Zone 2 layer, but some began below this in lighter colored sand (see Figure 9). In this figure, some of the features are compressed along a single east/west axis to simplify the presentation. The lower layer of features (see F11, ash lens and shell midden pockets) have top depths ranging from 70 to 90 cmbs. These are all associated with the earliest occupation. Feature 11 is a fire pit located in the area of the later, westerly units. It is the only feature below 70 cmbs in the western units. Figure 10 is a photograph of these two fire pits (F11 and F6) from different
Figure 9: Profile Map of East/West Trench.

periods of occupation. The depth and discontinuity of F11 with the above discolored soils associates it with the earlier occupation. A combination of stratigraphy and radiocarbon dates helped defined the temporal boundaries within the site.

The last characteristic of the site depicted in this profile is a wedge shaped deposit of beach sand that covers only the eastern 10 m of the site. It sits directly atop the buried anthropogenic horizon. This deposition effectively ended the 8th century occupation. The boundary between this sand wedge and the Amerindian deposit is abrupt, leading some authors (Hardman et al. 1998) to conclude that a heavy storm surge or hurricane suddenly buried the site. Alternatively, citing factors that argued for a low energy deposition, Scudder (1997) concluded that this feature was the result of a gradual rise in sea level.
A horizontal separation of time periods occurs at this site, evidenced by differing radiocarbon dates for separate areas and the lack of deep, continuous stratigraphy. The settlement was moved at one point away from the creek. It also seems to have moved south over time. As Rouse pointed out (1977), the residents of West Indian sites moved their houses often and dropped their refuse everywhere. This pattern can be seen on St. Eustatius (Versteeg and Schinkel 1992), and on St. Croix, where Faber Morse (1997) demonstrates this phenomenon at multiple sites. Even so, intra-settlement patterns are usually discernible from the remains.

Taking all this into consideration, roughly designated locations within the site were assigned time ranges, resulting in three general phases for the occupation. Using more fine-grained distinctions noted in the vertical
stratigraphy, each of these areas and phases were then sub-divided into early and late segments. Phase 1 is the colonization period occupation, with deposition occurring only in the 8th century; 17 units produced artifacts only from this time period. Phase 2, with 28 units, is roughly the period between A.D. 800 and 1000. Phase 3, with 19 units, is the final period between A.D. 1000 and 1200. Temporal changes in faunal use were charted along these subdivisions.

It has been eight years since explorations began at the Coralie site on Grand Turk. Many people have been involved in numerous aspects of the project. Because it is a small site, a great amount of very detailed information has been collected. The strategies and methods used to accomplish the goals for this investigation evolved over the years as new questions were raised by the findings. The stage is now set to discuss what was found and to put forth an interpretation of what happened when people first colonized the island of Grand Turk.
CHAPTER 5
RESULTS OF FAUNAL ANALYSIS:
VERTEBRATE AND INVERTEBRATE REMAINS

There is nothing of greater human concern than sustaining oneself. From analyses of the zooarchaeological remains at the Coralie site, it is possible to reconstruct the diet consumed at this settlement, and to assess how well the occupants provided for themselves from the resources available on this small island. Because this is a colonization period settlement, the diet consumed tells us something about the process of choice in human subsistence. We get a glimpse of what the Amerindians preferred to eat, with selections made from a variety of obtainable species. When looking at only bone and shell remains, the focus is necessarily restricted to the consumption of animal protein and fat from vertebrate and invertebrate species living in either marine or terrestrial habitats. The total diet, which includes the contribution of plant foods, cannot be understood from these methods (see Stokes 1998).

Some of the animals recovered at Coralie are of interest beyond their ability to provide calories to a diet. Certain identifications revealed animals of biogeographic importance to this region, with species unknown from the Turks and Caicos Islands, and a few undescribed in the West Indies. This chapter will also report on what contexts and in what condition these bones were found, which can give clues to how these animals were processed in the site.
Diet Reconstruction

The terrestrial habitat of Grand Turk supported an array of species that are of biogeographic interest and provide evidence for overexploitation within a limited space. But when looking at the total biomass making up the overall Taino diet, it is the marine species that make the greatest contribution, providing 94% of the estimated meat. Tropical inshore waters are "one of the most complex, stable, and biologically productive ecosystems on earth" (Nietschmann 1972:1). It is this habitat that truly sustained the inhabitants of Grand Turk. The vast majority of meat consumed at this site was from sea turtle. According to optimal foraging theory, sea turtle would have been a preferred food when available (Keegan 1992), yet few Caribbean sites have produced abundant turtle remains (for an exception see Allaire 1977). Coralie provides evidence for the popularity of turtle meat in the Amerindian diet.

Green Turtle

Green sea turtle (Chelonia mydas) is the primary faunal deposit in the site, with 75% of the bone, by mass, belonging to this one species. The three seasons of excavations recovered 45 kg of turtle bone. Over 6000 identifiable elements were counted, not including small shell fragments. The estimated usable meat weight (referring only to the edible portion of the animal) from this amount of bone was 2386 kg (over 5000 lbs), providing 77% of the meat in this diet. An individual sea turtle provides a very large food package. Even though there were six times as many individual iguanas captured here as turtles, the turtles were more important as a meat source.
The MNI for sea turtle was conservatively estimated at 50. Small juveniles, with a carapace length (C.L.) of 30 to 50 cm, comprised ¼ of this population and weighed between 5 and 20 kg each. Mid-sized, sub-adult turtles (C.L.: 50-85 cm) made up 60% of the collection, weighing between 20 and 70 kg each. The remaining 15% were large turtles over 1 m in length. The largest green turtle in this site is estimated to have weighed 160 kg. These are rough size estimations based on humeri measurements (Bjorndal et al. 1998).

The turtles harvested on Grand Turk were 85% sub-adults, and the few adults captured were relatively small. Carr (1952) reported that adult green turtles weigh on average 110 to 180 kg, but that specimens had been reported up to 390 kg. Green turtles have an extremely slow growth rate, particularly once adulthood has been reached (at ca. 70 kg or 85 C.L.), growing only scant centimeters each decade (Bjorndal and Zug 1995). They can live and continue to grow for beyond a century. Past populations, with no human predation, would have supported very large adults, yet these were not harvested at Coralie.

The Miskito Indians of Nicaragua are a modern turtle hunting society with a subsistence pattern similar to that seen at the Coralie site. This culture was intensively studied by Nietschmann (1972) and will be used as a point of comparison for this investigation. The Miskito and the Taino exploited similar resources, with an especially heavy reliance on turtle meat for the protein and fat portion of their diets. The average size of the turtles harvested by the Miskito was 86 kg, larger than those on Grand Turk. Their 6-m-long by 1-m-across dugout canoes can carry a load of three to four adult turtles. Miskito
turtlers are technically capable of harvesting 180 kg turtles, but these are increasingly rare within local populations.

Neitschmann calculated the amount of meat consumed in one Miskito village over one year's time. A large village of 1000 people ate 819 turtles (35,000 kg or 77,000 lbs of meat). This is just less than one turtle per person per year. Yet, turtle still contributed 70% of the animal portion of this diet. Fish provided 6% of the meat consumed, and iguanas, small birds, and mammals a total of 3%. The remaining 20% came from store-bought foods. Even though the Coralie site is comparatively a much smaller habitation, the percentages of meats consumed are roughly similar (see Figure 11).

![Figure 11: Percentage of Total Biomass Provided by the Primary Vertebrate and Invertebrate Remains.](image)

Species Identified and Quantified

Turtle may be the dominant meat source, but a great variety of animals from various habitats were also harvested and deposited in the Coralie site
including fish, rock iguana, tortoise, conch, small invertebrates, and birds. Table 2 is a list of the vertebrate and invertebrate species identified in the remains. There are 32 species of fish, 20 species of bird, and seven species of reptile. No mammal bones were found. For the invertebrates, there are 33 species of gastropod, 22 bivalves, five crustaceans, two echinoderms, and one chiton. In looking over this simple list of names, a few unusual discoveries emerge; the first is tortoise. Only historic period, introduced tortoises survive in the West Indies, and all the endemic tortoises were thought to have gone extinct before humans first arrived in these islands (Auffenberg 1967; Schwartz and Henderson 1991; Watters et al. 1984). There are other unusual finds in the bird identifications including two parrots, only one of which is known from this region (Snyder et al. 1982), the South American scarlet ibis, and the double-striped thick-knee, a bird thought to be long extinct in the Bahamas (Buden 1987; Raffaele et al. 1998; Olson 1982; Pregill and Olson 1981).

Other species common in West Indian archaeological sites are absent here, notably rats and hutias. Rice rats (Oryzomyines) were regularly consumed in Lesser Antillean sites, but no species of rat inhabited the Bahamian archipelago before the contact period (Deagan 1988; Morgan 1989). The only rodent native to this region is the Bahamian hutia (Geocapromys ingrahami). Once common throughout these islands, this species survives today only on East Plana Cay in the southeast Bahamas (Allen 1892; Clough 1972). A cave recently excavated on Middle Caicos, with deep non-cultural deposits, produced no hutia bone (R. Franz: personal communication). It appears that the hutia never occupied either the Turks or Caicos banks.
Table 2: Vertebrate and Invertebrate Species List from the Coralie Site, Grand Turk, with Scientific and Common Names.

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VERTEBRATES:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>REPTILES:</strong></td>
<td></td>
</tr>
<tr>
<td>Chelonia mydas</td>
<td>Green turtle</td>
</tr>
<tr>
<td>Caretta caretta</td>
<td>Loggerhead turtle</td>
</tr>
<tr>
<td>Geochelone sp.</td>
<td>Tortoise</td>
</tr>
<tr>
<td>Cyclura carinata</td>
<td>Rock iguana</td>
</tr>
<tr>
<td>Leiocephalus psammadromus</td>
<td>Curlytail lizard</td>
</tr>
<tr>
<td>Epicrates chrysochistes</td>
<td>Boa</td>
</tr>
<tr>
<td><strong>BIRDS:</strong></td>
<td></td>
</tr>
<tr>
<td>Sula dactylatra</td>
<td>Masked booby</td>
</tr>
<tr>
<td>Sula sula</td>
<td>Red-footed booby</td>
</tr>
<tr>
<td>Ardea herodias</td>
<td>Great blue heron</td>
</tr>
<tr>
<td>Egretta rufescens</td>
<td>Reddish egret</td>
</tr>
<tr>
<td>Nyctanassa violacea</td>
<td>Yellow-crowned night heron</td>
</tr>
<tr>
<td>Ardeidae</td>
<td>Heron/egret</td>
</tr>
<tr>
<td>Eudocimus ruber</td>
<td>Scarlet ibis</td>
</tr>
<tr>
<td>Phoenicopterus ruber</td>
<td>Roseate flamingo</td>
</tr>
<tr>
<td>Dendrocygna arborea</td>
<td>West Indian whistling duck</td>
</tr>
<tr>
<td>Pandion haliaetus</td>
<td>Osprey</td>
</tr>
<tr>
<td>Haematopus palliatus</td>
<td>American oystercatcher</td>
</tr>
<tr>
<td>Burhinus bistriatus</td>
<td>Double-striped thick-knee</td>
</tr>
<tr>
<td>Limnodromus griseus</td>
<td>Short-billed dowitcher</td>
</tr>
<tr>
<td>Larus atricilla</td>
<td>Laughing gull</td>
</tr>
<tr>
<td>Columba leucocephala</td>
<td>White-crowned pigeon</td>
</tr>
<tr>
<td>Zenaida aurita</td>
<td>Zenaida dove</td>
</tr>
<tr>
<td>Geotrygon chrysis</td>
<td>Key West quail dove</td>
</tr>
<tr>
<td>Amazona leucocephala</td>
<td>Cuban parrot</td>
</tr>
<tr>
<td>Amazona sp.</td>
<td>UID Parrot</td>
</tr>
<tr>
<td>Tyrannus dominicensis</td>
<td>Gray kingbird</td>
</tr>
<tr>
<td>Corvus nasicus</td>
<td>Cuban crow</td>
</tr>
<tr>
<td><strong>FISH:</strong></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus sp.</td>
<td>Shark</td>
</tr>
<tr>
<td>Dasyatis americana</td>
<td>Southern stingray</td>
</tr>
<tr>
<td>Albula vulpes</td>
<td>Bonefish</td>
</tr>
<tr>
<td>Holocentrus ascensionis</td>
<td>Long-jaw squirreelfish</td>
</tr>
<tr>
<td>Epinephelus striatus</td>
<td>Nassau grouper</td>
</tr>
<tr>
<td>Epinephelus sp.</td>
<td>Grouper/hind</td>
</tr>
<tr>
<td>Mycteroperca sp.</td>
<td>Grouper</td>
</tr>
<tr>
<td>Caranx cryosos</td>
<td>Blue runner</td>
</tr>
<tr>
<td>Caranx hippos</td>
<td>Crevale jack</td>
</tr>
<tr>
<td>Caranx ruber</td>
<td>Bar jack</td>
</tr>
<tr>
<td>Caranx sp.</td>
<td>Jack</td>
</tr>
<tr>
<td>Trachinotus cf. falcatus</td>
<td>Permit</td>
</tr>
</tbody>
</table>
### Table 2—continued.

<table>
<thead>
<tr>
<th>FISH (Con't):</th>
<th>MUTTON snapper</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lutjanus</em> cf. <em>analis</em></td>
<td>Schoolmaster</td>
</tr>
<tr>
<td><em>Lutjanus</em> cf. <em>apodus</em></td>
<td>Gray snapper</td>
</tr>
<tr>
<td><em>Lutjanus</em> cf. <em>griseus</em></td>
<td>Snapper</td>
</tr>
<tr>
<td><em>Lutjanus</em> sp.</td>
<td>Margate</td>
</tr>
<tr>
<td><em>Haemulon</em> cf. <em>album</em></td>
<td>French grunt</td>
</tr>
<tr>
<td><em>Haemulon</em> cf. <em>flavolineatum</em></td>
<td>White grunt</td>
</tr>
<tr>
<td><em>Haemulon</em> cf. <em>plumieri</em></td>
<td>Blue-striped grunt</td>
</tr>
<tr>
<td><em>Haemulon</em> cf. <em>sciurus</em></td>
<td>Grunt</td>
</tr>
<tr>
<td><em>Haemulon</em> sp.</td>
<td>Porgy</td>
</tr>
<tr>
<td><em>Calamus</em> sp.</td>
<td>Bermuda/yellow chub</td>
</tr>
<tr>
<td><em>Kyphosus</em> sectatrix/incisor</td>
<td>Great barracuda</td>
</tr>
<tr>
<td><em>Sphyraena</em> barracuda</td>
<td>Spanish hogfish</td>
</tr>
<tr>
<td><em>Bodianus</em> <em>rufus</em></td>
<td>Pudding wife</td>
</tr>
<tr>
<td><em>Halichoeres</em> radiatus</td>
<td>Parrotfish</td>
</tr>
<tr>
<td><em>Scarus</em> sp.</td>
<td>Parrotfish</td>
</tr>
<tr>
<td><em>Sparisoma</em> sp.</td>
<td>Surgeonfish/blue tang</td>
</tr>
<tr>
<td><em>Acanthurus</em> sp.</td>
<td>Mackeral</td>
</tr>
<tr>
<td>cf. <em>Scomberomorus</em> sp.</td>
<td>Peacock flounder</td>
</tr>
<tr>
<td><em>Bothus</em> lunatus</td>
<td>Queen triggerfish</td>
</tr>
<tr>
<td><em>Balistes</em> vetula</td>
<td>Boxfish/trunkfish</td>
</tr>
<tr>
<td><em>Lactophrys</em> sp.</td>
<td>Checkered pufferfish</td>
</tr>
<tr>
<td><em>Sphoeroides</em> cf. <em>testudineus</em></td>
<td>Porcupinefish</td>
</tr>
<tr>
<td><em>Diodon</em> cf. <em>hystrix</em></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INVERTEBRATES:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CRUSTACEANS:</td>
<td>Common blue crab</td>
</tr>
<tr>
<td><em>Callinectes</em> <em>sapidus</em></td>
<td>Land hermit crab</td>
</tr>
<tr>
<td><em>Coenobita</em> clypeatus</td>
<td>Land crabs</td>
</tr>
<tr>
<td><em>Gecarcinidae</em></td>
<td>Spiny lobster</td>
</tr>
<tr>
<td><em>Panularis</em> argus</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GASTROPODS:</th>
<th>Keyhole limpets</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Fissurellidae</em></td>
<td>Cayenne keyhole limpet</td>
</tr>
<tr>
<td><em>Diodora</em> cayenensis</td>
<td>Long-spined starsnail</td>
</tr>
<tr>
<td><em>Astrantium</em> phoebiurn</td>
<td>West Indian starsnail</td>
</tr>
<tr>
<td><em>Lithopoma</em> tectum</td>
<td>West Indian topsnail</td>
</tr>
<tr>
<td><em>Cittarium</em> pica</td>
<td>Bleeding tooth</td>
</tr>
<tr>
<td><em>Nerita</em> <em>peloranta</em></td>
<td>Tessellated nerite</td>
</tr>
<tr>
<td><em>Nerita</em> tessellata</td>
<td>Four-toothed nerite</td>
</tr>
<tr>
<td><em>Nerita</em> versicolor</td>
<td>Nerites</td>
</tr>
<tr>
<td><em>Nerita</em> sp.</td>
<td>Beaded periwinkle</td>
</tr>
<tr>
<td><em>Cenchritis</em> muricatus</td>
<td>Mangrove periwinkle</td>
</tr>
<tr>
<td><em>Littorina</em> angulifera</td>
<td>Prickly-winkle</td>
</tr>
<tr>
<td><em>Nodilittorina</em> dilatata</td>
<td>Cerith</td>
</tr>
<tr>
<td><em>Cerithium</em> sp.</td>
<td>Queen conch</td>
</tr>
<tr>
<td><em>Strombus</em> <em>gigas</em></td>
<td>Worm-snail</td>
</tr>
<tr>
<td><em>Vermetidae</em></td>
<td>White hoof-snail</td>
</tr>
<tr>
<td><em>Hipponix</em> antiquatus</td>
<td></td>
</tr>
</tbody>
</table>
Table 2—continued.

<table>
<thead>
<tr>
<th>GASTROPODS (Con't):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Macrocypraea zebra</td>
<td>Measled cowrie</td>
</tr>
<tr>
<td>Naticarius canrena</td>
<td>Colorful Atlantic natica</td>
</tr>
<tr>
<td>PSehinae leucus</td>
<td>Milk moon-snail</td>
</tr>
<tr>
<td>Tectonica pusilla</td>
<td>Miniature natica</td>
</tr>
<tr>
<td>Cypraeasassis tecticulus</td>
<td>Reticulated cowrie-helmet</td>
</tr>
<tr>
<td>Tonna pennata</td>
<td>Atlantic partridge tun</td>
</tr>
<tr>
<td>Charonia tritonis variegata</td>
<td>Atlantic trumpet triton</td>
</tr>
<tr>
<td>Cymatium muricinum</td>
<td>Knobbed triton</td>
</tr>
<tr>
<td>Bursa sp.</td>
<td>Frog-snail</td>
</tr>
<tr>
<td>Chicoreus pomum</td>
<td>Apple murex</td>
</tr>
<tr>
<td>Pticopurpura patula</td>
<td>Wide-mouthed rock-snail</td>
</tr>
<tr>
<td>Columbella mercatoria</td>
<td>West Indian dove-snail</td>
</tr>
<tr>
<td>Columbellidae</td>
<td>Dove-snail</td>
</tr>
<tr>
<td>Fasciolariia tulipa</td>
<td>True tulip</td>
</tr>
<tr>
<td>Oliva sp.</td>
<td>Olive</td>
</tr>
<tr>
<td>Olivella sp.</td>
<td>Dwarf olive</td>
</tr>
<tr>
<td>Tenebra dislocata</td>
<td>Eastern auger</td>
</tr>
<tr>
<td>Bulla striata</td>
<td>Striate bubble</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIVALVES:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brachiodontes sp.</td>
<td>Mussel</td>
</tr>
<tr>
<td>Anadara notabilis</td>
<td>Eared ark</td>
</tr>
<tr>
<td>Arca zebra</td>
<td>Turkey wing</td>
</tr>
<tr>
<td>Barbatia sp.</td>
<td>Ark</td>
</tr>
<tr>
<td>Pinctada imbricata</td>
<td>Atlantic pearl-oyster</td>
</tr>
<tr>
<td>Lima scabra</td>
<td>Rough fileclam</td>
</tr>
<tr>
<td>Spondylus americanus</td>
<td>Atlantic thorny oyster</td>
</tr>
<tr>
<td>Anodonta alba</td>
<td>Buttercup lucine</td>
</tr>
<tr>
<td>Codakia orbicularis</td>
<td>Tiger lucine</td>
</tr>
<tr>
<td>Divalinga quadriruscata</td>
<td>Cross-hatched lucine</td>
</tr>
<tr>
<td>Lucina pensylvanica</td>
<td>Pennsylvaniana lucine</td>
</tr>
<tr>
<td>Diplodonata sp.</td>
<td>Diplodon</td>
</tr>
<tr>
<td>Chama macerophylla</td>
<td>Leafy jewelbox</td>
</tr>
<tr>
<td>Chama sarda</td>
<td>Cherry jewelbox</td>
</tr>
<tr>
<td>Americardia media</td>
<td>Atlantic strawberry cockle</td>
</tr>
<tr>
<td>Laevicardium laevigatum</td>
<td>Eggcockle</td>
</tr>
<tr>
<td>Tellina fausta</td>
<td>Faust tellin</td>
</tr>
<tr>
<td>Tellina listeri</td>
<td>Speckled tellin</td>
</tr>
<tr>
<td>Tellina radiata</td>
<td>Sunrise tellin</td>
</tr>
<tr>
<td>Asaphis deflorata</td>
<td>Gaudy sanguin</td>
</tr>
<tr>
<td>Chione cancellata</td>
<td>Cross-barred venus</td>
</tr>
<tr>
<td>Periglypta listeri</td>
<td>Princess venus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AMPHINEURA:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthopleura granulata</td>
<td>West Indian fuzzy chiton</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ECHINODERMS:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Meoma ventricosa</td>
<td>Red heart urchin</td>
</tr>
<tr>
<td>Tripneustes ventricosus</td>
<td>West Indian sea egg</td>
</tr>
<tr>
<td>Clypeastroida</td>
<td>Sand dollar</td>
</tr>
</tbody>
</table>
Tables 3 and 4 are the quantified results of the analyses on all the vertebrate and invertebrate remains. The most numerous animal in the site, by MNI, was the rock iguana with 387 individuals. Fishes and reptiles contributed nearly equal numbers of individuals to the total remains (ca. 450 each), but by usable meat weight, reptiles provided 84% of the diet, fishes just 15%. Although birds present a small portion of the diet, providing only 1% of the meat consumed, a range of species was hunted and the species targeted changed through time. Conch dominates the invertebrate remains. More invertebrates were harvested than vertebrates (by total MNI), but by meat weight, invertebrates contributed less than 3% of the total diet. Only 6% of the diet, by estimated meat weight, came from terrestrial resources, yet there were remains of many terrestrial species in the site, 49% by MNI (see Figure 12). Crab is not included in this calculation. Tortoise, bird, and primarily iguana

![Bar Chart]

Figure 12: Percentage of Total MNI Provided by the Primary Vertebrate Species.
Table 3: Quantified Totals on Vertebrate Fauna from the Coralie Site.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>NISP</th>
<th>NISP BY %</th>
<th>MNI</th>
<th>MNI BY %</th>
<th>WEIGHT (in g.)</th>
<th>WEIGHT BY %</th>
<th>ESTIMATED MEAT WT. (in kg.)</th>
<th>E.M.W. BY %</th>
<th>AVERAGE INDIVIDUAL WT. (in kg.)</th>
<th>% OF USABLE MEAT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REPTILES:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelonia mydas</td>
<td>6545*</td>
<td>19.35%</td>
<td>50</td>
<td>5.20%</td>
<td>45340.50</td>
<td>80.40%</td>
<td>2385.90</td>
<td>73.00%</td>
<td>55.00</td>
<td>50%</td>
</tr>
<tr>
<td>Caretta caretta</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>64.90</td>
<td>0.12%</td>
<td>226.80</td>
<td>6.90%</td>
<td>226.80</td>
<td>50%</td>
</tr>
<tr>
<td>Geocheleone sp.</td>
<td>533</td>
<td>1.55%</td>
<td>18</td>
<td>1.90%</td>
<td>4179.20</td>
<td>7.40%</td>
<td>26.25</td>
<td>0.80%</td>
<td>2.50</td>
<td>70%</td>
</tr>
<tr>
<td>Cycleta carinata</td>
<td>12,538</td>
<td>37.00%</td>
<td>386</td>
<td>40.00%</td>
<td>2359.60</td>
<td>4.20%</td>
<td>111.35</td>
<td>3.40%</td>
<td>0.70</td>
<td>67%</td>
</tr>
<tr>
<td>Cyrtura sp.</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>1.70</td>
<td>&lt;</td>
<td>3.35</td>
<td>0.10%</td>
<td>5.00</td>
<td>67%</td>
</tr>
<tr>
<td>Leiocephalus psammadromus</td>
<td>52</td>
<td>0.15%</td>
<td>12</td>
<td>1.20%</td>
<td>5.40</td>
<td>0.01%</td>
<td>0.84</td>
<td>0.02%</td>
<td>0.10</td>
<td>70%</td>
</tr>
<tr>
<td>Epicrates chrysoaster</td>
<td>4</td>
<td>0.01%</td>
<td>2</td>
<td>0.20%</td>
<td>0.30</td>
<td>&lt;</td>
<td>0.42</td>
<td>0.02%</td>
<td>0.30</td>
<td>70%</td>
</tr>
<tr>
<td>Subtotal for reptiles:</td>
<td>19,674*</td>
<td>58.20%</td>
<td>470</td>
<td>49.00%</td>
<td>51,951.60</td>
<td>92.10%</td>
<td>2754.91</td>
<td>84.20%</td>
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</tr>
<tr>
<td><strong>BIRDS:</strong></td>
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</tr>
<tr>
<td>Sula dactylatra</td>
<td>20</td>
<td>0.06%</td>
<td>7</td>
<td>0.70%</td>
<td>15.30</td>
<td>0.03%</td>
<td>8.82</td>
<td>0.27%</td>
<td>1.80</td>
<td>70%</td>
</tr>
<tr>
<td>Sula sula</td>
<td>65</td>
<td>0.19%</td>
<td>7</td>
<td>0.70%</td>
<td>47.50</td>
<td>0.08%</td>
<td>4.90</td>
<td>0.15%</td>
<td>1.00</td>
<td>70%</td>
</tr>
<tr>
<td>Ardea herodias</td>
<td>23</td>
<td>0.07%</td>
<td>2</td>
<td>0.20%</td>
<td>19.80</td>
<td>0.03%</td>
<td>1.80</td>
<td>0.03%</td>
<td>1.50</td>
<td>60%</td>
</tr>
<tr>
<td>Egretta rufescens</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>2.10</td>
<td>&lt;</td>
<td>0.42</td>
<td>0.21%</td>
<td>0.70</td>
<td>60%</td>
</tr>
<tr>
<td>Nyctannsa violacea</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>1.30</td>
<td>&lt;</td>
<td>0.30</td>
<td>0.01%</td>
<td>0.50</td>
<td>60%</td>
</tr>
<tr>
<td>Ardeidae</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Budocimus ruber</td>
<td>8</td>
<td>0.02%</td>
<td>1</td>
<td>0.10%</td>
<td>1.90</td>
<td>&lt;</td>
<td>0.52</td>
<td>0.02%</td>
<td>0.80</td>
<td>65%</td>
</tr>
<tr>
<td>Phoenicopterus ruber</td>
<td>3</td>
<td>0.01%</td>
<td>2</td>
<td>0.20%</td>
<td>2.50</td>
<td>&lt;</td>
<td>1.80</td>
<td>0.03%</td>
<td>1.50</td>
<td>60%</td>
</tr>
<tr>
<td>Dendrocyna arborea</td>
<td>15</td>
<td>0.05%</td>
<td>4</td>
<td>0.40%</td>
<td>10.40</td>
<td>0.02%</td>
<td>2.80</td>
<td>0.09%</td>
<td>1.00</td>
<td>70%</td>
</tr>
<tr>
<td>Pandion hallaeus</td>
<td>3</td>
<td>0.01%</td>
<td>1</td>
<td>0.10%</td>
<td>3.20</td>
<td>&lt;</td>
<td>0.50</td>
<td>0.02%</td>
<td>1.00</td>
<td>50%</td>
</tr>
<tr>
<td>Haematopus palliatus</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>0.30</td>
<td>&lt;</td>
<td>0.21</td>
<td>&lt;</td>
<td>0.35</td>
<td>60%</td>
</tr>
<tr>
<td>Burhinus bistriatus</td>
<td>4</td>
<td>0.01%</td>
<td>2</td>
<td>0.20%</td>
<td>5.60</td>
<td>0.01%</td>
<td>0.30</td>
<td>0.01%</td>
<td>0.25</td>
<td>60%</td>
</tr>
<tr>
<td>Limnodromus griseus</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>0.20</td>
<td>&lt;</td>
<td>0.08</td>
<td>&lt;</td>
<td>0.15</td>
<td>55%</td>
</tr>
<tr>
<td>Larus argentatus</td>
<td>2</td>
<td>0.01%</td>
<td>2</td>
<td>0.20%</td>
<td>0.70</td>
<td>&lt;</td>
<td>0.48</td>
<td>0.02%</td>
<td>4.00</td>
<td>60%</td>
</tr>
<tr>
<td>Columbia leucocephala</td>
<td>2</td>
<td>0.01%</td>
<td>2</td>
<td>0.20%</td>
<td>0.70</td>
<td>&lt;</td>
<td>0.33</td>
<td>0.01%</td>
<td>0.25</td>
<td>65%</td>
</tr>
<tr>
<td>Zenaida aurita</td>
<td>2</td>
<td>0.01%</td>
<td>2</td>
<td>0.10%</td>
<td>0.20</td>
<td>&lt;</td>
<td>0.09</td>
<td>&lt;</td>
<td>0.15</td>
<td>60%</td>
</tr>
<tr>
<td>Geotryon chrysia</td>
<td>2</td>
<td>0.01%</td>
<td>2</td>
<td>0.20%</td>
<td>0.50</td>
<td>&lt;</td>
<td>0.18</td>
<td>&lt;</td>
<td>0.15</td>
<td>60%</td>
</tr>
<tr>
<td>Amazona leucocephala</td>
<td>6</td>
<td>0.02%</td>
<td>2</td>
<td>0.20%</td>
<td>0.80</td>
<td>&lt;</td>
<td>0.33</td>
<td>0.01%</td>
<td>0.25</td>
<td>65%</td>
</tr>
<tr>
<td>Amazona sp.</td>
<td>2</td>
<td>0.01%</td>
<td>1</td>
<td>0.10%</td>
<td>0.30</td>
<td>&lt;</td>
<td>0.26</td>
<td>0.01%</td>
<td>0.40</td>
<td>65%</td>
</tr>
<tr>
<td>Tyrranuss dominicensis</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.10%</td>
<td>0.10</td>
<td>&lt;</td>
<td>0.05</td>
<td>&lt;</td>
<td>0.10</td>
<td>65%</td>
</tr>
<tr>
<td>Corvus nasicus</td>
<td>22</td>
<td>0.06%</td>
<td>6</td>
<td>0.60%</td>
<td>7.50</td>
<td>0.01%</td>
<td>1.26</td>
<td>0.04%</td>
<td>0.35</td>
<td>60%</td>
</tr>
<tr>
<td>Aves</td>
<td>111</td>
<td>0.33%</td>
<td>47</td>
<td>4.90%</td>
<td>149.50</td>
<td>0.26%</td>
<td>25.43</td>
<td>0.79%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal for birds:</td>
<td>296</td>
<td>0.88%</td>
<td>47</td>
<td>4.90%</td>
<td>149.50</td>
<td>0.26%</td>
<td>25.43</td>
<td>0.79%</td>
<td></td>
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</tr>
<tr>
<td><strong>FISH (cont' next page):</strong></td>
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</tr>
<tr>
<td>Carcharhinus sp.</td>
<td>82</td>
<td>0.25%</td>
<td>4</td>
<td>0.40%</td>
<td>24.00</td>
<td>0.04%</td>
<td>98.40</td>
<td>3.00%</td>
<td>30.00</td>
<td>80%</td>
</tr>
<tr>
<td>Dasyatis americana</td>
<td>39</td>
<td>0.10%</td>
<td>7</td>
<td>0.70%</td>
<td>14.30</td>
<td>0.03%</td>
<td>11.90</td>
<td>0.36%</td>
<td>2.00</td>
<td>85%</td>
</tr>
</tbody>
</table>

*Some categories under NISP were not entirely counted and underestimate the results.
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Table 4: Quantified Totals on Invertebrate Fauna from the Coralie Site.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>NISP</th>
<th>NISP BY %</th>
<th>MNI</th>
<th>MNI BY%</th>
<th>WEIGHT (in g)</th>
<th>WEIGHT BY %</th>
<th>ESTIMATED MEAT WT.**</th>
<th>E.M.W. BY %</th>
<th>AVERAGE INDIVIDUAL MEAT WT. (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GASTROPODS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fasciariidae</td>
<td>10</td>
<td>0.02%</td>
<td>6</td>
<td>0.46%</td>
<td>15.80</td>
<td>&lt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diodora cayenensis</td>
<td>2</td>
<td>&lt;</td>
<td>2</td>
<td>0.16%</td>
<td>0.30</td>
<td>&lt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astralium phoebeum</td>
<td>2</td>
<td>&lt;</td>
<td>2</td>
<td>0.16%</td>
<td>80.40</td>
<td>0.02%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithopoma tectum</td>
<td>2</td>
<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>8.10</td>
<td>&lt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cittarium pica</td>
<td>1306</td>
<td>2.49%</td>
<td>79</td>
<td>0.61%</td>
<td>15,688.80</td>
<td>3.28%</td>
<td>2.76</td>
<td>2.70%</td>
<td>0.035</td>
</tr>
<tr>
<td>Nerita peloranta</td>
<td>4</td>
<td>0.01%</td>
<td>4</td>
<td>0.31%</td>
<td>14.30</td>
<td>&lt;</td>
<td></td>
<td>0.01</td>
<td>&lt;</td>
</tr>
<tr>
<td>Nerita tessellata</td>
<td>29</td>
<td>0.05%</td>
<td>18</td>
<td>1.40%</td>
<td>64.60</td>
<td>0.01%</td>
<td></td>
<td>0.04</td>
<td>&lt;</td>
</tr>
<tr>
<td>Nerita versicolor</td>
<td>60</td>
<td>0.12%</td>
<td>35</td>
<td>2.70%</td>
<td>114.10</td>
<td>0.02%</td>
<td></td>
<td>0.07</td>
<td>&lt;</td>
</tr>
<tr>
<td>Nerita sp.</td>
<td>284</td>
<td>0.54%</td>
<td>102</td>
<td>0.79%</td>
<td>399.10</td>
<td>0.08%</td>
<td></td>
<td>0.20</td>
<td>&lt;</td>
</tr>
<tr>
<td>Conchris muriatus</td>
<td>19</td>
<td>0.04%</td>
<td>19</td>
<td>1.48%</td>
<td>11.30</td>
<td>&lt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Littorina angulifera</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>0.40</td>
<td>&lt;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Nodilittorina dilatata</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>0.20</td>
<td>&lt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerithium sp.</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>0.10</td>
<td>&lt;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Strombus gigas</td>
<td>45,613</td>
<td>86.76%</td>
<td>395</td>
<td>30.80%</td>
<td>455,936.40</td>
<td>95.38%</td>
<td>67.15</td>
<td>64.70%</td>
<td>0.17</td>
</tr>
<tr>
<td>Vermetidae</td>
<td>5</td>
<td>0.01%</td>
<td>1</td>
<td>0.09%</td>
<td>6.10</td>
<td>&lt;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hipponix antiquatus</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>0.80</td>
<td>&lt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macrocyprea zebra</td>
<td>6</td>
<td>0.01%</td>
<td>6</td>
<td>0.46%</td>
<td>113.10</td>
<td>0.02%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naticarius canrena</td>
<td>3</td>
<td>&lt;</td>
<td>3</td>
<td>0.23%</td>
<td>21.10</td>
<td>&lt;</td>
<td></td>
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</tr>
<tr>
<td>Polinices lacteus</td>
<td>1</td>
<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>1.10</td>
<td>&lt;</td>
<td></td>
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</tr>
<tr>
<td>Tectonatica pusilla</td>
<td>2</td>
<td>&lt;</td>
<td>2</td>
<td>0.16%</td>
<td>3.20</td>
<td>&lt;</td>
<td></td>
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<tr>
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<tr>
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<td>0.16%</td>
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<tr>
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<td>0.09%</td>
<td>31.40</td>
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<tr>
<td>Oliva sp.</td>
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<td>0.01%</td>
<td>4</td>
<td>0.31%</td>
<td>6.90</td>
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<tr>
<td>Olivella sp.</td>
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<td>0.02%</td>
<td>11</td>
<td>0.85%</td>
<td>2.20</td>
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<td>Tenebra dislocata</td>
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<td>&lt;</td>
<td>1</td>
<td>0.09%</td>
<td>0.20</td>
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<tr>
<td>Bulla striata</td>
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<td>0.06%</td>
<td>32</td>
<td>2.50%</td>
<td>52.60</td>
<td>0.01%</td>
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</tr>
</tbody>
</table>

Subtotal Gastropods: 47,453* 90.26% 762 59.15% 472,936.40 98.94% 71.04 68.00%  

*This category under NISP was not entirely counted and underestimates the results.

