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The Zooarchaeological Record from Formative Ecuador

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The systematic recovery and analysis of animal remains from archaeological sites in Ecuador is a recent development of the past few decades. Although we might cite Jacinto Jijón y Caamaño's pioneering work at Quinche (1912) and Cerrito de Macají (1927) as early exceptions, the potential importance of zooarchaeological data was not actually realized until the late 1950s with the work of Meggers, Evans, and Estrada (1965) at the Formative site of Valdivia. Not only did they list the frequencies and proportions of identified taxa by excavation unit but they also integrated these data into their interpretation of the site's early occupation. With the explosion of interest in Formative archaeology during the late 1960s and early 1970s, the recovery, analysis, and interpretation of archaeofaunal specimens became somewhat standard, as zooarchaeological data assumed increasing importance for archaeological inference.

Throughout the relatively brief history of Formative archaeology in Ecuador, archaeologists have used zooarchaeological data to support inferences about prehistoric subsistence and ecology. Like most forms of archaeological evidence, faunal remains were pliantly manipulated to support different and often conflicting interpretations of regional prehistory. Inferential statements generally complied with the specific research biases and competing theoretical or methodological interests held by different archaeologists. Coastal sites with abundant marine and limited or no terrestrial fauna were regarded by some researchers as examples of a primary or exclusive marine subsistence orientation. These sites stood in contrast to coastal middens with lower-than-expected amounts of marine and no recovered terrestrial resources, which were believed

to implicate agricultural subsistence. High proportions of juvenile human bones, recovered with nonlocal marine resources at inland sites, suggested the need to establish coastal trade connections to overcome dietary protein deficiency. Some archaeologists analogically associated identified faunal taxa with the natural histories of their contemporary counterparts to argue the primacy of both riverine alluvial foci and horticultural pursuits at inland sites. Others used diachronic fluctuations in the relative abundance of identified faunal taxa within excavated assemblages as inferential support for prehistoric environmental oscillations that underlay presumed periods of abandonment and repopulation.

Regardless of the interpretive scenario offered and the dominant research paradigm guiding it, supporting inferences from faunal data have usually been based on the manipulation of taxonomic lists and/or respective abundances. That is, archaeologists were interested in what species were present, and sometimes absent, in specific archaeological provenances. To increase the interpretive power of their zooarchaeological data, researchers occasionally analyzed changes in relative abundances of different taxa between separate archaeological contexts. These methods are not without drawbacks, which can become insurmountable, especially when specimen abundances are uncritically used as variables in ratio scale measurement.

This essay introduces the zooarchaeological record from Formative contexts throughout the western lowlands and highlands of Ecuador. I begin by presenting the geographical and temporal distribution of the database followed by a brief discussion of limitations that the record holds for subsistence and paleoecologic interpretation. Here, I focus specifically on how taxonomic lists and corresponding abundances from excavated contexts can be qualitatively and quantitatively influenced throughout assemblage formation history. This brief review of the processes, which can potentially operate on assemblages predating their original accumulation to their eventual excavation and analysis by archaeologists, serves as a guide to what we should *not* say, at the risk of being wrong. Next, I return to the database and discuss a number of inferences about ancient Formative subsistence and environment in a way that minimizes the risk of incorrect interpretation, or at least increases our chances of being right. A brief conclusion follows.

FORMATIVE ARCHAEOFAUNA

The record consists of a comprehensive faunal database compiled from 27 archaeological sites throughout highland and western lowland areas of Ecuador (Fig. 1). For purposes of comparison, the highland assemblages are chronologically keyed to the sequence established for the adjacent western lowland

