ON LAND AND SEA

Native American Uses of Biological Resources in the West Indies

LEE A. NEWSOM & ELIZABETH S. WING

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Preface

Our aim in writing this book is to present data derived from studies of plant and animal remains from archaeological sites in the West Indies and to use these data to better understand life on these islands in the past. The data that form the basis of this study come from an array of archaeological sites that span the times of occupation from the Archaic to the arrival of Europeans in the Caribbean. The biological remains come from sites excavated from islands off the coast of Venezuela, the Lesser and Greater Antilles, the Virgin Islands, the Bahamas, and the Turks and Caicos. These biological remains include very fragile carbonized seeds and tubers as well as robust shells of conchs. Thus preservation is uneven and the database does not include a complete inventory of the plants and animals used by past colonists of the islands. To compensate for the flawed and incomplete data we studied biological samples from as many sites as possible and concentrated on samples from sites where recovery strategies were optimal. We include data presented by other colleagues to increase the number of samples from critical periods and places. Despite the limitations of archaeological preservation, we do see patterns of past exploitation of resources.

The replication of patterns gives us the confidence that we can see a glimpse of the activities that sustained the lives of the early settlers in the West Indies. These patterns show clear differences between the resources used by people living on different island groups. For example, people living on small coral islands had access to quite different resources than did those people living inland on the larger islands. Similarly, groups of people with Archaic-period technology had a different impact on the environment than did subsequent people who built terraces and intensified agricultural production. We apply the concept of shifting baselines in charting the changes that are evidenced in the data from the islands (Jackson 1997; Jackson et al. 1996; Pauly 1995).

Without a paleontological, archaeological, or historical perspective it is hard to imagine what environmental conditions were like in the past. The archaeological data reveal changes wrought directly and indirectly by humans and the more widespread environmental fluctuations. Without this time perspective we may view a forested area as pristine when in fact it had been selectively forested, cleared, farmed, and reforested with second-growth trees that may support a different complex of plant and animal species. Shifting baselines in the West Indian Islands indicate initial forested islands, clearing, incipient agriculture and arboriculture, and ultimately agricultural intensification. At the same time fishing and gathering of land crabs and marine molluscs were the focus of the subsistence economy. Endemic rodents were hunted, managed, and introduced from island to island. When land crabs and reef fishes were overexploited there was a shift to more intensive gathering of molluscs and fishing pelagic species. In some places agricultural systems were intensified, perhaps in part to compensate for declines in protein sources. Trade networks were wide and some animal parts and domestic animals, dogs and guinea pigs, were dispersed. The most major shift in the baseline came with the European takeover, during which Old World domestic animals and plantation crops were introduced.

We hope that this review of the biological remains from the islands will be both interesting and conducive to further study. Our survey of the biological remains from archaeological sites has large gaps with no data from whole islands. We leave the reader with the challenge of many unanswered questions.

Acknowledgments

This research could not have been possible without the help of many people and support from a number of organizations. The work was initiated with the support of the National Science Foundation BNS 8903377. The NSF grant grew out of a paper written with the intention of summarizing the status of zooarchaeological work in the Caribbean by 1989 [Wing 1989]. This paper was published in the *Biogeography of the West Indies: Past, Present, and Future*, edited by Charles A. Woods. Zooarchaeological research and recovery methods have advanced greatly during the past two decades. Many new faunal and botanical samples were recovered using improved recovery techniques and form the basis of this research. This new work could not have been done without funding from the Virgin Islands Division of Archaeology and Historic Preservation; L'Association Archéologique Saint Martin; the Centro de Investigaciones Arqueologicas, Bieque, San Juan, Puerto Rico; PanAmerican Consultants, Inc.; the Municipio de Carolina, Puerto Rico; the San Juan National Historic Site, Puerto Rico; LAW Environmental and Engineering-Caribe, Miami; and funds from Marisol Meléndez Maíz and Samuel Wilson, in addition to the original NSF grant. Additional support was provided by grants from the National Science Foundation (Ref. #0106520), the National Geographic Society (Grant # 6260–98), the H. John Heinz III Charitable Trust, and the Consejo para la Protección del Patrimonio Arqueológico Terrestre de Puerto Rico (Antonio Curet and Lee Newsom, Tibes Archaeological Project).