**Calculations completed only for primary edible species.
<table>
<thead>
<tr>
<th>SPECIES</th>
<th>NISP</th>
<th>NISP BY %</th>
<th>MNI</th>
<th>MNI BY %</th>
<th>WEIGHT (in g.)</th>
<th>WEIGHT BY %</th>
<th>E.M.W. (in kg.)</th>
<th>E.M.W. BY %</th>
<th>AVERAGE WT. (in kg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIVALVES:</strong></td>
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<tr>
<td>Brachioidontes sp.</td>
<td>338</td>
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<td>31</td>
<td>2.50%</td>
<td>113.60</td>
<td>0.02%</td>
<td></td>
<td></td>
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<td>Anadara notabilis</td>
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<td>0.09%</td>
<td>2.20</td>
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<td>Arca zebra</td>
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<tr>
<td>Pinctada imbricata</td>
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<tr>
<td>Lima scabra</td>
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<td>0.09%</td>
<td>1.90</td>
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<td>56.20</td>
<td>0.01%</td>
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<tr>
<td>Anodontia alba</td>
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<td>4</td>
<td>0.31%</td>
<td>13.10</td>
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<td>Codakia orbicularis</td>
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<td>3.70%</td>
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<td>0.21%</td>
<td>0.49</td>
<td>0.50%</td>
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<tr>
<td>Divatlinga quadrirugulata</td>
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<td>0.79%</td>
<td>5.50</td>
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<tr>
<td>Lucina pensylvanica</td>
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<td>2</td>
<td>0.16%</td>
<td>17.50</td>
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<tr>
<td>Diplodonta sp.</td>
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<td>1</td>
<td>0.09%</td>
<td>0.80</td>
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<tr>
<td>Chama macerophylla</td>
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<td>4</td>
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<td>67.60</td>
<td>0.01%</td>
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<tr>
<td>Chama sarda</td>
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<td>48</td>
<td>3.70%</td>
<td>91.80</td>
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<tr>
<td>Americardia media</td>
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<td>1</td>
<td>0.09%</td>
<td>7.10</td>
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<tr>
<td>Laevicardia laevigatum</td>
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<td>0.02%</td>
<td>5</td>
<td>0.40%</td>
<td>12.90</td>
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<tr>
<td>Tellina fausta</td>
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<td>0.16%</td>
<td>2.60</td>
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<tr>
<td>Tellina listeri</td>
<td>186</td>
<td>0.35%</td>
<td>43</td>
<td>3.30%</td>
<td>442.10</td>
<td>0.09%</td>
<td>0.43</td>
<td>0.40%</td>
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<td>569</td>
<td>1.08%</td>
<td>61</td>
<td>4.80%</td>
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<td>0.22%</td>
<td>0.61</td>
<td>0.60%</td>
<td>0.01</td>
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<td>Asaphis deflorata</td>
<td>165</td>
<td>0.32%</td>
<td>25</td>
<td>1.90%</td>
<td>605.50</td>
<td>0.13%</td>
<td>0.25</td>
<td>0.30%</td>
<td>0.01</td>
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<td>Chione cancellata</td>
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<td>0.32%</td>
<td>81</td>
<td>6.30%</td>
<td>130.10</td>
<td>0.03%</td>
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<tr>
<td>Periglypta listeri</td>
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<td>&lt;</td>
<td>2</td>
<td>0.16%</td>
<td>31.30</td>
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<tr>
<td>Subtotal Bivalves:</td>
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<td>3.68%</td>
<td>381</td>
<td>29.60%</td>
<td>3696.80</td>
<td>0.77%</td>
<td>1.78</td>
<td>1.80%</td>
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<td><strong>AMPHINEURA &amp; ECHINODERMS:</strong></td>
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<tr>
<td>Acanthopleura granulata</td>
<td>100</td>
<td>5.50%</td>
<td>14</td>
<td>1.10%</td>
<td>252.40</td>
<td>0.05%</td>
<td>0.07</td>
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<td>0.005</td>
</tr>
<tr>
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<td>1</td>
<td>0.09%</td>
<td>0.10</td>
<td>&lt;</td>
<td></td>
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<tr>
<td>Tripneustes ventricosus</td>
<td>13</td>
<td>0.03%</td>
<td>1</td>
<td>0.09%</td>
<td>2.40</td>
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<tr>
<td>Clypseasteroida</td>
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<td>1</td>
<td>0.09%</td>
<td>1.10</td>
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<td></td>
<td></td>
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<tr>
<td>Subtotal Amphineura/Echin.:</td>
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<td>5.53%</td>
<td>17</td>
<td>1.37%</td>
<td>256.00</td>
<td>0.05%</td>
<td>7.00%</td>
<td>&lt;</td>
<td>0.005</td>
</tr>
<tr>
<td><strong>CRUSTACEANS:</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Callinectes sapidus</td>
<td>7</td>
<td>0.01%</td>
<td>2</td>
<td>0.16%</td>
<td>2.30</td>
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<tr>
<td>Coenonia clupeata</td>
<td>102</td>
<td>0.19%</td>
<td>9</td>
<td>0.70%</td>
<td>24.90</td>
<td>&lt;</td>
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<tr>
<td>Gecarcinidae</td>
<td>2894</td>
<td>5.50%</td>
<td>85</td>
<td>6.50%</td>
<td>1025.40</td>
<td>0.21%</td>
<td>17.00</td>
<td>16.40</td>
<td>0.20</td>
</tr>
<tr>
<td>Panulirus argus</td>
<td>65</td>
<td>0.12%</td>
<td>33</td>
<td>2.50%</td>
<td>63.90</td>
<td>0.01%</td>
<td>13.20</td>
<td>12.60</td>
<td>0.40</td>
</tr>
<tr>
<td>Subtotal Crustaceans:</td>
<td>3068</td>
<td>5.80%</td>
<td>33</td>
<td>10.00%</td>
<td>1116.40</td>
<td>0.24%</td>
<td>30.20</td>
<td>29.00%</td>
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</tr>
<tr>
<td><strong>INVERTEBRATE TOTALS:</strong></td>
<td>52,575*</td>
<td>100.00%</td>
<td>1289</td>
<td>100.00%</td>
<td>478,005.60</td>
<td>100.00%</td>
<td>103.09</td>
<td>100.00%</td>
<td></td>
</tr>
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</table>
contribute to these subsistence remains. These numbers indicate that the inhabitants put considerable effort and time into harvesting terrestrial species.

From a computation made from the faunal remains of 13 Turks and Caicos and Bahamian sites, I found an average of 4% (by MNI) terrestrial resources. If I include crab in this tally, the number of terrestrial remains jumps to 12.5% (using a six site sample). According to these results, Bahamian islands provided little in the way of terrestrial resources to its inhabitants.

The data from Coralie presents a different picture. The radiocarbon dates and the pottery style found here show that this occupation occurred in the early colonization period. Because island resources are often utilized before any settlement occurs (Irwin 1992), it can be difficult to prove that a site represents the first arrival of humans onto an island. The fact that there is no evidence for human occupation in the Bahamian archipelago during the aceramic period further supports the possibility that this settlement was the first predation by humans upon this pristine population of animals. In this situation, terrestrial species do contribute substantially to the Amerindian diet, simply because they had not yet been eliminated from the environment.

Other Reptiles

Only one sea turtle bone belonged without a doubt to a species other than green turtle. A very large maxillary fragment (upper jaw) was identified as the remains of a loggerhead (*Caretta caretta*). This specimen had an estimated live weight of at least 450 kg (1000 lbs). Carr reported (1952) that loggerheads
commonly grow to 350 kg, but that since the 1960s, they had rarely been seen over 150 kg. Because of its size, the giant loggerhead from Grand Turk must have been caught while laying its eggs and its meat butchered in the field. This suggests that both loggerheads and greens were nesting on Grand Turk beaches in the past.

Leatherbacks (*Dermochelys* spp.) are the largest turtles known from the West Indies, weighing an average of 450 kg (Carr 1952). They have not been found archaeologically and apparently were never consumed. The other large reptile missing from the Grand Turk assemblage is the crocodile. Crocodile has been identified at the archaeological site of CK-14 on Crooked Island and AK-14 on Acklins (deFrance 1991), legitimizing Spanish accounts of Bahamian lakes inhabited by “serpents...seven palmos in length” (Dunn and Kelley 1989:107), which totals 1.7 m. Cuban crocodiles (*Crocodylus rhombifer*) have been found in cave deposits on New Providence (Pregill 1982), San Salvador (Olson et al. 1990), and Abaco (Franz et al. 1995). There is no evidence that crocodiles ever inhabited Grand Turk or any of the Caicos islands.

The rock iguana (*Cyclura carinata*) is the most abundant single species at Coralie, contributing 40% of the MNI. The total amount of fish eaten outnumber the iguanas, and because of this, rock iguanas rank third in overall contribution to the Taino diet. Iverson (1979) conducted an extensive study of a large population of *Cyclura carinata* on the island of Pine Cay on the Caicos bank. He found the average weight of an adult male to be .94 kg, an adult female to be .48 kg, with average lengths (using snout-vent measurements—SVL) of 28 cm (with tail about 60 cm) and 23 cm (with tail about 50 cm)
respectively. With a maximum length of 75 cm and a maximum weight of about 2 kg, this species of rock iguana is the smallest in the West Indies.

The iguanas harvested at Coralie were 75% sub-adult (n=296), weighing an estimated average of .3 kg each. For the 91 adults found, an average of .7 kg was used in calculations to take into account the sexual dimorphism found in this species. Also identified from large vertebrae were three, probably male, iguanas weighing 1 kg each, and another two individuals weighing approximately 2 kg each. All these individuals fall into the known size range for this species. A final individual exceeds this size range.

A specimen with a live weight estimated at 5 kg was found in the deposits on Grand Turk. This very large iguana had an estimated SVL of 45 cm, and a total length of nearly 1 m. It approaches the size of rock iguanas from Hispaniola and Cuba. The size was calculated from a maxilla that had a tooth row length of at least 55 mm, yet this maxilla was broken at both ends, so this figure may be an underestimation. This individual suggests that the size range of Cyclura carinata was larger than it is known presently, due to its evolution on an island with no predators.

**Fishes**

Fishes were an important resource from the very beginning of this occupation, ranking second in the contribution to overall diet. Fish provided a usable meat weight of 495 kg, 15% of the total meat intake at this site. There was a variety of species identified from the nearly 14,000 bones, totaling 24 genera. Appendix A gives a systematic account of all the fish species identified.
to date, and relevant data on availability, size, habitat preference, and behavior. All of the fishes identified in the site are still present in the waters surrounding Grand Turk today, although some are rare.

The most common fishes at Coralie were grunts (*Haemulon* sp.), with 167 individuals recovered. This reflects the situation in the water today, where grunts provide the majority of the biomass on the reefs. They are almost three times as numerous in this site as the second ranking species, snappers. Even though grunts are a relatively small fish, they still contribute the greatest amount of biomass to the diet because they are so abundant. In the Coralie remains, they range in size from .3 to 1.8 kg in live weight. The average size clustered quite strongly, with 74% of the atlas centrum measurements being between 5 and 7 mm (equaling .4 to .75 kg live fish weight). Many of the species within this genus school, so this size clustering may reflect a particular procurement strategy, but it is more likely a natural reflection of the size ranges within the population.

This assemblage contained a high percentage of large fish. Table 5 lists the calculated sizes for identified species based on vertebra and atlas centrum measurements. The largest vertebra found belonged to a grouper and measured 26 mm across. Allometrically, this converts to a fish weighing nearly 11.5 kg. A huge jaw came from a barracuda estimated to have weighed 20 kg. One fully adult shark was captured, weighing approximately 65 kg, along with one juvenile shark (ca. 4 kg), and two mid-size sub-adults, weighing about 27 kg each. A few other groupers, snappers and parrotfish (*Scarus* sp.) fell into a large size range, weighing between 5 and 10 kg each. The average size for the
Table 5: Fish Size Estimates from Vertebrae of Identified Species.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Element measured</th>
<th>NISP</th>
<th>Size Range** (centrum diam.-in mm)</th>
<th>Average (in mm)</th>
<th>Size Range (by weight-in kg)</th>
<th>Average (in kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Carcharhinus</em> sp.</td>
<td>vertebra</td>
<td>4</td>
<td>8.4 to 24.7</td>
<td>15.80</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Dasyatis americana</em></td>
<td>vertebra</td>
<td>34</td>
<td>5.5 to 12.5</td>
<td>8.20</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Albula vulpes</em></td>
<td>vertebra</td>
<td>67</td>
<td>6.0 to 10.5</td>
<td>7.95</td>
<td>.57 to 1.79</td>
<td>1.00</td>
</tr>
<tr>
<td><em>Holocentrus ascensionis</em></td>
<td>atlas</td>
<td>1</td>
<td>6.4</td>
<td>6.40</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td><em>Epinephelus</em> sp.</td>
<td>atlas</td>
<td>32</td>
<td>4.9 to 22.0</td>
<td>8.40</td>
<td>.37 to 8.13</td>
<td>1.13</td>
</tr>
<tr>
<td><em>Caranx</em> sp.</td>
<td>atlas</td>
<td>5</td>
<td>4.9 to 7.8</td>
<td>6.10</td>
<td>.37 to .97</td>
<td>0.59</td>
</tr>
<tr>
<td><em>Trachinotus cf. falcatus</em></td>
<td>atlas</td>
<td>2</td>
<td>5.0 to 5.5</td>
<td>5.25</td>
<td>.39 to .47</td>
<td>0.43</td>
</tr>
<tr>
<td><em>Lutjanus</em> sp.</td>
<td>atlas</td>
<td>57</td>
<td>3.8 to 17.5</td>
<td>7.70</td>
<td>.22 to 5.09</td>
<td>0.95</td>
</tr>
<tr>
<td><em>Haemulon</em> sp.</td>
<td>vertebra</td>
<td>47</td>
<td>5.0 to 19.3</td>
<td>8.70</td>
<td>.39 to 6.22</td>
<td>1.22</td>
</tr>
<tr>
<td><em>Calamus</em> sp.</td>
<td>atlas</td>
<td>132</td>
<td>4.5 to 10.6</td>
<td>6.60</td>
<td>.31 to 1.82</td>
<td>0.69</td>
</tr>
<tr>
<td><em>Kyphosus</em> sp.</td>
<td>atlas</td>
<td>2</td>
<td>5.2 to 6.0</td>
<td>5.60</td>
<td>.42 to .57</td>
<td>0.49</td>
</tr>
<tr>
<td><em>Sphyraena barracuda</em></td>
<td>atlas</td>
<td>1</td>
<td>7.6</td>
<td>7.60</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td><em>Halichoeres radiatus</em></td>
<td>vertebra</td>
<td>8</td>
<td>4.6 to 14.4</td>
<td>8.20</td>
<td>.33 to 3.41</td>
<td>1.08</td>
</tr>
<tr>
<td><em>Scarus</em> sp.</td>
<td>atlas</td>
<td>6</td>
<td>5.3 to 6.3</td>
<td>5.75</td>
<td>.44 to .63</td>
<td>0.52</td>
</tr>
<tr>
<td><em>Sparisoma</em> sp.</td>
<td>vertebra</td>
<td>4</td>
<td>13.8 to 15.5</td>
<td>14.60</td>
<td>3.13 to 3.97</td>
<td>3.51</td>
</tr>
<tr>
<td><em>Acanthurus</em> sp.</td>
<td>vertebra</td>
<td>23</td>
<td>12 to 20.5</td>
<td>16.10</td>
<td>2.35 to 7.25</td>
<td>4.29</td>
</tr>
<tr>
<td><em>Balistes vetula</em></td>
<td>atlas</td>
<td>1</td>
<td>8.0</td>
<td>8.00</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td><em>Lactophrys</em> sp.</td>
<td>vertebra</td>
<td>24</td>
<td>4.3 to 11.0</td>
<td>7.65</td>
<td>.29 to 1.97</td>
<td>0.93</td>
</tr>
</tbody>
</table>

**Formula for allometric conversion from measurement to weight:
Log y = 2.047 (log x) + 1.162 (based on known dimensions and weights of 50 specimens). x = anterior diameter of the centrum (mm); y = body weight (grams). (Wing and Scudder 1983:204)

plentiful snappers and groupers was between 1 and 2 kg each. Parrotfish (Scarus sp.) weighed on average between 3.5 and 4 kg.

If the meat weights of just the three large sharks and the barracuda are combined, they end up providing the majority of meat in the fish diet. Sharks
only rank 16th in terms of the number of individuals captured in this site, but they rank second in meat contribution. The rankings for all these fish species, by MNI and meat weight, are presented in Table 6. Reitz (1990) found a similar situation at the site of El Azúcar, Panama, where six cartilaginous fish equaled the meat value of 68 bony fish. Similarly, Wing (1998) found in West Indian sites that often a few large sharks or tunas provided the majority of the estimated meat weight from fishing.

The ¼” mesh assemblage of fish vertebrae were all measured and provided an average size, site wide, of 6.03 mm (equaling .57 kg live fish weight). The average size of the vertebrae recovered in the fine mesh samples

Table 6: Ranking of Fishes at Coralie by MNI and Estimated Meat Weight.

<table>
<thead>
<tr>
<th>RANK</th>
<th>SPECIES</th>
<th>MNI</th>
<th>SPECIES</th>
<th>MEAT WEIGHT (in kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Haemulon sp.</td>
<td>167</td>
<td>Haemulon sp.</td>
<td>105.93</td>
</tr>
<tr>
<td>2</td>
<td>Lutjanus sp.</td>
<td>59</td>
<td>Carcharhinus sp.</td>
<td>98.40</td>
</tr>
<tr>
<td>3</td>
<td>Epinephelus sp.</td>
<td>36</td>
<td>Scarus sp.</td>
<td>78.75</td>
</tr>
<tr>
<td>4</td>
<td>Albula vulpes</td>
<td>27</td>
<td>Lutjanus sp.</td>
<td>48.96</td>
</tr>
<tr>
<td>5</td>
<td>Halichoeres radiatus</td>
<td>25</td>
<td>Epinephelus sp.</td>
<td>38.02</td>
</tr>
<tr>
<td>6</td>
<td>Scarus sp.</td>
<td>25</td>
<td>Albula vulpes</td>
<td>24.30</td>
</tr>
<tr>
<td>7</td>
<td>Caranx sp.</td>
<td>17</td>
<td>Sphyraena barracuda</td>
<td>24.20</td>
</tr>
<tr>
<td>8</td>
<td>Sparisoma sp.</td>
<td>12</td>
<td>Dasyatis americana</td>
<td>11.90</td>
</tr>
<tr>
<td>9</td>
<td>Lactophrys sp.</td>
<td>12</td>
<td>Halichoeres radiatus</td>
<td>10.62</td>
</tr>
<tr>
<td>10</td>
<td>Diodon cf. hystrix</td>
<td>9</td>
<td>Caranx sp.</td>
<td>10.08</td>
</tr>
<tr>
<td>11</td>
<td>Dasyatis americana</td>
<td>7</td>
<td>Lactophrys sp.</td>
<td>8.64</td>
</tr>
<tr>
<td>12</td>
<td>Balistes vetula</td>
<td>7</td>
<td>Diodon cf. hystrix</td>
<td>7.20</td>
</tr>
<tr>
<td>13</td>
<td>Sphyraena barracuda</td>
<td>6</td>
<td>Balistes vetula</td>
<td>6.30</td>
</tr>
<tr>
<td>14</td>
<td>Holocentrus ascensionis</td>
<td>5</td>
<td>Sphyraena barracuda</td>
<td>5.40</td>
</tr>
<tr>
<td>15</td>
<td>Calamus sp.</td>
<td>5</td>
<td>Calamus sp.</td>
<td>3.15</td>
</tr>
<tr>
<td>16</td>
<td>Carcharhinus sp.</td>
<td>4</td>
<td>Kyphosus sp.</td>
<td>2.52</td>
</tr>
<tr>
<td>17</td>
<td>Bodianus rufus</td>
<td>4</td>
<td>Holocentrus ascensionis</td>
<td>2.40</td>
</tr>
<tr>
<td>18</td>
<td>Kyphosus sp.</td>
<td>4</td>
<td>Trachinotus cf. falcatus</td>
<td>1.88</td>
</tr>
<tr>
<td>19</td>
<td>Sphoeroides sp.</td>
<td>2</td>
<td>Bodianus rufus</td>
<td>1.70</td>
</tr>
<tr>
<td>20</td>
<td>Acanthurus sp.</td>
<td>2</td>
<td>Mycteroperca sp.</td>
<td>1.32</td>
</tr>
<tr>
<td>21</td>
<td>Bothus lunatus</td>
<td>2</td>
<td>Sphoeroides sp.</td>
<td>0.95</td>
</tr>
<tr>
<td>22</td>
<td>Trachinotus cf. falcatus</td>
<td>2</td>
<td>Acanthurus sp.</td>
<td>0.94</td>
</tr>
<tr>
<td>23</td>
<td>cf. Scomberomorus sp.</td>
<td>1</td>
<td>cf. Scomberomorus sp.</td>
<td>0.90</td>
</tr>
<tr>
<td>24</td>
<td>Mycteroperca sp.</td>
<td>1</td>
<td>Bothus lunatus</td>
<td>0.90</td>
</tr>
</tbody>
</table>
(n=182) dropped to 4.2 mm (equaling .3 kg live fish weight). The smallest vertebra recovered in the 1 mm mesh was 1.2 mm in diameter (a fish weighing only 20 grams). These tiniest fishes may have been used as bait or added to soup stocks. Table 7 is a listing of the remains found in the fine mesh samples.

**Invertebrates**

There were 61 invertebrate species identified in this collection harvested from various habitats (Colin 1978). Some of the smallest species are associated with the mangrove fringe and are likely natural deposits in the site, yet most represent subsistence activities. From a total of 1289 individuals, the invertebrate contribution of meat to this diet is only 2.2%. With the exception of Queen conch, gastropods and bivalves do not provide much meat per individual. The fact that the small gastropods and bivalves were gathered at all may seen odd when so many other food sources were readily available (Shackleton 1983).

In looking again at the Miskito Indians of Nicaragua, Nietschmann (1972) reported that they included small invertebrates as a semi-regular addition to their diet. They gathered tiny coquinas (*Donax* sp.) in the leaner, summer months when turtles were scarce. The *Donax* is a shell only 1 to 2.5 cm across, housing a very tiny creature. Yet, in two hours, one person can gather enough *Donax* shells to yield almost 1 kg of meat and 750 calories. Turtle hunting provides 2000 calories in the same amount of time, just three times as much (Keegan 1992). Mollusks can be gathered at very little cost to
Table 7: Fine Mesh Samples of Fauna from the Coralie Site.

<table>
<thead>
<tr>
<th>MESH SIZE:</th>
<th>4 mm NISP</th>
<th>MNI</th>
<th>WEIGHT</th>
<th>2 mm NISP</th>
<th>WEIGHT</th>
<th>1 mm NISP</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTEBRATES:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reptiles:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Chelonia mydas</em></td>
<td>237*</td>
<td>73.30</td>
<td>71</td>
<td>4.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cychira carinata</em></td>
<td>100</td>
<td>3</td>
<td>13.20</td>
<td>122</td>
<td>4.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Leiocephalus psammadromus</em></td>
<td>1</td>
<td></td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iguanidae</td>
<td>2</td>
<td></td>
<td>18</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Typhlops ricordi</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Dasyatis americana</em></td>
<td>1</td>
<td></td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lutjanus sp.</em></td>
<td>2</td>
<td></td>
<td>0.20</td>
<td>5</td>
<td>0.20</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><em>Haemulon sp.</em></td>
<td>11</td>
<td>1</td>
<td>11.10</td>
<td>10</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sphyraena barracuda</em></td>
<td>1</td>
<td></td>
<td>0.20</td>
<td>1</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Halichoeres sp.</em></td>
<td>2</td>
<td></td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labridae</td>
<td></td>
<td>3</td>
<td>0.10</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Scarus sp.</em></td>
<td>1</td>
<td></td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sparisoma sp.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaridae</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lactophrys sp.</em></td>
<td>2</td>
<td></td>
<td>0.10</td>
<td>38</td>
<td>0.80</td>
<td>6</td>
<td>0.10</td>
</tr>
<tr>
<td><em>Diodon sp.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteichthyes -- fragments</td>
<td>84</td>
<td></td>
<td>7.80</td>
<td>203</td>
<td>6.20</td>
<td>90</td>
<td>0.70</td>
</tr>
<tr>
<td>Osteichthyes -- vertebrae</td>
<td>86</td>
<td></td>
<td>7.10</td>
<td>105</td>
<td>3.60</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Vertebrata</td>
<td>93</td>
<td></td>
<td>8.10</td>
<td>750</td>
<td>23.70</td>
<td>80</td>
<td>0.80</td>
</tr>
<tr>
<td>Subtotal for Vertebrates:</td>
<td>620*</td>
<td>5</td>
<td>121.70</td>
<td>1315</td>
<td>44.00</td>
<td>207</td>
<td>1.70</td>
</tr>
<tr>
<td>INVERTEBRATES:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crustaceans:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gecarcinidae</td>
<td>25</td>
<td></td>
<td>5.10</td>
<td>19</td>
<td>0.90</td>
<td>10</td>
<td>0.10</td>
</tr>
<tr>
<td>Gastropods:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Strombus gigas</em></td>
<td>1000*</td>
<td></td>
<td>1011.30</td>
<td>many</td>
<td>250.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Oliva sp.</em></td>
<td>1</td>
<td></td>
<td>2.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Olivella sp.</em></td>
<td>2</td>
<td></td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Gastropod:</td>
<td>Truncatella pulchella</td>
<td></td>
<td></td>
<td>many</td>
<td></td>
<td>many</td>
<td></td>
</tr>
<tr>
<td>Bivalves:</td>
<td>Asaphis deflorata</td>
<td>1</td>
<td></td>
<td>1</td>
<td>6.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echinoderms:</td>
<td>Echinoidea</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Subtotal for Invertebrates:</td>
<td>1049*</td>
<td>4</td>
<td>1025.50</td>
<td>20*</td>
<td>251.20</td>
<td>10*</td>
<td>0.10</td>
</tr>
<tr>
<td>FAUNAL FINE MESH TOTALS:</td>
<td>1669*</td>
<td>9</td>
<td>1147.20</td>
<td>1335*</td>
<td>295.20</td>
<td>217*</td>
<td>1.80</td>
</tr>
</tbody>
</table>

*Certain remains occurred in abundance in very small fragments and were not individually counted.
its consumer (Armstrong 1980). They require no long travel expenditures to
harvest and there are no risks involved. Invertebrates are available year-round
and can provide food when hunting, fishing, or weather is unfavorable. Women
and children often collect invertebrates when men are engaged in other
subsistence activities (Meehan 1983). It is for these reasons that mollusks will
make a contribution to even the richest diets. At Coralie, it is a very small part
of the diet, used either to supplement calories in a lean time, or to add some
variety to the menu. The nerites, in particular, seemed to cluster in the
deposits, with each grouping being the refuse from a single meal.

Even though invertebrate remains are small in quantity at Coralie, the
collection is diverse. Gastropods outnumber bivalves, but if conch is
eliminated from consideration, the MNI from small gastropods and bivalves is
equal. Conch is the most important invertebrate species, with an MNI of 395.
Each of these conchs provided .17 kg of meat, totaling 67 kg. This is
undoubtedly a small percentage of the total conch meat consumed by these
settlers, for very rich conch beds surround the Turks and Caicos and have
been harvested for centuries (Sadler 1997).

The presence of conch in this site represents both a dietary resource and
a functional material resource, for conch has many secondary uses. Here, it
was fashioned into tools and ornaments, and used in the construction of
cooking hearths. It is this last use that accounts for the majority of the
remains inside the confines of the settlement. Heavy conch shells would not be
carried back to a site except for secondary uses such as these; meat would be
extracted in the field.
This fact is reiterated in some aceramic period shell middens, which contain a few targeted species, usually bivalves, and already fashioned conch tools (Nodine 1987). Conch refuse does not show up in these middens either, except from a secondary use. The whole conchs recovered at Coralie are large and many detached, full grown lips were found. The larger conchs were preferred in hearth construction and may have been better suited for tool manufacture as well. The length of 10 whole, adult conchs ranged between 19 cm and 25 cm from spire to base, averaging 22 cm. Only two whole, sub-adult “rollers,” approximately half the size of the adults (11 cm long) and three whole juveniles (3 to 5 cm long) were recovered inside the site area. Most of the conch refuse was broken up from secondary uses.

Nerites (*Nerita* sp.), small marine snails, are the second most common mollusk by MNI, with 159 individuals. Three different species of nerites were picked off the rocks south of the site on the leeward shore. This same habitat supports the West Indian topsnail (*Cittarium pica*), periwinkles, and chitons. The topsnail also had a secondary use here as a raw material for tool making. The most common edible bivalves were two species of tellin (*Tellina radiata* and *Tellina listeri*), tiger lucines (*Codakia orbicularis*), and the gaudy sanguin (*Asaphis deflorata*). This last species is new in Turks and Caicos archaeological sites.

The contribution of sea urchins to human diets is rarely recognized, although they are consistently present in small numbers in archaeological sites. The red heart urchin (*Meoma ventricosa*) and the West Indian sea egg (*Tripneustes ventricosus*) occur at Coralie. The eggs of the female sea egg are
quite palatable. Spiny lobsters (Panularis argus) are common with 33 individuals recovered. Blue crabs (Callinectes sapidus), which occupy the mangroves and shallow, tidal flats, are present but rare in the site.

The only terrestrial invertebrates that were consumed at Coralie were crabs. Land snails did not contribute to the diet. Land crabs (Gecarcinidae) dominate the collection. There are two species living on Grand Turk today. The giant white crab (Cardisoma guanhumi), also called blue crab because of their purple, juvenile phase, reach a maximum body length of 9 cm. They are coastal inhabitants whose burrows must reach the water table. Black crabs (Gecarcinus lateralis) are smaller, tastier, and live more inland in cliffs and hills (Chace and Hobbs 1969). Depending on the location of the site and the habitat surrounding it, different crabs will be exploited. On St. Kitts, the black crab predominates, but on Antigua, Crooked Island and the site of Maisabel, Puerto Rico, all remains are of the white crab (DeFrance 1989, 1991; Jones 1985; Goodwin 1979). The amount of crab remains in some Saladoid sites can be staggering. At the earliest site on St. Kitts (the Cayon site), there was an average of 2500 crab claws in each 1 m unit. At the Coralie site, it took 217 1 m units to produce an equivalent amount of crab claws. Both species of land crab were harvested and some crab remains were found burned inside cooking hearths. Crab ranked eighth in meat provided to this diet.

**Biogeographically Important Species**

The species just described comprises the primary subsistence base of the early occupants of Grand Turk. Some of the other animals identified in the
remains provide information on past environments, past species distributions, speciation on islands, and human interference with these processes. The most unusual find at Coralie is the discovery of a large bodied, thin-shelled tortoise.

**Tortoise**

All native species of West Indian tortoise are extinct. They are only known today from paleontological sites in the Bahamas, Hispaniola, Cuba, Barbuda, Mona, Navassa, and Sombrero Island (Auffenberg 1967; Franz and Woods 1983; Pregill 1982; Steadman et al. 1994; E. Williams 1952). All are of the genus *Geochelone*. Even though tortoises did not make a large contribution to the diet at Coralie, they were consumed. The discovery of tortoise bones of this genus in Amerindian cooking hearths on Grand Turk introduces a previously unknown element to West Indian biogeography. This tortoise has a unique morphology and is a new species endemic to Grand Turk. The systematic associations between this specimen and other extinct varieties of West Indian tortoises are presented in Appendix C.

All Caribbean islands that currently support tortoise populations do so because of human introductions of South American species (Pritchard and Trebbau 1984). Today, some of the Virgin Islands and Lesser Antilles sustain populations of *Geochelone carbonaria* (South American yellow-footed tortoise), which is still a food source for some of these local populations (Censky 1988). It is uncertain whether Amerindians or early European colonists did this introduction. Watters et al. (1984) and Schwartz and Henderson (1991) report that it was supposed that the Saladoid people transported the tortoise, as they
did small mammals, to the Lesser Antilles. This assumption is unsupported because the tortoises' remains have never been found in archaeological sites. Due to its island evolution, the Grand Turk tortoise is three times larger than the South American species.

Analyses at Coralie identified 18 separate individuals, including hatchlings, juveniles and large adults. These tortoises were harvested from a local breeding population. The Taino did not introduce this animal to this region. Numerous remains of a tortoise, structurally similar, though not identical, to the one on Grand Turk, were found recently in a cave on Middle Caicos that contained deep, pre-human deposits (R. Franz: personal communication). Tortoises lived in the Turks and Caicos Islands for a long time, adapting themselves precisely to this habitat, long before the first people arrived.

Certain inferences can be drawn from the morphology of the shell, which reveal how this species adapted to a small, dry, island environment. On oceanic islands with no large predators, tortoises were free to grow large without bearing the weight of a thick protective covering. The Grand Turk tortoise's shell is very thin and correspondingly high domed to provide the structure with some strength. This species did not have to dig burrows for protection, like its thin-shelled North American counterpart the gopher tortoise (Gopherus polyphemus). The ability to retract its neck and limbs under its shell is another tortoise defense mechanism. Gopherus can fully retract its neck and rotate its forelimbs in front of its face for further protection (Bury and Germano 1994). From reconstruction of the anterior peripherals, nuchal and bridge
elements of the Grand Turk tortoise, it appears retraction of the head would not have been possible inside this narrow, slot-like opening.

Tortoises are herbivorous, live in temperate and tropical zones only, and lay a few eggs at a time, which they bury in shallow sand burrows (Auffenberg 1976). They are very slow growing, but if undisturbed they can reach great proportions and live extremely long lives. It takes 20 years, under optimal conditions, for tortoises to grow to sexual maturity (P. Pritchard: personal communication). The two largest and oldest Grand Turk specimens (with a C.L. of 75 cm, or 2.5 ft) show unusual evidence of wear on the plastral surfaces nearest the bridge. This area had literally been flattened by these large, heavy animals scraping themselves across this rocky landscape. This seems to be a function of age and weight, for the smaller specimens do not display this characteristic.

Morphologically, and perhaps behaviorally, the Grand Turk tortoise is similar to another species long adapted to dry, small, and isolated oceanic islands—the famed Galápagos tortoise (*Geochelone elephantopus*). The Galápagos tortoise is larger, reaching 130 cm in total length (Fowler 1983), but the two species share other characteristics, most notably thin, high domed shells. Neither animal has any adaptation against predation. Galápagos tortoises use their long necks to reach under cactuses and spiny desert shrubs to obtain fruits (Fowler 1983). Similar habitats on Grand Turk would suggest a similar dietary adaptation. This collection of *Geochelone* remains from Grand Turk has contributed greatly to our knowledge of the structure of this phylogenetically unique species.
Birds

Birds make up a small portion of the Taino subsistence at Coralie, yet this assemblage is quite extensive and diverse when compared with bird bones found at other Amerindian sites excavated to date (deFrance 1989; Righter n.d.; Versteeg and Schinkel 1992; Wing and Scudder 1980, 1983). The total number of bird bones recovered was 296, yielding 47 individuals; 62% of these remains could be identified to species. Out of these 20 species, 15 are represented by just one or two individuals. Dominating the assemblage are two species of booby (Sula sula and Sula dactylatra), one species of duck (Dendrocygna arborea), and one species of crow (Corvus nasicus), which together make up 50% of the individuals recovered. The collection includes 12 species of seabird (birds that feed over open ocean) and eight of landbird. A complete description of the avifauna found at Coralie is provided in Appendix B. This includes species systematics, material recovered, and remarks concerning habitat preference, size, and present geographic distributions. A few of the birds identified in this collection were not previously known from this region, and inform us about varying past distributions.

The thick-knee is a common Old World genus with only two species occupying the New World; one lives in the Peruvian Andes and the other in northern South American, Central America and on Hispaniola (Blake 1977). This latter species, the double-striped thick-knee (Burhinus bistriatus), was identified on Grand Turk. There are no other Late Holocene period records for this species in the West Indies outside of Hispaniola. Pregill and Olson (1981) have presented paleontological records for thick-knee in the Bahamas from San.
Salvador and New Providence. Because this landbird prefers dry habitats, the authors proposed that it fell victim to climate changes in the Early Holocene period, when dry scrubland habitats were replaced by dense, mixed woodlands. Thick-knee is found at Coralie in the 12th century deposits inside a Taino cooking hearth. This introduces the possibility that human hunting pressure played a role in the reduction of the range of this species.

The scarlet ibis (*Eudocimus ruber*) is a rare discovery, for it is not found anywhere in the West Indies today except as an occasional vagrant to Grenada (Raffaele et al. 1998). Furthermore, it is not present in paleontological sites, and has only recently been identified at one Puerto Rican archaeological site (D. Steadman: personal communication). This species comes from northern South America, and as of yet, there is no evidence that it had a wide natural distribution in the Caribbean in the past. The bright red feathers of this ibis would have made it a highly coveted species for the Taino who decorated themselves and many objects with multi-colored feathers (Lovén 1935), and particularly esteemed the color red. It has not been determined whether the scarlet ibis was a non-cultural or a cultural introduction to Grand Turk.

There were two species of parrot identified in the remains of the Coralie site. Only one species has ever been known to inhabit the Bahamian archipelago. Today, Cuban parrots (*Amazona leucocephala*) are found on Great Inagua, Abaco, the Caymans, and Cuba, but its former range extended through all the Bahamian islands (Juniper and Parr 1998). Columbus was impressed by the abundance of these birds in the Bahamas, writing "and there are flocks of parrots that obscure the sun" (Dunn and Kelley 1989:105). The only other
archaeological context for parrot in this region is from a deposit on Crooked Island (Olson and Hilgartner 1982). The second species of parrot found at Coralie is 10 cm larger than the Cuban variety. Represented by a single palatine bone and a scapula, it is, as of yet, an unidentified species of the genus *Amazona*.

This unidentified parrot is in the size range of four species of Amazon parrot that live today only on three islands in the Lesser Antilles (Juniper and Parr 1998). The Greater Antillean Amazon parrots (of which there are also four species) are all small-bodied in comparison (Wiley 1991). In the past, the distribution of these parrots was much broader and more complex than it is today. Greater Antillean parrots have been found at the Trants site on Montserrat and on the island of Antigua (Reis and Steadman n.d.; Steadman et al. 1984). Small parrots did inhabit the Lesser Antilles, and perhaps the larger parrots, similarly, had a wide distribution that included the Bahamian archipelago. It is also possible that these large parrot remains from Grand Turk come from an undescribed, extinct species that was indigenous to these northern islands. Not enough material has yet been recovered to resolve these affiliations.

