

BIOLOGICAL ARCHEOLOGY IN THE WEST INDIES

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It is time to recognize a new direction in archeology, particularly on islands, that for want of another term I shall call "biological archeology." Whereas zooarcheology, as usually practiced, consists mainly of providing faunal lists of animal remains, biological archeology emphasizes the impact that prehistoric (and in some cases, historic) man had on natural environments and the biologically significant information that is retrievable from archeological sites.

Biological archeology is concerned to a large extent with the extinction of organisms, whether extirpation of a local population or the total extinction of species. From such data the biologist hopes to learn of the existence of previously unknown species, or of zoogeographic patterns that are not apparent from the historic distribution of living forms. The anthropologist can learn about which animals were used in the culture under study, about possible instances of animal husbandry, and about the resources that may have been available to the earliest colonizers of an island or archipelago that were not necessarily available for following generations. Man-induced alterations in environment for agricultural or other purposes have caused many extinctions. Documenting the extent, nature, and timing of such alterations is the concern both of the biologist and of the archeologist, each of whom stands to benefit from broadening the scope of their investigations and from developing new techniques.

One of the best recent illustrations of the impact of man on insular faunas comes from combined paleontological and archeological investigations in the Hawaiian Islands. It has recently been determined that well over half of the species of birds that originally occurred in the archipelago were exterminated by man in the prehistoric period (Olson and James in press a,b,c). Bones of a number of these species were found in direct archeological contexts, thus proving their contemporaneity with Polynesians. Some species are as yet known only from late Holocene fossil deposits that antedate the arrival of man. As these species all survived any Pleistocene climatic changes that may have influenced the islands, the most likely cause of their extinction is prehistoric man. In this case, the purely paleontological deposits still contain information pertinent to anthropologists, as they document potential food resources for the earliest colonizers that were subsequently lost, such as large flightless geese and certain seabirds. These doubtless would have helped sustain the first human populations until a reliable agricultural system could be established.

Extinction of a number of species of Hawaiian birds, particularly large flightless ones, can be attributed to simple overexploitation. The extinction of many species of small arboreal passerines, such as finches, cannot be explained in this manner, however. The paleontological evidence, in tandem with that from botany, archeology, and other sources, points towards the virtual annihilation of dry, lowland forest habitats as the primary cause of the disappearance of large portions of the original fauna and flora of the Hawaiian

Islands. This destruction by fire and other means, made land available for the extensive cultivation of taro and sweet potatoes, which in turn made possible the large populations of Polynesians observed in the islands at the time of western contact.

From the new paleontological data it is clear that few reliable zoo-geographical or other biological inferences can be made about Hawaiian birds without reference to the fossil record. It is also evident that a sound knowledge of the prehistory of the Hawaiian archipelago would not be possible without extensive interchange between biologists and archeologists.

In the West Indies, there is a fairly good fossil record of vertebrates, at least from the Greater Antilles. From this, it has been possible to document numerous extinctions and changes in distribution of reptiles, birds, and mammals (Olson 1978; Pregill and Olson 1981). Many of these extinctions have been attributed to Pleistocene changes in climate and sea level. It has been hypothesized that during the last glaciation the West Indies not only comprised fewer and larger islands, but they were generally more arid, with extensive areas of grassland and savanna. The postglacial reduction in land area, combined with the expansion of more mesic environments are believed to have led to the extinction or fragmentation in range of many species of vertebrates (Pregill 1981; Pregill and Olson 1981; Olson 1982a,b; Olson and McKittrick 1982).

Whereas some extinctions appear almost certain to be the result of Pleistocene climatic changes (e.g. the disappearance of grassland-inhabiting meadowlarks, *Sturnella*, from the Bahamas [Olson and Hilgartner 1982]), others are known to be more recent. In the past, these recent extinctions have been documented almost entirely through archeological excavations.