We are also grateful to the various archaeologists who entrusted faunal and botanical samples to us for study. This study would not have been possible without the careful recovery of these samples by archaeologists and their confidence in us for identification and analysis. We have benefited immensely from their expertise and keen insights.

This work also could not have been accomplished without help from a num-

ber of scholars at the Florida Museum of Natural History and the Smithsonian Institution, who helped with identifications, and from a number of colleagues who granted permission for the inclusion of their data. Those who worked on many samples are Susan deFrance, Laura Kozuch, Irv Quitmyer, Sylvia Scudder, and Nathalie Serrand. Colleagues who granted permission to use their data are Lizabeth Carlson, Sandrine Grouard, Heleen van der Klift, Yvonne Narganes, and Elizabeth Reitz. Irv Quitmyer prepared the faunal figures, Molly Wing-Berman prepared the pen-and-ink drawing of the pottery representation of the hutía (Figure 7.3), Robin C. Brown photographed the maize and manioc specimens from En Bas Saline, Haiti, and Florence E. Sergile drafted all of the maps. Discussions with all of these colleagues and particularly Antonio Curet, Jack Ewel, Bill Keegan, José Oliver, Elizabeth Reitz, Miguel Rodríguez, Stephen Wing, and Tom Zanoni helped focus ideas for the interpretation of these bioarchaeological remains. We gratefully acknowledge them all.

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I
An Introduction to Native American Uses of Biological Resources in the West Indies

Native Americans have a long history in the Caribbean Islands, one spanning more than six millennia. They eventually occupied nearly every island of the archipelago and developed very complex and varied cultures. They quickly adapted to living in the West Indies and became adept at exploiting the natural resources of the island environment. Subsistence, in its broadest sense, is defined as the means of providing the necessities of life, including food and other items needed for health and comfort. Biological resources were the foundation of subsistence; they were deeply integrated into civic, ceremonial, ritual, and daily and occasional activities, and they provided foods, medicines, fuel for cooking and craft production, raw materials for fiber and other industries, magical and mind-altering substances, and more.

Native Americans were embedded in the Caribbean ecosystem as a keystone species. By means of their daily subsistence activities and other cultural practices, they were a biotic factor in the region. In this respect they were no different from people elsewhere. However, fragile biotic communities on small tropical islands are easily disrupted and quickly changed by human activity. Positioned in effect as a keystone species, colonists in the West Indies were responsible for biodiversity and landscape changes. Redmond (1999) has emphasized the importance of understanding the depth and diversity of human environmental impacts, both sustainable and destructive, to appreciate human-environmental interactions. This is essential to understanding long-term socioeconomic trends and intrinsic underpinnings of political economies, both historic and prehistoric. In the Caribbean, anthropogenic changes were largely the result of wood collection and land clearing for habitation sites and agricultural plots, but marine resources were also affected. The extent and scale of these activities on any given island at particular points in time ranged from limited to highly intensive extraction of biotic resources from marine and ter-

restrial environments. Useful plants and animals were maintained in the immediate vicinity of the human settlements, and staple crops were produced in cultivated fields known as *conucos* (Sauer 1966:51–53). On some islands the preparation of terraced slopes and ditch irrigation systems for intensive agriculture occurred.

Forest clearing for construction timber, fuelwood, and cultivation exposes soil to erosion and other changes and promotes ecosystem succession and disturbance (Ewel 1986; Ewel et al. 1981; Frelich and Puettmann 1999). The increased runoff associated with extensive clearing can affect adjacent freshwater aquatic and marine ecosystems by changing water quality and the character of nearshore habitats. Conversely, accumulations of refuse such as shell, bone, and charcoal may positively change the soil constituents and nutrient status, thereby attracting small animals such as land snails and providing suitable conditions for the growth of plants useful to humans (e.g., cycads and bottle gourds). Human exploitation of plant and animal resources thus has both direct and indirect consequences for the species that share the island ecosystem, and these consequences may necessitate or lead to new adaptations on the part of humans.