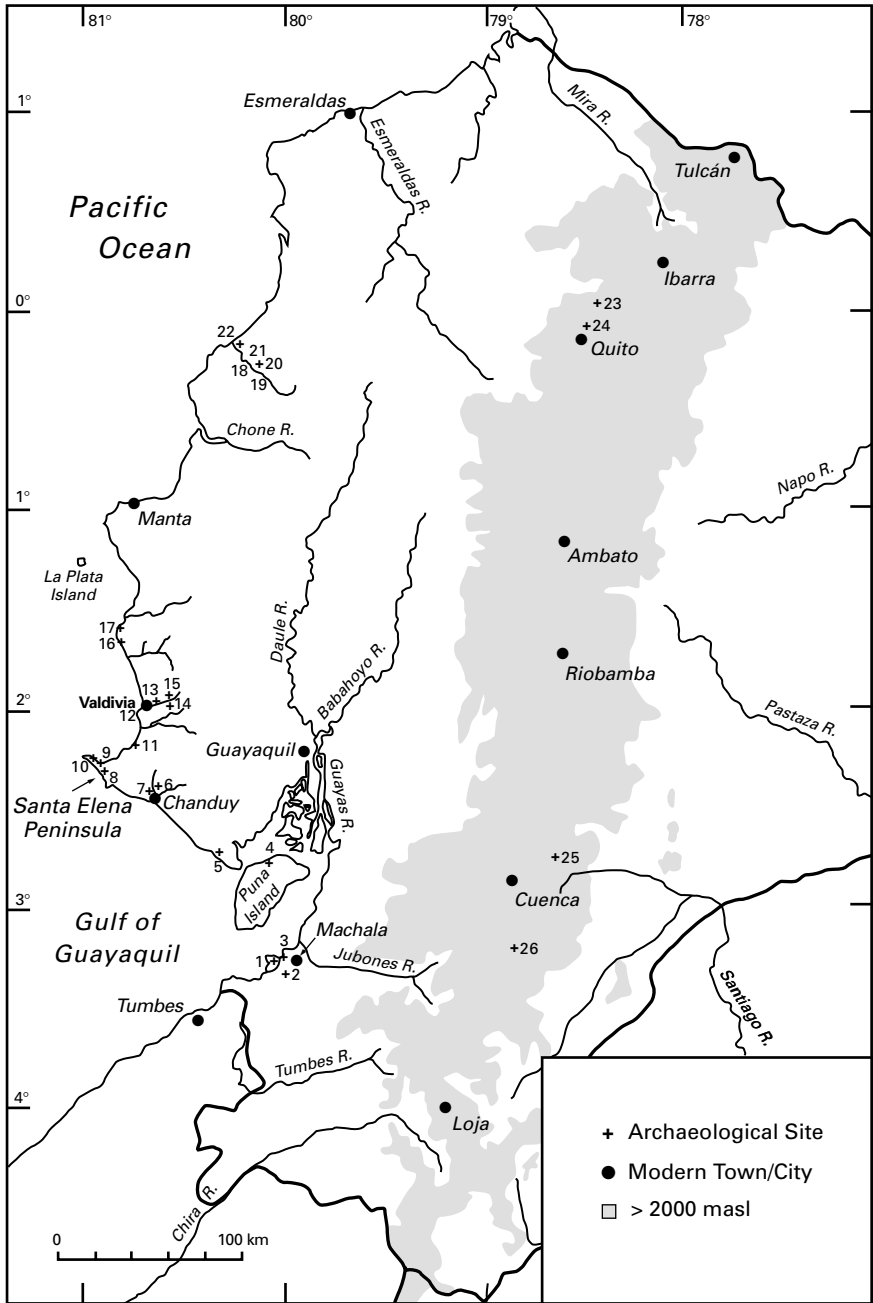
area. The designations Early, Middle, and Late (see Fig. 1) conform to the Valdivia, Machalilla, and Chorrera phase cultures, respectively. As some sites are multi-component occupations, the total number of chronologically discrete assemblages examined in this essay is 32.

The zooarchaeological database is presented in three tables. Table 1 lists the invertebrate and principally molluscan fauna recovered from Formative contexts mainly in the coastal lowlands. Table 2 lists all of the identified cartilaginous and bony fishes from Formative archaeological contexts. Table 3 compiles similar data for amphibian, reptile, bird, and mammal remains recovered in Formative contexts. For ease of presentation, the majority of uncertain identifications are considered in the next higher taxonomic category (e.g., cf. Rodentia is considered Rodentia). Where contemporary genera are represented by only one specific form, that species name is used.

INTERPRETIVE LIMITATIONS OF THE RECORD

To varying degrees, all archaeological samples are temporally and spatially distanced from their parent population. Many processes can subtract from, add to, and/or spatially rearrange an assemblage after it has departed a living context, is deposited, buried, and eventually excavated, and analyzed. Therefore, for purposes of subsistence or paleoecological reconstruction, it is usually difficult to refer the exact structure of an excavated sample back to its parent population, our target of interest. Here, I briefly focus on some of the more important processes that can confound this relationship, emphasizing how they can potentially affect the qualitative and quantitative structure of an excavated sample. Some points are obvious, but those that are not are very often subtly pernicious.

Animals differ in both the number and distribution of durable body parts, and these intrinsic factors alone can strongly influence the presence or absence and abundance data during each stage of assemblage formation. Certain taxa have more durable parts that are often identifiable to differing levels of accuracy when found in isolation. For example, a gastropod has one shell that can be reliably identified when complete; a fish has hundreds of bony elements, many of which are difficult to identify when separated from the rest of the skeleton. Moreover, these parts are usually recovered as fragments. Skeletal portions of diverse taxa—or even different portions of the same skeleton—often exhibit differential durability. For example, the preservation potential of a discarded marine oyster shell is unlike that of a digested microvertebrate skeleton, as is the survivorship of a durable tooth isolated from the highly fragmented skull of a small animal. These variables strongly influence the data presented



here, certainly in terms of what survives to be identified, at what level of accuracy, and in what quantity.

Obviously, for human subsistence interpretation, it is crucial to identify which portion of the zooarchaeological record was culturally accumulated and deposited as a byproduct of intentional acquisition, preparation, and consumption. Generally, the simple assumption that an archaeological bone sample was necessarily accumulated, modified, and deposited by humans is not straightforward. Any portion of the assemblage may have been introduced through noncultural mechanisms, either during or after cultural deposition. For example, small pests may be attracted to and eventually die in refuse pits. After abandonment, human habitation sites may become favored locales for roosting owls, denning carnivores, or burrowing animals, all of which could contribute faunal remains not directly associated with human involvement. These portions of the assemblage cannot provide human subsistence information but can be useful for paleoecological inference, especially if the agent of accumulation or deposition can be recognized.