When Columbus landed on San Salvador in 1492, one of the first gifts he received was a parrot (Sauer 1966). Chroniclers of the period (Oviedo 1959) reported that parrots were a popular trade item within the Taino culture. The Taino word for parrot was “guacamayas” (Wilson 1997). Wilson proposes that the prefix ‘gua’ may have been a syllable meaning “a favored thing,” for it was commonly used to begin the names of caciques (chiefs) and is the first syllable
of the Taino word for gold. Long distance trade was an integral part of both the Saladoid and contact period cultures (Rodriquez 1991; Watters 1997). A trade network in brightly colored birds, such as the parrot and scarlet ibis, may have existed between the Taino and the inhabitants of the Lesser Antilles or even the South American continent. Olson (1982) identified a species of macaw, not indigenous to the West Indies, from an archaeological context on St. Croix. He attributed its presence to trade. The differences between natural distributions and movement from trade or human introductions will only be further deciphered through a combination of paleontological and archaeological investigations. Nevertheless, because elite trade items are not present in the Coralie remains, it is likely that both these species of parrots and the scarlet ibis were indigenous to this region.

**Contexts of Faunal Remains**

The cultural horizon at Coralie contained dense deposits of bone, pottery, charcoal, shell, and fire-cracked limestone. Variations in how these items were combined and the color and configuration of the soil housing the artifacts led to the identification of six different types of site features. These were bone and shell midden deposits, roasting hearths, fire pits, large stains without inclusions, and post-molds. Figure 13 is a map of the excavation units with the primary features illustrated. Isolated areas of the site contain material concentrations that suggest specialized activity areas. By looking carefully at the associations between these activity areas and deposits of skeletal elements of various species, information can be gathered on how these resources were
Figure 13: Features in the Central Section of the Coralie Site.
transported into the settlement, and once there, how they were processed and discarded.

**Middens and Turtle Roasting Hearths**

The contexts within the Coralie site that contained turtle remains were roasting hearths and midden deposits. From careful excavation of these hearth and midden features, it was possible to reconstruct how the Taino exploited these turtle resources. Bone and other cultural remains are scattered all over this site, but there is one large area of concentrated midden deposit, a linear strip of material running parallel to the creek. This midden occupies the area in between the earliest and the latest occupations and is at least 40 m long by about 5 m wide; portions of it are 30 cm thick. An 8\textsuperscript{th} century radiocarbon date came from the base of this midden. Its slightly discolored soil contained no burnt conch or charcoal and few fire-cracked rocks, but pottery was common. All the ornaments, decorated pottery, and many of the shell tools were found here.

Bone, particularly from sea turtle, was this midden's primary deposit. Most of it showed no signs of burning. In just one 10 cm level of one unit, 13 kg of turtle bone were recovered. Fish bone was common also, and there were small numbers of tortoise, iguana, lobster, and invertebrates. This midden contained the remains of only one bird, a Cuban parrot, represented by five scattered bones. There is one other midden area in the site that contains mostly shell refuse and many shell tools. It is located further north in an area dated to the 10\textsuperscript{th} century.
Excavations identified two types of burn features in the sediments—small fire pits and large roasting hearths. These occur outside of the midden areas. Roasting hearths, up to 1 m in diameter, are scattered throughout the site from the earliest to the latest occupations, but are more frequent in the later periods. Figure 14 is a drawing and photograph of one of these roasting hearths (Feature 25). The top layer is an 80 cm circular ring of fire-cracked rock and burnt, large conch shells. There is a lower ring of rock and conch, 40 cm in diameter. The two levels are separated by a 5 cm layer of near sterile soil, indicating that this hearth may have been used a second time. This construction method differs from the hearths found at the Golden Rock site (Versteeg and Schinkel 1992), which were simple rings of stone, 60 to 70 cm in diameter. Feature 25 contained the remains of two green turtles, one small juvenile and one mid-sized sub-adult, three iguanas, two lobsters and some burnt land crab claws. A 2 kg parrotfish was among the seven fish roasted in this pit. Another hearth showed evidence of being re-used three times. Near the base of this feature (F36) were three layers of small, broken bits of turtle bone, each separated by 2 to 3 cm of sterile sand. This hearth contained the remains of three sea turtles, seven iguanas, and 14 fishes.

Preparing a table that compares the percentage of skeletal elements recovered in the site to the percentage of elements in a complete skeleton aids in focusing attention on what parts of an animal are absent from the remains. Table 8 lists the recovered percentage for each sea turtle element (by weight) in the site. The greatest difference between this and the expected finds is in the skull material. This can be explained by the fragility of the cranium. The
Figure 14: Drawing and Photograph of Turtle Roasting Hearth (F25)
Table 8: Comparison of Percentage of each Green Turtle Element from the Coralie Site to Percentage of each Element in a Complete Skeleton.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>NISP</th>
<th>WEIGHT</th>
<th>% OF TOTAL (by weight)</th>
<th>% OF TOTAL IN COMPLETE SPECIMEN</th>
<th>MORE (&gt;) OR LESS (&lt;) THAN EXPECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VERTEBRAE:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervical</td>
<td>445</td>
<td>444.40</td>
<td>1.00%</td>
<td>2.10%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Thoracic</td>
<td>59</td>
<td>162.70</td>
<td>0.35%</td>
<td>0.60%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Caudal</td>
<td>53</td>
<td>25.10</td>
<td>0.06%</td>
<td>0.70%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>557</td>
<td>632.20</td>
<td>1.40%</td>
<td>3.30%</td>
<td>&lt;</td>
</tr>
<tr>
<td><strong>LIMBS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humerus</td>
<td>95</td>
<td>1528.30</td>
<td>3.40%</td>
<td>3.30%</td>
<td>&gt;</td>
</tr>
<tr>
<td>Ulna</td>
<td>69</td>
<td>229.30</td>
<td>0.50%</td>
<td>0.50%</td>
<td>equal</td>
</tr>
<tr>
<td>Radius</td>
<td>63</td>
<td>279.30</td>
<td>0.62%</td>
<td>0.50%</td>
<td>&gt;</td>
</tr>
<tr>
<td>Femur</td>
<td>55</td>
<td>362.20</td>
<td>0.80%</td>
<td>1.50%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Tibia</td>
<td>12</td>
<td>70.80</td>
<td>0.16%</td>
<td>0.50%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Fibula</td>
<td>4</td>
<td>10.40</td>
<td>0.02%</td>
<td>0.40%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Podials</td>
<td>338</td>
<td>191.10</td>
<td>0.43%</td>
<td>0.60%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Metapodials</td>
<td>929</td>
<td>434.10</td>
<td>0.97%</td>
<td>1.00%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Phalanges</td>
<td>108</td>
<td>50.70</td>
<td>0.11%</td>
<td>0.50%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Distal Phalanges</td>
<td>31</td>
<td>9.50</td>
<td>0.02%</td>
<td>0.30%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Fragments</td>
<td>674</td>
<td>933.60</td>
<td>2.10%</td>
<td>9.10%</td>
<td>equal</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>2378</td>
<td>4,099.30</td>
<td>9.10%</td>
<td>9.10%</td>
<td>equal</td>
</tr>
<tr>
<td><strong>HIPS/SHOULDERS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scapula</td>
<td>117</td>
<td>700.20</td>
<td>1.60%</td>
<td>1.90%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Corocoid</td>
<td>45</td>
<td>598.50</td>
<td>1.30%</td>
<td>1.60%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Pubis</td>
<td>15</td>
<td>117.10</td>
<td>0.25%</td>
<td>1.30%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Ischium</td>
<td>17</td>
<td>217.10</td>
<td>0.49%</td>
<td>0.60%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Ilium</td>
<td>8</td>
<td>48.10</td>
<td>0.11%</td>
<td>0.30%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Rib</td>
<td>20</td>
<td>12.50</td>
<td>0.03%</td>
<td>0.20%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>222</td>
<td>1,915.50</td>
<td>4.30%</td>
<td>5.90%</td>
<td>&lt;</td>
</tr>
<tr>
<td><strong>SKULL:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandible</td>
<td>31</td>
<td>99.10</td>
<td>0.22%</td>
<td>1.50%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Frontal</td>
<td>55</td>
<td>203.80</td>
<td>0.48%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-frontal</td>
<td>24</td>
<td>44.10</td>
<td>0.10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parietal</td>
<td>4</td>
<td>5.20</td>
<td>0.01%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occipital</td>
<td>26</td>
<td>65.30</td>
<td>0.15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporal</td>
<td>22</td>
<td>70.90</td>
<td>0.16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadrate</td>
<td>4</td>
<td>6.50</td>
<td>0.01%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UID skull</td>
<td>291</td>
<td>545.80</td>
<td>1.21%</td>
<td>6.00%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>457</td>
<td>1,040.70</td>
<td>2.30%</td>
<td>7.50%</td>
<td>&lt;</td>
</tr>
<tr>
<td><strong>PLASTRON:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epiplastron</td>
<td>2</td>
<td>154.90</td>
<td>0.34%</td>
<td>1.40%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Xiphialastraon</td>
<td>20</td>
<td>270.60</td>
<td>0.62%</td>
<td>2.00%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Hyo/Hypoplastron</td>
<td>&gt;400</td>
<td>4,397.40</td>
<td>9.80%</td>
<td>12.00%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>&gt;400</td>
<td>4,822.90</td>
<td>10.80%</td>
<td>15.40%</td>
<td>&lt;</td>
</tr>
<tr>
<td><strong>CARAPACE:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pleural</td>
<td>&gt;500</td>
<td>12,875.40</td>
<td>28.70%</td>
<td>34.90%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Neural</td>
<td>266</td>
<td>1,317.70</td>
<td>2.90%</td>
<td>2.70%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Peripheral</td>
<td>&gt;400</td>
<td>5,191.50</td>
<td>11.60%</td>
<td>14.20%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Nuchal</td>
<td>20</td>
<td>462.90</td>
<td>1.03%</td>
<td>2.40%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Pygal</td>
<td>37</td>
<td>488.70</td>
<td>1.09%</td>
<td>1.00%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Suprapygal</td>
<td>20</td>
<td>155.10</td>
<td>0.35%</td>
<td>2.20%</td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>&gt;1300</td>
<td>20,491.30</td>
<td>45.70%</td>
<td>57.40%</td>
<td>&lt;</td>
</tr>
<tr>
<td><strong>UID TURTLE BONE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>many</td>
<td>44,849.30</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
</tr>
</tbody>
</table>
percentage of carapace (the top of the shell) and plastron (the bottom of the shell) recovered is slightly low because of the problem of recovering all the small, crushed fragments of the turtle shell. In general, the two calculations are quite comparable and suggest that every part of the turtle was brought into the site without previous field processing.

There is an interesting discrepancy in the number of recovered turtle long bones; 95 humeri, but only 55 femora, were found. Although no reworking of the humeri was noticed, their differential abundance may indicate a secondary use. Many of the humeri were recovered from the midden area, where other shell tools were deposited. Allaire (1977) proposed the use of turtle long bones, particularly the humeri, as tool handles. This idea is supported by an ethnographic description of this practice in the Guianas (Roth 1924).

Evidence from plotting the percentages of separate skeletal elements found in the hearths suggests that very little butchering of the turtle was done before roasting. The hearths contained turtle carapace, plastron, all the long bones and some broken up skull pieces; even the small bones of the fins and the tail were found. The bony elements were not butchered before roasting, but perhaps some of the soft tissue was removed. Eggs from females, green fat deposits, and blood are favored non-meat parts of the turtle (Nietschmann 1972). Only the stomach and some of the viscera are inedible. These tissues could have been removed from the turtle before roasting by severing the cartilage holding the plastron and carapace bones together, and peeling back the plastron. A few large, circular stains, about 1 m in diameter, were found in
the site. They contained no inclusions to give clues to their origin, yet they occurred near roasting hearths and fire pits. They could relate to butchering activities, where soft tissues were discarded before roasting or where the raw turtle meat was prepared for preservative activities, which in turn stained the surrounding soil.

The method of turtle preparation recorded for the Australian aborigines by O'Dea (1991) was to place the whole animal directly on the coals and lay hot stones inside the abdomen. The Guiana Indians studied by Roth (1924) cooked unprocessed turtles by placing them in a hole, covering it with sand and lighting a fire on top. The turtle carapace and plastron bones from Coralie were rarely charred. Instead of placing the turtle right on the hot coals, perhaps an insulating layer of conch shell was laid down in between the coals and the turtle. The centers of these pits did overflow with small, burnt conch fragments. In contrast, at least some of the tortoises were laid directly over an open fire for the bottoms of several plastra were charred black. There was only one example of an extremely burned turtle plastron, and this bone came from the final phase of occupation, the same time period as most of the tortoises.

The roasted turtles at the Coralie site appear to have been cooked whole in their shells. Most parts of the turtle, including the head, neck and flippers have food value and would have been consumed. Each excavated roasting hearth contained approximately the same ingredients—the partial remains of one turtle (unless the hearth was re-used, in which case the number of turtles equals the number of layers in the hearth), one or two iguanas, and three or four fish of various species.
Another type of feature, small fire pits, served a different purpose than the larger roasting hearths. They contained charcoal and fire-cracked limestone, but were not full of burnt conch and held no or very little bone. Animals were not placed directly in these fire pits. Small post-molds are in association with many of them, indicating that something was being suspended over these fires. Storing a portion of each turtle for leaner times is customary among turtlers. Nietschmann (1972) reports two turtle storage techniques used by the Miskito. Meat strips are cut and smoked, in small amounts, directly over a fire. Alternately, the strips can be parboiled, then salted or sun-dried on long lines stretched along the beach. Turtle fins and fish are also prepared in this manner. The Taino gave us our word "barbeque" from their term ("babacoa") for the process of smoking meat over an open fire (Taylor 1977). In the Coralie site, these small fire pits with associated posts may be the remnants of these types of preservation processes. They occur only in the middle and late period of the occupation.

There are many small, shallow post-mold configurations in the site, which are not in association with fire pit features. Formations similar to these were described at Golden Rock, where lines of posts up to 6 m long, T-shapes, and square or rectangular arrangements 1 to 2 m across, were interpreted as storage racks (Versteeg and Schinkel 1992). The patterns seen at Coralie are similar, but smaller T-shapes, squares, and semi-circles. Some post-molds are embedded within, or sit on the perimeter of, linear and circular stains. These patterns of discoloration may be the additional remains of the various food preservation and storage activities.
Contexts of Bird, Iguana, and Tortoise Remains

Only one bird bone was recovered inside a roasting hearth; the remains of a thick-knee. Most of the bird bones came from the material surrounding the features, rather than within the middens or burned areas themselves. Clusters of 15 to 20 bones from a single individual were occasionally found, but most remains were fragmentary and scattered.

With over 12,000 iguana bones in this collection, a recovered vs. expected element table could be completed (Table 9), as was done with the turtle remains. This comparison was made between the total number (NISP by %) of each element recovered in the site and the total number of each element in a complete skeleton. Each element was not individually weighed. However, four element categories (vertebrae, skull, limbs, and pelvis/shoulder girdle) were each weighed as a group and this was compared against the weight of each of these groups on a complete skeleton. The vertebrae and ilia (pelvis) were overrepresented in the Grand Turk sample. Proportionally, the only underrepresented elements were the distal caudal vertebrae (the tail) and the phalanges and metapodials (the feet). Phalanges, in particular, were not recovered fully with the ¼" mesh screen, but were common in the fine screened samples. However, tail vertebrae were not found in the small mesh screens. The tail has no meat value and may have been butchered and discarded. Alternatively, this species can detach its tail to try and avoid capture. In Iverson’s study (1979), 30% of the population had lost tails. This occurred mostly among the young adult class, which is also the class most represented in this archaeological sample.
Table 9: Comparison of Percentage of each Rock Iguana Element from the Coralie Site to each Element Category in a Complete Iguana Skeleton.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>WEIGHT (grams)</th>
<th>NISP</th>
<th>% OF TOTAL (by NISP)</th>
<th>% OF TOTAL (by Wt.)</th>
<th>% OF TOTAL IN COMPLETE SPECIMEN (by NISP)</th>
<th>% OF TOTAL IN COMPLETE SPECIMEN (by Wt)</th>
<th>MORE (&gt; OR LESS (&lt;) THAN EXPECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTEBRAE:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlas</td>
<td>5</td>
<td>0.04%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Axis</td>
<td>10</td>
<td>0.08%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Cervical</td>
<td>448</td>
<td>3.66%</td>
<td>2.35%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Thoracic</td>
<td>2265</td>
<td>18.50%</td>
<td>6.30%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Sacral</td>
<td>412</td>
<td>3.37%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Caudal</td>
<td>2475</td>
<td>20.20%</td>
<td>5.90%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Distal caudal</td>
<td>69</td>
<td>0.56%</td>
<td>6.30%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>UID Vertebrae</td>
<td>755</td>
<td>6.17%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal:</td>
<td>392.70</td>
<td>6439</td>
<td>52.59%</td>
<td>47.80%</td>
<td>22.30%</td>
<td>33.00%</td>
<td>&gt;</td>
</tr>
<tr>
<td>LIMBS:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humerus</td>
<td>309</td>
<td>2.52%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Ulna</td>
<td>25</td>
<td>0.21%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Radius</td>
<td>11</td>
<td>0.09%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Femur</td>
<td>146</td>
<td>1.19%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Tibia</td>
<td>101</td>
<td>0.83%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Fibula</td>
<td>52</td>
<td>0.42%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Podial</td>
<td>28</td>
<td>0.23%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>1st Metatarsal</td>
<td>35</td>
<td>0.29%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Metapodial</td>
<td>263</td>
<td>2.15%</td>
<td>7.90%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Phalange</td>
<td>71</td>
<td>0.58%</td>
<td>27.30%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Shaft fragments</td>
<td>2251</td>
<td>18.39%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal:</td>
<td>279.90</td>
<td>3292</td>
<td>26.89%</td>
<td>34.10%</td>
<td>50.80%</td>
<td>36.20%</td>
<td>&lt;</td>
</tr>
<tr>
<td>PELVIS/SHOULDER:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scapula</td>
<td>222</td>
<td>1.81%</td>
<td>1.60%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Sternum</td>
<td>3</td>
<td>0.03%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Pubis</td>
<td>169</td>
<td>1.38%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Ischium</td>
<td>227</td>
<td>1.85%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Ilium</td>
<td>724</td>
<td>5.91%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>6</td>
<td>0.05%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Rib</td>
<td>40</td>
<td>0.32%</td>
<td>12.50%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>89.60</td>
<td>1391</td>
<td>11.36%</td>
<td>10.90%</td>
<td>17.50%</td>
<td>15.70%</td>
<td>&lt;</td>
</tr>
<tr>
<td>SKULL:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dentary</td>
<td>413</td>
<td>3.38%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Maxilla</td>
<td>192</td>
<td>1.57%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Premaxilla</td>
<td>27</td>
<td>0.22%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Tooth row frags.</td>
<td>21</td>
<td>0.17%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Articular</td>
<td>137</td>
<td>1.12%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Coronoid</td>
<td>8</td>
<td>0.07%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Frontal</td>
<td>94</td>
<td>0.77%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Pre-frontal</td>
<td>47</td>
<td>0.38%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Parietal</td>
<td>37</td>
<td>0.30%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Post-orbital</td>
<td>12</td>
<td>0.10%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Quadrate</td>
<td>83</td>
<td>0.68%</td>
<td>0.80%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>Basiocipital</td>
<td>16</td>
<td>0.13%</td>
<td>0.40%</td>
<td></td>
<td></td>
<td></td>
<td>&gt;</td>
</tr>
<tr>
<td>UID Skull</td>
<td>35</td>
<td>0.29%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>58.70</td>
<td>1122</td>
<td>9.17%</td>
<td>7.20%</td>
<td>9.30%</td>
<td>15.30%</td>
<td>&lt;</td>
</tr>
<tr>
<td>TOTALS:</td>
<td>820.90</td>
<td>12,244</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
</tr>
</tbody>
</table>
The contexts of the tortoise bones are important for definitively associating these remains with the Amerindian period settlement. Tortoises were found throughout the excavations, but the majority of the remains came from the very top of the cultural deposit, between 35 and 40 cmbs. One tortoise was found lying atop the wedge-shaped beach sand deposit, at 37 cmbs. There were no other cultural inclusions in this area. The bone from this tortoise was not discolored, and is the only specimen that still had most of its internal skeleton in association. It was found 50 m from the marshy edge of North Creek. The remains showed evidence of having been submerged for some time, as marine worms had bored holes into the bone. This suggests that sometime after the sand wedge was deposited, sea level was higher than present. Tanner (1991) describes two periods of higher sea level since Grand Turk was settled—A.D. 850 to 1150 and 1550 to 1750. The date when the sand wedge was deposited has not yet been established, but if this tortoise is associated with all the others in this site found at this same depth, then the sand wedge must have been laid down before the site was abandoned. All of the other tortoises sit directly atop the Amerindian layer indicating that a tortoise butchering event was the very last activity at this site. Two tortoises were found 20 cm above the latest dated feature (intercept A.D. 1170) at Coralie.

All the adult plastra were discovered with their margins intact but with the thin center portion crushed, producing a ring of bone (Figure 15). The tortoise in this photograph occurred in an area of concentrated roasting hearths. Two turtle hearths and a large fragment of Taino ceramic griddle were
adjacent to and at the same depth as this tortoise (ca. 40 cmbs). A piece of burned long bone remained inside the plastron.

The greatest amount of reconstructable carapace came from a secondary deposit of tortoise bone. The remains of three individuals were jumbled together in an area 40 cm square by 25 cm deep. The bottoms of the plastra were charred from direct exposure to fire. There was very little else in the deposit besides tortoise shell. Most of the meat bearing elements were gone, just two pieces of internal skeleton were recovered. The only other materials in this deposit were a few pieces of fire-cracked limestone, one piece of Ostionan pottery at the base, and one layer, also near the base, of small, burnt, conch
shell fragments; all deposited in a white, sand matrix. These are materials from a cleaned out roasting hearth.

A few isolated pieces of tortoise came from the deeper, earliest deposits. A complete scapula was found in an easternmost unit at the same depth as an A.D. 710 radiocarbon date. Finding tortoise in the area dated to the 8th century demonstrates that the tortoise was here when the Amerindians first arrived, although it was not regularly consumed early in the occupation.

In this chapter I have reviewed the zooarchaeological findings from excavations at the site of Coralie, making an inventory of the animals once available on the island, presenting which animals were most important to the Taino diet, and explaining how these foods were prepared in the site. The results of the faunal analysis show that sea turtle was the primary meat source for this community, because of its size and the quantity of meat each individual provided. However, a variety of species were consumed. The sum total of vertebrates harvested was equal to that of the invertebrates. The number of individuals procured from the terrestrial environment equaled the number from the marine environment. Similar numbers of reptiles and fishes were captured. Multiple habitats and resources were exploited. The following chapters will discuss further implications of these conclusions.
Previous chapters introduced the animal species identified on Grand Turk and the basic environmental structure in which they lived. The following discussion addresses how the environment, the fauna, and the human population, all interacted, and the effect human presence had on this pristine island ecosystem. Remembering that only a small portion of any total diet comes from animal protein (Harris and Ross 1987), direct and indirect evidence for horticulture is explored. Procurement techniques are reconstructed both from material evidence and from understanding the ecology of these species and the multiple micro-environments they inhabit. The reader is left with an impression of how the total environment contributed to the sustenance of these settlers. The analysis of faunal remains brings many aspects of Amerindian life to light, far beyond purely a dietary reconstruction.

**Horticultural Practices**

The Taino were a horticultural society. Their staple crop was manioc, but they planted a variety of root crops, tended fruit trees, planted household gardens, and harvested wild plant foods. A conservative estimate for the percentage of plant foods in the Taino diet is 50% (Keegan 1992). This is based on preliminary isotopic data and could well underestimate its contribution (see
The Miskito Indians, whose lives revolve around the acquisition of turtles, still get 74% of their overall caloric intake from agricultural activities, 40% of that from manioc (Nietschmann 1972). It is only the protein and fat portion of their diet that they obtain by hunting and fishing. The figures for the Taino diet probably approach these proportions.

The Taino introduced horticulture to Grand Turk very early in the occupation, for remains of imported ceramic griddles for baking cassava bread from manioc are present throughout the site. The earliest context for a griddle sherd was 10 to 20 cm directly below a hearth dated to A.D. 790, so at least by the second half of the 8th century, cassava was produced on the island. The earliest dated context in the site contained no griddle sherds, and one area of seven contiguous units (28 m³) in the southernmost east/west trench, curiously, produced no griddle at all. It did, however, contain ceramic vessel fragments. This area sampled deep, easterly strata and is no doubt an early part of the site. The lack of griddle in only this area could mean that for a period when the site was first established, manioc had not yet been harvested.

Environmental Consequences

The horticultural activities of the Grand Turk colonists certainly affected the environment and thus the biogeography of this small island. Clearing land for planting, in addition to the harvesting of wood for fuel and construction, could have altered the nature of this habitat. One line of evidence for these types of activities is seen in changes in the bird species over time. Grand Turk is today a very dry, low scrub environment, and it is hard to imagine that it
could have been densely wooded in the past. Yet, two of the land birds from Coralie are indicative of a wooded habitat, the Key West quail dove (Geotrygon chrysia) and the Cuban parrot (Amazona leucocephala). Neither of these species inhabit Grand Turk today and may have gone extinct here during, and as a result of, the Amerindian period of occupation. The quail dove is represented by just two MNI for the whole site. These bones came from a context 10 cm below a horizon that was dated to A.D. 885. Although it was not found in the earliest 8th century deposits, it is still near the beginning of the occupation. The parrot bones come from two different contexts with 84% from the 8th century and 17% from the 10th century. All the bones from both these wooded habitat species come from the first half of the occupation. They may have been rarely harvested because they provided a small package of meat compared to the readily available boobies and ducks that were most common in this early period.

The bird species from the collection that are indicative of a dry scrubland, grassland, or disturbed habitat are the thick-knee, Zenaida dove, and kingbird (Raffaele et al. 1998). The kingbird bone was found high in the deposits and in association with a 19th century belt buckle, but the other two species were within Amerindian contexts. The two Zenaida dove bones came from an 11th century deposit, and 75% of the thick-knee bones came from a 12th century fire pit. These species, which prefer a drier, more open habitat such as surrounds the site today, occurred only in Phase 3 of the occupation. Horticultural practices of the Taino population appear to have affected the
environment enough to alter the resident bird population. However, with such small MNI for these species, this is still a preliminary observation.

The presence of iguanas and tortoises support the argument for a past dry environment, which must have been especially suitable for the plentiful rock iguana. Iguanas prefer rocky and mesic coppice vegetation or dense scrub, but never inhabit mixed woodlands or marshy areas. Juveniles favor open scrub, rocky coasts, and sandy beaches (Iverson 1979). The high percentage of juveniles in the remains may indicate a more open vegetation immediately surrounding the settlement. Still, there must have been enough pockets of wooded habitat to support species such as parrots and the quail dove, at least in the early centuries of occupation.

Material Evidence

Ceramic cassava griddles are sufficient evidence to propose local horticulture, but additional evidence is found in tools that relate to the processing of plant foods. Tools fashioned from Queen conch (*Strombus gigas*) are rare at this site, with only 10 identified to date. One type of implement, manufactured from the body whorl of the shell could have been used in planting and harvesting root crops, functioning like a modern day hoe (Figure 16). This tool is similar to the widespread conch “gouge” (illustrated in Keegan 1994), but its form is larger and wider. The other three named types of conch shell tools found at the site are 1) “hammers,” which show battering on the superior and/or inferior ends; 2) “punches,” in which the pointed inferior tip of the columella is exposed, and 3) “picks,” which are the broken, inferior ends of
Figure 16: Queen conch (*Strombus gigas*) Tool.

punches. The particular function of these tools is debated (Keegan 1981). The pointed ends of picks and punches work well in harvesting some invertebrate species.

Celts, or ax heads, were roughly hewn from the lips of fully grown “samba” conchs. There is only one complete stone tool in this assemblage—a stone ax (Figure 17), which bore evidence of battering on both ends. The material is a greenish-gray, metamorphic stone that originated in the Greater Antilles. It came from the base of one of the easternmost units in the site, just above the water table. This ax may have been imported with the first settlers and used to clear land and prepare the initial agricultural fields on this island.

The natural characteristics, and natural functions, of bones are often co-opted and incorporated as tools. One bone tool, associated with the baking of
cassava bread, was reportedly used by the Island Carib (Breton 1665). Pieces of sea turtle plastron functioned like a modern day spatula in turning over the baking cassava bread. Not to be confused with the long, thin, vomit spatulas often made of manatee bone (Kerchache 1994), these are flat, triangular or trapezoidal pieces of turtle plastron with one side beveled down to an edge. On Barbados, similar beveled-edge turtle bone tools were found (Drewett 1991), and concluded to be some sort of scraper. Allaire (1977) describes turtle bone spatulas in the assemblage from the Macabou site on Martinique. Another bone tool identified at Macabou was a parrotfish dentary (lower jaw bone) that had adhesive pitch residue on one articular surface. It was evidently bound to a handle (perhaps a turtle humerus), with the multiple rows of teeth used as a scraper or abrader. Some modern Guiana Indians reportedly used parrotfish
grinders in this exact way (Roth 1924). At Coralie, the tooth rows of the upper pharyngeal grinder of large parrotfish (*Scarus* sp.) appear to have been modified for use as an abrader, but no other bone tools were identified. It is likely that bone, shell, and limestone were utilized without ever altering the shape of the natural object. These types of "expedient tools," which complicate tool identification, are the most common type of implement in Bahamian assemblages (Keegan 1981).

Bitter manioc roots have to be both peeled and shredded. Various types of scrapers or abraders could have performed this task. Oval pieces of cowrie shell with one beveled edge, called "spoons," were used to peel root crops in prehistoric Pacific islands sites (Kirch 1995). In the West Indies, scrapers made from cowries (*Cypraea* sp.) have been described on Barbados (Drewett 1991), St. Eustatius (Versteeg and Schinkel 1992), Puerto Rico (Rouse and Alegria 1990:53), St. Martin (Havisier 1991:650), and St. Thomas (Righter n.d.). Measled cowries (*Cypraea zebra*) were found in the midden at Coralie, but none were shaped into scrapers.

Recognizable, modified scrapers of any sort are uncommon at the Coralie site, yet unmodified bivalves, and even individual chiton plates (Jones 1985), could have been used as scraping and cutting tools. Tiger lucine valves show regular breakage patterns along the rim of the shell, and occasionally exhibit interiorly beveled edges. A possible use for these valves would be in scaling fish. A very sharp, unforgiving material is not ideal for this purpose because it disturbs the flesh beneath the scales. A piece of unmodified limestone or shell is a better choice. Lammers-Keijzers (1999) found tiger
lucine valves to be the best expedient tool, common in West Indian Amerindian sites, for scaling fish.

A few oval pieces of West Indian topsnail (*Cittarium pica*) were found in the midden, but the most common worked form was a transversally split whole topsnail shell with finished edges (Figure 18). Versteeg and Schinkel (1992:113) describe a group of 19 "*Cittarium pica* objects with lip" at the Golden Rock site, all found in one area and retaining a black residue on the working edge. The authors proposed that this tool was used to clean meat, but noted no finished edges. The residue would suggest their use as some kind of scraper, but the form seems more suited to a receptacle. Sutty (1978:197; illustration: 208) calls this form a "spoon" and reports that they are "very

![Figure 18: West Indian Topsnail (*Cittarium pica*) Shell Tool.](image-url)
common" at some sites in the Grenadines. Spoon is a confusing term since it is often used interchangeably with oval scrapers. The term "split receptacle" is a more accurate description. The eight split topsnail receptacles from Coralie were deposited in clusters, coming from two areas of the site. No residue remained on these specimens. This tool's function is undetermined.

Common tools in many West Indian archaeological sites are abraded pieces of coral, particularly of the genus *Acropora*. Large slabs of elkhorn coral (*Acropora palmata*) were used like mortars for grinding plants and other materials. Slender stalks of staghorn coral (*Acropora cervicornis*) could have been used in grating manioc tubers or in shredding agave leaves to extract workable fibers. The most commonly described, historical method for grating manioc is to scrap the tubers against a wooden board inset with microchips of chert (Roth 1924). No chipped, stone grater "teeth" were found in this site, although they would only have been retrieved in fine mesh screens. A few staghorn coral abraders, deposited in clusters inside the midden area, were the only coral tools found.

Beyond plant processing, coral is also a good polishing tool. There is evidence from Polynesia of coral being used to work shell (Kirch 1995). At Coralie, one abrader made from finger coral (*Porites porites*) was found in the earliest, deepest deposits. It is worn on all surfaces and shaped into a flattened oval with one squared off end. This soft but dense species of coral would function well for fine grained polishing. Volcanic stone, both small, fine-grained, tan colored pumice pebbles and large, coarse-grained, black vesicular
basalt, occur within the deposits. Both types could have functioned as abraders, although no worn surfaces were observed on the specimens.

**Hunting and Fishing Practices**

Some of the tools mentioned above may have had additional applications in the harvesting and preparation of fish and game. Recognizing fishing implements for what they are can be a complicated task (Marquardt 1992), yet it is made possible through the application of ethnographic analogies and discussions with modern fishermen (Edic 1996; Price 1966; Steward 1977). Hard evidence for procurement strategies, in the form of material remains, is surprisingly rare in West Indian sites. Even so, the types of fishing technology used can be inferred from the variety of species caught, the habitats in which they live, their behavior and feeding practices, and individual fish sizes.

**Material Evidence**

Harpooning is the most common turtle capture method worldwide, accomplished today with a hardwood harpoon, 2.5 to 3 m long, topped by a short detachable point that is secured to a line (Bacon 1975; Hirth 1971; Nietschmann 1972; Ross 1985). The Island Carib spears were 1.2 to 1.5 m long and topped with wooden points (Breton 1665). Turtlers work in teams of two; one maneuvers the boat while the other harpoons. No higher level social organization or cooperation between groups is necessary to harvest turtles. Within 20 m, the harpoon is released with a high arc and the carapace is pierced vertically.
In the turtle remains from Coralie, there are a few examples of carapace with round, possible harpoon holes. The bone in Figure 19 (left) is the fourth pleural on the right side of the turtle shell. There are eight pleurals in total, so this one is half way down the animal's back. The hole is 8 cm off the mid-point of the spinal column. This was a fairly centralized harpoon shot. The hole itself is 2 by 2.5 cm wide on the exterior of the bone and 2.5 by 3 cm on the interior. More of the inside of the bone was blown out by impact. This pleural was examined and X-rayed by the late Dr. Bill Maples, a former forensic scientist with the University of Florida, who concluded that the bone displayed a depressed fracture; a puncture wound produced by some blunt instrument. Chroniclers mentioned fire-hardened wood spear points for the

Figure 19: Sea Turtle Pleurals with Harpoon-produced Fractures (interior surfaces shown).
Taino at contact (Lovén 1935). Spearhead points made out of wood would not have preserved under normal conditions in this site.

Only a few pieces of chert (3-4 cm across), whose nearest source is the Greater Antilles, have been recovered at Coralie. Though there are no chert tools here, this raw material may have been used to make spear points, drill bits, scrapers, knives, or other tools used in the harvesting and processing of fish and game. Chert was probably too precious a commodity to be used as harpoon heads, when other locally abundant materials could have worked equally well.

Spear points made out of sting ray spines are common in archaeological sites and occur at Coralie. There is evidence of these spines being used as spear points from burials in Puerto Rico. At Maisabel, Siegel (1992) excavated a male burial with a sting ray spine stuck between his ribs. Similarly, at Hacienda Grande, a spine was found embedded in a human skull (Siegel 1992). If these points were capable of puncturing a human skull, then it is certain they could also puncture the carapace of a sea turtle. However, the holes in the turtle shells at Coralie were made by a larger, blunter point than a sting ray spine. The same spears used to hunt turtles, this time topped with sting ray spines, would have been an ideal weapon to capture certain of the large fish species present in the remains, particularly ray, flounder, and large parrotfish. These fishes can be speared in shallow, clear water.

No definitive evidence of fishhooks were found at Coralie. The only ones known from the Bahamas are one-piece wooden hooks recovered from an
Amerindian site on Crooked Island (Granberry 1978). There are historic materials in the collection as well, so their prehistoric association may be questionable. The Island Carib made hooks of turtle shell, wood, and fish bones (Price 1966). One-piece shell hooks, cut from Pacific topsnails (*Trochus* sp.) and pearl oysters (*Pinctada* sp.), are common and well preserved in Polynesian sites (Kirch 1995). Both these shells have shiny, mother-of-pearl interiors. Their Caribbean equivalents (*Cittarium pica* and *Pinctada imbricata*) are regularly deposited in archaeological sites, yet few have been worked into hooks. Versteeg and Schinkel (1992) report a tentatively identified West Indian topsnail fishhook from St. Eustatius. Lammers-Keijzers (1999) recently presented several topsnail fishhooks from Anse à la Gourde, Guadeloupe. If in use, remains of shell fishhooks would have been preserved at Coralie.

Cut or broken pieces of mother-of-pearl shell may have been used as lures. Lures are tied to a fishing line just above the hook, where the iridescent piece of shell attracts the fish to the line. Feathers and white pieces of cloth or wood were similarly used by the Island Carib (Price 1966). Notched or perforated pieces of these shells are usually interpreted as ornaments, but could have been part of a fishing implement assemblage (Marquardt 1992). Coralie has numerous teardrop-shaped pieces of topsnail shell, whose function is often described as a scraper. Their use as lures is another possibility.

With little evidence for one-piece fishhooks at Coralie, the possibility of compound hooks remains. Compound hooks employ carved wooden bases with lashed single-pointed barbs (Steward 1977). These barbs are usually carved of bone (Walker 1992). However, there are many natural examples of
barbs in the environment of Grand Turk that could have been used in compound hooks. Steward (1977) reports that salmon fishermen of the Northwest Coast tribes employ cactus thorns for this purpose. This practical solution could be easily replicated on Grand Turk. Some fish bones, such as brachiostegal rays from large fish, are pointed and relatively sturdy. The tri-pointed barbs off the porcupinefish abound in these deposits and are occasionally burnt, perhaps intentionally fire-hardened. These barbs could also have been used, in an unaltered form, as a type of throat gorge for hand line fishing (see Marquardt 1992). Porcupinefish, whose viscera contain a deadly toxin, are avoided by modern fishermen. However, they are a common species in most Turks and Caicos sites. It is possible that the acquisition of its barbs was a factor in making this species desirable prey.