Overexploitation of animals results in both a decline in abundance and a reduction in the average individual size of the targeted species. Prolonged and intense fishing pressure can result in species growth problems: "growth overfishing," when reproduction is depressed because species fail to reach the size at which they become fully mature; and "recruitment overfishing," when the species population size is reduced to the point that no breeding takes place (Russ 1991). The decline of some species in the reef community through overfishing, such as carnivores, can result in a greater dependence by humans on reef herbivores until they too are overfished. Likewise, decreased availability of preferred plant species—for example, dense fuelwoods or a particular type of edible fruit—can lead to greater use of secondary species, including those from disturbed forest associations. This situation conforms to the summary rule in terms of the diet breadth (resource selection) model. Following the decline of a top-ranked resource in the optimal set and the resultant diminished foraging efficiency, the selection will progressively expand stepwise to include items of lower rank (Winterhalder and Goland 1997). Introductions of both plants and animals indirectly affect native flora and fauna by competition and selective consumption. For example, domestic dogs (*Canis familiaris*) accompanied people in the domination of worldwide ecosystems including the West Indies, and had the potential to catch and reduce the populations of lizards, ground-dwelling and flightless birds, and endemic rodents. The cultivation of introduced plants, such as fruit trees, that are managed at the expense of native flora may alter the natural structure and composition of vegetation. Such a

change may have the effect of reducing the food plants and habitats of endemic species.

MANY AND VARIED USES

Plants and animals were put to many uses in the Caribbean, and food was chief among them. A balanced diet requires carbohydrates supplied by plants and proteins and fats provided primarily by animal flesh. By the time of historic contact with Europeans, the starchy tubers of manioc, or cassava (*Manihot esculenta*), were predominant among plants that provided a carbohydrate staple in the Caribbean Islands. Early Native American colonists carried manioc into the West Indies from the adjacent mainland. Manioc continues to be widely used as an important staple crop throughout tropical America (Norman et al. 1995). Little direct evidence of manioc or other edible tubers has been excavated or identified from archaeological sites in the Caribbean, but the microlithic chips from grater boards or coral tools used to shred and pulp the tubers, and the ceramic griddles on which cassava bread is typically cooked, are common constituents of archaeological deposits in the region. Manioc and other starchy root staples were supplemented in the Caribbean by seeds, fruits, and greens. Direct evidence for more than 100 plant species that could have contributed to the diet and overall subsistence economy among Caribbean Indians has been recovered from archaeological sites in the region (Newsom 1993a; Newsom and Pearsall 2003), as described in later chapters of this book. In addition to sustenance, some plants also probably had medicinal uses. The animal protein portion of the diet of the Native Americans living in the West Indies comes from both terrestrial and marine animals. The people choosing home sites located close to the shore relied heavily on marine organisms for food, whereas those living farther inland depended more on land animals. Animals that formed the basis of the diet were endemic mammals such as the rice rats (Oryzomyini) of the Lesser Antilles, introduced mammals and birds, oceanic birds, pigeons (Columbidae), land crabs (Gecarcinidae), molluscs—both snails and bivalves—and a great variety of fishes.

Some food items required special preparation because of the presence of poisonous constituents. For example, all cultivars of manioc contain varying concentrations of cyanogenic glucosides throughout their tissues, and these are hydrolyzed to hydrogen cyanide (HCN) when the plants are damaged from insect attack or other mechanical breakage of leaves, stem, bark, root, and tubers (Wilson and Dufour 2002). Manioc cultivars that contain higher concentrations of this toxic compound in their tissues must be put through an elaborate process to extract or neutralize the HCN before the tubers can be safely eaten. In the Caribbean, the shredded, mashed pulp of tubers was detoxified by

washing, drying, and exposure to air, after which it was made into cassava bread or cooked with meat and fish in a stew known as a pepper pot. Some fish are or can be poisonous. Some species of puffer fishes (Tètraodontidae) have viscera containing tetraodotoxin, a poison that can be fatal if ingested. Other fishes, particularly large carnivorous fishes such as the great barracuda (*Sphyraena barracuda*), can acquire a poisonous component in their flesh that causes ciguatera poisoning if consumed.