If we are relatively certain that the excavated remains are those of human food resources, then inferences about prehistoric subsistence are usually based upon the kinds of animals selected and their relative importance. Archaeologists understand that taxonomic representation in cultural deposits differs notably from the original parent population. Humans, like any other predator, select their prey; therefore, any paleoecological inference must be treated accordingly. The relative cultural importance of food taxa is often evaluated with a number

Fig. 1 (*opposite*) Formative zooarchaeological assemblages in Ecuador. (1) Punta Brava, Late (Currie n.d.). (2) La Emerenciana, Early (Staller n.d.). (3) Guarnal, Late (Currie n.d.). (4) El Encanto, Early (Porras 1973). (5) Hormiga Shelter, Early (Spath n.d.). (6) OGCH-20, Early/Middle (Byrd n.d.: 128–129). (7) Real Alto, Early (Byrd n.d.: 113–122; Marcos 1988; Stahl and Zeidler 1988: 279, 1990: 158; unpublished). (8) OGSE-62, Early (Byrd n.d.: 104–106). (9) OGSE-46, Middle/Late (n.d. 1976: 124–126). (10) OGSE-42, Early (Byrd n.d.: 103). (11) San Pablo, Early (Zevallos and Holm 1969) (12) Valdivia, Early (Byrd n.d.: 108; Meggers et al. 1965: fig. 9), and La Cabuya, Middle (Meggers et al. 1965: 110). (13) Buena Vista, Early (Byrd n.d.: 107). (14) Loma Alta, Early/Late (Byrd n.d.: 110–112; Stahl n.d.e: 232–233, n.d.a: tables 1, 2, 1991). (15) La Ponga, Middle (Lippi n.d.: table 3). (16) Río Chico, Early (Sánchez Mosquera n.d.: 103). (17) Salango, Middle/Late (Cooke 1992; Sánchez Mosquera n.d.: 81, 103; app. 1; Stahl n.d.c). (18) Capaperro, Early (unpublished). (19) Dos Caminos, Late (unpublished). (20) San Isidro, Early/Late (Stahl n.d.d: 187; unpublished). (21) Finca Cueva, Late (unpublished). (22) El Mocaral, Late (unpublished). (23) La Chimba, Late (Athens 1990; Wing n.d.). (24) Cotocollao, Middle, and Late (Villalba 1988: 347). (25) Pirincay, Late (Miller and Gill 1990: 52). (26) Putushío, Late (Freire, personal communication, 1993; Sánchez Mosquera 1997: 87).

of derived measures. However, these numbers are usually confounded by the many factors associated with assemblage formation history. They often become unreliable proxy measures, either for estimating the original amount of edible dietary tissue or for understanding the quantitative structure of the original accumulation. We must critically ask how and in what proportion each food taxon was culturally accumulated and deposited (e.g., Stahl 1995). Were any durable portions lost through the differential transport of body parts? For example, were only portions of large animals, or whole bodies of small animals, introduced into the area of eventual deposition? Was there further reduction during processing and consumption? For example, were larger body parts processed into smaller portions and smaller parts left more or less intact? Finally, does the *recovered* assemblage accurately reflect the *deposited* assemblage, or was it affected by a host of postdepositional processes? Cultural assemblages can be modified by biological or physical means during and after their deposition and prior to burial.

Archaeologists have long been aware that burial environments in the neotropical lowlands are usually hostile to all but the most durable remains. High humidity and temperature, acidic soil, and significant biological activity can have profound effects on the survivorship of bone remains, especially when they enter the burial environment in fragmented condition. Furthermore, as all archaeologists who have excavated Formative middens know, stratigraphic and temporal resolution are difficult, often necessitating the need for arbitrary excavation levels. We must critically evaluate exactly what is compressed into these relatively homogenous burial contexts, for time averaging of assemblages often leaves us uncertain as to how many separate depositional events are compacted into the excavated substrates. The resultant palimpsest assemblages can mask both temporal and spatial heterogeneity (e.g., Stahl 1991). This has further importance for grouping data during counting, for regardless of which statistics we use, the arbitrary way in which data are aggregated will have an important effect on the conclusions.

Of course, *where* we choose to dig and *why* are obvious and crucial considerations. The strong coastal bias in Formative archaeology is quickly demonstrated by looking at any map of excavated sites (see Fig. 1). This bias is further compounded by the preferential excavation of the earliest assemblages. Site location was undoubtedly a prominent consideration for the Formative inhabitants of Ecuador and has important effects on *what* and *how much* is recovered. Often, where and how we excavate and what remains for us to recover are dictated by factors outside of our control like *huaquerismo*, or looting, construction, or the recent explosion of *camaroneros* (commercial shrimp farms). How

we retrieve samples from any excavated site has an enormous influence both on the kinds of taxa present and their relative quantities (e.g., Stahl 1992). Some excavated collections contain no zooarchaeological data. Some were only casually recorded or partially analyzed. Some were lost, and more recently some reflect the heavy use of intensive recovery techniques. Depending upon the specific circumstances of recovery, analysis, and curation, assemblages vary in their representation of taxa, thus compromising intersite comparability.

The well-explored relationship between sample size and assemblage diversity must also be taken into consideration. As a function of increased sample size, the number of different categories (*richness*) in any sample rapidly increases to a point where fewer new categories are added at a much slower rate. This tight correlation between richness and sample size can be demonstrated for Ecuadorian faunal assemblages from the western lowlands, as can the related statistic measuring the distribution or spread of abundances across recovered categories (*evenness*). In those few cases where sample size does not correlate with assemblage diversity, separate measures of richness and evenness are controlled by either excavation sampling and/or site assemblage formation (Stahl 1992; n.d.d).