There is no material evidence from Coralie to indicate fishing with nets. Implements associated with the production and use of nets are well represented at the small, island site of Île à Rat off the north coast of Haiti (Keegan 1997c). Here, side-notched disks, made from pottery sherds and flat, water-worn stones, were identified as net sinkers (Figure 20). Some of the smaller weights may have been used to weigh down a hook when line fishing. The larger stones, up to 10 cm in diameter, would have weighed down the bottom edge of seine nets, while the top edge was held up with wooden floats (Price 1966). Mesh gauges are another artifact associated with netting (see Figure 20, top). These are flat, smoothed, rectangular tablets used in the process of knotting twine into nets or other objects like hammocks or bags (Walker 1992). The tablets are usually 3 to 4 cm wide, but the size can range
Figure 20: Fishing Implements from Île à Rat, Haiti. (top) Net Mesh Gauge; (center) Notched Ceramic Disks; (bottom) Notched Stone Disks.
depending on the purpose of the net being made (i.e. a baitfish net vs. a turtle net). These gauges can be made from wood, conch shell, or turtle bone (Edic 1996). Amerindian net fishing practices were described by the Spanish chroniclers, who recorded the Taino word for net weight—"potala" (Olazagasti 1997:134). Even though conch was a primary resource for Amerindian toolmaking in this region, no columella net sinkers, such as those common in Calusa Indian sites in southwest Florida (Marquardt 1992), have been found.

Coralie lacks definitive physical evidence for both fishhooks and net use. If material evidence was the only means of deciphering procurement techniques, then this interpretation would be limited to the use of wood tipped harpoons to harvest turtles and sting ray spine tipped spears to harvest large fishes and rays.

Inferred Evidence

In order to recreate past procurement technologies employed for hunting and fishing, it is instructive to understand the biology and behavior of the species identified in the faunal remains. By understanding how and where fish live—their eating habits, activity cycles, behavioral patterns and habitat use—the way to capture them becomes clear. Based on the habits and habitats of the fish identified here, multiple techniques must have been utilized, including spearing, hook and line fishing, netting, and/or weiring.

Habitats Exploited. Many habitats were exploited in order to procure the variety of resources seen in the diet at Coralie. Being oriented toward the sea, most of the Taino's subsistence activities took place either in wetlands or along
the coast. There are three primary marine habitats utilized for hunting and fishing practices at this site—the lagoon (North Creek), the turtle grass flats, and the reefs. These can be further subdivided into eight micro-habitats (see Table 10).

Of the marine species identified in the archaeological remains, the lagoon habitat would support rays, some sharks, bonefish, and pufferfish (Böhlke and Chaplin 1993). These species are still present in North Creek, but most abundant in the nearshore waters today are juvenile barracudas and porgies, which are rare in this site. As adults, the only sharks that will enter a shallow lagoon are bull and nurse sharks (Compagno 1988). Nurse sharks were not found in the site, but bull sharks are a possible match for the recovered shark remains. Rays follow their favored prey of crabs and jellyfish into very shallow water, where they could easily be speared. Inland lagoons also sustain clams and a variety of birds such as herons, egrets, and ibises. Salinas, which cover much of the interior of the central and south end of this island, also support ducks and flamingos. Today, flamingos live near the mouth of North Creek, and in the salinas at the island’s southern tip.

Turtle grass (*Thalassia testudinum*) grows today in great beds in the shallow, calm waters surrounding these islands. It is the primary food source for sea turtle, conch, and some species of parrotfish (Randall 1965). At least until the 19th century, green turtles were reported living inside North Creek (Parsons 1962). Therefore, turtle grass beds must have also grown in the calmer waters of this creek in the past. The leeward coast due west of the site supports shallow water turtle grass beds today. This portion of the shelf was
Table 10: Habitats of the Marine Species found at Coralie.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>MANGROVE (North Creek)</th>
<th>LAGOON</th>
<th>GRASS FLATS</th>
<th>DEEP, OPEN WATER</th>
<th>SHALLOWS sandy bottom</th>
<th>SHALLOWS rocky bottom</th>
<th>SHALLOW REEFS</th>
<th>CLEAR, DEEP WATER REEFS</th>
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<tbody>
<tr>
<td>Chelonia mydas</td>
<td>X (juvs)</td>
<td>X</td>
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<td>X</td>
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<td>X (edges)</td>
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<td>Carcharhinus sp.</td>
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<td>Dasyatis americana</td>
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<td>Albula vulpes</td>
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<td>Holocentrus ascensionis</td>
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<td>Epinephelus sp.</td>
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<td>Caranx cryos</td>
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<td>Trachinotus cf. falcatus</td>
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<td>Lutjanus cf. anatis</td>
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<td>X (night)</td>
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<tr>
<td>Lutjanus cf. griseus</td>
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<td>Lutjanus cf. mahogoni</td>
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<td>Haemulon cf. album</td>
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probably exposed during the lowered sea level period between A.D. 500 and 1000, and the edge of the Turks bank would have been very close to shore.

Deep water habitat, supporting pelagic species such as tuna, mackerel, and flyingfish, was not exploited by the Amerindians of Grand Turk. The few pelagic individuals found at Coralie were likely caught with hook and line inshore or in the lagoon. At least two species from the usually deep water Scombridae family (mackerels and tunas) regularly follow prey into very shallow, clear water; these are *Scomberomorus* sp. and *Euthynnus* sp. (Böhlke and Chaplin 1993). Only the former species is known from these waters today. This mackerel spawns in inland waters and is found occasionally in mangrove habitats (Jones 1985).

The open ocean contains many micro-habitats including shallow reefs, deep, clear water reefs, nearshore waters with a hard or rocky substrate, and nearshore waters with a sandy substrate. The shallow reefs support parrotfish, surgeonfish, wrasses, squirrelfish, and porcupinefish. The deep, clear water reefs abound with groupers, snappers, jacks, grunts, and triggerfish (Randall 1968). Certain fishes prefer a rocky bottomed, shallow habitat such as the puddingwife, gray snappers, and chubs. Fishes found in sandy areas are boxfish, pufferfish, porgies, rays, and flounders. One excellent food fish from the wrasse family, which is not present at Coralie but shows up at later Turks and Caicos sites (including GT-2), is the hogfish (*Lachnolaimus maximus*). It replaces the other primarily reef inhabiting wrasses in the diet. This hogfish is found in sandy bottomed inshore environments. This suggests that hook and
line fishing on the reefs was replaced by netting and trapping in the inshore environment in later sites.

Of all the vertebrate and invertebrate individuals collected, 29% (by MNI) were captured on land, 71% in water. Within the marine environment, 37% of the individuals came from the turtle grass flats, 19% from the reefs, 14% from the rocky shore, and 3% from the lagoon. The dominance of the grass flats is gained by the inclusion of invertebrates in this tally. In looking just at fishes, the species are primarily reef dwellers (82% by MNI).

Eating Practices. A study in Polynesia (Kirch and Dye 1979) linked the availability of lagoon habitat with the occurrence of net fishing. Sites near tidal flats or a lagoon contained more herbivorous fishes and fewer fishhooks. Although a large lagoon and flats are adjacent to Coralie and no fishhooks were recovered, herbivorous fishes are rare in these deposits (see Table 11). Only parrotfish, surgeonfish and chubs are strictly herbivorous, subsisting on turtle grass and algae off coral polyps (Randall 1967). These make up 10% of the individuals in the fish assemblage. Green turtles are also mostly herbivorous, living on turtle grass and occasionally feeding on invertebrates (Mortimer 1995).

The carnivorous fishes in this assemblage that can be captured with a baited hook and line are barracudas, sharks, jacks, mackerals, groupers, snappers, and bonefish. These provide 36% of the fish MNI in the site. The remaining species—grunts, porgies, rays, wrasses, squirrelfish, triggerfish, pufferfish, boxfish, porcupinefish, and permits—are omnivorous, subsisting on invertebrates such as crabs and small gastropods. These omnivores commonly
Table 11: Feeding Practices of the Marine Species found at Coralie.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>CARNIVORES</th>
<th>OMNIVORES</th>
<th>HERBIVORES</th>
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<tbody>
<tr>
<td></td>
<td>FISH</td>
<td>INVERTEBRATES</td>
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<tr>
<td>Chelonia mydas</td>
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<td>CRUSTACEANS</td>
<td>JELLYFISH</td>
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<td>Carcharhinus sp.</td>
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<td>Dasyatis americana</td>
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<td>Albula vulpes</td>
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<td>Holocentrus ascensionis</td>
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<td>Epinephelus sp.</td>
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<td>Caranx sp.</td>
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<td>Trachinotus cf. falcatus</td>
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<tr>
<td>Lutjanus sp.</td>
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<td>Haemulon sp.</td>
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<td>Calamus sp.</td>
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<td>Halichoeres radiatus</td>
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<td>Scarus sp.</td>
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<td>Sparisoma sp.</td>
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<tr>
<td>Acanthurus sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cf. Scomberomorus sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bothus lunatus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balistes vetula</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactophyrs sp.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sphoeroides cf. testudineus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diodon cf. hystric</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
reside in more than one habitat and can be captured in various ways (Böhlke and Chaplin 1993). They contribute the majority of the individuals to the fish assemblage with 54% of the total.

**Activity Cycles.** In addition to knowing where and how to capture prey, it is necessary to know when, for it is predictability of behavior that makes an animal susceptible to capture. Rock iguanas bask anywhere from one to five hours a day, depending on the season, and in the same spot each day (Iverson 1979). Some fish, such as certain species of grunts and snappers, spend nights feeding on the flats. At times of dusk and dawn, when they are moving *en masse* between the flats and the reefs, these species are vulnerable to capture by nets (Keegan 1986). It is also this window of time when predators are most active on the reefs, and perhaps most likely to take a baited hook. Some fish species, such as the rainbow parrotfish (*Scarus guacamaia*), are more easily caught at night (Kirch and Dye 1979). The modern Guiana Indians use “a torch at night...to bring certain fish within reach of club or cutlass” (Roth 1924:174). Other nocturnal feeders include sharks, squirrelish, lobsters, and marine and land crabs.

Besides these daily cycles, there are monthly and yearly cycles. Bonefish are seasonally abundant, as are Nassau groupers, which form mass congregations between November and February (Erlich 1975). Lobsters aggregate seasonally due to spawning migrations (A. Williams 1984). The rainy season (Fall on Grand Turk) is the best time of the year for catching land crabs, for hard rains drive them from their burrows. Fishing is unaccountably better around the new and full moons. Taking all this into consideration, subsistence
activities often target one species at a time for a particular period of time, be it a day or a season (Meehan 1983). Strategies include secondary options and a certain amount of opportunistic behavior, but overall there is a planned system behind hunting and gathering, and this is often based on cycles of availability (Shackleton 1983). Additionally, certain edible species can be deliberately not harvested, saved only for very lean times.

The resources harvested on Grand Turk do not point to a strictly seasonal occupation. Abundant and varying resources were available year-round. Even so, late spring/early summer must have been the richest time of the year for these inhabitants. Summer fruits would be coming into season. Nesting turtles and turtle eggs could be harvested. Iguanas congregate in communal nesting areas every June to lay eggs in shallow, sand burrows (Iverson 1979). The Miskito Indians gather the small, white, iguana eggs and consider them a delicacy (Nietschmann 1972). Many of the birds hunted at Coralie were easy prey while nesting. The masked booby's nesting season occurs between February and August, whereas the red-footed boobies lay eggs sometime between August and March (Nelson 1978). The flamingos mate in early March, then build 25 cm high mud mounds on the flats in April that house solitary eggs (Sprunt 1975). Some of the birds in the collection are mainly winter residents, such as the great blue heron and the short-billed dowitcher (Buden 1987). Agricultural fields are prepared in the dry season (February to April on Grand Turk), and crops would have been planted early in the Fall, just before the rainy season arrived. There is indirect evidence for subsistence activities throughout the year at this site.
**Procurement Techniques.** After compiling all the direct and indirect evidence on procurement techniques, Table 12 was completed. Trapping

Table 12: Possible Fish Procurement Technologies used at Coralie.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>HOOK AND LINE FISHING</th>
<th>SPEARS</th>
<th>NETS/WEIRS</th>
<th>TRAPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chelonia mydas</td>
<td></td>
<td>X</td>
<td>X (?)</td>
<td></td>
</tr>
<tr>
<td>Carcharhinus sp.</td>
<td>X (small)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dasyatis americana</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albula vulpes</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Holocentrus ascensionis</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epinephelus sp.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caranx ruber</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Caranx hippos</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caranx cryosos</td>
<td>X (inshore)</td>
<td></td>
<td>X (offshore)</td>
<td></td>
</tr>
<tr>
<td>Trachinotus cf. falcatus</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutjanus analis</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutjanus apodus</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutjanus griseus</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutjanus mahogoni</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemulon album</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemulon flaviolineatum</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Haemulon plumieri</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Haemulon sciurus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calamus sp.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyphosus sectatrix/incisor</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sphyraena barracuda</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bodianus rufus</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halichoeres radiatus</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scarus sp.</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sparisoma sp.</td>
<td>(shallows)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Sparisoma rubripinne</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Acanthurus sp.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>cf. Scomberomorus sp.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bothus lunatus</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Balistes vetula</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactophyrs sp.</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sphoeroides cf. testudineus</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Diodon cf. hystrix</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
becomes very important to Amerindian subsistence later in time, but there is no evidence for it at Coralie. Nearshore, herbivorous species could have been captured in nets, although nets are only an efficient tool if the fish are aggregated. Of the fish identified at Coralie, the species most likely to have been caught in abundance in nets are schooling grunts (*Haemulon flaviolineatum* and *H. plumieri*), snappers (*Lutjanus apodus*), and jacks (*Caranx ruber* and *Caranx cryos*). Jacks are found in the remains in very small numbers, certainly not in the abundance expected from net fishing. However, grunts and snappers are the two most common fishes in the site. These small to medium-sized fishes could have been captured in nets while on route to and from the tidal flats. Alternatively, the use of weirs may account for some of these remains. A weir is a type of fence or corral that blocks off the fish's exit from a creek or pool as the tide shifts.

Nets may have also been used to capture turtles. As late as 1878, green turtles were being harvested in nets from the mouth of North Creek and exported to the commercial New York market (Parsons 1962). Prehistorically, the Miskito turtlers hunted only with harpoons (Nietschmann 1972). Netting turtles is a recent, post-European phenomenon in this region, attempted solely in the dry season when turtles are most abundant. It is apparent that the turtles at the Coralie site were hunted with harpoons, probably wood tipped harpoons, but other techniques like netting may have been simultaneously employed.

Even though the type of fishhook and paraphernalia used is uncertain, many of the fish in the Coralie sample must have been caught with hook and
line technology. Carnivorous fishes, including groupers, jacks, snappers, sharks, barracudas, bonefish, flounders, and mackerels can be taken with a line, as can omnivorous species that mainly eat crustaceans and mollusks. Only the small bodied herbivores, which make up 4% (by MNI) of this assemblage, are unlikely to have been captured by hook and line or spearing.

Location of Turtle Harvests

Age and size calculations for the green turtles in this site aids in reconstructing past population distributions and suggests where the turtles were being harvested. Turtles migrate to different habitats at various life stages (Carr 1995), forming locally available age-graded populations. The density of these congregations is limited only by the availability of forage. Turtles graze one plot of grass then move en masse to another when it is depleted, allowing the first to rejuvenate. This is something akin to the slash and burn techniques of horticulturists (Bjorndal et al. n.d.). Therefore, turtles are obtainable in limited areas, but in vast quantities.

On the second voyage of Columbus, Bernáldez described seeing so many turtles “that it seemed as if the ships would run aground on them, and their shells actually clattered” along the topsides (in Morison 1942:470). This occurred in the Gulf of Batabanó off the southwest coast of Cuba. This region of Cuba was sparsely inhabited at contact, so turtles in this bay had probably met with little human exploitation up to that point. Populations of this density may have only survived outside of the regions where large Taino villages flourished. Jackson (1997) estimates the pre-Columbian turtle population of
the West Indies to have been between 33 and 39 million adults. This figure is meant to describe population numbers before Europeans began harvesting green turtles, but pre-Columbian exploitation is not considered.

Studying the life cycle of green turtles is complicated by their “obscure and wide-ranging movements” (Carr 1980:490), and prolonged juvenile stage, which lasts multiple decades. Sub-adult turtles graze in shallow tidal flats until reaching about 75 cm C.L. (and 30 years of age), at which time they migrate to deeper water feeding grounds. Sexually mature females are between 100 and 110 cm in length, but it takes an estimated 40 to 60 years to reach this stage (Bjorndal and Zug 1995). This extremely slow growth to reproductive age, the aggregating behavior of the populations, and the accessibility of turtle eggs are all factors that make green turtle stocks difficult to sustain.

Little is known about the immediate post-hatchling life stage. Consequently, the time when young turtles grow from 5 to approximately 30 cm C.L. is referred to as the “lost year.” These young turtles are carnivorous and pelagic and Bolten and Balazs (1995) report that the lost “year” in loggerheads can last up to five years. The Coralie site remains did include a complete pleural bone less than 1 cm long that came from a hatchling with a total length of 5 cm. A femur from a second hatchling was also recovered. This indicates that turtle eggs were being raided from a nearby nesting beach.

Nests contain between 75 and 200 eggs, each approximately 5 cm in diameter (Carr 1952:352). The Guiana Indians (Roth 1924) dried mass quantities of turtle eggs over a slow fire. They also extracted turtle egg oil by boiling pots of mashed eggs.
The presence of these hatchlings suggests that this island once supported a nesting population of green turtles and that the few fully adult turtles in the remains were captured while out of the water laying their eggs on a Grand Turk beach. These large females are defenseless during this process and need only to be turned over to be captured. The sex of the turtles from this collection could not be determined from the skeletal remains. There are no historic records of greens ever having nested on Grand Turk, although there are reports of turtle nesting beaches in the Caicos Islands (Sternberg 1981). Nesting beaches are usually on the windward, rough side of an island, where the sand is coarse and the beach has a flat platform above high tide (Carr 1980). The most suitable nesting beaches on the Turks bank are on the eastern shore of Grand Turk.

This capturing method can only account for 15% of the turtles in this collection, because the majority of these remains are from sub-adults. Juveniles between 25 and 35 cm C.L. congregate on shallow tidal flats for the first time and begin to consume turtle grass. Most of the turtles in this collection were being captured in a shallow water grass flat, possibly inside North Creek. The Union Creek lagoon on Great Inagua is similar to North Creek and today supports hundreds of green turtles between 25 and 80 cm (C.L.) long—all sub-adults (Bjorndal and Bolten 1988). If the inhabitants of Coralie were hunting turtles from the lagoon, the settlement location would have been ideal.

One way to ensure turtle supplies is to store them. Even harpooned turtles can be returned to the site and kept alive as a semi-storable resource
for some time; two methods are possible. The first, called the "dry method," entails keeping the turtles on their backs in the shade with their flippers tied up (Babcock 1938). A few buckets of water per day splashed over them keeps them alive for about three weeks; but after a week, meat weight can rapidly decline. Another method, described by early Spanish chroniclers (Lovén 1935), involved the use of corrals or crawls. Turtle crawls are approximately 3 by 3 m enclosures constructed in about 60 cm of water (Nietschmann 1972). Wooden posts are set about 30 cm apart, just close enough so the turtles cannot get through the slats. Turtles fed on mangrove leaves can be kept alive for months in these crawls. When the time comes to dispatch them, it is most easily done by smashing the skull. All the skull remains in the site are badly broken up with the exception of one complete juvenile skull. An ideal place for these corrals would have been in the shallow waters of North Creek on the edge of the site. As sea level is higher today than it was during the occupation of Coralie, corral posts may still be preserved in the peat under the creeks' nearshore waters.

Because of their predictable habits and aggregated populations, turtles are easy to hunt (Parsons 1962). Turtles sleep on shallow coral flats and migrate between feeding and sleeping sites along the same daily route (Carr 1995). Though turtles can hold their breath for 10 to 20 minutes, they must regularly surface to get air. They blow multiple times upon surfacing and can be heard and found before they dive again (Nietschmann 1972). Even in modern times with reduced turtle population densities, 73% of the Miskito turtling trips were successful (Nietschmann 1972).
The one factor that mitigates harvesting pressure on these populations is that turtles tend to migrate. But if suitable forage, water temperatures, and nesting beaches are available in one area, turtles will not leave. Grand Turk may have provided this range of habitats and constant temperatures, enabling a year-round presence of green turtles. All the life cycles of these turtles, except the initial, pelagic phase, are represented in the remains from Coralie. Adult, female turtles were captured while laying eggs on their nesting beach, turtle eggs were gathered, and numerous sub-adults were harvested while feeding in shallow grass flats on the Turks bank or inside North Creek.

Having outlined how the occupants of Coralie obtained the resources of this environment, the following chapter will explore how these hunting, fishing and agricultural practices altered habitats and disrupted certain animal populations. A small group of inhabitants can have a catastrophic effect on a small island such as Grand Turk. The time span where a diet of the abundance seen at Coralie could be obtained is a short one. The relationship between human needs and environmental stability will eventually find a balance, but at a point well below the biological richness these habitats are capable of sustaining.
Zooarchaeological remains from the Coralie site provide evidence for the first utilization of an island fauna that had never been previously harvested, allowing a glimpse of a diet with temporarily unlimited resource choices before overexploitation changed the available menu. These kinds of data are essential as a baseline if later human influences on species are to be evaluated. In this chapter, changes in subsistence over time at Coralie will be discussed, and results will be compared against faunal data from later sites in the region. Through the course of documenting species presence or absence on different islands at different time periods, it becomes possible to pinpoint the timing and direction of changes in species distributions. Overexploitation plays a role in this process. Local extinction can be the result for many of the terrestrial species, and sometimes for the human population as well. Documenting faunal changes within archaeological sites has helped to elucidate the role humans have played, not just in recent times, in the reconfiguration of West Indian fauna.

**Temporal Changes in Fauna at the Coralie Site**

Within the sediments of Coralie, the remains of birds, tortoises, and sea turtles were charted through each time period to recreate harvesting patterns
from the entire occupation. This kind of detailed plotting of species to temporal context was not done for all the remains. For fishes, iguanas, and the invertebrates, two equal-sized samples (ca. 440 bones each) from the earliest and latest contexts were compared to check the density of each species at the beginning of the occupation and at the end after 400 years of exploitation had taken place.

**Terrestrial Resources**

Even though birds make up a small portion of the Taino subsistence at Coralie, they are important indicators of human activity, provoking questions regarding dietary choices, animal introductions, habitat changes, overexploitation, and extinction. Table 13 divides the distribution of bird bones into three occupation phases. Number of specimens found (NISP) was used in this calculation because of the small number of bird bones in the assemblage. The results are comparable since all birds contain the same total number of bones.

Of the birds available on Grand Turk, the Taino’s favorite prey appears to have been boobies. The earliest 8th century occupation produced 95 bird bones; 70% were from two species of boobies. The larger of the two species, the masked booby (*Sula dactylatra*), is more common in the very lowest levels of the deposit than the smaller red-footed booby (*Sula sula*). Booby bones occur in small numbers in the second phase and just two bones came from the last period of occupation (Figure 21).
Table 13: Bird Distributions Through Time at the Coralie Site.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Phase I: 8th century 17 units</th>
<th>Phase 2: AD 800 - 1000 28 units</th>
<th>Phase 3: AD 1000 - 1200 19 units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NISP</td>
<td>NISP by %</td>
<td>NISP</td>
</tr>
<tr>
<td>Sula dactylatra</td>
<td>12</td>
<td>60%</td>
<td>3</td>
</tr>
<tr>
<td>Sula sula</td>
<td>55</td>
<td>84%</td>
<td>3</td>
</tr>
<tr>
<td>Ardea herodias</td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Egretta rufescens</td>
<td>1</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Nyctanassa violacea</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Eudocimus ruber</td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Phoenicopterus ruber</td>
<td>2</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Dendrocygna arborea</td>
<td>13</td>
<td>87%</td>
<td>2</td>
</tr>
<tr>
<td>Pandion haliaetus</td>
<td>2</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Haematopus palliatus</td>
<td>1</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Burhinus bistriatus</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Limnodromus griseus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larus atricilla</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columba leucocephala</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zenaida aurita</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geotrygon chrysa</td>
<td>2</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Amazona leucocephala</td>
<td>5</td>
<td>84%</td>
<td>1</td>
</tr>
<tr>
<td>Amazona sp.</td>
<td>2</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Corvus nasicus</td>
<td>2</td>
<td>1%</td>
<td>10</td>
</tr>
<tr>
<td>Aves</td>
<td>7</td>
<td>6%</td>
<td>43</td>
</tr>
<tr>
<td>TOTALS</td>
<td>95</td>
<td>32%</td>
<td>82</td>
</tr>
</tbody>
</table>
Figure 21: Decline in Number of Boobies through Time at Coralie.

It is likely that a nesting colony was located near the settlement. Boobies nurture a single, slow-growing chick each nesting season (Nelson 1978). Egg harvests coupled with hunting of the adult birds could quickly diminish the number of boobies on this island. The other common bird in the early occupation was the West Indian whistling duck, 87% of these remains were found only in the 8th century deposits. Another large bodied, but rare, bird encountered in the first phase was the flamingo. Lastly, 84% of the Cuban parrot bones found came from the 8th century.

The main change in the second phase is the sudden diversity of bird species. The number of species present more than doubles from the previous century. More bones, 46% of the total, came from this time period, but this is probably due to its larger sample size. In terms of bone density per unit, it is
highest in the 8th century with an average of 5.5 bird bones per unit. Phase 2 averages 4.5 bird bones per unit and in the latest phase only 3 bones per unit. Some of the phase 2 birds are large packages of meat such as the great blue heron, yellow-crowned night heron, osprey, and scarlet ibis, but now small land birds are added to the diet including doves and pigeons, a second species of parrot, thick-knee, and especially crows. Crow is the dominant species in the later half of this occupation. By the last phase going into the 12th century, few large birds are taken at all, only two masked booby bones and one flamingo bone were found in the late deposits. Mostly recovered were crow, doves and pigeons, thick-knees, and small shore birds. After multiple centuries of occupation, there were still some birds for the taking late in this settlement.

Of the bird species identified at the Coralie site, 42% are no longer present on the island (see Table 14). Data for modern distributions discussed below are derived from Bradley (1992), Buden (1987), and Raffaele et al. (1998). The birds that no longer occur on any island in the Turks and Caicos are the two species of parrot, thick-knee, scarlet ibis, and the boobies. Two others, the West Indian whistling duck and Key West quail dove, are gone from the Turks but occur occasionally in the Caicos. The flamingo was extirpated from Grand Turk for most of this century. Recently, a new colony of flamingos has established itself on Grand Turk, although it nests elsewhere.

It is hard to say at what point in the human history of Grand Turk that all these species were eliminated. By the last period of Amerindian occupation at Coralie, the bird bone density is low and restricted to certain species. This
Table 14: Modern Distributions of Avifauna Identified at Coralie.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>TURKS ISLANDS</th>
<th>CAICOS ISLANDS</th>
<th>BAHAMAS</th>
<th>GREATER ANTILLES</th>
<th>LESSER ANTILLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sula dactylatra</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sula sula</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ardea herodias</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Egretta rufescens</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nyctannasa violacea</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Eudocimus ruber</td>
<td></td>
<td></td>
<td>Vagrant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phoenicopterus ruber</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dendrocygna arborea</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pandion haliaetus</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Haematopus palliatus</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burhinus bistriatus</td>
<td></td>
<td></td>
<td>Hispaniola</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limnodromus griseus</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Larus atricilla</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Columba leucocephala</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Zenaida aurita</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Geotrygon chrysia</td>
<td></td>
<td>North Caicos</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazona leucocephala</td>
<td></td>
<td>Gr. Inagua</td>
<td>Cuba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazona sp. (large)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Tyrannus dominicensis</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Corvus nasicus</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Cuba</td>
</tr>
</tbody>
</table>

decline, seen most dramatically in the boobies and the duck, can be accounted for by overhunting. No birds were harvested by the inhabitants of GT-2. It is possible that by the 13th century boobies no longer nested here and that habitat changes eliminated some of the small land birds.

Table 15 shows the less detailed early vs. late sample results, computed by MNI. For the bird remains, this calculation highlights the dramatic drop in the number of boobies harvested over time, and the addition of crow and gull in the late period. This same table shows that for rock iguanas the number of
Table 15: Faunal Remains Comparing Nine Units of Material from an Early Context to Nine Units of Material from a Late Context.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>EARLY CONTEXT</th>
<th>LATE CONTEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MNI</td>
<td>% by MNI</td>
</tr>
<tr>
<td>REPTILES:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelonia mydas</td>
<td>26</td>
<td>6.0%</td>
</tr>
<tr>
<td>Caretta caretta</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Geochelone sp.</td>
<td>2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Cyclura carinata</td>
<td>89</td>
<td>21.0%</td>
</tr>
<tr>
<td>Leiocephalus psammadromus</td>
<td>2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Epicrates chrysogaster</td>
<td>2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>121</td>
<td>28.5%</td>
</tr>
<tr>
<td>BIRDS:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sula sp.</td>
<td>7</td>
<td>1.5%</td>
</tr>
<tr>
<td>Pheonicopterus ruber</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Larus atricilla</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Corvus nasicus</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>8</td>
<td>1.5%</td>
</tr>
<tr>
<td>FISH:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus sp.</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Dasyatis americana</td>
<td>3</td>
<td>0.5%</td>
</tr>
<tr>
<td>Albula vulpes</td>
<td>12</td>
<td>3.0%</td>
</tr>
<tr>
<td>Holocentrus ascensionis</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Epinephelus sp.</td>
<td>19</td>
<td>4.5%</td>
</tr>
<tr>
<td>Caranx sp.</td>
<td>5</td>
<td>1.0%</td>
</tr>
<tr>
<td>Trachinotus cf. falcoatus</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Lutjanus sp.</td>
<td>26</td>
<td>6.0%</td>
</tr>
<tr>
<td>Haemulon sp.</td>
<td>56</td>
<td>13.0%</td>
</tr>
<tr>
<td>Calamus sp.</td>
<td>2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Sphyraena barracuda</td>
<td>4</td>
<td>1.0%</td>
</tr>
<tr>
<td>Bodianus rufus</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Halichoeres radiatus</td>
<td>3</td>
<td>0.5%</td>
</tr>
<tr>
<td>Scorus sp.</td>
<td>5</td>
<td>1.0%</td>
</tr>
<tr>
<td>Sparisoma sp.</td>
<td>6</td>
<td>1.5%</td>
</tr>
<tr>
<td>cf. Scomberomorus sp.</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Bothus lunatus</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Balistes vetula</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Lactophrys sp.</td>
<td>17</td>
<td>4.0%</td>
</tr>
<tr>
<td>Spheeroides cf. testudineus</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Diodon cf. hystrix</td>
<td>1</td>
<td>&lt;</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>164</td>
<td>36.5%</td>
</tr>
<tr>
<td>INVERTEBRATES:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panularis argus</td>
<td>10</td>
<td>2.5%</td>
</tr>
<tr>
<td>Cittarium pica</td>
<td>3</td>
<td>0.5%</td>
</tr>
<tr>
<td>Nerita sp.</td>
<td>9</td>
<td>2.0%</td>
</tr>
<tr>
<td>Strombus gigas</td>
<td>44</td>
<td>10.0%</td>
</tr>
<tr>
<td>Codakia orbicularis</td>
<td>16</td>
<td>4.0%</td>
</tr>
<tr>
<td>Chama sarda</td>
<td>17</td>
<td>4.0%</td>
</tr>
<tr>
<td>Tellina sp.</td>
<td>28</td>
<td>6.5%</td>
</tr>
<tr>
<td>Asaphis deflorata</td>
<td>7</td>
<td>1.5%</td>
</tr>
<tr>
<td>Acanthopleura granulata</td>
<td>3</td>
<td>0.5%</td>
</tr>
<tr>
<td>Echinoida</td>
<td>2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>139</td>
<td>32.0%</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>432</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
individuals taken increases through time by one-third (from 89 to 119). The survivability of the iguana population on Grand Turk is evident throughout the site's occupation, yet there is evidence for changes in the structure of the population being harvested. A site-wide plot was made of all the iguana thoracic vertebrae above a certain size (12 mm height of centrum). These all fell within the 8th and 9th century strata. The larger, old iguanas were harvested early. Although adults continued to be taken, there were none over 1 kg in weight in the later years. The maxillary of the 1 m long specimen came from a deposit 10 to 20 cm below a context with an intercept date of A.D. 890. The size of the iguanas eaten decreases in the late period, but the number of individuals harvested increases in compensation.

Small reptiles, including snakes and curlytail lizards were recovered in the site. They are possibly a non-cultural deposit. However, in the 12th century deposits there were three times as many curlytails as in the earlier deposits. It is difficult to explain this without invoking cultural factors. One species of curlytail (*Leiocephalus cuneus*) from the Lesser Antilles reached a length of 20 cm and was driven to extinction by the Saladoid and Post-Saladoid people (Pregill et al. 1994). These data provide a precedent for the consumption of curlytails. Nevertheless, with the abundance of rock iguanas at Coralie, even late in the occupation, these small curlytails would seem an unnecessary dietary choice.

The tortoises were evidently not a preferred resource, occurring sparingly in the early years of the settlement and frequently in the very latest period of occupation. The sample from just the early and late deposits show tortoise
increasing over time from two to five individuals. In looking at the total sample from all time periods, tortoises occur in nearly equal numbers in phases 1 and 2 and double that amount in the last phase; use was more intensive with time. It is possible that this population of tortoises survived longer than the human occupation of Coralie, but they are not in evidence at the later site of GT-2. The timing of the local extinction of the Grand Turk tortoise is undetermined.

**Marine Resources**

Because the marine environment is less restricted in area than the terrestrial environment, dramatic changes over time are not expected within the marine resources harvested at Coralie. Even so, some changes are evident. Sea turtle remains decrease over time (see Figure 22). The number of MNI drops from 25 in the early period sample to 10 in the later. This is despite the fact that most of the turtle cooking hearths are in the later contexts. Site wide, a total of 50% of the turtle MNI came from 8th century contexts; only 15% came from post-A.D. 1000 contexts. The largest specimens also came from the earlier deposits. Of the 10 adult turtles over 1 m C.L. (or ca. 90 kg), seven of these came from the early phase. The massive loggerhead turtle was also found in the deepest deposit. More turtles and the largest turtles were harvested early. Nesting beaches appear to have been overexploited first. Juveniles under 50 cm C.L. were taken throughout the occupation providing 35% of the total each in phases 1 and 2, and 45% of the total in phase 3. There is some evidence that turtles, especially those over 50 cm long, were becoming rare in the layer years of this occupation.
Within the Coralie site, changes in fish procurement over time were minimal. The largest packages of meat, such as the sharks, barracudas, Scarus parrotfish, and groupers show up more in the earlier contexts. There were fewer lobsters and no barracuda or sharks in the later deposits. Yet, high quality food fishes, especially groupers and snappers, continue to be taken in the later occupations with only slightly lowered yields and individual fish sizes. Bonefish and grunt harvests stayed the same over time. Within the boundaries of the Coralie site, overexploitation of any one fish species, or any great technological change related to procurement, do not seem to have occurred.

When comparing bivalve invertebrates over time in the Coralie remains, the tellins (Tellina sp.) and the gaudy sanguin (Asaphis deflorata) decrease in abundance between the early and late contexts, but the tiger lucine (Codakia orbicularis) stays constant. The harvesting of sanguin is previously unreported.
in the Bahamas, and only one other site in the West Indies has recorded the incorporation of this species into the Amerindian diet. Punta Cana is an A.D. 4th century ceramic-bearing site in southeastern Dominican Republic (Veloz Maggiolo and Caba Fuentes 1996). This site was occupied before the Saladoid/Ostionoid people migrated into Hispaniola. The faunal component here was almost entirely gastropods (marine and terrestrial), but the primary bivalve was gaudy sanguin (Rimoli 1996). This species was twice as common as the second ranking bivalve—tiger lucines.

Tiger lucines live deep within the roots of turtle grasses, whereas tellins and the sanguins burrow in sandy substrata (Colin 1978). These species represent slightly different harvesting locations. The tiger lucines are the most tolerant of all the bivalves of disturbance in their environment, weathering any changes in temperature, salinity or water flow (Jackson 1972). They are possibly more capable of withstanding exploitation, because their numbers often increase over time in deposits. Tiger lucines are the primary bivalve in all later Turks and Caicos sites.

Other changes seen over time in this invertebrate sample are an increase of the number of nerites (9 to 22 MNI) and conch (44 to 88 MNI). The presence of more conch is probably related to the increased number of hearths in the later period and does not represent a diet change. Nerites provide the smallest package of meat of any species in the collection. It may have functioned as emergency food like the donax clam does for the Miskito Indians (Nietschmann 1972), becoming more common as overexploitation of other species occurred. Overall, changes through time of marine species at this site are slight.
To summarize the diet changes within the Coralie deposits, the inhabitants ate the largest sea turtles, iguanas, birds, groupers, snappers, and lobsters at the beginning of their occupation on Grand Turk. The number of turtles harvested decreased in the later period. Juvenile turtles and iguanas were taken in increasing numbers through time. The iguanas sustained their healthy population over many years of predation. Even at the end of the occupation, many iguanas were still being harvested, but no large individuals remained. In the last period, consumption was increased of another large reptile, tortoise. Tortoise was present on the island at the beginning of the occupation but was not a preferred food until late. This contradicts the optimal foraging idea that all the large, terrestrial animals will be harvested first. With birds, the large-bodied species disappeared first. Later, they turned to smaller birds like crows and doves, but eventually these too became rare. Fish harvests remained fairly constant. Some changes are evident over time within the sediments of Coralie, but when these results are compared with data from other sites in the region, much more dramatic differences become apparent.

Comparison of Coralie Results with Other Regional Sites

In addition to the faunal data obtained at Coralie, there are six sites in the Turks and Caicos that have had zooarchaeological samples analyzed—two on Grand Turk, including Coralie (Carlson 1993; Frank 1992), three on Middle Caicos (Carlson 1994a; 1994b; Wing and Scudder 1983), one on Pine Cay, and one on Providenciales (Sullivan 1981; Wing 1987). In the Bahamas,
zooarchaeological data are available from San Salvador, Samana Cay and Crooked Island (deFrance 1991; Wing 1969, 1987).