Several species of rodents are known from middens and fossil deposits but have never been taken in life by naturalists. The extinct rodents *Brotomys voratus*, *Isolobodon portoricensis*, *Plagiodontia hylaeum*, and *Quemisia gravis* were popular human food on Hispaniola and may be abundant in midden deposits (Miller 1929). In Puerto Rico and the Virgin Islands, *Isolobodon portoricensis* is known only from midden deposits and it has long been speculated that this species was transported to those islands by man (Miller 1918; Reynolds et al. 1953). My own paleontological work in Puerto Rico convinces me that this was the case, as I never found *Isolobodon* outside of a cultural context and it is invariably absent in Pleistocene cave deposits (Olson and Pregill 1982). I have also examined specimens of one of the endemic species of *Heteropsomys* from a midden deposit in Puerto Rico, which indicates that it, too, persisted well into the Holocene. A large, extinct genus and species of rice rat, as yet undescribed, occurs abundantly in middens on Antigua, and it, or a similar form, is known from midden material from Monserrat and Guadeloupe as well (Wing et al. 1968). It also occurs as a fossil on Barbuda.

The cause of the extinction of these rodents has not been determined. A decrease in abundance of bones of the extinct rice rat in the upper midden layers on Antigua was interpreted as "possibly indicating marked reduction of the rat population, perhaps as a result of human predation" (Wing et al. 1968:128), but habitat destruction cannot be ruled out either, as we shall see.

Transportation of endemic West Indian animals from one place to another by aboriginal man has been documented in a number of instances and should be

an important consideration in attempting to reconstruct the natural distribution of various organisms. I have already mentioned the case of the rodent Isolobodon. A similar one involves the transport of the Cuban rodent Capromys pilorides, which has been found in a midden in the Dominican Republic (Miller 1929; Rimoli 1974).

Transportation of endemic birds also occurred with the large, extinct, flightless rail Nesotrochis debooyi, which has been found in fossil deposits in Puerto Rico and in midden deposits in Puerto Rico and the Virgin Islands, including St. Croix (Olson 1974). Because St. Croix is not on the Puerto Rican Bank and was never connected with Puerto Rico or the other Virgin Islands, it is highly unlikely that it would have had the same species of flightless bird as those islands. Thus it seems probable that man was transporting and very likely raising Nesotrochis in captivity (Olson and Pregill 1982). Another instance involves the macaw Ara autochthones, which was described from a single bone from a midden on St. Croix (Wetmore 1937). This specimen does appear to be from an extinct species, but its provenience is far from certain. The only macaw definitely known from the West Indies is Ara tricolor of Cuba, which became extinct in the 19th century. Several species of macaws were attributed to other Antillean islands by early explorers and were subsequently named despite the absence of specimens (Greenway 1958). Given the fact that there was a lively trade in macaws between Indians in tropical Mexico and those in the desert southwest, it seems probable that trade in macaws would have been carried on in the West Indies as well, so that Ara autochthones may well not have been autochthonous to St. Croix at all.

So far, I have mentioned only rather large animals that could possibly have been exterminated directly, by overhunting. But we also have evidence of habitat destruction causing the extinction of smaller vertebrates, as in Hawaii. In 1980, G. K. Pregill, D. W. Steadman, and I excavated a fissure fill in a limestone quarry on Antigua that contained numerous bones of small vertebrates such as lizards, snakes, frogs, bats, birds, and rodents. In the same deposit were a few pieces of worked flint and remains of marine mollusks and crustacea that most likely represent midden material. The source of the vertebrate bones, which are largely from species that are unlikely to have been eaten, is as yet undetermined. This site has been radiocarbon dated at about 3500 years B.P., which is well into the Holocene and a late date for fossils but an early date for man in the Lesser Antilles. One of the bats from this site is a species that is otherwise known only from the Pleistocene of Puerto Rico and one of the lizards is known only from the Pleistocene of Barbuda. There is an extinct snake and two or more taxa of extinct rodents, as well as a bird (Cinclocerthia ruficauda) that is widespread in the Lesser Antilles but that has never been recorded on Antigua. Because these small animals could hardly have been hunted to extinction, habitat destruction within the past 3500 years is the most likely cause of their disappearance. We do not know whether these extinctions took place in the pre-Columbian period of aboriginal cultivation, or in the colonial period when agriculture was much more intense (Harris 1965). Thus there is biological information potentially available even from colonial archeological sites.