In short, the interpretation of presence or absence and relative abundance data is usually not straightforward. Years ago, Grayson (1981; see also 1979: 227–229; 1983: 100; 1984) detailed most of these problems and cogently argued that the use of relative abundance—in the form of frequencies or ratios—can be fraught with difficulty, as it makes too many assumptions about the structural relationship between the excavated sample and its parent population. Unless we can control for all the effects of assemblage formation history, and we normally cannot, then we should treat inferences from ratio scale data with healthy skepticism. Fortunately, nominal scale data, whereby taxa are parsimoniously treated as variables that can be either present or absent, make far fewer assumptions. Of course, reliable inferences asymmetrically emphasize presence over absence, as the presence of a taxonomic category in a collection is verifiable, whereas its absence is not. Along with archaeological context and analogical reasoning, we can use these qualitative data to build inferences about prehistoric subsistence and ecology. The reliability of these inferences can be corroborated through the repeated excavation of similar associations in contemporaneous archaeological deposits throughout a particular region. Their validity can be corroborated through association with other fauna that demonstrate similar evidence for diet or shared ecology and then independently checked with separate lines of botanical and contextual evidence.

SUBSISTENCE AND ENVIRONMENT

An initial impression of the Formative zooarchaeological database is one of striking richness. No less than 55 orders, 134 families, 175 genera, and 193 species belonging to nine zoological classes are represented in Tables 1, 2, and 3. The distribution of zoological categories is certainly biased by many of the previously outlined factors, particularly site location and the many variables affecting differential identifiability. Also, the majority of these data are derived from the earliest portion of the Formative continuum. Much less is known about later, especially middle, temporal sequences. However, I stress that the nature of the zooarchaeological record is no less representative or impressive than any other artifact category known thus far from Formative Ecuador. It supplies us with an impression, albeit a biased one, of the many taxa that accumulated at various times in coastal, inland, and highland archaeological settings over the years spanning Formative occupation in Ecuador.

Contemporary Ecuador is characterized by a complex and richly heterogeneous environmental mosaic. The western lowlands in particular are well known for a high rate of endemism, which contributes to an overall biodiversity described as astonishing (Southgate and Whitaker 1992: 795). For example, despite occupying an insignificant land mass ($< 1/28$ the size of Brazil), Ecuador nevertheless possesses roughly over 83 percent as many known vertebrate species (Southgate and Whitaker 1992: 795; Stahl n.d.b). An extremely broad sampling of numerous ecological habitats are represented in the zooarchaeological record. Despite the presence of a few taxa that can inhabit offshore, moderately deep, and pelagic habitats, the majority of invertebrate fauna in the sample are representative of shallow, nearshore conditions, including intertidal and mangrove habitats. The spondylid oysters and tun shells are examples of mollusks intentionally harvested from moderately deep waters since the earliest Valdivia occupations. The well-studied fish fauna from a number of coastal sites fill out the range of represented marine habitats, with taxa typically occupying waters ranging from brackish, estuarine conditions to offshore, pelagic, and deep water. Like their marine counterparts, the vertebrate fauna from inland and highland sites reflect a variety of settings. These range from dry, semiarid habitats to semiaquatic, riverine, and humid forested environments, grasslands, high-altitude *páramo*, and uniquely anthropogenic conditions.

Although future research will undoubtedly fill in many of the zoological, ecological, temporal, and spatial lacunae that presently exist within the known archaeofaunal record, a number of taxa already emerge as consistently present throughout the entire Formative sequence. These include conch, requiem shark, sea catfish, snook, sea bass, tilefish, jack and pompano, snapper, grunt, porgy,

drum, mullet, barracuda, mackerel and tuna, triggerfish and filefish, sea turtle, duck, pigeon and dove, opossum, fox, deer, squirrel, cotton rat, agouti, and rabbit. Virtually all of these taxa have also been identified in earlier Vegas contexts from the Santa Elena peninsula (Stothert 1988: 188). Without question some of these were important food sources, notably fish and the universal Native American mammalian protein source par excellence, the white-tailed deer. The remains of many taxa undoubtedly were introduced into archaeological contexts for use as tools, adornments, ritual adjuncts, or through noncultural mechanisms.

Molluscan fauna have been identified and described, mainly from a number of Early Formative contexts along the southern coast. Of course this does not imply the absence of shellfish exploitation in other areas or at later times; rather, it indicates that much archaeological work still needs to be done. The record includes marine mollusks principally from intertidal, shallow water, and mangrove habitats, at least since the first appearance of Valdivia occupations and much earlier (Stothert 1988: 191–192). This would represent a broad-based collection that certainly did not necessitate sophisticated technology. Where available, mangroves were heavily exploited. Ferdon (1981) has eloquently demonstrated how coastal uplift and sediment deposition created favorable conditions for mangrove formation along the southwestern coast. Continuation of the same processes could also have lead to the eventual disappearance of estuarine and mangrove habitats; however, nothing is comparable to the startling rate at which they are disappearing today in the wake of contemporary *camaroneros* (Southgate and Whitaker 1992).