Table 16 lists the radiocarbon dates obtained from sites, other than Coralie, in the Turks and Caicos Islands to date. When looking at the period of occupation for these sites, 10 out of 16 radiocarbon dates have an intercept date

Table 16: Radiocarbon Dates for Turks and Caicos Sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Laboratory Number</th>
<th>Material</th>
<th>Age - B.P.</th>
<th>Calibrated Intercept</th>
<th>Calibrated Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A.D.</td>
<td>(2 sigma)</td>
</tr>
<tr>
<td>Grand Turk</td>
<td></td>
<td></td>
<td></td>
<td>A.D.</td>
<td></td>
</tr>
<tr>
<td>GT-2</td>
<td>Beta-42983</td>
<td>charcoal</td>
<td>830 +/- 80</td>
<td>A.D. 1215</td>
<td>A.D. 1004-1280</td>
</tr>
<tr>
<td>GT-2</td>
<td>Beta-42985</td>
<td>charcoal</td>
<td>820 +/- 50</td>
<td>A.D. 1219</td>
<td>A.D. 1041-1280</td>
</tr>
<tr>
<td>GT-2</td>
<td>Beta-42984</td>
<td>shell**</td>
<td>1170 +/- 60</td>
<td>A.D. 1252</td>
<td>A.D. 1120-1330</td>
</tr>
<tr>
<td>GT-2</td>
<td>Beta-42986</td>
<td>shell**</td>
<td>1080 +/- 50</td>
<td>A.D. 1307</td>
<td>A.D. 1250-1410</td>
</tr>
<tr>
<td>GT-2</td>
<td>Beta-61150</td>
<td>charcoal</td>
<td>910 +/- 60</td>
<td>A.D. 1070-1154</td>
<td>A.D. 1000-1260</td>
</tr>
<tr>
<td>Middle Caicos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC-6</td>
<td>ISGS-2633</td>
<td>charcoal</td>
<td>450 +/- 70</td>
<td>A.D. 1437</td>
<td>A.D. 1327-1636</td>
</tr>
<tr>
<td>MC-12</td>
<td>Beta-70335</td>
<td>charcoal</td>
<td>950 +/- 60</td>
<td>A.D. 1040</td>
<td>A.D. 990-1230</td>
</tr>
<tr>
<td>MC-12</td>
<td>ISGS-896</td>
<td>charcoal</td>
<td>800 +/- 70</td>
<td>A.D. 1230-1256</td>
<td>A.D. 1030-1280</td>
</tr>
<tr>
<td>MC-12</td>
<td>ISGS-1098</td>
<td>charcoal</td>
<td>680 +/- 70</td>
<td>A.D. 1282</td>
<td>A.D. 1220-1410</td>
</tr>
<tr>
<td>MC-32</td>
<td>Beta-67886</td>
<td>charcoal</td>
<td>660 +/- 50</td>
<td>A.D. 1284</td>
<td>A.D. 1260-1410</td>
</tr>
<tr>
<td>MC-36</td>
<td>Beta-70608</td>
<td>charcoal</td>
<td>740 +/- 80</td>
<td>A.D. 1280</td>
<td>A.D. 1170-1400</td>
</tr>
<tr>
<td>MC-16 (cave)</td>
<td>ISGS-2670</td>
<td>?</td>
<td>820 +/- 70</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Providenciales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-1</td>
<td>ISGS-2632</td>
<td>charcoal</td>
<td>660 +/- 70</td>
<td>A.D. 1284</td>
<td>A.D. 1220-1420</td>
</tr>
<tr>
<td>P-4</td>
<td>Beta-70797</td>
<td>shell**</td>
<td>960 +/- 50</td>
<td>A.D. 1410</td>
<td>A.D. 1320-1460</td>
</tr>
<tr>
<td>P-5</td>
<td>Beta-70798</td>
<td>shell**</td>
<td>1250 +/- 50</td>
<td>A.D. 1170</td>
<td>A.D. 1040-1270</td>
</tr>
<tr>
<td>Pine Cay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC-1</td>
<td>Beta-70799</td>
<td>charcoal</td>
<td>690 +/- 50</td>
<td>A.D. 1290</td>
<td>A.D. 1260-1400</td>
</tr>
<tr>
<td>West Caicos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC-2</td>
<td>Beta-70800</td>
<td>shell**</td>
<td>820 +/- 60</td>
<td>A.D. 1490</td>
<td>A.D. 1420-1630</td>
</tr>
</tbody>
</table>

*Laboratories are Beta Analytic, Inc. and Illinois State Geologic Survey, ISGS dates were provided courtesy of Glen Freimuth and the Caribbean Research Foundation. Dates calibrated using Calib and Display Program, ver. 2.0, University of Washington, 1984. ISGS dates are uncorrected. Beta dates are corrected for C^12/C^13. **Shell dates adjusted for local reservoir effect.
from the 13th century. This period was a time of population increase and settlement division in these islands, especially on the island of Middle Caicos. The faunal assemblages from all these sites show a limited diet in sharp contrast to the finds at Coralie. Resource overuse and depletion had already occurred. One of these later sites occurs on Grand Turk.

**Diet at a Later Grand Turk Site**

The 13th century Governor's Beach site (GT-2) is located behind a wide, flat beach on the southern leeward shore. It has access to coral reefs, inland salinas, beachrock shores, and is just west of “South Wells,” which are now brackish ponds built by the 17th and 18th century Bermudan settlers. It may be significant that the Coralie site is just north of “North Wells,” the other Bermudan period wells on the island. Both sites are within 1 km of these features, suggesting that at one time, these may have been locations that accumulated fresh water.

A different set of resources were harvested at GT-2. Excavations did not find any turtle, tortoise, iguana, large fish, lobster, or birds. The dominant remains were from conch, land crabs and carnivorous, schooling, grunt fishes. In the faunal sample excavated during one year's field season, 78% (by MNI) of the vertebrate diet came from grunts. This intensification of grunt fishing implies the use of a high yield technology such as nets or traps. A preservation bias may be in effect here, for most of the remains are the more durable elements—otoliths, pharyngeal grinders, or teeth. Only 71 vertebrae were recovered, even though all the matrix was fine screened. A second, earlier
sample (ca. A.D. 1100) from another area of the site contained more bony elements, but still only produced grunt and parrotfish remains. There were no differences in the diet results between the early and late sample.

The two known Grand Turk Amerindian settlements briefly overlap in time, and it is curious how different the exploited resources from these sites were. A closer look is needed at the earliest deposits at GT-2 to discern if overexploitation had removed resources such as turtles and iguanas from the area, or if there was a cultural or sociological reason that could account for the change in subsistence choices. The Meillacan inhabitants of GT-2 traveled to this island, probably from Middle Caicos, for the sole purpose of producing shell beads. Laying traps in a shallow reef or netting in the sandy shallows adjacent to the site may have been the easiest way to meet basic subsistence needs while performing their primary task here. At this time on Middle Caicos, these were the common subsistence practices.

The samples from GT-2 match the zooarchaeological profile for all sites from this time period in this region. A diet that relies on a single species of fish and lacks terrestrial fauna is the typical subsistence pattern. The Coralie site, because of its early occupation date, is clearly the exceptional case.

Diet at Caicos Island Sites

Middle Caicos was the most intensively settled island on the Turks and Caicos banks in the Amerindian period. Three sites have had faunal studies completed—MC-6, MC-12 and MC-32 (see Figure 23).
MC-6. The large, contact period settlement of MC-6 exploits an unusual habitat for this region. It is located on the southern, bank side of Middle Caicos just along the elevation for permanently dry land, and adjacent to extensive networks of shallow tidal channels. Its proximity to the large salt producing Armstrong Pond helps explain the location (Sullivan 1981). The north shore and its deeper water habitats are 3 km away. The available resources differ accordingly (Sullivan 1981; Wing and Scudder 1983). Most of the fishes harvested were small, tidal creek or lagoon inhabiting species (42% by MNI). Small bonefish are the most common remains in this assemblage,
which is dominated by carnivorous species (68% by MNI). Many reef species spend their juvenile lives in these shallow tidal flats. Because of its location, very small numbers of invertebrates are present. All the conch remains in this site are tools or the byproducts of tool production.

MC-6 is the only other site in the Bahamian archipelago with significant amounts of sea turtle remains. These were all small, less than 30 cm long (ca. 5 kg in weight), because only these very young juveniles can live in the shallow, tidal flat habitat near this site. The Miskito Indians call these “chicken turtles” and rarely consume them (Neitchmann 1972). In fact, the Miskito will only strike a turtle under 50 kg (ca. 70 cm C.L.) if there is an extreme meat shortage in their village. The Miskitos’ harvesting practices are not a deliberate conservation effort, but rather the result of having to repay the energy costs of traveling to far off turtle grounds with larger turtles. The size of turtles harvested at these archaeological sites is a reflection of the age-grades that were locally available.

MC-6 is also the only other Turks and Caicos site with appreciable rock iguana remains, providing 8% of the vertebrate MNI. Chroniclers reported (Oviedo 1959) that the Taino had great esteem for iguanas as a food source, noting that they were usually reserved for consumption by elites only. There is evidence for social stratification at MC-6 (Sullivan 1981), and perhaps the relative abundance of iguana here is related to the presence of high status individuals in the settlement. Terrestrial species make up 18% of this sample, consisting primarily of crab and iguana with some bird remains and one hutia bone.
Hutia has been identified at 50% of the archaeological sites excavated to date in the Bahamas (Wing 1993). It usually occurs in very low densities, providing less than 1% of the MNI. Of the seven sites in the Turks and Caicos with analyzed faunal remains, two have produced hutia bones, with one MNI each coming from MC-6 and P-1 on Providenciales (Sullivan 1981; Wing and Scudder 1983). It is possible that the Amerindian populations moved this species between the islands for their own use. Hutias are not known today from any Turks or Caicos island, nor from any paleontological excavation here. The solely archaeological context of hutia bones in the Turks and Caicos Islands is possible evidence for a post-13th century human introduction, or perhaps their use as a trade item. If people had tended them, they may not have survived here beyond the Taino occupation.

**MC-12.** The site of MC-12 is located about 80 m from the present northern shoreline of the island. A faunal sample taken from the 13th century deposits showed a reliance on crab and fish (Wing and Scudder 1983). Of those fish species, 72% (by MNI) are omnivorous and 58% are small parrotfish. Late period sites in the Bahamian archipelago typically show fishing activities focused on herbivorous and omnivorous inhabitants of the shallow reefs, particularly the spotlight parrotfish (*Sparisoma viride*). Spotlight parrotfish eat sea grasses near shallow water reefs, and scrap algae and polyps from coral and rock (Erlich 1975; Randall 1965, 1967). They cannot be taken in a predictable manner by hook and line. They are diurnal and travel in loose aggregations with surgeonfish and blue tangs (*Acanthurus* spp.), but do not school in large numbers (Böhlke and Chaplin 1993).
The use of fish traps in inshore, marine habitats will result in a mix of captured species dominated by parrotfish (*Sparisoma* sp.), snappers, and grunts. (Keegan 1986). However, grunts will be more common in traps set in reef environments (i.e. GT-2), while parrotfish will dominate traps set in tidal flat environments (i.e. MC-12). The size range of trapped fish is limited, with neither the very large or the very small being restrained. The MC-12 parrotfish vertebrae had a uniform size range between 4 and 8 mm. Wing (1969) reports a similar size clustering in the fish sample from Palmetto Grove on San Salvador. At all the later Bahamian sites, traps appear to be the primary capturing technique (Wing 1987). Small parrotfish (*Sparisoma* sp.) can provide up to 70% of the fish remains in a typical later period Bahamian site (Berman 1994; Wing 1969; Winter and Wing 1995). At Coralie, where no trapping is evidenced, small parrotfish contribute only 2% of the fish MNI.

Terrestrial remains at MC-12 include a few iguanas (2% of the MNI), one bird from the gull family, a domesticated dog and fragments of human bone. One of the human limb bones, a small section of tibia, was heavily charred. Caribbean inhabitants kept dogs since Early Saladoid times (Wing 1993). Their remains are mostly encountered in burials. Dogs are known to be excellent hunting aids for small terrestrial prey and today the Miskito Indians (Nietschmann 1972:33) use them to kill iguanas and tortoises. Dogs would have greatly increased the rate of overexploitation for these species and for small ground birds. No remains of the domesticated Amerindian dog were found on Grand Turk.
A faunal sample was analyzed from 11th century contexts at MC-12 (Carlson 1994b). This is the earliest radiocarbon date and faunal sample from Middle Caicos. The remains were identical to those of the later period, suggesting that the island had sustained a human occupation for some time before this date. Sullivan (1981) hypothesized an initial colonization date of A.D. 700 for Middle Caicos. No Ostionan pottery has been found on this island. Meillacan pottery first appears around A.D. 800 and the Meillacan people were probably the first to colonize Middle Caicos. Sometime between A.D. 800 and 1000, this island was settled and the available fauna depleted. An initial colonization period site, with rich terrestrial faunal remains, has yet to be identified and excavated here.

MC-32. Located approximately 2 km due east of MC-12, and adjacent to a small tidal creek, is the site of MC-32. Faunal materials are dense and well preserved at this site (see Carlson 1994a). One sea turtle (cf. Caretta caretta) scapula was found, but over 90% of the remains are from fish. Silversides (Atherinomorus stipes), small schooling fishes about the size of a herring, are the most common species; 50% of the fish vertebra centraums in this collection measured less than 2 mm across. Small parrotfishes (Sparisoma spp.) are the second most common species. Traps could have procured the parrotfish, but the small silversides must have been captured with a very fine mesh net. It is not uncommon at later sites for the remains to be dominated by fish weighing less than 100 g (Wing 1998), but fine mesh screening techniques are necessary to recover them. The extensive fine mesh excavations at GT-2 did not produce
an abundance of small fish. Only ¼” screening was used at the other Middle Caicos sites.

Invertebrate use at MC-32 is dominated by the tiger lucine, which provides 60% of the MNI. Nerites rank second with 19%, and conch makes up 17% of the remaining individuals. Temporal analysis indicates a switch from a predominance of conch in the early years to one of clams and nerite snails later. Two-thirds of the conch occurs in the lower third of the excavation; 81% of the tiger lucines and 70% of the nerites occur in the top half of the excavation. The average length of the conchs is only 12 cm, mostly immature “rollers.” The resources of this 13th century site appear depleted.

One other site on Middle Caicos has been dated but not yet excavated—MC-36. It is contemporaneous with MC-32 and has a coastal location similar to MC-12. The faunal remains should resemble those at these two sites.

**Pine Cay and Providenciales.** The only other islands in the Caicos chain with analyzed faunal remains are Pine Cay and Providenciales. PC-1 on Pine Cay is adjacent to a deep water channel on the bank side of the island (Keegan 1986). Large bonefish, porgies, and snappers dominate the sample; 69% of the fish are carnivorous (Wing 1987). The large size of the fish is due to the depth of the lagoon in front of the site. Crab remains are few (4% by MNI), with the remaining bones all belonging to fish. The invertebrate percentages are 50% conch, 30% tiger lucine, 7% nerite, and 4% chiton. This is exactly the same as found at MC-6. MC-6 and PC-1 share many traits because of their similar locations and reduced dependence on reef resources.
No iguana remains were found in PC-1. Yet in 1973, this small island (3 km$^2$) had a rock iguana population that was estimated at 15,000 and a population density of 120 individuals per hectare (Iverson 1979). This equates to 22 kg of meat per hectare. Suitable available forage is the only limiting factor in terms of population size and density for these animals (Auffenberg 1975). If rock iguanas flourished on Pine Cay in the 13th century, they would have been hunted and consumed. I can only assume that they were overexploited in the past, then rebounded in the post-Amerindian period. By 1978, the iguanas of Pine Cay were all eliminated through development, habitat reduction and introduced cats and dogs (Iverson 1978). Even with very large populations, iguanas are vulnerable to localized extinction.

The site of P-1 is located on the southeastern point of Providenciales. Sullivan (1981) reports 27 species at this site with 4% (by weight) being terrestrial fauna. There was one MNI each of hutia and iguana. Of the fish remains, 40% are carnivorous and 28% are reef omnivores, with parrotfish and snappers dominating the sample (with 17% each). Outside of Middle Caicos, the marine environment had suffered less intensive exploitation by the 13th century.

To conclude, from a dietary point of view, bird, iguana, or sea turtle did not make much of a contribution at these later Turks and Caicos sites. The most common diet is one that exploited conch and small invertebrates, and targeted various fish species through trapping and netting. Only at MC-12, the site with the longest occupation, does stoplight parrotfish dominate the remains. Carnivorous fishes outnumber herbivores in most Turks and Caicos
sites. Caicos island faunal sets show a reliance on fish and parrotfish, but not to the extreme extent that is seen at many Bahamian sites.

**Diet at Other Bahamian Sites**

Faunal remains have been analyzed from sites on Crooked Island, Samana Cay and San Salvador (Figure 24). The dates for these sites range from early Ostionan (Three Dog site, SS-21) to the contact period (Palmetto Grove, SS-2). Palmetto Grove has the largest biosample in this region, but only \( \frac{3}{8} \)" mesh was used to collect the remains. Most of the sites excavated in the Bahamas to date have insufficient sample sizes and poor faunal preservation, from which conclusions are necessarily tentative.

**Crooked.** The faunal analysis from the site of CK-8 (Major's Landing) on Crooked Island consists of one fine mesh screened level from a single 1 m unit

![Figure 24: Bahamian Archaeological Sites with Completed Faunal Studies.](image-url)
(deFrance 1991; Wing 1987). The small, but rich, sample was densely packed with bone producing 1100 identifiable bones and another 3900 UID fish bones. It contained the most hutias ever found at a Bahamian archaeological site (27% by NISP/11% by MNI). Of nine bird bones recovered, only one was further identified to *Sula* sp. No iguana was found.

CR-14, the site of Pittstown Landing, produced a representative sample from a test unit column sample (deFrance 1991) containing over 5000 vertebrate and invertebrate remains, including crocodile. Here, 3% (by MNI) of the fauna was hutia, but the majority were fish (89%). Some large fish, especially groupers, came from the earlier levels, with one specimen having an estimated live weight of 6.5 kg. In the later levels, few hutia remained and evidence for trapping reef omnivores was increasing. Parrotfish, surgeonfish, and triggerfish, averaging 500 g each, made up the majority of the later sample.

Rainey excavated an archaeological midden on Crooked Island in 1933-34, and the material, subsequently reported by Olson and Hilgartner (1982), contained bird species similar to those found on Grand Turk including osprey, crow, parrot, booby, pigeon, and ibis. Of these, crow, parrot, and ibis are locally extinct. Two species of petrels (*Pterodroma* spp.) and the Audubon's shearwater (*Puffinus lherminieri*) also came out of Rainey's excavation, indicating that these oceanic species must have nested in these islands in the past. With excellent preservation, abundant remains, and interesting species found to date, further work at Crooked Island sites may yield corroborating
data to Coralie, with unadulterated, early period fauna and subsequent changes at later sites due to human exploitation.

**Samana Cay.** A change in subsistence is evident at the site of SM-7 on Samana Cay. The diet below 20 cmbs in the excavations was a reef omnivore dominated (80% by MNI) strategy (Wing 1987). The levels above 20 cmbs contained 81% small herrings, tunas, and UID fish, with an average body weight of less than 15 g. If many units were sampled and all produced these results, it would seem that the inhabitants had truly hit the bottom of the subsistence barrel, where heavy reliance on baitfish was necessitated.

**San Salvador.** Three sites from San Salvador have published zooarchaeological reports, Palmetto Grove (SS-2) (Wing 1969), Three Dog (SS-21) (Berman 1994), and Minnis-Ward (SS-9) (Winter and Wing 1995). Taken together, the San Salvador vertebrate remains averaged 95% fish. The inhabitants relied heavily on spotlight parrotfish (*Sparisoma viride*), which provided on average 65% of the total fish remains. The extreme focus on one species suggests an intensive use of one procurement strategy, such as trapping.

One kind of intensification effort that developed late in Remote Oceania was aquaculture. The Polynesians built seawalls on the flats and tended a few species of fish, particularly mullets and milkfish (Kirch 1990). There is no direct documented evidence of this practice in the West Indies, but grass flat inhabitants could have been corralled and managed. Certain species of parrotfish live primarily on the grass flats and for all parrotfish, sea grasses make up a substantial percentage of their diet.
The Lucayans of San Salvador were relying on fish almost exclusively for their diet, which implies a lack of terrestrial species and marine mammals on or near this island. The only evidence of these species is a few MNI of sea turtle from the Minnis-Ward site (Winter and Wing 1995), and scant remains (.2% by MNI) of rock iguana (*Cyclura rileyi*) at the Palmetto Grove site (Wing 1969).

The Three Dog site has radiocarbon dates from the 7th and 8th centuries and may have been the first human occupation on this island (Berman and Gnivecki 1995), yet the diet does not look like an initial colonization period site. The faunal remains are identical to the other two sites from this island. Bone samples from Three Dog have been small, so further sampling of the deepest, earliest deposits may reveal a more diverse fauna.

The question remains whether the San Salvador data sets accurately represent the vertebrate dietary intake, or whether a preservation bias has skewed the results. Mouthparts of the parrotfish are very durable, but so are fish otoliths from grunts and bonefish, and these are not abundant in the remains. If this parrotfish was truly as dominant in the diet as the remains suggest, overexploitation may have forced the reliance on this one species. Palmetto Grove is a contact period site, and perhaps the reef was not supporting the diversity of fish it once had after centuries of use. The size of the fish from Minnis-Ward (Winter and Wing 1995) was, on average, only 235 g, further pointing to a depleted marine environment.

Fringing reefs are such rich, seemingly sustainable ecosystems that overuse of this habitat is hard to imagine, but archaeological data can provide
evidence for the unimaginable. The diet revealed in sites on San Salvador and Samana Cay was focused on shallow reef omnivores, and regularly relied on harvesting of very small fishes. This may be an accurate reflection of what was left on the reef after years of intensive exploitation. The careful excavation and analysis of multi-site faunal remains can provide answers to the questions of where, when, and perhaps why subsistence change happened in this region.

Overexploitation and Extinction

The Coralie site provides data for one aspect of the overexploitation issue—initial human impact to a habitat after colonization. Charting overexploitation requires databases that range many time periods. Paleontological excavations can provide the list of available resources on an island before the introduction of humans. Initial colonization period sites can show which resources were preferred, and later sites in the same habitat can show the results of sustained human predation. There are many examples in the Caribbean of human-caused extinctions, some of which can be correlated to the Amerindian occupation (Morgan and Woods 1986; Steadman et al. 1984). The following section explores various reasons for diet change, addresses how overexploitation is recognizable in the archaeological record, and discusses the role humans have played in West Indian extinctions.

Explanations of Diet Change

One of the governing anthropological theories attempting to explain subsistence change is that of “optimal foraging” (Winterhalder 1987;
Winterhalder and Smith 1981). This theory has as its central premise the idea that human overexploitation of prey species is an inevitable occurrence. Its tenets profess to predict how the diet will change in response to reduced availability of resources. On small island environments, terrestrial animals will decline rapidly. The breadth of the original diet will then start to expand because the preferred items, those with the lowest cost and highest return, are becoming harder to acquire. Later, the harvesting of some foods will be intensified by adopting a technological change. The later period West Indian diet conforms to these predictions with 1) few marine mammals or terrestrial species, 2) more conch, fish, and a variety of small packages of meat such as bivalves and rocky shore invertebrates, and 3) intensified harvests of a few targeted species of fish. Could this late period subsistence regime be the result of factors other than overexploitation?

There are multiple explanations for why subsistence menus shift, including domestication, population replacement, socio-political changes within a population, technological development, and changes in human preferences. When domestication occurs, species diversity in the diet can plummet. This is seen on Hispaniola before and after contact. At the Taino site of En Bas Saline (1250-1500), 130 species of vertebrates and invertebrates were identified; while at Puerto Real, a European town founded in 1503, 10 species were identified, mostly domesticated pigs and cattle (Wing 1989). This situation may, coincidentally, allow certain native species to recover as hunting pressures are removed. Alternately, an extreme lowering of dietary diversity can occur when the environment is in a state of radical decay (Cohen 1977).
This may be the case on San Salvador. Barring natural catastrophes, the decay is usually caused by humans. Apart from these extreme cases, at most Amerindian sites, including Coralie, we are looking at a more subtle shifting of resources, where diversity within a certain classes of animals, or within vertebrates in general, decreases, but another resource is added to the diet.

Diets can shift due to changes within the human population, rather than changes in the animal population (Hill 1977; Johnson and Earle 1987). This is most evident when one cultural group replaces another (Rouse 1986). New human migrations into already inhabited environments can be accompanied by sudden changes in subsistence remains, but a sudden change in material remains, such as the pottery style, will simultaneously occur. This is the case for the settlement of GT-2 on Grand Turk.

The classic case in West Indian archaeology where sudden changes in diet and material remains were mistakenly interpreted as a new migration was in the "crab/shell dichotomy" debate. This dichotomy describes the boundary between the Saladoid and Ostionoid periods. Rainey (1940) proposed a population replacement to explain the sudden shift from crab remains and fancy pottery to mollusk remains and plain pottery. It was a reasonable assumption, but upon closer inspection the shift was found to be the result of gradual, internal, developmental forces (deFrance 1989). Other reasons were sought to explain the sudden change in subsistence remains (Carbone 1980; Goodwin 1979; Jones 1985; Keegan 1989). An increase in social complexity occurs at this same time period (Curet 1996), as do certain technological innovations. It is debated what specifically caused the cultural changes seen
in the Early Ostionoid, but a changing relationship between the Late Saladoid people and their environment may have been a key factor.

Diets can change due to simple human preference for one food over another. It is possible to hypothesize the desirability of different fishes to Taino tastes by noting changes in species over time. Rays, trunkfish, surgeonfish, porcupinefish, and pufferfish, for example, are not eaten today by the local Turks and Caicos fishermen (Sullivan 1981). These last two species contain highly toxic secretions, which the Taino undoubtedly knew about, and either utilized, or knew how to avoid for safe consumption. Part of the porcupinefish mouth was worked into ornamental pieces (Keegan 1999; Winter and Stipp 1983), and may be an indication that this species was especially venerated. The poisonous pufferfish abound in eastern tropical Pacific sites of Central America (Cooke 1992). Some changes in consumption of different species over time is culturally, not environmentally, conditioned. Archaeological evidence to support diet change due to human preference is rare. This explanation can only be proposed if overexploitation is ruled out first.

**Zooarchaeological Evidence of Overexploitation**

Overexploitation is recognized in the archaeological record in three ways—1) a decrease in species' harvests over time, 2) a decrease in the size of individual animals over time, or 3) an increase in the number of juveniles harvested (deFrance 1989). When a decrease in the harvesting of certain species is seen, overhunting is assumed to have lowered the population density of that species. This is a gradual process with the result being either the
eventual disappearance of the species through extirpation, or a failure to consume it because of the high costs of locating increasingly rare individuals (Winterhalder and Smith 1981). If an archaeological site had many species of birds in the lowest level of a continuous stratigraphy, and these birds decrease in abundance over time, you could assume that they were overexploited by the human population. This is the case for the boobies of Grand Turk.

When a decrease in the average size of individuals in a population is seen, humans are assumed to be the cause, at least when there are no other large predators in the environment (Wing 1993). The larger individuals are selected over smaller ones, and through time the overall size of the individuals within a population is reduced due to resulting genetic change. Documentation of this process is rare in the archaeological record. This scenario occurred with a population of hutia on Puerto Rico (Wing 1993), where two size classes within a single species resulted from human selection within a managed population. This may have happened within the iguana population on Grand Turk, due to the continuous removal of the largest individuals from the gene pool.

Many sites contain a high number of juveniles within the harvested populations. One case where the disproportionate presence of juveniles does not necessarily equate with overexploitation of adults concerns Queen conch. Juvenile conchs are regularly overrepresented in site deposits (see MC-32 and Île à Rat, Haiti), reflecting more than the natural 3:1 proportion of rollers to adults in the nearshore grass flat populations (Keegan 1985). The meat of juvenile roller conchs, though a smaller portion, is much more tender than adults and may be preferable because of palatability. Small rollers are also
more likely to be carried to a site and deposited in a midden, so a deposition bias may apply. This practice, though it may not have been instigated by overexploitation would over time result in it.

Another example concerns oryzomyine rodents. These animals respond to concentrated predation by increasing their rate of reproduction. Because of this, they are ultimately less susceptible to human overexploitation (Wing 1995).

The natural proportion of juveniles in rock iguana populations is at least 3:1. This is not surprising when you consider the juvenile growth rate of *Cyclura carinata*, which is the slowest among all the lizard species. Adulthood is reached around age seven. In areas of optimal iguana habitat, this proportion may increase to 4:1. This was the harvesting ratio found at Coralie. Iverson (1979) reported three plant species to be primary in juvenile rock iguana diets. One of these, black torch (*Erithalis frutiosa*), was identified in the Coralie paleobotanical samples (L. Newsom: personal communication). The Grand Turk habitat may have been ideal for the increased survivorship of the juvenile population. In these cases, the high proportion of juveniles in the site may accurately reflect the proportion in the wild.

Within Coralie there is evidence for overexploitation in the form of changing distributions of birds, the lack of large iguanas and turtles in the later occupation, and increasing harvests of tortoise through time. Some of these practices may have led to local extinctions, for very few of the staple foods in this diet still inhabit this region.
Extinctions in the West Indies

Work on bird extinctions in Remote Oceania (Steadman 1993, 1995; Kirch et al. 1992) shows that by the time of European expansion, most of these island bird populations had already been decimated by the native inhabitants. This same scenario is likely to be true for the West Indies. Olson and Hilgartner (1982) found that 50% of the avifauna from an Early Holocene cave on New Providence are now locally extinct, and 40% no longer inhabit the Bahamian archipelago. Morgan and Woods (1986) report that 88% of the known Greater Antillean mammals are now globally extinct. West Indian faunal populations as they exist today are relics, made up of isolated species with limited distributions, but in the past these islands supported numerous and various species. What is certain is that sometime between the Late Pleistocene and the present, a massive extinction event took place in the West Indies. At issue is how much natural environmental changes played a role in these extinction processes (Martin and Klein 1984; Pregill and Olson 1981), and how much was the result of human activities.

Morgan and Woods (1986) concluded that natural immigration events for mammals in the West Indies were rare, with only 13 dispersals being necessary to account for the 76 species of mammals that once inhabited the West Indies. This means that even though islands are isolated and immigration events rare, species can still abound in these locales, if given sufficient time to radiate into all the available niches within an ecosystem. Morgan and Woods found little evidence linking species disappearance to natural, background extinctions. Steadman et al. (1991), from work in the Galápagos, similarly found a very low
natural extinction rate, where only three in 34 extinctions could not be
definitely traced to human activity. A range of species did not fail to arrive and
disperse through these islands, although they did fail to endure. Data from
archaeological sites are perfectly suited to try to answer the question of
whether climate or humans played more of a role in this scenario.

Climate-caused Extinctions. The most dramatic recent change in global
environmental conditions occurred at the end of the last Ice Age, when sea level
began to rise and the climate went from cool and dry to hot and wet (Imbrie et
al. 1983; van der Hammen 1974). As the Caribbean was unpopulated 10,000
years ago, any extinctions traceable to this time period would have been
environmentally induced. Especially in the Bahamas, island size and the
available habitat for terrestrial fauna were drastically reduced from rising sea
levels (Bloom 1983).

Paleontological excavations have been conducted mostly in the northern
Bahamian islands, specifically on Abaco, New Providence, Andros, the Exumas,
Cat Island and San Salvador (Brodkorb 1959; Morgan 1989; Olson 1982;
Olson et al. 1990; Wetmore 1938). The evidence for climate-caused extinctions
in this region have come mostly from the Banana Hole cave deposit on New
Providence (Brodkorb 1959; Morgan 1989; Pregill and Olson 1981; Pregill
1982), which produced 16 species of regionally extinct birds, and had a 20%
local extinction rate for reptiles. The collection is dominated by dry-adapted
species such as thick-knee, Bahamas mockingbird, crow and burrowing owl,
rock iguana, curlytail lizard, tortoise and hutia. Pregill and Olson (1981)
hypothesized that these animals did not survive the shift to a hotter, wetter
climate, with the extinctions targeting species more adapted to dry habitats.

Five of the species used in Pregill and Olson's argument are present in the diet of the early inhabitants of Coralie. On Grand Turk, the role of human exploitation in the decline of these species is clear.

This evidence does not rule out climate changes as a force in West Indian faunal extinctions. Some species are vulnerable both to exploitation by humans and to climate changes. Large tortoises (Geochelone sp.) require an arid climate and no human interference to survive. The three largest meat-eating Bahamian birds, which are now extinct, were the caracara (Polyborus creightonii), a gigantic hawk (Titanohierax sp.), and a 90-cm-tall owl (Tyto pollens). Their primary food source was the Bahamian hutia (Geocapromys ingrahami), which makes up the vast majority of bones in paleontological cave deposits in the northern Bahamas (Morgan 1989). It is hypothesized that these birds went extinct in response to changes in the hutia populations. But it is not certain whether the hutia's range shrank because of climate changes and habitat loss, or from human predation and the introduction of dogs. It is possible that climate changes did reduce certain species' range, particularly the dry-adapted thick-knees and tortoises. For many species, in the end, it was humans and human hunting pressure that ultimately caused their extinction.

Pregill and Olson (1981) do concede that reptiles are more subject to the effects of climate changes than birds, yet overall, birds have suffered more extinctions in the West Indian Holocene. Morgan (1989) points out that only the largest reptiles (tortoise, iguana, crocodile) have suffered great population decreases. These are also the animals most likely to be harvested by humans.
The way the extinction process targeted certain species, ignoring small reptiles, invertebrates, and much of the flora, in favor of mammals, birds and large reptiles forces further doubt upon the primary importance of climate change in this process.

Human-caused Extinctions. Martin (1990) first presented the "overkill model" in 1958, to account for the mass extinction event seen in North America at 11,000 B.P. affecting large bodied (>44 kg) mammals, especially mammoths, sloths, mountain goats, and large cats. This hypothesis proposes that waves of extinctions followed the spread of humans throughout the world. In North America, two major events coincided—a period of global warming was coupled with the first incursion of humans into the Americas. Because oceanic islands were the last outposts of initial human colonization, studies here are well suited to distinguish between these two forces and their relative contribution to animal extinctions (Martin and Klein 1984; Martin and Steadman 1999; Steadman 1995). Pleistocene age fauna in archaeological sites on islands is excellent evidence in support of the human overkill hypothesis.

Extinctions that have occurred since the time of human occupation in the West Indian islands, approximately 6000 years ago, are related to human activities. Some extinctions occurred after European contact. All eight species of West Indian oryzomyine rodents are extinct today because of interspecific competition with the introduced European variety of rat (Rattus rattus) (Morgan and Woods 1986). However, Morgan and Woods (1986) point the finger at Amerindian populations for other mammalian losses. The earliest inhabitants of the Greater Antilles were hunters and gatherers of wild foods, and were
probably responsible for the extinctions of monkey and sloth. An endemic species of Ceboid monkey lived on Jamaica (Williams and Koopman 1952), but it has not been found in Holocene contexts. There are potential Amerindian contexts for two species of monkey from Hispaniola and Cuba (Morgan and Woods 1986). Sloths lived throughout Cuba, Hispaniola and Puerto Rico, and two sites from Hispaniola show inconclusive overlaps between two genera of sloth bones and human remains (Miller 1929; Veloz Maggiolo and Ortega 1976). The sites date to 1900 B.C. and 800 B.C. respectively.

The people of the Archaic period settled in the West Indies after 4000 B.P. The ensuing habitat changes from arboriculture and small-scale gardening (Newsom 1993), plus increased levels of hunting and trapping of animals, would have caused further shifts in the distribution of species. The Archaic period site of El Porvenir, Dominican Republic, reportedly had remains of sea turtle, crocodile, manatee, and whale (Veloz Maggiolo and Ortega 1976). Hunting and fishing skills were highly developed and a vital part of the Archaic subsistence regime.

Steadman et al. (1984) found evidence for Amerindian-caused extinctions at the Burma Quarry site on the island of Antigua. The authors reported nine small vertebrate species that suffered prehistoric extinction, and three that went extinct historically. These 12 species comprised 1/3 of the entire assemblage. The remarkable thing about this study is the time period for these prehistoric extinctions, which links the losses to the Archaic inhabitants of the 2nd millennium B.C. This study implies that fauna from even the earliest Saladoid settlements still are not presenting us with subsistence
choices made from pristine ecosystems. Humans had caused the extinctions of certain bird species, at least on Antigua, before the Saladoid migration had even begun.

The diet of a typical Saladoid period site contains an abundance of land crab, fish, rice rats, and some land birds (deFrance 1988; Reitz 1994; Wing 1995). The prevalence of terrestrial fauna, in itself, does not indicate an unexploited environment. Rat consumption increases over time at Saladoid period sites (Wing 1995). This animal was probably never considered a preferred food. On the island of Mangaia in Remote Oceania, rats were added to the diet late, only after other subsistence options were strained (Kirch 1997). The birds exploited for food during the Saladoid period were mostly columbids, shearwaters, and rails. Doves and pigeons (the columbids) are particularly dominant in Saladoid and Post-Saladoid remains, not uncommonly making up 90% of the avifaunal collections (deFrance 1988; Reis and Steadman n.d.; Maíz 1996; Wing 1995). In most cases, the Saladoid period sites in the Lesser Antilles were not initial settlements, and the diets consumed were constructed from degraded environments.

The Bahamian archipelago provides a set of islands with a short period of human occupation, only about 1300 years. In much of the rest of the West Indies, exploitation of these environments had been ongoing for up to six millennia. The task of tracing diet changes was made possible on Grand Turk because of this short time scale of occupation, the small size of this island, and because the Turks and Caicos are well surveyed and many of its sites have been dated and excavated. The multi-scale data necessary to undertake a
study such as this one is not available in most areas of the West Indies to date (for an exception see the Tutu site, St. Thomas, Righter n.d.). The principles illustrated at Coralie that condition the overuse of environments are applicable to all island settlements, and it must be assumed that unless a site represents the first occupation of an island, we will be looking at overexploited faunal sets.