Food is a necessity of life, as are medicines. Most medicines and mind-altering substances are derived from plants. Definitive evidence of these special-purpose plants and their particular uses is very difficult to recover archaeologically because the plant materials tend to have been completely processed and consumed. For example, leaves and bark that are dried, crushed, and steeped in medicinal teas or poultices leave little or no traces of their use. Among the special-purpose plants known to have been important in the Caribbean Islands are tobacco and a native tree legume that was the source of a snuff (Nieves-Rivera et al. 1995; Rouse 1992:14). Both plants had special significance among the historically known Taino of the region. For example, concerning tobacco: "The Indians of this island had a bad vice among others, which is taking a smoke they called tobacco, to leave the senses. This herb was most precious by the Indians, and it was planted in their orchards and farm lands for what I said; they insinuate if you take the weed and to smoke it was not only a sane stuff, but very sacred" (Fernández de Oviedo 1556, quoted in Nieves-Rivera et al. 1995). A narcotic snuff was made from the pulverized and powdered seeds of the tree called cojóbana or cojobilla (*Anadenanthera peregrina* [Liogier and Martorell 2000:69]) combined with crushed shell or lime. This mixture was inhaled directly into the nostrils through tubes made of pottery or wood as part of the important *cojoba* ritual that served primarily to communicate with the Taino deities and the spirit world (Alegría 1997a, 1997b; Nieves-Rivera et al. 1995). Cojóbana seeds contain an adrenergic agent known as bufotenine (the same as in certain poison toads, genus *Bufo*), a powerful hallucinogenic drug that strongly affects the cardiovascular and nervous systems and that can or should be used only in low doses (Dobkin de Rios 1984:120). This is another example of cultural materials associated with a particular plant, in this case combined for ritual and ceremonial purposes. Moreover, ritual purification involved vomiting induced mechanically by thrusting a shell or wood spatula down the throat (Alegría 1997a; Kaye 2001; Olazagasti 1997). Induced vomiting was also part of rituals focused on the treatment of disease. The shaman would ritually purify him or herself before entering into a trance state to confer with the spirit world regarding the cause and cure for the illness. Potential examples of this practice from ethnohistoric documents describe both the cojóbana tree and an herb called gioia used variously for this purpose (Rouse

1992:14). Nieves-Rivera et al. (1995) raise the question of whether hallucinogenic fungi may also have been used prehistorically in the Caribbean, based on their interpretations of wood and ceramic figurines that suggest mushroom forms. Thus even though evidence of particular plants used for such specialized purposes is often difficult to recover, the presence of these plants may reasonably be inferred from the presence of tightly associated ritual paraphernalia.

Other major uses of plant and animal resources were as raw materials. Probably most important among these were woods used as fuel and for building and construction. In the Caribbean archaeologists are beginning to reveal house constructions by the patterns of postholes and soil stains. Among the first examples are several structures, including a very large one about 19 meters in diameter, the remains of which were found at the Golden Rock site on St. Eustatius (Versteeg and Schinkel 1992). Patterns of postholes and associated house floors or activity surfaces are being located at other Caribbean sites, for example, at Luján I on Vieques, Maisabel in northern Puerto Rico, and Los Buchillones in Cuba (Jardines Macías and Calvera Roses 1999). The woods that were used for posts and rafters for these buildings or that served as fuel are being identified. Wood was also used to make canoes, containers, and furniture such as the stools known as *duhos*, as well as various tools and implements (Olazagasti 1997). Calabash tree fruits (*Crescentia cujete*) and conch shells (*Busycon* spp.) are almost ready-made bowls and containers. Cordage and plant fibers were used for items including fabrics, baskets, netting, fish traps, hammocks, slings, ropes, and fishing lines. Other tools and ornaments were made with shell, bone, teeth, and stone; plant and animal products such as fish poisons, tannins, gums, resins, hides, and other materials were undoubtedly also important to Native American lifeways in the Caribbean. Together, the manufacture of utilitarian and ornamental objects contributed to a rich material culture throughout the era of human occupation in the archipelago.

Among the most important and consistent uses of plant resources, aside from food, was as a source of fuel. Fuelwoods and tinder were burned not only to provide heat for cooking food but also for firing pottery and to extract valuable resins and other compounds from wood and other plant items (e.g., boiling palm nuts for their oils). Craft production such as ceramics manufacture requires the use of particular woods most suitable for adequate firing of clays; wood collection for this purpose tends to be very selective. Collecting fuelwood is one of the quickest ways humans can deforest an island or region. People who practice shifting cultivation use fire to clear land for cultivation. We presume that this form of land clearing was also practiced on the islands, as indicated in the early chronicles regarding cultivation in the Greater Antilles: "The Indians first cut down the cane and trees where they wish to plant it [maize]. . . . After the trees and cane have been felled and the field grubbed,