All of these marine habitats were exploited for invertebrate fauna. In particular, arks, oysters, clams, and horn shells were consumed as food or used in food preparation. Others became tools, adornments, and ritual commodities. For example, pearl oyster (*Pinctada mazatlanica*) fishhook lures and blanks are a hallmark of early Valdivia phase assemblages, as are the frequently encountered stone reamers used in their manufacture. Pearl oysters, along with various forms of clams, scallops, and marine gastropods, were used at various sites throughout the Early Formative to produce beads, pendants, ceramic decorators, bowls or cups, hoes, and picks. It has long been suspected that concentrations of the mangrove-dwelling horn shell, or *concha prieta* (*Cerithidea* spp.), suggest a lime source used in the processing of maize or consumption of coca (e.g., Zevallos M. et al. 1977:388). Marine shells like *Pinctada mazatlanica* and *Ostrea columbiensis* were also included in earliest Formative phase burial contexts as fill or were strategically placed over anatomical articulations and crania (e.g., Norton, Lunnis, and Nayling 1984: 47; Stahl n.d.e: 229; Staller n.d.: 304–313). The shallow marine-dwelling conch (*Strombus* spp.) was fashioned into utilitarian objects

like hoes and picks. It is also implicated along with its more famous partner, the spondylid oyster, as an important ritual adjunct, widely distributed from earliest times and eventually reaching far-flung points in the prehistoric Andean world (Marcos and Norton 1984; Norton et al. 1984: 42; Paulsen 1974).

Two important molluscan taxa from the Formative zooarchaeological record inhabit moderately deep waters. It is likely that they were intentionally harvested in their natural habitats. Ample evidence for early seafaring certainly corroborates this possibility. Middle Valdivia phase settlement of La Puná Island (Porras 1973), contemporaneous artifacts unearthed some 23 km from the coast on La Plata Island (Marcos and Norton 1981), and unmistakably realistic depictions of canoes and fiber boats resembling the Peruvian *caballito del mar* from Valdivia and Chorrera contexts (Lathrap, Collier, and Chandra 1975: 23–25), respectively, attest to the seafaring capacity of prehistoric inhabitants in Formative Ecuador. The sturdy tun shell (*Malea ringens*), one of the largest Panamic shells averaging up to 240 mm in height and 100 mm in diameter (Keen 1971: 499), inhabits moderately deep waters and was fashioned into spoons or shell scoops in Valdivia contexts. Lathrap has suggested that heavily worn examples may have been used in the manufacture of dugout canoes or in the decortification of tuberous crops (Lathrap et al. 1975: 23). Alternatively, these and similar instruments fashioned from a variety of shallow marine gastropods (*Ficus*, *Fasciolaria*, and *Comus*) could also have been used as shell diggers.

Tun shells could conceivably have been stranded on shore and subsequently collected; however, their deeper water counterpart, the thorny oyster (spondylus spp.), likely was not. These large tropical bivalves attach themselves to local substrates and can be harvested only by divers at depths of 15 to 50 m—their native habitat—off the tropical Ecuadorian coast (Marcos and Norton 1984: 14). Of course, much has been written about the ceremonial and economic importance of spondylus in the prehistoric Andean world, where *mullu* was especially revered as an essential offering to the gods (Murra 1975). Archaeologists have successfully traced the evolution of a vibrant trade in spondylus, often coupled with the strombus conch, beginning at least in the Early Formative. Shell products like beads, necklaces, pendants, and figurines appear later in highland contexts (e.g., Athens 1990: 72; Bruhns 1989: 63; Collier and Murra 1943: 69) and eventually expand into areas throughout the Andean world. The importance of the trade is evinced by its continued persistence, even after the cataclysmic arrival of Europeans (e.g., see Estrada 1990; Paulsen 1974; Zeidler 1991).

Identified fish bones from a number of coastal sites fill out the range of marine habitats represented in the zooarchaeological record. Certainly many of

the represented taxa are denizens of easily accessible habitats, ranging from brackish and estuarine conditions, extending seaward to neighboring inshore and nearshore areas. Although certain fish, like bonefishes (*Albula vulpes*), may be beached by wave action or opportunistically scavenged along shorelines, it is reasonable to suppose that the majority identified in archaeological contexts were actively pursued, caught, processed, and consumed by prehistoric peoples. It is perhaps no coincidence that most of the represented taxa are carnivores that readily take to hook and line. As noted above, shell hook lures are common in coastal Valdivia assemblages; however, this certainly does not preclude the use of perishable materials for fishing equipment as cactus spines or plant thorns. Zevallos and Holm (1960: 7) also suggested the possibility that cotton lines were utilized; however, the use of wild fibers cannot be ruled out. In either case, many nearshore carnivores, especially the commonly encountered snooks, sea basses, jacks and pompanos, snappers, grunts, porgies, drums, barracudas and wrasses could have been captured through relatively solitary shoreline hook-and-line fishing. This method could have been supported by trapping or spearing taxa like eels, catfish, grunts, and drums in shallow and estuarine waters. Still other nearshore schooling fishes like herrings, croakers, pigfish, and mullets—and surface schoolers like needlefish—could have been readily procured through communal haul seining. This is a common sight today along the Ecuadorian coast. These fishermen hold one end of a long net on the beach while its other end is drawn by boat around a school of fish, which is eventually hauled ashore.

Access to deeper marine environments was undeniably within the grasp of the earliest Formative inhabitants. Deepwater shell diving could easily have been supplemented by spearing of reef fishes like cornet and parrotfishes or inshore toadfishes. Spearing or hook-and-line and net fishing could also have been undertaken in deeper conditions from water craft. Coastal Valdivia assemblages include stone netweights in their inventories. A number of taxa that frequent offshore, pelagic, and deepwater environments are included in the recovered zooarchaeological assemblages. Two notable carnivores in this group, swordfishes and tunas, take bait; however, their large size and immense power necessitate an extremely heavy line. Alternatively, their beached carcasses may also have been occasionally and opportunistically scavenged along the shore, but the quantity and ubiquity of scombrid deposits in archaeological contexts argue against this. Interestingly, these taxa have been for the most part uncovered in Middle Formative deposits from which bone barbs for composite harpoon heads have been illustrated (Lathrap et al. 1975: 23, 86); thus harpooning from boats remains a possibility. Similar observations apply for the remains of sea turtles found in coastal contexts.