When it came time for the Saladoid/Ostionoid people to expand out of Puerto Rico, the large islands of the Greater Antilles offered them more overexploited environments, but the Bahamian archipelago was different. These islands had vast amounts of pristine resources such as sea turtles, conchs, iguanas, hutias, crocodiles, manatees, monk seals, whales, tortoises, seabirds and landbirds, and extensive coral reefs. This factor must have conditioned migration decisions. In the following chapter I consider Ostionan period sites, how they differed in diet from Coralie, and explore how the settlement on Grand Turk came to happen.
CHAPTER 8
ISSUES OF COLONIZATION AND THE SETTLEMENT OF GRAND TURK

These last few chapters have focused on animal populations of certain West Indian islands, particularly Grand Turk, and how human contact changed them. Archaeological studies require contemplation of the situation from the reverse point of view, inquiring into the effects of resource depletion and insularity on the human population. How does island life influence human culture (Patton 1996), and how do people respond to changes in their environment? The relationship between island ecosystems and humans can be studied from both an anthropological and a biogeographical perspective. In this final chapter, the focus turns to the people who settled this remote island.

The occupation on Grand Turk provokes questions regarding how the settlement functioned, why this island was colonized when it was, and how these events fit in with the larger picture of population movements in the West Indies. Trying to decipher how and why humans settle an island is one of the key issues in any archaeological island study. Certain general principles govern the decision-making processes of colonization. Cross-cultural examples will be explored to understand the mechanisms of colonization in this region.

In keeping with the subsistence focus of this dissertation, we will compare available faunal data at contemporaneous Ostionan period sites from Puerto Rico, Hispaniola, and Jamaica to see what different resources Grand
Turk had to offer colonists at this time. It is clear that the animal resources on Grand Turk were the reason for its initial settlement. But the way that settlement progressed, and how the colonization of Grand Turk relates to West Indian prehistory, particularly the Ostionoid expansion, must still be explored.

**Principles Governing Colonization Decisions**

Why people decide to move from their homes and establish a new settlement is a question many researchers have attempted to answer, citing forces such as external aggression, political ambition, the search for new resources, environmental decay, and overpopulation (Kirch 1995; Sears and Sullivan 1976; Siegel 1992; Veloz Maggiolo 1976, 1977). Often multiple forces work together to instigate colonization decisions. Ultimately, the impetus for new settlements is that the quality of life is lowered to a point where villages either must pick up and resettle, or fission into separate, smaller settlements. Nietschmann (1972) reported that when conditions got bad in a Miskito village, the leader suggested that people move. The circumstances that cause larger-scale population movements may be multifaceted and more complex, yet at their core, the quality of life is not maintained and a percentage of the population are forced to leave.

Not just anybody can go out and colonize an oceanic island. Certain conditions must already be in place within the society. The most important predictive factor is that the likely colonizers will be from a fully maritime culture with the technology and inclination to make oceanic voyages. Individual predilection for voyaging is an unpredictable realm and not governed
by the overall level of a culture's technology nor by how accessible oceanic islands may be to a population. Madagascar lies just off the coast of Africa but was colonized by people from Indonesia. The aceramic peoples of Cuba had easy access to the Bahamas but never occupied them. It would take a navigationally advanced society to finally colonize all the islands of the West Indies.

Besides voyaging ability, other prerequisites which A. Smith (1995:371) proposed are necessary in order for a society to successfully colonize islands include horticulture, a marine economy, a material culture that uses shell as a major raw resource, and the ability to change the island's resource base by introducing plants, animals, and assets through exchange. Since Saladoid times, all West Indian cultures have met each of these requirements.

The ability to supplement the natural resources of an island with domesticated foods substantially reduces the risks involved in island settlements. When the Polynesians colonized a new island, they brought certain staples with them including yams, fruit trees, and domesticated pigs. A. Smith asserts that all successful colonizing cultures will carry with them such a "portable resource base" (1995:368), which will reproduce their subsistence foundations on the new island. In the West Indies, in addition to root crops and some fruit trees, the Saladoid populations introduced agouti, dogs, guinea pigs, opossums, and armadillos from South America (Wing 1989). They also transported endemic West Indian species, such as hutias and rails, from one island to another, expanding some species' natural distributions (Wing 1989). Sweet potato may have been a key ingredient in island
colonization by horticulturists because it produces an edible crop in two months or less, quickly establishing a reliable food base.

Many authors have attempted to model the process of how the colonization of a set of islands will predictably progress (Cherry 1990; Held 1993; Irwin 1992; Keegan 1995; Keegan and Diamond 1987). Most often these models are concerned with factors that determine an island's physical accessibility, applying some of the variables first proposed by MacArthur and Wilson (1967). These include island size and distance from the mainland, but secondarily consider island configuration, intervisibility, and navigational concerns such as winds and currents. Some geographical conditions do seem to predict correctly the likelihood of an organism, human or otherwise, bumping into a landmass. Whether humans choose to colonize—establish a settlement—on an island or not may have little to do with proximity to the staging platform (point of origin) or the size, orientation, or visibility of the target (the island). In other words, accessibility is not the most important factor. The nature of the island, its habitat diversity, rainfall levels, availability of fresh water, and exceptional resources (such as a chert outcropping), may also influence decisions. The mechanisms of colonization are driven primarily by the attributes of each island, and by the predilections of a society to voyage.

**Settlement Theory**

Big islands were not necessarily a greater draw to voyagers than small islands. This was true for the earliest "Lapita" culture colonizers of the Pacific, as well as the West Indies. Lapita sites were often located on the smallest cays
of a set of islands (Kirch 1996; Lepofsky 1988). The earliest sites in the Mussau Islands, Melanesia (Kirch 1987), are located on offshore cays and near the thinnest part of the landmass, so that both coasts were equally accessible. Later, as populations expanded, settlements occurred on the larger "mainland" islands (Kirch 1996), yet the initial, preferred locations were on the smaller cays. This indicates a maritime outlook and implies that island size was not the most important variable. A similar pattern occurs in Caribbean sites, where small cays, no matter how tiny or insignificant they appear, inevitably support Amerindian sites.

For the Taino, who were oriented toward the sea for much of their subsistence and cultural interactions, the most important factor in choosing a settlement was access to the open ocean. They needed launching and beaching places for their large canoes. If the site could straddle an intermediate zone between inland lagoon and reef environments, or turtle grass beds and salt ponds, the better it would be for obtaining diverse resources (Jones 1985). When Nietschmann (1972) looked at settlement choices for the Miskito, he found three criteria—1) near turtle banks, 2) near terrestrial hunting grounds, and 3) at a haulover site (a narrow neck of land that separates two bodies of water). Access to multiple environments where resources were clumped together was the key factor in settlement choice.

Saladoid settlements functioned mostly on or within 2 km of the coast. The Trants site, Montserrat (Petersen and Watters 1991), and Golden Rock, St. Eustatius, are both located 1 to 2 km inland. However, these are very small islands and the Golden Rock location is actually equidistant between both
coasts (as previously described for Mussau), and 1.5 km closer to fresh water than would be possible from any coastal location. Terrestrial resources were never the primary draw of interior locations, fresh water and agricultural lands were. The earliest Saladoid sites had interior locations in order to be close to the best agricultural lands when fields were first laid out. On St. Kitts, only one out of 20 sites are inland—the earliest one (Goodwin 1979). Recently, Boomert (1999) suggested that the Early Saladoid preference for an inland, somewhat hidden location may also be related to defense.

In the West Indies, the superior agricultural lands are on the windward side of the islands (Sealey 1985). Leeward sites provide better beaches and shelter from the pounding wind and surf. Both locations were exploited for different reasons (Haviser 1997). The Miskito preferred windward locations to help reduce the chance of malarial infection (Nietschmann 1972). Lapita sites occupied the windward locations initially, later settling the leeward shore as well (Kirch 1990). Only in the late period did some Pacific Island settlements turn inward and become radially divided (like pieces of a pie) into territories ensuring access to multiple habitats (Hommon 1986). This was the result of an extreme population pressure that apparently never occurred in the Caribbean.

Examples of Colonization Progressions from Other Regions

Irwin’s (1992) volume on the colonization of the Pacific addresses the issue of why certain islands are settled before others from the standpoint of navigational theory. Navigational abilities may override factors such as wind and current direction. His thesis is that all Polynesian navigation was directed
with the primary goal of safety in mind. Drift (in other words, easiest access in terms of winds and currents) played no part. The settlement direction proceeded against the prevailing wind and later, with increased skill, across wind and lastly, occasionally downwind. The key to the order of colonization was successful return voyaging.

The south equatorial current flows north from the Venezuelan coast up the Windward Islands. As it reaches the Leeward Islands it is eclipsed by the north equatorial current, which flows westward past the Leewards, paralleling the northern coasts of the Greater Antilles. In the West Indies, the direction of colonization followed the direction of the currents. This different scenario than the Pacific is due to the intervisibility of all the islands in this chain. The distances between the islands are not great, and once the 120 km gap between Trinidad and Grenada was bridged, every other volcanic island was intervisible from the next with distances of less than 50 km (Macpherson 1975). There was no fear of not finding the way home after setting out to investigate a new island.

Once you can navigate well, you possess the maritime skills to sail past one island to reach a better one. Thus, accessibility fails to be a determining factor. The peoples of the Mediterranean had the technology to colonize their islands long before they actually did (Patton 1996). Each island was discovered before any serious colonization efforts had even begun (Cherry 1981). There is evidence of early, even Pleistocene era, use of Mediterranean island resources without any accompanying settlement. The island of Melos (Cherry and Torrence 1982) was exploited for its obsidian outcrop for
thousands of years, and some islands sustained large mammals, including pygmy elephants, which were hunted to extinction before permanent settlement ever occurred (Cherry 1990). These initial Mediterranean colonizers were fishermen who had the skills necessary to explore their environment fully and decide which islands they wanted to exploit. Available resources were the most important aspect in utilization and finally colonization of these islands. Kirch reported (1995:270) that the Polynesian’s impetus to colonize was to look for new raw material sources for inclusion in the trade network. The search for new resources is a key element in all colonization activities.

Worldwide, most islands were settled in prehistoric obscurity, with no first hand, written records of the event. The settlement of Iceland, in A.D. 800, is an exception. This event and the successive settlement decisions were well documented historically by those colonizers and their descendants (K.P. Smith 1995). The records discuss colonization, settlement location, diet, trade networks, and how these changed over time. Colonization progressed as follows: 1) Iceland was found by accident by fishermen, 2) exploratory voyages assessed its resources, and 3) people deliberately colonized the island bringing their agricultural base with them. This example reiterates the three stages of initial island settlement—discovery, utilization, and colonization (Irwin 1992). It further supports the hypothesis that resources are the primary draw and that the colonizers will be maritime horticulturists.

Additional descriptions concern the nature of this initial settlement on Iceland. The first choice for site location was coastal; any early interior sites were for agriculture or special resource procurement only. Early settlers used
more locally manufactured goods. The colony was more self-sufficient in the early years before the environment was degraded through overexploitation. The faunal subsistence base was diverse, concentrating on resources that could be captured on land, such as birds and walrus. Within the first century of colonization, erosion problems were evident in sediment cores. In the later period, interior, special use sites became permanent settlements as population increased. More imported items entered the settlements because the colony was now integrated into a trade network with the homeland, and because of overexploitation, more dependent on outside resources. The diet became focused on marine resources, especially fish. Special, collective fishing technologies were acquired in order to capture large marine mammals such as whales. Even though this is an example of one specific episode, the principles that drove these events and the resulting settlement decisions are the same in the West Indies and perhaps in all island colonization scenarios.

Population Movements in the West Indies

The first, aceramic colonizers of the West Indies settled on the largest islands of Cuba and Hispaniola, which correspondingly supported desirable resources such as large vertebrates and high quality stone (Wilson et al. 1998). In the Lesser Antilles, Antigua has the most aceramic sites and possesses, along with St. Kitts, the only chert outcroppings in the Lesser Antilles (Davis 1982; Knippenberg 1999; Watters 1997). Resources were the draw of these islands. There is no evidence that these first colonizers maintained ties with their homeland through trade. They were probably not a society inclined
toward navigational exploration. The largest islands of the Greater Antilles provided for their needs.

Saladoid Migration

The Saladoid people originated in the lower Orinoco river basin of Venezuela, where the first Saladoid-like ceramics appeared ca. 1100 B.C. (Rouse et al. 1985). Their ancestors were apparently pushed from the middle Orinoco toward the coast during a period of riverine population explosion (Roosevelt 1980), hypothesized to have been due to the advent of maize agriculture. Population pressure may have pushed the Saladoid people to the coasts, but would not, could not, have pushed them straight into the West Indian islands. Ecological or demographic pressures may encourage expansion, but without the technological ability to expand to island life, no oceanic migrations will occur (Arnold 1995). The push that instigated the Saladoid migration may have been the bridging of a technological barrier. Once they were able to navigate the waters of the Caribbean safely and repeatedly, the Saladoid people left their homeland.

The mainland Saladoid predecessors must have been inhabitants of the coasts of Venezuela and Guiana, rather than solely the riverine flood plain. This supposition is based on the argument that it is not possible to transfer riverine canoe technology into ocean-going vessel technology without substantial modification (Arnold 1995 suggests these restrictions for the Northwest Coast Indian cultures). Coastal Saladoid people inhabited this northern shoreline, the gigantic delta of the Orinoco, plus the continental
islands of Trinidad and Tobago (Rouse et al. 1985). For 600 years (1100 to 500 B.C.), these populations were adapting to an ocean oriented way of life, advancing technologically toward the ability to make repeated open water voyages. The movement of people throughout this region, due to increasing navigational abilities, led to further interaction between multiple ethnic groups. In this light, the Venezuelan coast can be likened to the "voyaging corridor" hypothesized for the Solomon Islands in the Pacific (Irwin 1992). Irwin depicts the Solomons as a nursery for navigational skills, where a great deal of forced mixing of people resulted from the increased mobility of these populations. If this was the case in the Caribbean, the intermixing of people would have been carried over into the island colonizations, resulting in the material variation and richness seen particularly in Early Saladoid settlements. The idea of a single migration of just one ethnic group followed by local development has been questioned by many Caribbean scholars because of the divergent material cultures of these early sites (Chanlatte 1981; Haviser 1997; Rodríguez 1989; Roe 1989).

Saladoid pottery consists of two very different decorative styles—one painted and one incised. The painted sub-style is mostly white-on-red designs (abbreviated WOR). The incised sub-style is characterized by bounded zones of thinly incised cross-hatching (abbreviated ZIC). These two styles are referred to respectively as Cedrosan Saladoid and Huecan Saladoid, when they are found in West Indian archaeological sites. Both styles evolved from separate ceramic traditions of the Venezuelan mainland (Rouse 1992).
A debate within the Saladoid migration issue is whether or not the Huecan assemblages (ZIC) belong to different ethnic groups and separate migrations than the Cedrosan assemblages (WOR). Both are encountered in separated and mixed contexts at different sites and within the same sites (Petersen and Watters 1991; Rodríguez 1989). The purely incised styles tend to drop out earlier. Roe (1989) addressed this issue rigorously and concluded that the two styles of pottery were produced by different but closely related cultural groups. He envisioned a Saladoid people comprised of many ethnic groups who competed with each other and traded or raided each other for knowledge, material culture, and possibly wives. Roe sees populations of hostile multi-ethnic groups in competition with each other as the factor that compelled West Indian colonization. This characterization can be accounted for by increased interaction between ethnic groups, which resulted from advancing navigational skills and boat building technologies along the northern coast of South America. The colonization may have been initiated by the search for new resources, but the speed of the expansion was fueled by competition between groups. Boomert’s (1999) assertion that inland settlement was a defensive strategy makes more sense in this light.

Graves and Addison (1995) insist that all islands within an archipelago will be discovered at the same time. This seems to have been the case for the Lesser Antilles. The Saladoid colonizers moved very rapidly in a stepping stone fashion propelled toward Puerto Rico. The earliest ceramic age date in Puerto Rico is 430 B.C. at Hacienda Grande (Siegel 1992). The colonizers did stop at the first large island they found that met all their needs. It is also likely that
the larger, long established, aceramic populations in Hispaniola stopped further movement, even though some smaller aceramic populations in the Lesser Antilles and Puerto Rico must have been displaced. Perhaps, like the Mediterranean example, these navigators discovered all the available islands in the chain first, then went back to colonize where they wanted. The earliest Saladoid settlements are on the higher, wetter islands, which also had the richest volcanic soils (Petersen 1997). Some of the smaller, limestone islands in the chain were not permanently settled until Post-Saladoid times (Petersen and Crock 1999).

The Saladoid expansion was followed by a 1000-year hiatus, with no further population movements. This standoff created a “frontier” between Puerto Rico and Hispaniola (Rouse 1989, 1992), which acted as a barrier to further migration, but did not stop influences from diffusing between the cultures straddling this line. This is clearly seen in the adoption of pottery making by “El Caimito” and “Punta Cana” people of the Dominican Republic many centuries before the Ostionoid expansion (Veloz Maggiolo et al. 1974; Veloz Maggiolo and Caba Fuentes 1996). Trade does not seem to have been a part of these interactions.

Trade was, however, a vital part of the Saladoid culture. Widespread exchange networks extended from Puerto Rico to the Venezuelan mainland (Boomert 1999; Rodríguez 1991). Raw materials for amulet and bead manufacture, including turquoise and jade, were imported from South America, and individual sites monopolized the production of certain exotic goods (Crock and Bartone 1998; Watters 1997). An extensive interaction
sphere can also be deduced from the elaboration of the pottery style (Roe 1989). Roe contends that the more information being exchanged, the more complexity will result in the artistic expression of a culture, and Saladoid pottery is extremely diverse. For a maritime culture, where populations are dispersed on isolated islands, trade fulfills the vital function of maintaining some social integration between scattered groups. Ties to the homeland are sustained. Kirch (1995) calls this the "lifeline" theory and describes the phenomenon for the Pacific Islands.

Because of these rapid population movements, and the extent of the Saladoid trade networks that followed, we can assume that the degree of boat technology maintained by the Saladoid was fairly advanced. Arnold (1995) defines a true maritime society as one that uses large, ocean going boats, regardless of the percentage of marine foods in the diet. The Saladoid people could not be considered fully maritime in terms of their subsistence since they were horticulturists, but they were masters at negotiating their ocean territory as evidenced by the extensive trade networks of the time and certainly possessed large, ocean going vessels.

Watters (1982) described the Ostionan people at A.D. 600 as having a "seaward perspective." This is equally true for the Saladoid and the Classic Taino. At the time of contact, the Taino could be correctly termed a "thallosocracy," meaning this society was ruled by the sea (Patton 1996). The maritime orientation of West Indian peoples is central in understanding how and why these islands were initially colonized and why Amerindians from South America decided to adopt island life.
Ostionoid Migration

Many of the principles that guided the Saladoid migration are applicable to our discussion of the Ostionoid expansion. This second great wave of migration came around A.D. 650 when the Mona Passage frontier was breached, and the newly christened Ostionoid culture spread through the remaining West Indian islands (Rouse 1992). These re-structured Ostionoid people moved out assimilating or displacing, and in some regions avoiding, the previous population.

The Saladoid populations never penetrated the mountainous interior of Puerto Rico. When the Ostionan people started renewed colonization efforts, these maritime-adapted people still hugged the coasts of the new islands and settled offshore cays and small islands such as Grand Turk. With increasing population pressure on Puerto Rico, settlements finally penetrated the vast interior via the river valleys (Curet 1992).

Ostionan pottery is found in settlements in the Greater Antilles and Bahamian archipelago ranging in time between A.D. 695 and 1245 (cal. intercept dates, Rouse et al. 1985). The Samaná peninsula, on the northeast coast of Hispaniola, was first occupied by the Ostionan people at the end of the 7th century. Coralie’s earliest date (intercept A.D. 705) is contemporaneous with this first incursion into Hispaniola. Plain redware dominates the lower levels of these Samaná sites (Krieger 1929, 1931). The last appearance of this style occurs at “Anadel” sites in the Dominican Republic and on Grand Turk.

Two migration routes across Hispaniola have been identified (Rouse 1992). Some people followed the south coast, eventually settling Jamaica.
Others cut across the central Cibao Valley emerging on the northeast coast of Haiti. The north coast of the Dominican Republic was densely settled with sites containing the Meillacan pottery subseries (Veloz Maggiolo et al. 1981). There is no Meillacan pottery found in the southern and eastern Dominican Republic. Here, Ostionan sites were replaced directly by Chican sites and seem to be a development within the same culture. Ostionan pottery does not underlie the Meillacan deposits at the north coast sites. The Ostionans never settled the north coast of the Dominican Republic, perhaps deterred by a stronghold of previous populations.

At contact, the inhabitants of the north coast of the Dominican Republic were called the “Macorix,” and were described by chroniclers as a separate ethnic group from the Classic Taino (Wilson 1993, 1997). They spoke a different language and maintained a different material culture than the rest of the island. Veloz Maggiolo (1991) further suggests a link between the ethnohistoric Macorix and the earlier Meillacan pottery style. An interesting preliminary observation from Cordell’s (1998) thin section study of Ostionoid paste types is that the Ostionan pastes have no similarity whatsoever with Meillacan pastes, but some overlaps with Chican pastes. If the Meillacan represents a separate ethnic group from the Saladoid/Ostionan lineage, then the one part of their territory that was retained after the “invasion” from Puerto Rico was the north coast, making it inhospitable territory for the Ostionan settlers. All this may be relevant to the discovery of the Bahamian archipelago.

As you head north from the Samaná peninsula, avoiding the north coast of the Dominican Republic, you encounter within 75 km from shore a series of
shallow banks—the Navidad, the Silver and the Mouroir (Figure 25). They are submerged between 5 and 16 m today. If the colonizers explored this line of banks looking for dry land, they would have been led straight to the Turks Islands. Grand Turk is the largest island on this bank, and the only one that could have supported a population. The northwesterly Antillean current flows from Puerto Rico toward the Turks and Caicos Islands, eventually joining the gulf stream. This, in association with the trade winds, which blow east to west, would promote drift voyaging in the northwest direction (Callahan 1991), making voyaging from Samaná to the Turks easy, but return voyaging difficult.
The navigators of the Caribbean were not, however, at the mercy of the winds and currents of the region. The winds blow east to west in the summer and more northeast to southwest in the winter. All maritime cultures have a vast understanding of winds and weather systems. The Miskito (Nietschmann 1972) language has 25 words to describe types of winds. For them, the dry season, when trade winds are less intense and no unexpected squalls or storms occur, is the "time of...long distance journey" (Nietschmann 1972:71). For Grand Turk, February through April, with multiple day long intervals of still weather, are the driest months and perhaps the best time for long distance travels.

The original settlers of Grand Turk may have come from the eastern Dominican Republic. There is no evidence that they ever continued on to colonize the Caicos bank. Meillacan colonizers settled Middle Caicos from the north coast of Hispaniola. Upon finding an unusual pottery paste type on Middle Caicos, Sullivan (1981) proposed a Cuban connection for this ware. This "mafic" type paste is described by Cordell (1998), who finds correlates in northwest Haiti, not Cuba.

Berman and Gnivecki (1995) similarly proposed that the central Bahamas were settled in the 7th and 8th centuries from northern Cuba, with evidence coming from the Three Dog site on San Salvador. Ceramic-bearing peoples did live in Cuba by A.D. 620 (Dacal Moure and Rivero de la Calle 1996). The idea of pottery making diffused into Cuba much in the same way it was adopted in eastern Hispaniola before ceramic people migrated into the region. The earliest Cuban and Hispaniolan ceramic-producing societies had a
non-agricultural economic adaptation and may have also had limited open ocean voyaging abilities. If the red-slipped Three Dog pottery is of the Anadel style, like that at Coralie, then colonization may have proceeded quickly up the Bahamian chain, settling the central and southern Bahamas simultaneously. For at least the Turks and Caicos, all material cultural connections are rooted in Hispaniola.

**Explanations for the Ostionan Expansion**

The question of why the Bahamian archipelago was settled during the Ostionoid expansion has been debated this entire century. In 1912, Debooy hypothesized that the war-happy Caribs caused the Early Taino to escape to the safety of these islands. Rouse (1992), noting a growing influence of Venezuelan Barrancoid traits in the post-A.D. 350 pottery styles of the Lesser Antilles and Puerto Rico, surmised that the Barrancoid people pushed the prior inhabitants further up in the island chain. Curet (1992) showed in his study of the Maunabo Valley, Puerto Rico, that populations were steadily increasing from the Saladoid to the Early Ostionoid. Greater population densities may have spurred on colonization activities. The number of sites on islands was definitely increasing. On St. Kitts (103 km²), seven sites were simultaneously occupied at the end of the Saladoid (Goodwin 1979). It appears that there was steady, slow growth during the Saladoid period with an exponential growth spurt occurring around the Early Ostionoid (Boomert 1999; Wilson 1993).

Is it likely that it would take 1000 years for a population to grow to a point of crisis? Data from Remote Oceania shows that in a period of 1500
years of prehistoric settlement in the Hawaiian Islands, the first 800 years had very slow growth. After that, increases were compounded and populations peaked, surpassing the island's carrying capacity in 1300 years (Kirch 1990). On Easter Island, critical population densities were reached after 800 years of occupation (Stevenson 1986). With at least these two examples, timing of the West Indian situation is comparable.

Population pressure may have been accompanied by a crisis in environmental degradation from centuries of overuse. Veloz Maggiolo (1991) states that the Saladoid people depleted soils by indiscriminate slash and burn agriculture. This statement seems to be borne out by evidence from sediment cores taken in one Puerto Rican valley (Burney et al. 1994). This study shows that the amount of charcoal particulates in the samples reached their lowest point between A.D. 450 and 650. Perhaps there were few wooded patches of land left to clear, in this time period leading up to the renewed migrations.

Intensification techniques, where steps are taken to increase yields, are indirect evidence for overuse. The Early Ostionoid was a time of intensified agricultural production, with the first evidence of the construction of mounded fields (Curet 1996). Ortiz Aguilú et al. (1991) dates the agricultural terraces of southeast Puerto Rico also to this time period. By the Late Ostionoid, irrigation techniques developed in Hispaniola (Curet 1992). Technological innovations such as these act as "buffers" between a society and the perturbations of its environment (Clarke 1969), and are sought in hard times.

Climatic fluctuations coupled with environmental degradation must have been a factor in these cultural changes. At the end of the 6th century, sea level
had lowered, the climate was extremely arid, and there is evidence for multiple
drought episodes. With population numbers perhaps reaching critical levels,
people started to move. Stress, from imbalances between the population and
the available resources, is the most powerful impetus for migration.

Other authors argue that internal socio-political restructuring and
increasing complexity was the key to the changes seen in the Early Ostionoid
(Curet 1996; Siegel 1992), yet other factors must have nurtured the power
imbalances that led to this cultural development. The tribal social organization
of the Saladoid, as characterized by Siegel (1991), exhibited some personal
status variation and communal activities but had no centralized authority. In
contrast, Boomert (1999) argues that the Saladoid were organized into "big
man collectivities"—societies where dominant individuals rule through warfare
and by acquiring and distributing high status items through long-distance
exchange networks (Johnson and Earle 1987). These groups are mostly
egalitarian, but they are attracted to powerful, though often temporary, leaders
and participate in wide-ranging interaction spheres. This is consistent with the
material remains of Saladoid sites.

In the period between the Saladoid and the Classic Taino, complex
chiefdoms developed. The contact period Taino were organized into three
distinct social classes and had a multi-community political organization.
Paramount chiefs governed huge territories (up to 30,000 km²), and presided
over approximately 30 district chiefs and 70 to 80 village chiefs (Redmond and
Spencer 1994). District chief villages were distributed at 55 km intervals, or
one travel day by canoe. The paramount chiefs, of which there were between
four and nine at contact, depending on various, tenuous alliances, were located
four or five days of boat travel apart. Spanish repartimiento figures (records of
people who owed the crown tribute and service) for the island of Hispaniola
was 1,130,000 in 1496. These population numbers have been argued to be too
high (Henige 1978) or too low (Cook and Borah 1991), but remain a reasonable
estimate.

What was the mechanism that consolidated power in the hands of select
leaders at the beginning of the Ostionoid, which eventually led to the complex
and populous Taino society described at contact? Siegel (1992) proposed that
warfare against the aceramic populations of Hispaniola, spurred on over access
to resources, gave a select advantage to a military elite. The instability caused
populations to centralize for safety and strength, and social changes ensued.

Veloz Maggiolo (1976, 1977) and Chanlatte (1981) argue that techno-
environmental changes (such as the development of mounded “montone”
agriculture) led to a surplus, and the management of that surplus led to
unequal power relations. Curet (1996) brings our attention to the role ideology,
in its own right, can play in manipulating political power.

Some aspects of island life are particularly conducive to the rise of power
imbalances (Patton 1996). The diversity, abundance, reliability and storability
of marine resources can give island inhabitants an advantage over land-locked
communities (Yesner 1987). Marine species can endure great amounts of
exploitation and allow intensification techniques that increase yields. These
qualities may in turn encourage further cultural developments, such as
increased complexity, because of the more sedentary lifestyle and aggregated
populations. Entrepreneurial manipulation of these resources coupled with trade can create asymmetrical power relations leading to greater complexity (Arnold 1995). Because of this potential to control resources and interactions, increasing complexity is a likely consequence of the confined space of island life. Indeed it was on the island of Crete that the very first civilization level of complexity was reached (Patton 1996).

The key technology for any complex island society is advanced water transport. Large canoes allow for the distribution of wealth and the amassing of populations for military and ceremonial events, substantially increasing the amount and material exchange and social interaction. Sophisticated, ocean-going vessels that can carry large cargo loads and travel long distances can be, in themselves, vehicles for the co-opting of power (see Arnold’s description of the rise of Chumash Indian complexity, 1995). The Chumash of southern California had individual boats plus large, communal boats shared between 50 or more people. The material expense in building such communal boats, the labor and construction knowledge, and the ability to navigate them safely in ocean-going situations are all areas that an opportunistic social elite class can manipulate for personal gain. In the Pacific northwest, the Nootkan Indians had the most advanced boat technology and were the wealthiest tribe of the region. They produced many types of boats for different purposes including “freight canoes” used to move their house walls from one seasonal settlement to another (Arnold 1995). The Taino must have possessed canoes of various sizes and proportions for different activities as well. Small canoes may have been
individually owned, but some larger, special-purpose canoes must have been shared by a community and engendered restricted access.

The chroniclers of the contact period described immense canoes for the Taino. Las Casas (1951) said the canoes in Cuba were 20 m long, and Columbus reported seeing very large canoes under sheds on the coast of Cuba (Dunn and Kelley 1989:187). Oviedo (1959) wrote that the boats had cotton sails, but this is generally not believed to be a pre-Columbian trait. The Island Caribs in the 17th century did have sails, but again due to European influence. Glazier (1991) argues that the sides of the Taino canoes must have been built up with planks to allow for construction of such large vessels.

Rouse showed how the primary movement of people and goods in the Greater Antilles was between water passages, not within an island's landmass (Rouse 1992). The Mona Passage between eastern Hispaniola and western Puerto Rico was the site of daily voyages, and thus culturally more closely linked than eastern and western Hispaniola (Las Casas 1951). The Taino maintained "gateway communities" (Sullivan 1981), such as MC-6, which allied far-reaching political territories and greatly increased trade opportunities. By the time just before contact, the faunal resources closest to the centralized Taino villages must have been severely depleted. With increased travel time to subsistence items, access to canoes and wide-ranging trade networks would be ever more important.

In Puerto Rico around A.D. 600, cultural disruption is evident in many aspects of the archaeological record. The trade networks declined, prestige goods disappeared, artistic expression was drastically reduced, and some
subsistence change is suggested, but sites were not suddenly abandoned. The culture experienced what materially appeared as a devolution, but the socio-political complexity was evolving. On the Venezuelan coast, the late ceramic period began at this same time (called the "araquinoide"). The style is also "devolved" in comparison with the earlier ceramics. Using ethnohistorical accounts (Kirchoff 1948), Rouse et al. (1985:28) conclude that "degeneration was not accompanied by a decline in the rest of the culture." Certainly, the culture that followed the Ostionoid expansion was not in decline either.

It is clear how boat technology and maritime adaptations played a role in the first Saladoid colonization. These same realms lend themselves well to issues of growing complexity and the Ostionoid expansion. The primary cultural event of this time period was an explosion of colonization activity. The rhythms which guide these colonization events are surprisingly consistent. Populations tend to spread very rapidly through island clusters, perhaps as a result of competition to reach the best resources. The islands that provide the resources most important to the colonizers are colonized first. These resources may be terrestrial or marine and may be unrelated to island size. Overall the pattern of all large-scale population movements is one of a "punctuated equilibrium" (Patton 1996), proceeding in fits and starts, which are linked to changing social organization and economic development.

**Faunal Remains at Other Ostionan Period Sites**

Because resources are such an important factor in choosing to colonize certain islands, Grand Turk must have provided something unavailable at the
time in much of the rest of the Greater Antilles, namely unadulterated faunal populations. Including Coralie, there are six Ostianan period sites with faunal data available for review (see Table 17). By comparing diets between sites of the same time period, but in different regions, the uniqueness of Grand Turk becomes clear.

Table 17: Ostionan Period Sites with Completed Faunal Studies.

<table>
<thead>
<tr>
<th>OSTIONAN SITE</th>
<th>COUNTRY</th>
<th>APPROXIMATE DATE</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Dog</td>
<td>San Salvador</td>
<td>8th and 9th centuries</td>
<td>Berman 1994</td>
</tr>
<tr>
<td>Villa Taina</td>
<td>Puerto Rico</td>
<td>A.D. 800</td>
<td>Goodwin and Walker 1975</td>
</tr>
<tr>
<td>El Bronce</td>
<td>Puerto Rico</td>
<td>late 8th century</td>
<td>Robinson et al. 1985</td>
</tr>
<tr>
<td>Île á Rat</td>
<td>Haiti</td>
<td>1st half 10th century</td>
<td>Keegan 1997c</td>
</tr>
<tr>
<td>Paradise Park</td>
<td>Jamaica</td>
<td>A.D. 870 +/- 60</td>
<td>Keegan 1998</td>
</tr>
</tbody>
</table>

Puerto Rican Data

By Ostionan times, Puerto Rico had been settled for 1000 years by the Saladoid people, and for up to 3000 years before that by aceramic populations. At the site of Villa Taina on the southwest coast of Puerto Rico, resources had long been exploited. The occupants had a diet of bivalves, mostly oysters and turkey wings, and hutias, which may have been corralled and kept (Goodwin and Walker 1975). The hutia species, though unreported, was probably *Isolobodon portoricensis*, which was introduced to Puerto Rico from Hispaniola in late Saladoid times (Wing 1993). Mollusk predation, which was relatively rare in Saladoid times, increased in importance in the Ostionoid, as crab use diminished. The first species to be exploited at many Early Ostionan sites were bivalves. Only 27 fish bones were found, even though the site is located only
1 km inland on a now dry riverbed. This site produced 5000 bivalves, but also more than 5000 pottery sherds, proving that this was not solely a bivalve extraction site, but a true settlement. The lack of fish remains must relate to the use of ¼" mesh screens for sieving.

The site of El Bronce, Puerto Rico is located 6 km inland along a river. The diet is divided in equal parts between marine species, freshwater species, such as pond turtles and small fish (Eleotridae), and terrestrial species, mostly hutia (Robinson et al. 1985). Only nine bird bones came from this excavation, identified as rails and thrushes. The paucity of bird bones is in sharp contrast to Saladoid period sites on this island, which often contain numerous columbid remains (deFrance 1989).

The riverine habitat had not been exploited to much extent before the Ostionoid period. The freshwater sleeper fish weighs only 50 g, and these provided more than 1/3 of the fish MNI. Pond turtles are rarely represented in faunal remains, perhaps because of reported taboos against their consumption (Lovén 1935), but here, 11 MNI of pond turtle may indicate a food source, not a secondary use. Invertebrates make up 41% of the remains. A range of species was taken, dominated by bivalves and one species of gastropod—the small fighting conch (Strombus pugilis). Notched stones, interpreted as net sinkers, are common at this site. The salt water fish caught include mullet, grunts, jacks, mojarras, and snappers; all of which display some schooling behavior and are readily captured in nets. So, the diet at El Bronce consisted of tiny fish, netted fish, hutias, and bivalves. Intensification strategies, such as net
fishing and tending of animal populations, are to be expected on an island with a long history of human occupation.

**Haitian and Jamaican Data**

The site of Île à Rat occupies a tiny island guarding the mouth of the Baie de l’Acul on the north coast of Haiti (Keegan 1997). Its Ostionan component dates to the first half of the 10th century. This island was a fishing camp from Ostionan times through at least A.D. 1300 and probably until contact, although a Spanish brick and historic sherd are the only evidence of this. Faunal remains, which I analyzed, were dominated by parrotfish (*Sparisoma* sp.), which provided 60% of the vertebrate MNI. The diet was no different in the early levels than in the late levels.

Two mammal bones, one from an extinct spiny rat (*Brotonmys cf. voratus*) and the other from a hutia (*Plagiodontia* sp.), were the only terrestrial species found, besides some land crab and incidental snakes and small lizards. There were 25 fish species, plus lobster and some sea turtle, but the primary deposit was queen conch. An excavation of 20 m² yielded 3171 whole conchs and conch apexes (compared with Coralie which had 395 conchs in 217 m²). The average length of those conchs was 11 cm (compared with Coralie, which was 17 cm). Thousands of bivalves and gastropods from 88 different species completed the shell midden. The later deposits produced numerous net weights. From the beginning of the occupation, subsistence was based on fishing, harvesting conchs, and invertebrate gathering. The focus on marine
resources, particularly conch and parrotfish (*Sparisoma* sp.), is as intensive as the later central Bahamian sites.

Since Jamaica does not appear to have been occupied in the aceramic period, the Ostionan fauna may show more similarities with the findings from Grand Turk. On the south coast of Jamaica, two sites were recently found on the property of Paradise Park, Westmoreland Parish (Keegan 1998). They are located 500 m apart along the same dune ridge. One is an Ostionan period site (cal. A.D. 870 +/- 60) and the other a Meillacan period site (cal. A.D. 1430 +/- 60). Fauna from the earlier site consisted primarily of sea turtle. The later site produced dense deposits of fish (especially *Sparisoma* parrotfish), hutia, and rice rat, but no turtle.