The Antiguan site illustrates several important points. First, a "fossil" site that might otherwise seem of little importance to paleontologists because of its late age, and of no significance to archeologists because of its poverty of cultural evidence, may actually provide data of considerable interest to both disciplines. Second, we see once again that zoogeographers cannot rely on historical data for reliable information. And third, it is

absolutely essential to use fine-mesh screen when sampling sites that are at all likely to yield vertebrate remains. Most of the specimens we recovered from Antigua would have been missed had we not used window screen (1.5 mm). Such labor would not be repaid at most archeological sites but samples of sediment could be checked periodically when larger bones are regularly encountered. The 1/4 inch (7 mm) mesh that is usually used at archeological sites is practically useless for making accurate faunal surveys, whereas with 1/8 inch (3.5 mm) mesh, all but the smallest vertebrate bones will be recovered.

As the focus of this conference is to some extent on the Bahamas, I will point out some interesting problems in biological archeology in those islands. So far, the main archeological site in the Bahamas with interesting vertebrate remains is that excavated on Crooked Island in 1933-1934 by Froelich Rainey. The mammals and birds from the Crooked Island site have been treated by Lawrence (1934), Wetmore (1938), Olson and Pregill (1982), and Olson and Hilgartner (1982). No date other than "pre-Columbian" was suggested for these deposits. Other significant vertebrate localities in the Bahamas are apparently Pleistocene in age and are restricted to New Providence and Little Exuma (Olson and Pregill 1982).

The Bahamian hutia (Geocapromys ingrahami) is known as a living animal only from tiny East Plana Cay. It has been reported from middens on Crooked Island (Lawrence 1934) and San Salvador (Wing 1969), and as a fossil or sub-fossil from Abaco, New Providence, Andros, Great and Little Exuma, and the Cat Islands (Olson and Pregill 1982). Three subspecies have been recognized (Lawrence 1934), but the validity of these is questionable without more extensive series of specimens from the various islands. If the hutia was able to survive up to the present on East Plana Cay, why did it become extinct elsewhere? And when did it become extinct on each of the various islands it inhabited? Was it in the process of dying out because of post-Pleistocene changes in habitat and was only helped along by man, or was its demise due entirely to overexploitation and habitat destruction? If the Lucayans maintained the hutia in captivity, as the inhabitants of Puerto Rico and the Virgin Islands must have done with Isolobodon, then they could well have transported the animals to islands where they never occurred naturally or from which they had already disappeared due to natural processes (Olson and Pregill 1982). Thus the occurrence of Geocapromys in an archeological site does not indicate that it occurred on that island in a natural state. Only with accurately dated archeological and paleontological excavations on many islands will it be possible to determine the natural distribution and time of extinction of the various populations of Geocapromys in the Bahamas.

In the material from Crooked Island were remains of White Ibis (Eudocimus albus), Cuban Parrot (Amazona leucocephala), and Cuban Crow (Corvus nasicus), none of which have been recorded from the island in historic times. The crow occurs in the Bahamas today only in the Caicos but is known from fossils from New Providence and Little Exuma (Olson and Hilgartner 1982). Its occurrence in midden on Crooked Island indicates that its disappearance from most of the Bahamian archipelago either occurred during, or continued into, the Holocene. The parrot, too, had a wider distribution in the Bahamas in the past and was presumably extirpated from many islands by hunting for food and trapping for pets.

Most puzzling, however, is the occurrence among the Crooked Island material of two species of petrels (Olson and Hilgartner 1982)-- the Cahow

(Pterodroma cahow), known to breed only on Bermuda, and the Black-capped Petrel (P. hasitata), which is known to breed only on Cuba, Hispaniola, and certain of the Lesser Antilles. Except when they come to land to nest in burrows or crevices in rocks, these birds are strictly pelagic and would have been almost impossible to capture by any sort of aboriginal hunting methods. On land, however, they are quite vulnerable to predation and make a ready source of tasty protein. The Cahow, for example, was almost exterminated very quickly by the early settlers of Bermuda and persists only in small numbers. Thus, we are confronted with the possibility that one or both of these petrels may have bred in the Bahamas, or elsewhere in the West Indies, where neither species has been recorded. Intense human predation may have exterminated petrels from much of their natural range early in the period of settlement of the West Indies. Without the attention of archeologists and paleontologists to this problem, we may never know what the true breeding distribution of Pterodroma was in the Antilles.

It is just this sort of interdisciplinary exchange that I hope to encourage in this essay. Biologists have great need of information derived from archeological sites. The implications of their findings should have direct application to a better understanding of the environment and resources of the human cultures that are studied by archeologists. We can no longer afford to overlook the biological aspects of archeology.

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