Certain fishes may not have been eaten (e.g., certain tetraodontiforms can be poisonous) and may have been collected as they washed up on the shore. Some fish bones were worked into awls and adornments, and stingray spines, possibly having been traded from the coast (e.g., Collier and Murra 1943: 68), have been found as far as the southern highlands. On a local scale, an organized trade in marine products between coastal and inland groups has been suggested on the basis of early excavations at Loma Alta (e.g., Byrd n.d.: 67; Lathrap et al. 1975: 22–23; Norton 1982). This idea is supported by: (a) a presumed inland protein scarcity; (b) varied and abundant marine faunal assemblage lacking indication of fishing tool kits; (c) ceramic evidence suggesting the existence of coastal ethnic enclaves; and (d) a slightly exaggerated distance from the coast. However, in light of excavated evidence for preserved fishing equipment at Loma Alta (Stahl n.d.e; see also Lathrap et al. 1975: 81), the well-stocked larder of the site's inhabitants could have been supplemented through the regular exploitation of marine resources easily accessed via a moderate walk or simple dugout ride to the nearby coast (Stahl n.d.a: 15–16; 1991: 349).

Until recently, much less has been known of interior coastal and highland sites; however, the limited but expanding information available from these areas details a zooarchaeological record no less striking in richness than their coastal counterparts. A wide range of habitats is represented in the list of recovered nonmarine vertebrate fauna. These range from semiaquatic and riverine areas through forested, grassland, dry, semiarid, and anthropogenic settings. Weapons and tools used in the acquisition and processing of animals from these habitats are generally lacking. Durable antler, bone, and shell points, and hooks for use in spears and other projectiles, have been described from coastal lowland and highland contexts (e.g., Athens 1990: 72; Lathrap et al. 1975: 81, 105; Porras 1973: 64). However, weapons used in the hunt most certainly could have been fashioned from perishable materials as well (Lathrap et al. 1975: 23; Stahl n.d.e: 241).

Many of the terrestrial vertebrates identified in Formative contexts could easily have been pursued with the most rudimentary technology. Various amphibians, reptiles, and mammals could have been caught by hand or through the use of expedient projectiles. It is likely, however, that many smaller terrestrial and scansorial forest taxa were pursued by the many ingenious traps, snares, and deadfalls that are still commonly used to catch important food items like paca, agouti, spiny rats, and rabbits. Bird remains tend to be far less common in archaeological sites, perhaps because of their greater overall fragility. However, their identification in certain contexts suggest that early Formative hunters were also adept at birding the grebes, ibises, ducks, and coots that regularly frequent

wet habitats like mangroves, estuaries, lagoons, and swamps. Conceivably, they used nets or some form of projectile. Similarly, forest forms, including tinamous, curassows, and a variety of small, brilliantly plumed birds could have been stalked in canopied forests, where a host of terrestrial, scansorial, and arboreal mammals could also have been hunted. It is interesting to speculate on the way in which certain arboreal taxa were obtained, especially those sloths and primates who spend much of their lives in high canopy. This could implicate projectile weapons like bows and arrows, spear throwers (e.g., Lathrap et al. 1975: 105), or even blowguns. Recent Tsátchela of the western lowlands included blowguns with clay pellets in their arsenal (Métraux 1963: 251). The Chachi of Esmeraldas province are known to have employed the poisonous darts essential for relaxing the death grip of certain arboreal game (Murra 1963: 280).

Significantly, different kinds of open habitats are represented in the list of Formative archaeofauna. Access to semiarid landscapes may be suggested by the commonly encountered remains of *Dusicyon sechurae*, which is found in the desertic, yet highly labile environment of the southwestern coast. Forested habitats of the *páramo* are suggested by the remains of the mountain tapir, as are highland grassland habitats by the late appearance of domesticated camelids. Much has been made of the feeding preferences of the white-tailed deer. These browsers tend to thrive in edge environments, and, as most suburban gardeners can attest, flourish in and around areas cleared for crops. Nevertheless, the white-tailed deer and its close allies tend to dominate the profiles of prehistoric food fauna in practically every archaeological context that does not include domesticated animals. Indeed, many of the taxa in Table 3 can be described as ecological generalists, especially opossum, armadillo, various raccoons, peccary, certain rodents, and rabbits. Usually, when flotation recovery of lowland archaeological deposits is employed, remains of the rice rat tend to be common to ubiquitous. HersHKovitz (1960: 527–528) has noted that species of *Oryzomys* can become markedly commensal with humans through residence in roof thatch. Certain pastoral rodents like grass mouse and cotton rat include croplands in their range of exploited habitats, as do doves, parrots, and toucans.

Anthropogenic manipulation of animal populations is evident in the recovery of domesticated taxa. Domesticated dogs have been identified from early Formative contexts in the coastal lowlands. The notorious difficulty in using incomplete skeletal remains for discriminating amongst the various canids is mitigated through the infrequent recovery of intentional dog burials. The interment of domesticated dogs might explain why so few canine remains are found in Early Formative midden contexts. Dogs may certainly have possessed a variety of cultural roles as hunters, protectors, and sustenance. Some time ago,

Lathrap et al. (1975: 23–25) identified a breed of dog depicted in a Chorrera vessel as the Mexican hairless, a point recently rediscovered by Cordy-Collins (1994). Bred as a food source, Lathrap et al. claimed it was eventually introduced to the prehistoric cultures of western Mexico.