There was a change in the harvesting pattern of invertebrates between the two sites. The top three species in the Ostionan site were turkey wings (*Arca zebra*), leafy jewelbox (*Chama macerophylla*) and conchs (*Strombus gigas* and *Strombus rainus*). These provided 72% of the invertebrate individuals. Conch and turkey wing bivalves are common early site species. These are replaced at the Meillacan site by three different bivalves. Thick lucines (*Phacoides pectinatus*), eared arks (*Anadara notabilis*) and tiger lucines (*Codakia orbicularis*) provided 89% of the invertebrate individuals. Here is another example of tiger lucines increasing in density through time. Even though this is a large bivalve, the smaller sanguins and turkey wings seem to have been preferred. This may be because tiger lucine gills contain sulfur bacteria and must have been somewhat unpalatable (Berg et al. 1985; Keegan and DeNiro 1988).
These two Jamaican sites share the exact location, but harvested different foods. Overall, these Greater Antillean Ostionan period sites reveal a diet of small fishes and conch, a variety of invertebrates, and the intensification of harvests through the use of nets and the management of hutia populations. This is very different from what was found at Coralie, with its green turtles, large fish and iguanas. The Ostionan site at Paradise Park is the only other settlement in this period with considerable sea turtle remains. Turtle was a preferred resource of the Ostionan people, but it was also a rare resource in areas with previous populations.

Further evidence for the importance of turtle meat to Ostionan people is seen in the pottery. Turtle imagery is one of the few decorative motifs found in the Ostionan style. Effigy bowls have modeled lugs depicting the turtle's head and flippers, and a hemispherical vessel representing the turtle shell (Rouse 1981). The Coralie site produced two ceramic lugs with turtle head depictions—the only modeled motifs in the collection. Turtles were gifted with some special status, even if that was solely related to its value as a food item.

In Polynesia, turtles were a high status food eaten mostly by chiefs. They were used in ritual feasts and awarded religious significance (Rolett 1986). Being an animal of both land and water, turtles were symbolically associated with boundary crossings and became incorporated into mortuary activities. Similarly, the Taino imbued spiritual significance into animals that lived in more than one domain—earth, water, or sky (Harris 1994)—and depicted turtles and other nature spirits in their artwork. At Golden Rock, St. Eustatius, an intact Hawksbill turtle was found cached at the base of a midden
(Versteeg and Schinkel 1992). Furthermore, the authors interpreted the shape of one of the large houses at this site to be a visual rendering of a Hawksbill turtle shell. Excavations at Tutu, St. Thomas, revealed a green turtle (Righter 1997) deposited in the midden with all its internal elements resting within an overturned carapace. At a preceramic cemetery in Aruba, a flexed human burial was placed under a sea turtle carapace (Versteeg et al. 1990). The interment of whole turtles in West Indian sites may also be related to mortuary activities, and in these few cases, turtles display significance beyond their subsistence value.

There is no evidence for any greater ceremonial or religious aspect (i.e. feasting) in the turtle consumption seen on Grand Turk. Still, a great deal of the activity at the Coralie site revolved around turtle preparation and consumption, with the inhabitants utilizing this island's salt deposits to cure and store the surplus meat. The faunal resources of these uninhabited islands were the impetus for the colonization of the Bahamian archipelago. The final section of this chapter will discuss the actual settlement of Grand Turk and decipher the ways in which this population functioned on this island.

Settlement of Grand Turk

The Amerindian names for the islands of the southeastern Bahamian archipelago, though collected at the contact period from the Lucayans, seem to complement the colonization scenario that I have presented (Granberry 1991). Most of the island names recorded were directional indicators. Grand Turk was called "Abawana," which translates as "first small country." First to be
colonized? First one encountered when sailing north from Hispaniola? Both statements are true. The Turk’s bank is called “large northern basin.” It is directly north for people coming from Hispaniola. Many of the other deciphered names in the Caicos and southern Bahamas are referred to as west (Table 18). They are only west from the Dominican Republic and the Turks bank. The linguistic evidence is consistent with the first settlement in this region being on Grand Turk and the colonizers to both the Turks and Caicos banks coming from Hispaniola.

Table 18: Amerindian Names of Islands in the Southeastern Bahamas and Turks and Caicos Islands.

<table>
<thead>
<tr>
<th>ISLAND NAME TODAY</th>
<th>TAINO NAME</th>
<th>TRANSLATION OF NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turks Bank:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Turk</td>
<td>Babueca</td>
<td>Large Northern Basin</td>
</tr>
<tr>
<td>Salt Cay</td>
<td>Abawana</td>
<td>First Small Country</td>
</tr>
<tr>
<td>Cotton Cay</td>
<td>Kanamani</td>
<td>Small North Midland</td>
</tr>
<tr>
<td>Big Sand Cay</td>
<td>Makarike</td>
<td>Mid Top Island</td>
</tr>
<tr>
<td>Caicos Bank:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Caicos</td>
<td>Kasina</td>
<td>Little Northern Sand</td>
</tr>
<tr>
<td>East Caicos</td>
<td>Wana</td>
<td>Northern Rocky</td>
</tr>
<tr>
<td>Middle Caicos</td>
<td>Aniyana</td>
<td>Smaller Land</td>
</tr>
<tr>
<td>North Caicos</td>
<td>Kayko</td>
<td>Western Waters Headland</td>
</tr>
<tr>
<td>Pine Cay</td>
<td>Buyana</td>
<td>Northern Outlier</td>
</tr>
<tr>
<td>Providencias</td>
<td>Yanikana</td>
<td>Small Western Home</td>
</tr>
<tr>
<td>West Caicos</td>
<td>Makobisa</td>
<td>Western Waters Smaller Land</td>
</tr>
<tr>
<td>Bahamian Islands:</td>
<td></td>
<td>Mid Unsettled Outlier</td>
</tr>
<tr>
<td>Acklins Island</td>
<td>Yabake</td>
<td>Large Western Land</td>
</tr>
<tr>
<td>Mayaguana</td>
<td>Mayawana</td>
<td>Lesser Mid Western Land</td>
</tr>
</tbody>
</table>

(Source: Granberry 1991)

Settlement Location and Size

Coralie is situated between the open sea and reef community and the mangrove and inland lagoon habitat. It is on the leeward side of the island
protected from the wind and the surf, and near the faunal resources of North Creek. Within 1 km of the site is the windward shore with its banks and turtle nesting beaches, the leeward shore with its protected coral reefs, high ridges for agriculture, and "North Wells," a possible source of fresh water. Salt was undoubtedly utilized, and the best salt deposits on this island are on the south end. Resources were probably gathered from all around this island and this bank, facilitated by easy access via canoe travel.

The type of settlement seen on Grand Turk is a small, farming and fishing hamlet. In calculating population numbers at the Indian Creek site in Antigua, Jones (1985) concluded that the average population for a farming community was between 25 and 50. Likewise, Boomert (1999) describes the typical hamlet of the present-day mainland Arawak (Lokono) Indians as containing three to six houses, sheltering 30 to 60 people. Coralie is a small site whose main activity areas shifted over time. Given this horizontal distribution of dates, the settlement was probably a one or two house occupation at any point in time.

Small structures, between 8 and 10 m in diameter, house between eight and 13 persons each (Curet 1992, 1998). The average Saladoid house size was 10 m in diameter (Wilson 1997), with an average village size of 225 people (Boomert 1999). Taino villages at the contact period were even larger, with 50 to 100 houses supporting a population of 500 to 1000 people. Communities in the Bahamian archipelago were significantly smaller than this (Keegan 1992). The Coralie site probably housed less than 25 people at any one time. For a
colony of this size to endure, ties to the host population must have been unending, with the regular addition of new settlers to this island.

The primary house form throughout the prehistoric West Indies was a circular pole and thatch construction with a tall, conical roof (Drewett 1992; Hoogland 1997; Righter 1997; Siegel 1992; Versteeg and Schinkel 1992). This type of structure was described at contact for the Bahamian archipelago (Dunn and Kelley 1989). Remains of just one house (see Figure 26) have been

Figure 26: Post-mold Pattern Indicating Structure at Coralie.
identified at Coralie thus far. This structure is indicated from five post-molds, each 15 cm wide, on a circular perimeter 8 m in diameter. The post stains appear at 70 cmbs and continue into the water table. The same is true for two, larger (30 cm in diameter) center posts. Off the north end of the structure is a 4 m long line of posts interpreted as a windscreen. Its northernmost post is buttressed on its leeward side, supported against the trade winds that blow from the east (Figure 27). This structure is located deep in the area of the Phase 3 occupation, but the house is probably associated with the early colonization period, sitting farther away from the creek and the food processing activities. If this settlement pattern is continued, the structures associated with the later period may sit further west, where test pits revealed few remains.

Figure 27: Windscreen Post with Buttress Post.
Not enough large blocks were opened up, even in three years of excavations, to irrevocably plot all of this structure. But its components are consistent with structures from other sites (Drewett 1991; Hoogland 1997; Righter 1997; Versteeg and Schinkel 1992). At the Golden Rock site, Versteeg and Schinkel (1992) excavated the remains of three structures of similar size and construction to the house at Coralie. The post-mold patterns were interpreted as once open-sided structures, with rectangular or triangular extensions on either end for cooking, and a long curved row of posts off one or both sides that acted as a wind break to the house. The structures may be supported by one or two large, center posts. Another two houses of this description have been excavated at Tutu, St. Thomas (Righter 1997), and one on Saba (Hoogland 1997). Later period houses in the Lesser Antilles have two concentric circles of posts, and can reach up to 20 m in diameter (Versteeg and Schinkel 1992; Drewett 1991).

There is no evidence for the building of stilt houses in the West Indies, which was a common practice of the Lapita colonizers of the Pacific Islands. If stilt houses were built at a time of past, higher sea levels, they could be detected archaeologically due to the matrix surrounding the post remnant (unconsolidated sands over compacted coral rubble with certain species of intact bivalves), and a lack of cultural indicators like charcoal (Kirch 1987). If built at a time of lower sea level (like during the Coralie occupation), their remains would today be submerged in North Creek.

Of the wood species identified at Coralie, two are possible post materials. Buttonwood is common in sites all over the West Indies, and is both
an excellent fuelwood and construction material (Newsom 1993). Also common in West Indian sites is black torch. Because of its tall, slender trunk, it is a likely source for the posts in this structure.

**Nature of Settlement**

Small islands are sometimes used as resource outposts, occasionally exploited for one specific purpose. These types of "utilization sites" represent short-term, seasonally occupied settlements, where resources are procured and then returned to a primary village (Cherry 1990). Ferdinand Columbus, in recalling his fathers’ quests, wrote that the “natives habitually traveled to the coasts of uninhabited islets from inland villages to get fish, which they dried and roasted and carried home” (Columbus 1959:71-72; Martyr 1970). This may have been a necessity by the contact period since many local resources had been already depleted. Another use of island outposts is related to agriculture. The Island Caribs reportedly would plant uninhabited, small islands with manioc as a buffer against lean years (Breton 1665). Even the Australian aborigines planted offshore islands with yams as a reserve food supply (O’Dea 1991). This was probably a practice of the Taino at the time of contact as well. The question remains whether this site on Grand Turk was a true colony, where families lived for extended periods of time, or a resource outpost that men visited periodically to stock up on resources.

The full range of resources were harvested, cooked and consumed on Grand Turk, including reptiles, fish, birds and small invertebrates. Manioc was planted, harvested, and baked into cassava bread. A residential pattern
was established with the construction of a large house. At the time of its occupation, Coralie was quite a long distance from any mainland Ostionan community. This site was not a resource outpost for another settlement, but a true colony in itself. This does not mean that the site was occupied full-time for the duration of the settlement. The site does not contain deep, continuous deposits, nor is there sufficient debris to account for 400 years of occupation.

Cooke and Ranere (1992) discuss the nature of sedentariness in Amerindian societies, stating that even full-time occupations were not occupied continually for long. Cycles of abandonment and re-occupation were the norm. There are many reasons for this, including habitat regeneration and sanitation. Even large sites took hiatuses. They cite ethnohistoric accounts from the contact period in Panama to say that "even chiefs' villages in fertile sites were not used longer than decades at a time" (Cooke and Ranere 1992:128). Even though the site on Grand Turk could not have been occupied continually for those many centuries, it was still a habitation site, when it was inhabited, rather than a single purpose, extraction area. Part of the strategy of surviving on small, oceanic islands is to keep the settlements small and mobile (Keegan and Diamond 1987). Coralie may not have been the only Ostionan settlement in this region.

The zooarchaeological data give some clues to the population structure of these settlers. Chapman's study (1987) on Polynesian fishing practices found a division of labor between the sexes regarding fishing techniques used, even though both participated in fishing activities. Men tended to do hook and line fishing, fish from canoes, and use harpoons and/or spears. They also
collected any species that carried ceremonial significance, which included turtle. Women walked the shoreline looking for crab, shellfish, and sea urchins and fished opportunistically by hand, by diving, and by trapping and netting. Miskito women participated in shoreline gathering activities, and sometimes fished with hook and line (Nietschmann 1972). So far, the species reviewed from Coralie fall primarily in the realm of men’s work. The only evidence for the presence of women on Grand Turk, and it is circumstantial, is the wide variety of species in the remains including land crab, sea urchins, diverse marine invertebrates, and lobster, and perhaps the agricultural activities for which women traditionally carry much of the responsibility.

The occupants of Coralie had with them a few decorative items but nothing indicating wealth or elites within the population. The excavations produced four shell beads made from Queen conch. All the beads came from the 8th century deposits. The type of unburned conch shell debitage that indicates local manufacture of beads on a large scale (Carlson 1993) was not present. However, a few possible blanks were recovered. The finished beads were identical in size (10 mm in diameter and 2 mm thick with a 2.5 mm perforation); one was plain, but three had incisions, alternately on the top and bottom edges of the bead (Figure 28, right). This type of incised bead is described at Golden Rock (A.D. 600-900) (Versteeg and Schinkel 1992:109-110), at the Late Saladoid component of the Spring Bay site, Saba (Hoogland 1997:85,87), and the Ostionan/Meillacan component of the Île à Rat site, Haiti (Keegan 1997c). This bead type may be restricted to Late Saladoid and Early
Ostionoid times. Also recovered was a finished, highly polished, round piece of Queen conch inlay, 17 mm in diameter by 1.8 mm thick, with no perforation.

The most interesting pendant found in the site was a piece of Atlantic pearl oyster (*Pinctada imbricata*), carved into a cruciform shape measuring 22 by 18 mm (Figure 28, left). Each branch in the cruciform shape was perforated. Cross-hatching decorated the body of the pendant. The only other possible pendant was a perforated, but otherwise whole, flamingo tongue shell (*Cyphoma gibbosum*). No olive shell pendants or beads were found, which are so common at Meillacan sites in this region.

Only one definite piece of faunal material was fashioned into an ornament. A tooth from a Queen triggerfish (*Balistes vetula*) was drilled near its superior end for suspension. Its surface is also altered somewhat from its
natural form by being abraded on its back side to flatten it. Its front side displays a brownish gloss. Two of these triggerfish tooth pendants were found at the Tutu site, St. Thomas (Righter n.d.); one of these was fire altered giving the surface a multi-colored hue. A single bead blank from a cherry jewelbox shell (*Chama sarda*) was found in the 8th century deposits, indicating that the Early Taino may have recognized the potential for manufacturing *Chama* beads that existed on Grand Turk. Ornamental pieces were extremely rare in the deposits, and all could have been locally manufactured. This may indicate that trade was not well established, or common, within this community. Certainly, the pottery was imported, but it is a relatively rare commodity and bears evidence of overuse. It seems when people came to live on Grand Turk, they brought with them the items they needed to sustain themselves for a period of time, but only the bare necessities. Traders did not come to them. The site of Coralie was inhabited, on a part-time basis over a period of multiple centuries, by people rooted in eastern Hispaniola.

No human remains were encountered at Coralie. The Early Ostionan burial pattern, which was an extension of the Saladoid, was to inter people in cemeteries at the center of the village, or bury them under houses (Boomert 1999). Sometimes burials occurred in refuse middens. Formal burials may be expected for the time period, but not for the location. Small, limestone islands, inhabited by people who spend much of their time at sea, are unlikely places to find burials. The Polynesians buried all people at sea, saving only high chiefs' heads for special reverence (Spriggs 1986). Similarly, secondary exhumations of skulls or long bones of certain elite individuals are commonly reported for
the Caribbean (Lovén 1935). The only Amerindian interments found in the Bahamas have been in caves and blue holes (Keegan 1982). For the Turks and Caicos, limited, fragmentary human remains have been found only in the middens of GT-2, MC-12 and MC-32.

End of Occupation

By the last time the Coralie site was occupied, a second site had been established on the opposite end of this island. The earliest radiocarbon date from GT-2 overlaps with the latest date from Coralie. These two settlements appear to have temporarily coexisted, and probably not peacefully. There was never any evidence of trade between the Ostionan people of Grand Turk and the Meillacan people of the Caicos, and no exchange between the two settlements of this island.

Some elite goods from GT-2 were intentionally destroyed in the 13th century, and human remains were found in the midden deposits (Carlson 1993). GT-2 was a seasonally occupied, resource extraction site, and one where human remains would not be normally interred. Chemical tests on a human tooth from this GT-2 midden showed that the deceased had spent most of his life in a limestone, rather than metamorphic or volcanic, environment, and was therefore either a local Turks islander (from Coralie) or a resident of Middle Caicos (James Burton, University of Wisconsin: personal communication). Conflict between more than one local group is suggested.

There are no Ostionan sites anywhere in the West Indies after the mid-13th century. By approximately A.D. 1200, Meillacan people displaced the
Ostionan population on Grand Turk. Soon after, the Chican, or Classic Taino, "invaded" (to use Sears and Sullivan 1976's term) Middle Caicos, and later established their outpost colony at MC-6.

One of the effects of insularity on human societies is the conservation of cultural traits long after the core culture has changed patterns. The Ostionan occupation on Grand Turk survived at least into the 12th century, whereas in much of the Greater Antilles, Ostionan components had disappeared by A.D. 800. Patton (1996), in his study of "island sociogeography" of the Mediterranean, points out two contrasting trajectories of island cultural evolution. One is an elaborative path (i.e. Easter Island), but the other is a conservative path. Cultural traditions on islands can be very slow to change, due to being peripherally located in the society. Coralie is an example of this. Oliver (1995) notes the same phenomenon on Culebra Island off Puerto Rico, where Saladoid material culture endured into the 7th century.

The settlement on Grand Turk was a small, conservative and intermittent occupation, initially spurred on by the changing social and economic conditions in Puerto Rico during the Early Ostionoid. These migrating populations moved first to Hispaniola then up through the islands of the Bahamian archipelago in search of resources. The maritime adaptation of this society allowed exploration of this new territory while maintaining ties to its host population.

For humans with such a maritime focus, islands are not the finite environments that they are for the terrestrial fauna. Islands are often described as ecologically limited and pictured as closed systems, but this is a
biogeographical perspective. Culturally these systems are made open through the exploitation of the bountiful marine environment, and further through increased interaction and mobility made possible by the navigational abilities of these societies. Isolation and small island size should not be viewed as a hindrance to colonization, for it is on and near the ocean that these insular communities were most at home.
Islands that have sustained no human population until relatively modern times are very rare. The fauna that evolves in such a state, isolated and insulated in a predator-free environment, is incompatible with our modern conception of animal life. The Galápagos Islands, which were only sparsely and recently inhabited when discovered by Europeans in the 18th century, are a famous example of the abundance and apparent strangeness of pristine island faunas (Darwin 1839). Another example is Lord Howe Island between Australia and New Zealand, which was first discovered by the British in 1788 (Martin and Klein 1984). Archaeology has since established that no populations had ever lived on this island. The historic reports from that first voyage describe an “abundance of sea turtles and birds so tame they could be knocked over” (Martin 1984:393). I imagine that this is how Grand Turk appeared to the first people who discovered it; rich in animal resources beyond anything they had ever seen and with mountains of natural salt, ready and waiting to help them process these resources. The colonization period fauna on Grand Turk were easy prey for the settlers of the Coralie site, and changes to these animal populations are evident through time.

It must be assumed that the range of resources seen early in this occupation on Grand Turk are typical of all the islands in the West Indies at
some point in their history. However, archaeological sites with rich faunal assemblages like Coralie are rarely reported, because initial colonization period settlements are difficult to locate. Islands can be discovered and exploited before any settlements are even established (Cherry 1990; Irwin 1992; Patton 1996), leaving scant evidence behind. Even when that is not the case, finding the first, often small, settlement is a rare occurrence (Kirch 1996; Kirch et al. 1992). Although most of the West Indies have a long history of human occupation, the islands of the Bahamian archipelago were uninhabited, even unvisited, before the Ostionan migrations began in the 7th century A.D. The size and isolation of the Turks and Caicos Islands coupled with their short history of human occupation, increased the likelihood of uncovering the remains of their first occupation. The Coralie site is that rare occurrence for this region.

All zooarchaeological studies can provide insights into how island faunas are utilized, but only paleontological sites and the deepest deposits of initial colonization period sites can reveal what the pre-human faunal assemblage looked like. These data are essential in providing a baseline so that later human influences on species can to be put in a true context.

Modern-day patterns of species distributions are changing rapidly in response to multiplying human population figures and infringements into increasingly rare animal territories. Investigations such as this one show that these patterns are not only a modern phenomenon. All past human habitations have resulted in modified environments and exposed certain species to possible extinction. The material from Coralie is vastly different from
remains in the later archaeological sites of this region. These comparisons make it abundantly clear that the faunal resources of all these islands were degraded through Amerindian overexploitation.

Within the contexts of the Coralie site, degradation of the faunal resources is seen only in a few, vulnerable species. Certain birds and large reptiles were devastated early, but generally the island sustained its population well, with little evidence of dwindling resources for multiple centuries. This sustained economic abundance may have been possible because of cycles of abandonment. The occupation spans a period of over 400 years, although a continuous, permanent settlement for that entire time is unlikely from the amount of refuse deposited. Activities at this settlement include planting fields with manioc, and perhaps other crops, and capturing iguanas, sea turtles, and fish, which were roasted in large hearths. In the later period, more activities were pursued to store the abundant harvests. Turtle meat, fish, and conch were sun-dried, salted, and perhaps smoked. This bounty came to an end as soon as multiple permanent settlements came to the area. By A.D. 1200, there were numerous sites on many of these islands, all subsisting on overexploited resources.

This simple zooarchaeological investigation of changing subsistence patterns in the Turks and Caicos region, has generated data with much greater regional significance, particularly within the fields of West Indian biogeography and paleo-environmental reconstruction. Unusual discoveries in the species identifications creates a very different picture of past animal populations and illustrates how much more widely they were distributed. Many of these species
are extinct today on Grand Turk and some are regionally and even globally extinct. The timing of certain West Indian animal extinctions must be reconsidered. The appearance of rare and even previously unknown species (such as the thick-knee and tortoise) in Amerindian cooking hearths affirms that human hunting pressure, rather than Pleistocene/Holocene climate shifts, is implicated in their decline and eventual disappearance. Amerindian period, human-caused animal extinctions did commonly occur, through both human induced habitat changes over time and direct predation.

There is evidence at Coralie for sea level changes, with the lowest level deposits showing signs of both past inundations and past dry periods. These changes coupled with climatic fluctuations, particularly drought events, must be considered when discussing the cultural changes of the Early Ostionoid period and the large scale population movements that occurred at this time.

The people who colonized Grand Turk were fishermen, in flight from degraded environmental conditions and increasing population pressures in Puerto Rico. There was nothing accidental about this colonization process. These maritime oriented people were skilled enough at sea to explore this region, from their newly established home base in northeast Hispaniola, and choose the best place to create a colony. Grand Turk provided rich, unadulterated resources and a reasonable proximity to the source area.

On a more intimate scale, the excavations at Coralie have provided a picture of Amerindian life at an Ostionan period site. Food preferences and capturing and preparation techniques were inferred from the quantity and nature of the faunal remains and the contexts of their deposition. From bits of
discarded material information, the everyday activities and the character of this insular existence could be reconstructed.

Sustainability is a word often associated with descriptions of Amerindian lifeways. From research in southwest Florida, Marquardt (1996) determined that the Charlotte Harbor estuary provided for a large Amerindian population for over 7000 years without suffering any apparent degradation. Even though subsistence strategies such as these can be sustained over a very long period of time, all habitats exploited by humans are altered. Deterioration of an environment can happen so quickly after initial settlement that habitats functioning at less than optimum capacity may be unrecognizable. The Coralie site provides a point of comparison—a colonization period site with evidence of a pristine island fauna before and after exploitation occurred. The restricted diet at all the other settlements in this region imply that these populations quickly and broadly degraded their natural habitat, then learned how to function within the constraints of that lowered capacity, and to sustain that lowered capacity for the long term. The composition of pre-human habitats and the ability of humans to alter that environment is unimaginable without these types of data from initial colonizations.
APPENDIX A:
SYSTEMATIC ACCOUNTS FOR IDENTIFIABLE FISH REMAINS

Sources: Böhlke and Chaplin 1993; Burgess and Synder 1995; Humann 1994; Randall 1968

Order: Squaliformes
Family: Carcharhinidae
*Carcharhinus* sp. (shark)

*Material:* 82 specimens: 8 teeth; 74 vertebrae. *MNI:* 4

*Remarks:* The most common species of this genus around Grand Turk today are *Carcharhinus perezi* (reef shark). Young sharks (<10 kg), particularly *Negaprion brevirostris* (lemon shark) are very abundant nearshore and are common in the shallows near mangrove creeks. Adult sharks are generally nocturnal feeders and often follow prey into the shallows. Blacktips (*C. limbatus*) are known to enter lagoons as adults and 2 m bull sharks (*C. leucas*) are seen in North Creek today. The bull shark is an inshore species and quite common in archaeological remains. All these sharks inhabit the edge of the reefs, most often on the windward side of these islands.

Order: Rajiformes
Family: Dasyatidae
*Dasyatis americana* (southern stingray)

*Material:* 39 specimens: 7 spines; 32 vertebrae. *MNI:* 7

*Remarks:* The southern stingray is very common around Grand Turk today, especially inside North Creek. It was the only ray identified during surveys completed by George Burgess and David Snyder. Stingrays will follow its invertebrate prey into very shallow water along the sandy shore. Their average length, not including the tail, is 1 m and they can weigh over 20 kg. The local inhabitants of the Turks and Caicos Islands today do not hunt or eat rays.

Order: Teleostei
Family: Albulidae
*Albula vulpes* (bonefish)

*Material:* 294 specimens: 200 vertebrae; 84 otoliths; 4 operculums; 6 lower pharyngeal grinders. *MNI:* 27

*Remarks:* Bonefish live in very shallow sand or mud flats and lagoons, often near mangroves, and eat various invertebrates, especially clams. They live inside North Creek today. They are often solitary and swim near the surface of the water. *Size:* 30-75 cm; max. 90 cm.
Family: Holocentridae

*Holocentrus ascensionis* (long-jaw squirrelfish)

**Material:** 17 specimens: 6 preoperculums; 4 dentaries; 2 articulars; 1 atlas; 1 maxilla; 1 vomer; 1 vertebra; 1 cleithrale. MNI: 5

**Remarks:** These are reef fishes which hide in rocky cavities during the day and hunt for invertebrates only at night. They are most abundant in shallow patch reefs, in 1.2 m of water or more. Size: ca. 30 cm.

Family: Serranidae

*Epinephelus* sp. (grouper/hind)

**Material:** 395 specimens: 93 vertebrae; 46 premaxillas; 50 dentaries; 43 maxillas; 62 quadrates; 32 atlases; 19 articulars; 26 vomers; 4 operculum; 3 post-temporals; 3 epibrachials; 4 hyals; 2 hyomandibulars; 2 skull fragments; 3 supracleithrales; 2 parasphenoids; 1 scapula. MNI: 32

**Remarks:** All the serranids are carnivorous, preying on small fish and crustaceans. Only one species of this genus was identified, but doubtless many different species of groupers and hinds were captured.

*Epinephelus striatus* (Nassau grouper)

**Material:** 4 specimens: 3 atlases; 1 maxilla. MNI: 4

**Remarks:** This species is one of the larger serranids, reaching up to 1.2 m in length. They are commonly between 30 and 60 cm. The Nassau grouper is the most common member of this genus in Grand Turk waters today. They live in clear, deep (6 to 30 m) water on narrow shelves like that seen on the leeward coast of Grand Turk.

*Mycteroperca* sp. (grouper)

**Material:** 3 specimens: 1 dentary; 1 premaxilla; 1 maxilla. MNI: 1

**Remarks:** Tiger groupers (*Mycteroperca tigris*) are the most common members of this genus today in Grand Turk waters. All of the large serranids are solitary carnivores that are usually found resting near the bottom on the edges of reefs.

Family: Carangidae

*Caranx* sp. (jacks)

**Material:** 64 specimens: 49 vertebrae; 3 atlases; 3 maxillas; 3 dentaries; 3 articulars; 2 operculums; 1 premaxilla. MNI: 4

*Caranx hippos* (Crevalle jack)

**Material:** 1 specimen: 1 vertebra. MNI: 1

**Remarks:** This is a solitary species, rare today in the Bahamas. It was not identified by George Burgess and David Snyder in the waters surrounding Grand Turk. Crevelle jacks prefer open water to the reefs, where they are usually seen at depths of 30 m or more. This is the largest of the *Caranx* species. All the jacks are carnivorous, often feeding on small, schooling fishes like atherinids. Size: 30-75 cm; max. 110 cm.
Caranx ruber (bar jack)

**Material:** 34 specimens: 12 dentaries; 5 premaxillas; 12 vertebrae; 3 maxillas; 1 atlas; 1 articular. MNI: 9

**Remarks:** This is the most common jack in Grand Turk waters today schooling in and around the reefs and over sandy shallows. Size: 20-36 cm; max. 60 cm.

Caranx crysos (blue runner)

**Material:** 4 specimens: 2 vomers; 1 atlas; 1 premaxilla. MNI: 3

**Remarks:** Like the bar jacks, this species forms large schools but usually remain in the offshore environment. When encountered in the reefs, they are often solitary. The blue runner is the best eating fish of all the jacks. Size: 30-60 cm; max. 75 cm.

Trachinotus cf. falcatus (permit)

**Material:** 2 specimens: 2 atlases. MNI: 2

**Remarks:** This species occurs over sandy or muddy shallows and reefs from 1 to 35 m deep and eat invertebrates. Permits are an exceptionally good eating fish. Size: up to 1 m.

Family: Lutjanidae

Lutjanus sp.

**Material:** 441 specimens: 55 vertebrae; 54 atlases; 69 maxillas; 54 premaxillas; 43 quadrates; 27 dentaries; 40 articulors; 21 otoliths; 6 basioccipitals; 14 post-temporals; 12 vomers; 7 hyomandibulars; 5 supracleithrales; 2 parasphenoids; 2 hyals; 1 operculum; 1 preoperculum; 2 canines; 26 fragments. MNI: 51

Lutjanus cf. analis (mutton snapper)

**Material:** 1 specimen: 1 atlas. MNI: 1

**Remarks:** This species is a solitary resident of the reefs or, more commonly, open, sandy bottomed water. It is an exceptionally good eating fish. Size: 30-60 cm; max. 75 cm.

Lutjanus cf. apodus (schoolmaster)

**Material:** 5 specimens: 3 atlases; 2 premaxilla. MNI: 3

**Remarks:** Schoolmasters are the most common snapper on the Grand Turk reefs today, and the most common in the West Indies. This species forms the largest schools of any snapper. Along with L. synagris (lane snapper), which is uncommon in these waters, this species migrates inshore to feed at night on crustaceans and small fishes. Juveniles inhabit the lagoon. Size: 25-45 cm; max. 56 cm.

Lutjanus cf. griseus (gray snapper)

**Material:** 5 specimens: 3 atlas; 2 otoliths; 1 premaxilla. MNI: 3

**Remarks:** Also called “mangrove snappers”, this species prefers shallow water (between ½ and 18 m deep), inhabiting inshore areas, especially mangrove sloughs and rocky outcrops, and occasionally reefs. They form small groups but do not school like the schoolmasters. They are considered very good eating. Size: 25-45 cm; max. 60 cm.
Lutjanus cf. mahogoni (mahogony snapper)

**Material:** 1 specimen: 1 atlas. MNI: 1

**Remarks:** This is also a very common species on the Grand Turk reefs. Like the gray snapper, they form small groups but do not school.

Size: 18-30 cm; max. 38 cm.

Family: Haemulidae

**Haemulon** sp. (grunts)

**Material:** 1083 specimens: 159 atlases; 233 otoliths; 185 maxillas; 112 premaxillas; 120 vertebræ; 103 quadrates; 26 articulars; 28 parasphenoids; 30 pharyngeal grinders; 25 vomers; 18 dentaries; 6 basioccipitals; 5 supracleithrales; 1 hyomandibular; 2 scapulas; 3 operculums; 27 fragments. MNI: 149

**Remarks:** Grunts are schooling, reef fishes which feed mostly on crustaceans. The three commonest species in the waters surrounding Grand Turk today are *H. flaviolineatum* (French grunt), *H. sciurus* (blue-striped grunt) and *H. carbonarium* (caesar grunt); four species were tentatively identified.

**Haemulon** cf. *album* (margate)

**Material:** 16 specimens: 8 otoliths; 8 atlases. MNI: 8

**Remarks:** Identification of these specimens was mainly based on size, since margates are the only member of this family that reach over 46 cm in length. This species is usually solitary or found in small groups. Margates, French grunts and *H. plumieri* (white grunt) migrate to feed over the flats at night. They are considered a fine food fish. Size: 25-50 cm; max. 70 cm.

**Haemulon** cf. *flaviolineatum* (French grunt)

**Material:** 8 specimens: 8 atlases. MNI: 8

**Remarks:** This is the smallest of all the grunt species. This tentative identification was based on the shape and size of the atlas. French grunts are the most common species on the reefs of Grand Turk today, providing the largest single species biomass. They form very large schools by day in the reefs, then disperse to the flats at night. Size: 15-25 cm; max. 30 cm.

**Haemulon** cf. *plumieri* (white grunt)

**Material:** 3 specimens: 1 atlas; 2 otoliths. MNI: 1

**Remarks:** Size: 20-35 cm.

**Haemulon** cf. *sciurus* (blue-striped grunt)

**Material:** 1 specimen: 1 atlas. MNI: 1

**Remarks:** This species is also very common on Grand Turk reefs today. It does not migrate to feed over the flats. Size: 20-35 cm; max. 46 cm.

Family: Sparidae

**Calamus** sp. (porgies)

**Material:** 30 specimens: 6 maxillas; 4 premaxillas; 4 dentaries; 4 articulars; 2 atlases; 5 teeth; 2 premaxilla/dentary fragments; 1 vertebra; 1 operculum. MNI: 5
Remarks: The juveniles of this species are very common today in North Creek, but adults are never found there. Adults are solitary, feeding on crabs and mollusks along sandy-bottomed shallows. Porgies are also found in clear water over reefs. These remains probably come from either *Calamus calamus* (saucereye porgy) or *C. bajonado* (jolthead porgy). Saucereye porgies are the only species that comes into shallow waters (up to 1.2 m). It reaches a maximum size of 40 cm. Jolheads are larger, up to 60 cm, and live in water deeper than 6 m. Porgies are good food fishes.

Family: Kyphosidae
*Kyphosus sectatrix/incisor* (Bermuda or yellow chub)
*Material:* 5 specimens: 4 atlases; 1 dentary. MNI: 4
*Remarks:* This is a non-schooling species, but it will form small aggregations. They are herbivorous and feed near the water's surface, preferring rocky areas and shallow reefs.
*Size:* 30-60 cm.

Family: Sphyraenidae
*Sphyraena barracuda* (great barracuda)
*Material:* 21 specimens: 2 dentaries; 2 atlases; 9 teeth; 7 vertebrae; 1 otolith. MNI: 6
*Remarks:* Barracudas follow its fish prey into many habitats. This species drifts around reefs and the smaller individuals can be found in the shallow grass flats. Today, North Creek is full of juvenile barracuda. They live in water between 0 and 18 m deep and are easily captured while trolling. *Size:* 46-90 cm; max. 1.8 m.

Family: Labridae
*Bodianus rufus* (Spanish hogfish)
*Material:* 13 specimens: 4 lower pharyngeal grinders; 4 upper pharyngeal grinders; 2 maxillas; 1 dentary; 1 vomer; 1 quadrate. MNI: 4
*Remarks:* This is a reef fish not uncommon in waters between 3 and 30 m deep. They travel in loose aggregations and feed on invertebrates. At night, nearly all the smaller wrasses bury themselves in the sand. *Size:* 20-35 cm; max. 60 cm.

*Halichoeres radiatus* (pudding wife)
*Material:* 115 specimens: 29 lower pharyngeal grinders; 29 upper pharyngeal grinders; 15 dentaries; 10 premaxillas; 6 atlases; 6 basioccipitals; 4 maxillas; 2 articulars; 6 quadrates; 1 canine; 5 fragments. MNI: 25
*Remarks:* This is the largest species of this genus. It is primarily a reef dweller, but may be found in rocky shallows. *Size:* 30-38 cm; max. 46 cm.
Family: Scaridae

Scarus sp. (parrotfish)

Material: 380 specimens: 21 dentaries; 19 premaxillas; 27 lower pharyngeal grinders; 57 upper pharyngeal grinders; 132 grinder teeth; 37 vertebras; 4 atlases; 18 dentary/premaxilla fragments; 8 maxillas; 8 quadrate; 9 epibrachials; 1 hyal; 2 vomers; 2 scapulas; 1 basioccipital; 1 supraoccipital; 1 hyomandibular; 32 fragments.

MNI: 25

Remarks: Because many of the specimens recovered came from very large fish, some of the remains are probably from Scarus guacamaia (rainbow parrotfish). This is consistently the largest of the parrotfish family, regularly reaching between 46 and 90 cm in length. It can be found up to 1.2 m in length. Other species occasionally also reach up to 1 m in length including S. coeruleus (blue parrotfish) and S. coelestinus (midnight parrotfish), but are usually between 30 and 60 cm. All these species are equally common in the waters surrounding Grand Turk today. All parrotfishes are herbivorous, eating turtle grass and algae off the coral. Parrotfish sleep on the ocean bottom at night; some species secrete a mucus bubble around themselves. The most common species of this genus is Scarus iserti (striped parrotfish). This small species (up to 25 cm) spends days in the shallows and nights deep. Some small Scarus parrotfish were found in the remains.