The mechanism for introduction was likely the same means by which prized marine shells were transported away from their Ecuadorian habitats. In this sense, any number of smaller animals may have been introduced to far-flung areas. It is interesting to note the distribution of the domesticated guinea pig, or *cuy*, in Ecuador. Villalba (1988) claims its early appearance at Cotacalloa between 1500 and 1100 B.C.; however, it must be cautioned that the published photographs of *cuy* remains (Villalba 1988: lámina 59h,i) include those of rabbits. A sizeable sample of caviid remains were unearthed from a Late Formative context at the southern site of Putushío; otherwise, much of the evidence thus far unearthed for prehistoric *cuy*s comes from the western lowlands. Lippi (n.d.: 186) has identified *Cavia* remains in his excavated materials from La Ponga; however, their archaeological context at that site unfortunately contains a mixture of Guangala and Machalilla ceramics. Nevertheless, *cuy* remains have been identified in a variety of post-Formative contexts throughout the coastal lowlands, extending from the large sites of Peñón del Río and Jerusalén near Guayaquil (unpublished data), to the cemetery at Ayalán on the southern coast (Hesse 1981) and various sites along the Santa Elena peninsula (Fuentes González, Freires Paredes, and Valero Merino n.d.; Sánchez Mosquera n.d.), north through La Ponga and Salango (Stahl and Norton 1987), to a variety of sites in the Jama valley of northern Manabí province (unpublished data). In particular, the ancient role of Salango in coastal trade and the highly portable size of domesticated cavies could implicate purposive human introduction into areas far outside the range of either wild or early domesticated varieties (Stahl and Norton 1987).

Domesticated camelids appear to have been introduced into northern and southern highland contexts by the end of the Formative. Shortly thereafter, around A.D. 100, they dominated the faunal profile at Pirincay (Miller and Gill 1990) and eventually materialized in highland sites throughout Ecuador (Stahl 1988). Because of the notorious problem of osteologically discriminating between camelid taxa, especially the domesticated llama and alpaca, it is difficult to determine which form was introduced. Llamas have been identified at Cotacollao, and both domesticated forms have been tentatively identified at Putushío. Miller and Gill (1990: 64) suggested the early presence of a previously undocumented undersized llama, whose dimensions are transitional between either domesticated variety. At present, the nature of camelid utilization by Formative populations remains speculative; however, they appeared later on

the coast in burial contexts at Ayalán (Hesse 1981) and El Azúcar (Reitz n.d.). Their possible role in long-distance trade at Peñón del Río has been discussed (Stahl 1988).

Limited evidence, particularly from highland sites, suggests the use of mammal bone in the manufacture of needles, awls, spatulas, scoops, and ladles, as well as musical instruments and ornamentation. In particular, carnivore tooth pendants are found in Formative assemblages. In Vegas context, Wing (1988) noted the relationship of *Dusicyon* teeth, particularly in larger communal grave contexts, which she considered to be offerings. She further suggested that wild fox populations may have been minimally controlled, and possibly even domesticated prior to the Formative (Wing 1988: 185). Certainly, we have seen the ritual disposal of other Ecuadorian domesticates in Formative dog burials, as well as post-Formative *cuy* and camelid grave associations in the southwestern lowlands.

Clear evidence for the ritual use of animals during the Formative comes from the Jama valley of northern Manabí province. Zeidler (1988) has discussed the archaeological and religious context of feline effigy mortars uncovered in Terminal Valdivia context at the large ceremonial mound at San Isidro. Both feline and reptilian imagery have long been postulated to be included within the range of early decorative motifs found in the Northern Andean area (Damp 1982: 171; Stahl n.d.e: 168, 1985; Zeidler 1988: 250). Not surprisingly, nearby deposits also yielded burned fragments of the large tropical lowland jaguar (Stahl 1994: 189; Zeidler 1988: 264). Feline faunal remains, including those of the ocelot and puma, are found in different contexts throughout lowland and highland areas during the entire temporal span of Formative occupation. Perhaps the most dramatic example of ritual comes from recent excavations at the site of Capaperro, where one Terminal Valdivia burial yielded convincing evidence for shamanistic ritual. This feature included the close association of a miniature ceramic *coquero*; a polished green stone pendant; remains of a large fruit-eating bat (*Artibeus* sp.); and a ceramic figurine nestled within the mouth of an ocelot (*Felis pardalis*), whose snout rested on the midsection of a young woman (Zeidler et al. 1998).

CONCLUSIONS

The word *precocious* has crept into the literature on Formative Ecuador, and it is commonly used to underscore its early achievements. It is certainly my favorite descriptive term for the Ecuadorian Formative, as it richly conveys different meanings. It suggests to me the delight, astonishment, and mildly condescending amusement we experience when confronted with the gifted ex-

plots of a beloved inferior who has obviously been underestimated. At the same time, it reveals our own prejudices and naïveté in assuming that prehistoric maturity or complexity should somehow have been achieved at some later time or in some other place. With great fondness, I remember my visits to the magnificent exhibit of the famed Norton/Pérez collection housed in the Museo Arqueológico del Banco del Pacífico in Guayaquil. Liberated from the dry pages of archaeological reports and assembled into one magnificent visual presentation, this corpus of Formative artifacts can instill an overwhelming feeling of precocious achievement even in the most hardened skeptic. It is in this spirit, albeit in a less spectacular format, that I present the archaeofaunal record from Formative Ecuador.