Sparisoma sp. (parrotfish)

Material: 83 specimens: 22 dentaries; 15 premaxillas; 12 lower pharyngeal grinders; 12 upper pharyngeal grinders; 6 quadrate; 6 articulars; 3 maxillas; 4 dentary/premaxilla fragments; 2 parasphenoids; 1 atlas. MNI: 12

Remarks: The most common Sparisoma parrotfishes in the Grand Turk waters today are Sparisoma viride (stoplight parrotfish) and Sparisoma aurofrenatum (redband parrotfish). The stoplight reaches lengths of at least 50 cm, yet the redband only reaches 28 cm. These two are primarily reef species. Two other species are rare on reefs and common in shallow grass flats and shallow areas of coral rubble. These are Sparisoma rubripinne (redfin parrotfish) and Sparisoma chrysopterum (redtail parrotfish). Both reach a maximum of 46 cm. Only the redfin is seen today around Grand Turk. If these herbivores were netted or trapped on the flats, the redfin parrotfish would be the most likely species in the remains. Only one incomplete atlas was recovered, making identification of the particular species impossible.

Family: Acanthuridae

Acanthurus sp. (ocean surgeonfish/blue tang)

Material: 6 specimens: 4 vertebra; 2 caudal tangs. MNI: 2

Remarks: These common, herbivorous fishes swim in loose aggregations with parrotfishes on the reefs, also feeding on algae and turtle grass. Size: 15-30 cm.
Family: Scombridae

cf. *Scomberomorus* sp. (mackerel)

*Material:* 1 specimen: 1 vertebra. MNI: 1

*Remarks:* Scombrids are offshore, deep water fishes which come inshore only to spawn. *Scomberomorus* sp. will enter mangroves and lagoons as adults, following their prey of schooling atherinids. They also occur over reefs and near deep water drop-offs. The most common species of this genus in the Bahamas is *Scomberomorus regalis* (cero). They are usually solitary and are a fine eating fish.

*Size:* 45-90 cm.

Family: Bothidae

*Bothus lunatus* (peacock flounder)

*Material:* 10 specimens: 2 articulars; 8 fragments. MNI: 2

*Remarks:* This is a shallow water species, living in 1/2 to 12 m of water. They are carnivorous, feeding on small fishes and crustaceans. These flatfishes live in sandy bottom sediments or in areas of coral rubble or grass beds. They are a good food fish.

*Size:* 15-38 cm; max. 45 cm.

Family: Balistidae

*Balistes vetula* (queen triggerfish)

*Material:* 56 specimens: 26 vertebrae; 12 teeth; 5 2nd dorsal spines; 9 quadrates; 2 atlases; 1 dentary; 1 premaxilla. MNI: 7

*Remarks:* Triggerfish are solitary, fast swimming inhabitants of the extended barrier reef. They also can be found in sandy or coral rubble areas or on the grass flats. They feed on crabs, sea urchins, mollusks and occasionally graze the coral reefs.

*Size:* 20-40 cm; max. 60 cm.

Family: Ostraciidae

*Lactophrys* sp. (trunkfish/boxfish)

*Material:* 398 specimens: 23 teeth; 75 vertebrae; 257 scutes; 20 premaxilllas; 14 dentaries; 4 quadrates; 4 dentary/premaxilla fragments; 1 basioccipital. MNI: 12

*Remarks:* These are shallow water bottom dwellers, which live in the sea grasses and in open, sandy areas. They occasionally enter North Creek. The small (ca. 15 cm) *Lactophrys triqueter* (smooth trunkfish) is the most common species in Grand Turk waters, and is usually found on the reefs. *Lactophrys trigonus* (trunkfish) lives in the shallowest water, between 1 and 10 m, and primarily in the grass flats. They feed on a variety of invertebrates. They are solitary, very slow swimmers, protected only by their bony exterior carapace. Even though they secrete a poisonous epidermal toxin, their meat is highly esteemed for food.

*Size:* up to 48 cm.
Family: Tetraodontidae
*Sphoeroides* cf. *testudineus* (checkered puffer)

**Material:** 3 specimens: 3 premaxillas. MNI: 2

**Remarks:** This is the larger of the puffer species and the only one identified in Grand Turk waters today. It lives in the shallows, over sea grasses, coral rubble or in lagoons, tending to hover near the bottom. They are very slow swimmers, using their ability to inflate their bodies to discourage predation. The viscera of this species is extremely toxic, which does not seem to have discouraged its use as a food fish. Though uncommon in this site, some sites are dominated by this species (see MC-32 and Panamanian sites described by Cooke 1992). They feed on invertebrates and occasionally algae and sea grass. Size: 10-18 cm; max. 30 cm.

Family: Diodontidae
*Diodon* cf. *hystrix* (porcupinefish)

**Material:** 199 specimens: 10 mouthplates or "beaks" from the premaxilla and dentary; 188 barbs; 1 preoperculum. MNI: 9

**Remarks:** This is the largest species of the diodontidae family. Porcupinefish can be found in recesses of the reef or occasionally on the grass flats in 3 to 18 m of water, where they feed on invertebrates. These slow swimmers protect themselves by inflating their barbed bodies. Like the pufferfish, their viscera are toxic and porcupinefish are not consumed today. A smaller species, *Diodon holacanthus* (balloonfish) is more common in mangrove channels and may also be present in the samples. Comparative material was unavailable. Size: 30-60 cm; max. 90 cm.
ADDENDIX B
SYSTEMATIC ACCOUNTS FOR IDENTIFIABLE BIRD REMAINS

Sources: Bradley 1992; Buden 1987; Raffaele et al. 1998

Order: Pelecaniformes
Family: Sulidae
*Sula dactylatra* (masked booby)

*Material:* 20 specimens: 1 coracoid; 7 humeri; 2 tibiotarsi; 1 radius; 1 ulna; 1 scapula; 2 tarsometatarsi; 2 quadrates; 2 vertebrae; 1 mandible. Minimum Number of Individuals (MNI): 7

*Remarks:* This is the larger of the two species of this genus found at Coralie. Boobies are a wide-ranging, oceanic species which congregate only to nest. As boobies are the most common bird at Coralie, both of these species must have had breeding colonies on the islands. Masked boobies lay their eggs directly on the ground, and both the bird and its eggs would have been easy prey. This species forms comparatively small colonies today, with no known breeding colonies in the Bahamas. It has been recorded as an occasional vagrant in the Turks and Caicos Islands (TCI). The most common species in the West Indies today is the brown booby (*Sula leucogaster*) which nests throughout the Caribbean. It currently inhabits, and possibly breeds on the smaller Turks cays, but this common species was not found in the site. It has apparently replaced *Sula dactylatra* and *Sula sula* throughout much of the West Indies in the last 1000 years.

*Size:* 82-92 cm.

*Sula sula* (red-footed booby)

*Material:* 65 specimens (50% from just two proveniences): 1 carpometacarpus; 1 tarsometatarsus; 8 coracoids; 12 humeri; 3 ulna; 2 sternum; 2 synsacrum; 2 scapula; 7 radii; 3 quadrates; 1 ulnare; 3 tibiotarsi; 1 fibula; 1 manal phalanx; 11 vertebrae; 8 shaft fragments. MNI: 7

*Remarks:* The main differences with above species is the smaller size of *Sula sula*, and its nest, which it builds of sticks in low shrubs or trees. It especially likes to nest in mangroves and other nearshore bushes. Today only one colony of red-footed booby remains in the Bahamas, off the island of San Salvador.

*Size:* 69-74 cm.
Order: Ciconiiformes
Family: Ardeidae

*Ardea herodias* (great blue heron)

*Material:* 23 specimens: 2 tarsometatarsi trochlea; 3 phalanges; 1 first metatarsal; 1 manal phalanx; 1 skull fragment; 3 tarsometatarsi; 4 coracoids; 1 humerus; 3 scapula; 2 tibiotarsi; 1 femur; 1 radius.

*MNI:* 2

*Remarks:* Of the above specimens, 19 are from a single juvenile individual in one deposit. This species does not breed in the Bahamas, with the possible exception of Great Inagua. It is only a winter visitor to the TCI. It inhabits tidal flats, shorelines and swampy regions.

*Size:* 112-132 cm.

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*Egretta rufescens* (reddish egret)

*Material:* 1 scapula.  

*MNI:* 1

*Remarks:* This species does breed in the TCI today, but is an uncommon resident. It inhabits tidal flats, salinas, shorelines and lagoons.

*Size:* 67-80 cm.

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*Nyctanassa violacea* (yellow-crowned night heron)

*Material:* 1 ulna.  

*MNI:* 1

*Remarks:* This is a breeding resident of the TCI. It was hunted with traps until recent times by residents of Middle Caicos. A common resident of the mangrove swamps, but it also inhabit the coastal scrub. This species builds its nests in trees and is active both day and night.

*Size:* 55-70 cm.

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Ardeidae sp. (undetermined heron or egret)

*Material:* 1 scapula; unidentifiable to species but in the size range of the yellow-crowned night heron.

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Family: Threskiornithidae

*Eudocimus ruber* (scarlet ibis)

*Material:* 8 specimens: 1 complete femur; 2 radii; 1 quadrate; 1 humerus; 3 vertebrae.  

*MNI:* 1

*Remarks:* The scarlet ibis is a northern South American species. It has been recorded as an occasional vagrant to the island of Grenada, but otherwise does not occur on the oceanic islands of the West Indies. Ibises live in lagoon and mangrove habitats.

*Size:* 55-63 cm.

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Order: Phoenicopteriformes
Family: Phoenicopteridae

*Phoenicopterus ruber* (American flamingo)

*Material:* 3 specimens: 1 distal ulna (juvenile); 1 ulna shaft; 1 distal humerus.  

*MNI:* 2
Remarks: Today a small colony of flamingos live in the creek next to Coralie. They are there in the winter months, but breed elsewhere. The largest known breeding colonies in this region are on Great Inagua and Acklins Island. Small breeding colonies have been reported in the Caicos Islands. Until this group established itself some years back, flamingos had been extirpated from the Turks Islands. They inhabit salt flats, coastal lagoons and protected tidal flats. Size: 105-120 cm.

Order: Anseriformes
Family: Anatidae
*Dendrocygna arborea* (West Indian whistling duck)

*Material:* 15 specimens: 3 tarsometatarsi; 3 femora; 1 phalanx; 1 carpometacarpus; 2 tibiotarsi; 1 radius; 1 coracoid; 1 scapula; 1 mandible; 1 humerus. MNI: 4

*Remarks:* These ducks are primarily winter residents and do not inhabit the Turks Islands today. They do inhabit the Caicos bank, and may have a breeding colony there. Known breeding colonies exist on Great Inagua and Crooked Island. This species is most active at night and lives in mangrove swamps.

Size: 48-55 cm.

Order: Falconiformes
Family: Pandionidae
*Pandion haliaetus* (osprey)

*Material:* 3 specimens: 1 tibiotarsus; 1 carpometacarpus; 1 phalanx.

MNI: 1

*Remarks:* This family of birds constitutes only one species with a worldwide distribution, but is divided into multiple sub-species. The sub-species of osprey on Grand Turk is *P. h. ridwayi*. Its range extends throughout the southern Bahamas. It differs from North American mainland ospreys by being smaller and lighter in color. The carpometacarpus bone in this collection displays some structural differences from the North American species, and probably represents sub-species differentiation. There are breeding pairs in the area of the Coralie site today. It is a coastal inhabitant.

Size: 55-63 cm.

Order: Charadriiformes
Family: Haematopodidae
*Haematopus palliatus* (American oystercatcher)

*Material:* 1 coracoid. MNI: 1

*Remarks:* The oystercatcher inhabits beaches, especially rocky shores, and tidal flats. It breeds today in the TCI but is relatively uncommon.

Size: 43-53 cm.
Family: Burhinidae
*Burhinus bistriatus* (double-striped thick-knee)
*Material:* 4 specimens: 1 tarsometatarsus; 1 tibiotarsus; 1 femur; 1 humerus. MNI: 2
*Remarks:* The only West Indian occurrence of this species today in on Hispaniola. They are a good indicator of a dry environment, inhabiting grasslands, savannas or any open, cultivated country. Thick-knees are a ground dwelling bird which rarely takes to wing, and are most active at night. Their eggs are laid on the ground making them vulnerable to predators. Size: 38-43 cm.

Family: Scolopacidae
*Limnodromus griseus* (short-billed dowitcher)
*Material:* 1 humerus. MNI: 1
*Remarks:* This species is primarily a winter resident to the TCI. It inhabits tidal flats and lagoon edges. Size: 30 cm.

Family: Laridae
*Larus atricilla* (laughing gull)
*Material:* 2 specimens: 1 juvenile coracoid; 1 tibiotarsus. MNI: 2
*Remarks:* This bird congregates in colonies to breed during the summer months in the TCI, but is rarely seen in the winter months. It is the most common Antillean gull. Size: 48 cm.

Order: Columbiformes
Family: Columbidae
*Columba leucocephala* (white-crowned pigeon)
*Material:* 2 humeri. MNI: 2
*Remarks:* This species reportedly breeds in colonies in the Caicos Islands, but are not a common sight. They nest in great numbers in trees either on offshore cays or coastal mangroves. They prefer wooded habitats at low elevations. Columbids are the most common avifaunal remains at many Amerindian sites in the West Indies. Being frugivorous, their meat is quite palatable. Size: 35 cm.

*Zenaida aurita* (Zenaida dove)
*Material:* 2 specimens: 1 carpometacarpus; 1 sternum. MNI: 1
*Remarks:* This is a common dove in the Caicos Islands today, but rare in the Turks. It prefers open country at lower elevations. It is a ground-dwelling landbird, easily caught in traps and snares. Size: 28-30 cm.

*Geotrygon chrysia* (Key West quail dove)
*Material:* 2 humeri. MNI: 2
*Remarks:* This dove is rare today in the TCI only inhabiting and possibly breeding on North Caicos and Pine Cay. It is rare throughout the Bahamas and most of the Antilles except for Hispaniola. Its preferred habitat is a semi-arid woodland. Size: 28-30 cm.
Order: Psittaciformes
Family: Psittacidae
*Amazona leucocephala* (Cuban parrot)

*Material:* 6 specimens: 1 humerus; 1 tibiotarsus; 1 scapula; 1 coracoid; 1 axis; 1 C-3 vertebra. MNI: 2

*Remarks:* The only islands in the Bahamas which still supports parrot is Great Inagua and Abaco, although its past range extended throughout the archipelago. Parrots like dense scrubby woodlands in either high or low country, laying its eggs in tree holes or ground holes.

*Size:* 28-32 cm.

*Amazona* sp. (undetermined parrot)

*Material:* 2 specimens: 1 scapula; 1 palatine. MNI: 1

*Remarks:* These remains are substantially larger than the Cuban parrot remains. The only large parrots in the West Indies today come from Dominica, St. Lucia and St. Vincent. *Size:* approx. 38 cm.

Order: Passeriformes
Family: Tyrannidae
*Tyrannus dominicensis* (gray kingbird)

*Material:* 1 ulna. MNI: 1

*Remarks:* This bone was found in association with a 19th c. belt buckle and historic glass well above the Amerindian occupation layer. This is a very common West Indian bird which breeds today in the TCI during the summer months. The kingbirds like open, settled environments like are currently seen on Grand Turk. *Size:* 23 cm.

Family: Corvidae
*Corvus nasicus* (Cuban crow)

*Material:* 22 specimens: 3 tarsometatarsi; 3 tibiotarsi; 1 manal phalanx; 4 ulnas; 4 coracoids; 1 femur; 2 carpometacarpi; 1 sternum; 1 quadrate; 2 vertebrae. MNI: 6

*Remarks:* The crow is a North American species that inhabits only the Bahamas and Greater Antilles today, but it is known prehistorically in the Lesser Antilles. The Cuban crow is found today in the Caicos Islands, Cuba and Caymans, but the fossil record shows that its former range extended throughout the Bahamas. It is not found in the drier, eastern Caicos Islands or on the Turks bank. Crows occur in flocks and live in both mangrove and pine forests.

*Size:* 45-47.5 cm.
APPENDIX C
DESCRIPTION AND DISCUSSION OF GRAND TURK TORTOISE REMAINS

Systematics:

Class: Reptilia
Order: Testudinata
Suborder: Cryptodira
Family: Testudinidae
Genus: Geochelone
Subgenus: Chelonoidis
Species: unnamed

Material: ca. 630 specimens. Internal skeleton: 8 humeri; 3 femora; 4 scapulas; 5 ulnas; 1 tibia; 1 fibula; 5 radii; 1 ilium; 1 pubis; 4 cervical vertebrae; 2 first dorsal vertebrae; 16 vertebral processes; 2 prefrontals; 1 skull fragment; 1 podial. External skeleton: 1 complete plastron; 7 epiplastra, endoplastra and partial hyoplastra; 4 xiphiplastra and partial hypoplastra; 30 plastron fragments; 35 pleural fragments; 56 whole and fragmented peripherals; 13 whole and fragmented neurals; 4 nuchal fragments; 1 pygal; 1 suprapygal; 76+ carapace fragments; 246+ shell fragments.

MNI: 18

Remarks: Detailed description of whole and nearly whole elements are in the last section of this appendix.

Morphology of Geochelone sp. Identified on Grand Turk

The remains display the following characteristics:

1). A very thin shell; the carapace averaging 2 to 4 mm thick.
2). A round humeral and femoral shaft.
3). Carapace scute sulci raised above the adjacent shell surface by approximately 1 mm.
4). A roughened, slightly depressed area for insertion of the latissimus dorsi on the humerus, but no deep pit.
5). A high domed carapace with no denticulations and no flared margins.
6). Plastron length ranging from 27 cm (juvenile) to 60 cm.
7). A thickened epiplastral lip; ranging from 16 cm in the juvenile to 26 cm in the adult. The outline of the epiplastron is rounded with an indentation at the center suture.

8). A correspondingly thickened xiphiplastral lip (14 cm in a medium sized individual), and a shallow xiphiplastral notch—one quarter as deep as it is wide.

9). A thick ridge running across the top and down the center line of the endoplastron for muscle attachment.

10). Sulcus closing along the endoplastral bony crest; sutures and sulcus all meet at one center point.

11). Short centrum on the first dorsal vertebra.

Because the carapace, particularly the neurals and pleurals, are so thin and rarely preserved for this species, a reconstruction of the carapace and its scute pattern was not attempted. The exact neural sequence has not been determined. No complete pleurals were recovered. The pleurals dovetail, with #2, #4 and #6 being much wider distally than proximally. They are thin, ranging between 2.0 and 3.5 mm. The scute sulcus ridges are very pronounced on the pleurals, but on the plastron and peripherals, the sulci are not raised at all. All the peripherals are represented in the collection and some are complete. All the limb bones, complete scapula and a partial pelvis were recovered, but few vertebrae, incomplete nuchals and only two skull fragments exist.

Complete plastra allow a definite recreation of the bone and scute pattern (Figure 29). Noteworthy is the oblique angle of the xiphiplastral sulcus, and the meeting of the epiplastral sulci with the endoplastral ridge and suture. The bony ridges where muscle attachments are made to the shell are especially robust on the endoplastra (see Figure 30), in order to support a large boned tortoise. This particular trait is not described for any other Geochelone species, living or extinct, and is a byproduct of both the large size of this species and
Figure 29: Drawing of Plastron of Grand Turk Tortoise (*Geochelone* sp.), showing Scute Pattern. Includes five peripherals. Heavy line is the scute pattern. Most of the bones were unfused at the suture lines. Specimen is 340 mm in length (P.L.).
the thinness of the shell. The epiplastral and xiphiplastral ends are thickened with slight lateral ridges, but the rest of the plastron and all the carapace is thin. The extra bony matter on the endoplastron was pulled from the remaining shell, where it was not needed for protection, and added to this area.

Figure 30: Photograph of Interior of Tortoise Plastron in situ.
for attachment of large muscles. The result is very thin shells. On most of the individuals, the interior, thinnest part of the plastron was broken away leaving only a ring of bone in the sites' deposits.

For a thin dome structure to have strength, height must be added to the equation. The very high domed carapace of this *Geochelone* compensated for its thinness. Deciphering the shape of this carapace was difficult because of the fragility of the individual pleural elements, which were often very fragmented. A reconstructed carapace (left peripherals #7-10; pleurals #6-8; neurals 7 & 8; suprapygal) suggests a dome that is nearly as tall as it is wide.

The epiplastral opening is slot-like with the carapace jutting no more forward than the front edge of the plastron and rising approximately 6 or 7 cm above it. There would be no room for the head and limbs to contract nor could the forelimbs rotate much within a single horizontal plane of movement. The opening at the xiphiplastral end is correspondingly narrow as evidenced from the scute attachment scars.

The epiplastral lip is particularly developed with a thickness of up to 26 mm. This area of the plastron is not a supporting structure for the tortoise so its development must relate to a behavioral characteristic. It is usually thickened only on male individuals and is associated with particular courtship behaviors (Auffenberg 1978). It is pronounced on all the specimens from Grand Turk, not all of which are adult males, and therefore may have an alternate function. Only the three largest specimens in the collection are undoubtedly adult males, displaying concave central plastra. The largest
plastron measured 60 cm in length, although the majority of plastra measured between 35 and 40 cm. Of the 18 individuals recovered, four were hatchlings.

Phylogenetic History of the West Indian Tortoises

The phylogeny of the West Indian *Geochelone* species is poorly understood due to the scarcity of remains excavated till now. There are two subgenera of *Geochelone*—*Monachelys* and *Cheloides*. Characteristics of the former subgenus are 1) an elongated first dorsal vertebra, 2) lack of a xiphiplastral notch, and 3) a sulcus closing along the epiplastral bony crest. The tortoise from Grand Turk does not share any of these characteristics and therefore belongs in the classification *Cheloides*.

*Geochelone sombrerensis*: There are three described species of extinct fossil tortoise in the West Indies (Auffenberg 1967, 1974). *Geochelone (Chelonoidis) sombrerensis*, identified from Sombrero Island, near Hispaniola, is not a possible match for the Grand Turk tortoise due to its very large size and possibly pre-Pleistocene era context. One specimen of this species had a 90 cm long plastron and a humerus 30 cm in length.

*Geochelone cubensis*: *Geochelone (Chelonoidis) cubensis* is another large sized probably Pleistocene age tortoise from the island of Cuba. The only diagnostic characteristic this specimen shares with the Grand Turk tortoise is scute sulci that are raised on a ridge above the adjacent shell surface. *G. cubensis* are different than any other West Indies species in having an oval shaped humeral shaft and a deep pit for the latissimus dorsi insertion.
**Geochelone monensis**: Geocelone (Monachelys) monesis was described by E. Williams (1952) with material from Mona Island west of Puerto Rico. This is a smaller species that does not have raised scute sulci. It shares the humeral characteristics of the Coralie material (round shaft and roughened area for the latissimus dorsi insertion), but being in the subgenus *Monachelys*, it could not be the same species.

**Undetermined Geochelone sp. Remains**: The meager amount of Hispaniola material (Franz and Woods 1983) discovered to date display a combination of the *G. cubensis* trait of raised scute sulci with the *G. monensis* type of humerus. The individual recovered had a thin shell, though not nearly as thin as the Grand Turk specimens, and an estimated carapace length of 60 cm.

An indeterminate species of *Geochelone* was found in a cave in Barbados (Steadman et al. 1994), and small amounts of unspecified tortoise materials were described for the Bahamas (Auffenberg 1967). One pleural came from a cave on Andros, while some scanty remains were found in the Banana Hole site on New Providence. Auffenberg also described some bones from Navassa Island. All these specimens indicate a very thin-shelled species with up to 40 cm long plastrons. The New Providence tortoise had a 60 cm long carapace. The Bahamian tortoise humerus resembles that of *G. monensis*. It also lacks raised scute sulci.

The islands to date that have a paleontological record of *Geochelone* are Barbados, Cuba, Hispaniola, Mona Island, Sombrero Island, Navassa Island, Andros, Abaco, San Salvador, New Providence, and now Grand Turk and
Middle Caicos. From the assembled remains, three species have been formally described and named in the West Indies (Auffenberg 1974). These species are all morphologically different from the Grand Turk tortoise. The founding stock for the Grand Turk tortoise originated in the Greater Antilles. Assuming an overwater dispersal, Hispaniola may have been the source of this population based on drifting probabilities. Morphological similarities lend support to this idea (Franz and Woods 1983). The Grand Turk and Middle Caicos tortoises have plentiful remains and is the fourth species in the West Indies as yet undescribed and unnamed. It apparently was the one that endured for the longest time.

Detailed Element Descriptions

Codes to Differentiate Individual Tortoises:

A. Location: 110N 102E; 37 cmbs. Adult male. ca. 400 mm P.L.* (estimated from limb bone size)
B. Location: 96N 100E; 41 cmbs. Sub-adult. 340 mm P.L. (complete)
C. Location: 96N 100E; 41 cmbs. Sub-adult. ca. 350 mm P.L. (estimated from incomplete plastron)
D. Location: 96N 100E; 40-50 cmbs. Hatchling.
E. Location: 98N 100E; 54-60 cmbs. Juvenile. ca. 300 mm P.L. (estimated from incomplete plastron)
F. Location: approx. 84N 90E; 0-45 cmbs. Material was salvaged from a trench dug by developers to lay a water pipe. Adult male. ca. 600 mm P.L. (estimated from incomplete plastron)
G. Location: 110N 102E; 34-50 cmbs. Adult male. ca. 500 mm P.L. (estimated from limb bone size)
H. Location: 88N 102E; 32-40 cmbs. Adult. 500 mm P.L. (accurate measurements taken of in situ specimen)
I. Location: 88N 102E; 32-40 cmbs. Sub-adult.
J. Location: 88N 106E; 52 cmbs. Larger sub-adult. >350 mm P.L. (estimated from incomplete plastron)
K. Location: 146N 102E; 39-64 cmbs. 3 sub-adults, all ca. 340 mm P.L. (estimated from incomplete plastrons)
L. Location: 88N 110E; 64 cmbs. Hatchling.
M. Location: 126N 102E; 49-64 cmbs. Hatchling.
N. Location: 128N 104E and 125N 102E; both 49-64 cmbs. Adult. ca. 500 mm P.L. (estimated from neural size).
O. Location: 64N 100E; 35-45 cmbs. Hatchling.

*P.L. = plastron length

Internal Skeleton:

**Humerus**, left, nearly complete, just half of distal end eroded. (A)
- total length: 96 mm
- shaft diam.: 14.6 mm (transverse) x 16.6 mm (antero-posterior)
- proximal end width: 40 mm (antero-posterior)

**Humerus**, right, distal end broken, proximal end eroded. (l)
- shaft diameter: 11 mm (transverse) x 13.2 mm (antero-posterior)

**Humerus**, right, eroded ends. (K)
- shaft diameter: 11 mm (round)

**Humeri** (n=2), hatchling, left and right, ends eroded. (L)
- total length: >13 mm
- shaft diameter: 1.6 mm (transverse) x 1.8 mm (antero-posterior)

**Humerus**, hatchling. (D)
- total length: 12.5+ mm (epiphyses are eroded)
- shaft diameter: 1.9 mm (transverse) x 1.6 mm (antero-posterior)

**Humerus**, hatchling, distal end broken. (M)
- total length: >13 mm
- shaft diameter: 1.8 (transverse) x 2.0 mm (antero-posterior)

**Humerus**, hatchling, eroded ends. (O)
- total length: >10 mm
- shaft diameter: 2.1 mm (transverse) x 1.9 mm (antero-posterior)

**Femur**, left, distal 1/3 broken. (A)
- shaft diam.: 13.5 mm (transverse) x 11.3 mm (antero-posterior)
- proximal end width: 30.9 mm (antero-posterior)

**Femur**, hatchling, eroded ends. (L)
- total length: >9 mm
- shaft diameter: 1.3 mm (round)

**Scapula**, left, complete. (A)
- length of shafts: 90 mm; 50.7 mm
- articular surface length and width: 20.6 mm x 15.9 mm

**Scapula**, right, complete, proximal end of coracoid fused to scapula. (A)

**Scapula**, left, distal ends broken, unfused to coracoid. (B)
- articular surface length and width: 22.8 mm x 13.2 mm

**Ulna**, left, complete. (A)
- total length: 64.3 mm
- shaft diameter: 6.3 mm (transverse) x 10.3 mm (antero-posterior)
- proximal articular surface length and width: 19.5 mm x 12.4 mm
- distal end width: 19 mm

**Ulna**, left, distal half, end slightly eroded on edges. (G)
- distal end width: <25 mm
**Ulna**, right, proximal end and shaft. (H)
- shaft diameter: 8.5 mm (transverse) x 13.9 mm (antero-posterior)

**Ulna**, right, complete. (K)
- total length: 59.4 mm
- shaft diameter: 4.4 mm (transverse) x 8.5 mm (antero-posterior)

**Radius**, left, nearly complete, proximal tuberosities eroded. (A)
- total length: 56 mm
- shaft diameter: 7.3 mm (round)
- proximal end width: 16.6 mm (?)
- distal end width: 20.4 mm

**Radius**, left, some erosion mostly on proximal end. (G)
- total length: >79.2 mm
- shaft diameter: 9.2 mm (transverse) x 10.5 mm (antero-posterior)
- distal end width: >22.6 mm

**Radius**, right, nearly complete, slight erosion on ends. (H)
- total length: >80 mm
- shaft diameter: 10.0 mm x 10.5 mm (ca. round)

**Radius**, right, complete. (K)
- total length: 53.8 mm
- shaft diameter: 5.6 mm (round)
- proximal end width: 14.1 mm
- distal end width: 16.7 mm

**Tibia**, left (?), complete. (A)
- total length: 59.9 mm
- shaft diameter: 10.8 mm x 7.7 mm (compressed along antero-posterior axis).
- proximal end width: 20.4 mm
- distal end width: 14.8 mm

**Fibula**, left (?), complete. (A)
- total length: 58.2 mm
- proximal end width: 9.2 mm

**Ilium**, right, proximal end only. (A)
- proximal end width: 23.2 mm

**1st Dorsal Vertebra** (n=2). (K)
- centrum length: 19 mm
- centrum diameter: 9 mm

**Cervical Vertebra**, complete except for transverse processes. (N)
- centrum diameter: 15 mm

**External Skeleton:**

**Plastron**, complete including left bridge peripherals #5, 6, & 7, and right bridge peripherals #4 and 5. All are articulated but sutures unfused. (B)
- total length at center line: 340 mm
- total width at center line: 230 mm
- width along suture between xiphiplastron/hypoplastron: 150 mm
- thickness of hypo/hyoplastron: average of 4.0 mm
-thickness of epiplastral lip: 22 mm
-thickness of xiphiplastral notch: 13.5 mm
-distance along margin between epiplastral scute sulcus and the hyoplastral scute sulcus: 75 mm
-distance from epiplastral lip to bottom of endoplastron: 86 mm

**Plastron**, complete right epiplastron and endoplastron, 60% of left and right hyoplastra. (C)

-thickness of epiplastral lip: >18 mm (eroded on interior)
-distance along margin between epiplastral scute sulcus and the hyoplastral scute sulcus: 79 mm
-distance from epiplastral lip to bottom of endoplastron: >111 mm

**Plastron**, complete xiphiplastron and endoplastron, and left hyoplastron along margin. Endoplastral plate is completely fused to adjoining elements. (F)

-thickness of epiplastral lip: 26 mm
-thickness of hyoplastron in concave center area: average 3.0 mm
-distance along margin between epiplastral scute sulcus and the hyoplastral scute sulcus: 143 mm
-distance from epiplastral lip to bottom of endoplastron: >111 mm

**Plastron**, complete xiphiplastron, partial right & left hyoplastra. (J)

-width along suture between xiphiplastron/hyoplastron: 164 mm

**Plastron**, two complete xiphiplastron with partial hyoplastron. (K)

-width along suture between xiphi. & hypo.: 146 mm & 148 mm.

**Plastron**, three complete epi. and endoplastra with partial hyoplastra.

-thickness of epiplastral lip: 20.1 mm, 20.5 mm, and 21 mm
-distance from epiplastral lip to bottom of endoplastron: 80 mm, 85 mm, and 96 mm.

-thickness range of hyoplastron: 8.6 mm to 13 mm

**Xiphiplastron**, at notch, incomplete. (A)

-distance from scute sulcus to margin of xiphiplastron: 29.8 mm

**Epiplastron**, right, and partial hyoplastron. (E)

-thickness at epiplastral lip: 12 mm
-distance along margin between epiplastral scute sulcus and the hyoplastral scute sulcus: 66 mm

**Neural**, #1, broken, with scute. (K)

-height: 55 mm

**Neural**, #7, almost square with wider anterior edge. (K)

-height: 39 mm
-longest horizontal axis: 37 mm

**Neural**, #8, rectangular, nearly complete. (K)

-height: 35 mm
-longest horizontal axis: 31 mm

**Neural**, #3 or #5, scute sulcus slightly off-center, square, complete. (N)

-height: 39.9 mm
-longest horizontal axis: 39.9 mm

-thickness range: 3.0 - 4.0 mm
Neural, #3 or #5, scute sulcus near center, square, complete. (N)
  -height: 35 mm
  -longest horizontal axis: 38.5 mm
  -thickness range: 3.0 - 4.0 mm

Neural, #3 or #5, scute sulcus near center, square, edge eroded. (H)
  -height: 42 mm
  -longest horizontal axis: ca. 46 mm
  -thickness range: 2.0 - 3.0 mm (not including central ridge)

Suprapygal. (K)
  -height: 48.6 mm
  -longest horizontal axis: ca. 56 mm
  -thickness range: 2.6 - 3.4 mm

Nuchal, margin broken, burnt exterior. (K)
  -longest horizontal axis: 94.5 mm

Pleural, #8, left. (K)
  -width range: 42.2 mm (proximal end) to 46 mm (distal end)
  -thickness range: 3.5 - 4.0 mm

Pleural, #7, left. (K)
  -width range: 42 mm (proximal end) to 19 mm (distal end)
  -thickness range: 2.8 - 4.0 mm

Pleural, #6, left. (K)
  -width: ca. 90 mm (distal end)
  -thickness range: 2.4 - 3.4 mm

Pleural, #6 or #4. (K)
  -width range: 38 mm (proximal end) to 56 mm (distal end)
  -thickness: 3.0 mm

Pleural, #5 or #3. (K)
  -width range: 67.7 mm (proximal end) to 43.2 mm (distal end)
  -thickness range: 2.4 - 3.3 mm

Pleural, #3, sutured to bridge peripheral #5. (K)
  -width: 20.7 mm (distal end)
  -thickness: 4.2 mm

Pleural, ca. #4. (B or C)
  -width: 87.5 mm (distal end)
  -thickness range: 2.0 - 3.0 mm

Peripheral, #1, right, margin broken, exterior burnt away. (K)
  -longest horizontal axis: 43.3 mm (at proximal end)
  -longest horizontal axis: 57.5 mm (at scute)

Peripheral, #1, right, complete, burned. (K)
  -height: 40.2 mm
  -horizontal axis: 43 mm (proximal) to 59 mm (distal)
  -thickness: 13.3 mm

Peripheral, #1 (?). (J)
  -longest horizontal axis: 63.5 mm
  -thickness: 13.8 mm

Peripheral, #2, left, complete, burnt. (K)
  -height: 42.7 mm
Peripheral, #2, left, burned. (K)
- height: 36 mm
- longest horizontal axis: 45 mm

Peripheral, #2, right, broken margin, unburned. (K)
- height: 49 mm (on bridge side)
- longest horizontal axis: 45.2 mm

Peripheral (bridge), #4, right, complete. (K)
- height: 106 mm
- longest horizontal axis: 55 mm (at proximal end)
- thickness: 4.2 mm

Peripheral (bridge), #5, right, complete. (K)
- height: 108 mm
- longest horizontal axis: 54.5 mm (at proximal end)

Peripheral (bridge), #5 or 6. (J)
- longest horizontal axis: 62.2 mm (at scute sulcus)

Peripheral (bridge), #7, left, broken margin. (K)
- height: >60 mm
- longest horizontal axis: 42 mm

Peripheral (bridge), ca. #7, right, nearly complete. (B or C)
- height: >57 mm (distal edge eroded)
- longest horizontal axis: 40.1 mm
- thickness range: 1.6 - 4.0 mm

Peripheral, #8, left, complete, burned margin. (K)
- height: 59 mm
- longest horizontal axis: 37.7 mm
- thickest point: 12.3 mm

Peripheral, #9, left, complete. (K)
- height: 60 mm
- longest horizontal axis: 43.4 mm
- thickness: 9.7 mm

Peripheral, #9, left, complete. (B or C)
- height: 50.3 mm
- longest horizontal axis: 37.6 mm
- greatest thickness: 8.3 mm

Peripheral, #10, left, complete, slightly flared. (K)
- height: 54.5 mm
- longest horizontal axis: 51.3 mm
- thickness range: 7.6 - 10.5 mm

Peripheral, #10, right, complete. (K)
- height: 52 mm
- longest horizontal axis: 52 mm
- thickness range: 8.5 - 10 mm

Peripheral, ca. #11, right. (G)
- height: 65 mm
- longest horizontal axis: 50.4 mm (proximal) to 82.1 (distal)
- thickness range: 5.0 - 11 mm
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Lisabeth (Betsy) Carlson was born in Brugges, Belgium, and raised in Santa Barbara, California. The first of four universities she attended was the University of California at Riverside—at first not realizing that some places are better to live in than others. She received an undergraduate degree in Art History from the University of Utah and one in anthropology from Arizona State University. Her graduate career has been spent at the University of Florida, where her husband is an artist. She earned her Master's degree in 1993 with an emphasis in Caribbean prehistoric archaeology and has continued that focus with this Ph.D. She has worked on and visited numerous islands in the Caribbean including all the Turks and Caicos Islands, Andros, Haiti, Jamaica, Puerto Rico, Guadeloupe, Grenada, and Carriacou. Archaeology has helped to fulfill her primary objective in life, which is to travel.
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Graduate Faculty of the Department of Anthropology in the College of Liberal Arts and Sciences and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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