Only a relatively recent development in the history of Ecuadorian archaeology, zooarchaeological research has nonetheless contributed archaeofaunal data from at least 32 chronologically discrete assemblages at 27 Formative sites. Because of the many factors that can influence the life history of any faunal assemblage, it is usually difficult to refer the exact structural relationship of our samples back to their parent populations. Parsimoniously treating these data as variables that can be either present or absent makes fewer assumptions about this relationship. Asymmetrically emphasizing presence over absence also overcomes the presumption that our “telephone booth” excavations and coarse screens are capable of capturing an intact past, somehow preserved in its entirety. Through this conservative approach, which minimizes our chances of being woefully wrong, the record remains as astonishing as any other catalog of Formative remains.

The Formative zooarchaeological record is strikingly rich in represented taxa. Some may have entered archaeological contexts surreptitiously, whereas others were intentionally exploited as food, used in the manufacture of tools and adornments, or performed some capacity in the realm of ritual and ceremony. Numerous habitats, characteristic of the richly heterogenous environments of contemporary Ecuador, are represented. If we picture a transect through the country, we can plot along its Formative course the diverse habitats found within: deep, offshore pelagic waters; moderately deep and shallow nearshore conditions; shallow inshore, estuarine, and brackish zones; intertidal flats; mangroves and coastlines; riverine areas; dry, semiarid scrublands; forests; secondary growth; croplands; grasslands; and high *páramo*. The necessary exploitative technology is no less diverse, as it ranges from simple collection or opportunistic scavenging, through sophisticated weaponry and significant ocean-going skill, employing either solitary or communal effort. We also see what are normally considered as hallmarks of human achievement, including the manipulation of

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domesticates and the organization of long-distance trade. In special circumstances, the record also enables us to contemplate concepts of Formative after-life. In any case, the nature of the surviving archaeofaunal record is no less representative or impressive than any other artifact category thus far described from the precocious Formative of Ecuador.

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Table 1

Invertebrate Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context	
Mollusca Bivalvia (bivalves)				
Mytiloidea				
Mytilidae (mussels)				
<i>Mytella strigata</i>	strigata mussel	Hormiga Shelter	intertidal mud	Early
<i>Mytilus edulis</i>	bay mussel	La Emerenciana	shallow rocks	Early
Arcoida				
Arcidae				
<i>Anadara emarginata</i>	emarginate ark	La Emerenciana	shallow	Early
<i>Anadara esmeraece</i>	ark shell	La Emerenciana	shallow	Early
<i>Anadara grandis</i>	ark shell	La Emerenciana, Real Alto	intertidal sand	Early
<i>Anadara labiosa</i>	ark shell	La Emerenciana	shallow	Early
<i>Anadara multicosata</i>	ark shell	Valdivia	mod. shallow	Early
<i>Anadara obesa</i>	ark shell	La Emerenciana	shallow mud	Early
<i>Anadara similis</i>	ark shell	La Emerenciana	shallow	Early
<i>Anadara tuberculosa</i>	ark shell	La Emerenciana, Guarmal, El Encanto, Hormiga Shelter, Real Alto, Valdivia, Loma Alta	mangrove	Early/Late
<i>Arca pacifica</i>	ark shell	Valdivia	intertidal rocks	Early
Glycymeridae				
<i>Glycymeris inaequalis</i>	bittersweet shell	Valdivia	shallow mud	Early
Ostreoida				
Pectinidae (scallops)				
<i>Aequipecten circularis</i>	scallop	Valdivia	shallow	Early
<i>Argopecten circularis</i>	scallop	Hormiga Shelter	intertidal	Early
<i>Nodipecten subnodosus</i>	scallop	Valdivia	mod. deep	Early
Spondylidae (thorny oysters)				
<i>Spondylus</i>	thorny oyster	Real Alto, Valdivia, La Cabuya, Salango, Loma Alta, San Isidro, La Chimba, Pirincay	mod. deep	Early/Middle/Late
<i>Spondylus princeps</i>	thorny oyster	La Emerenciana, Valdivia	mod. deep	Early
Ostreidae (oysters)				
<i>Crassostrea</i>	oyster	Real Alto, Valdivia Guanal	shallow intertidal mud	Early/Late Late
<i>Ostrea columbiensis</i>	mangrove oyster	Punta Brava, La Emerenciana, Guanal, Hormiga Shelter	mangrove	Early/Late
<i>Ostrea corteziensis</i>	mangrove oyster	Hormiga Shelter	mangrove	Early
<i>Ostrea fischeri</i>	mangrove oyster	Hormiga Shelter, Valdivia	mangrove	Early
<i>Ostrea iridescens</i>	oyster	Valdivia	intertidal rocks	Early
<i>Pinctada</i>	oyster	Loma Alta	shallow	Early
<i>Pinctada mazatlanica</i>	pearl oyster	Valdivia, La Cabuya, Salango	mod. shallow	Early/Middle
Veneroidea				
Chamidae				
<i>Chama echinata</i>	jewel box	Valdivia	mod. shallow rocks	Early
Carditidae				
<i>Cardita megastrophia</i>	cardita	La Emerenciana	mod. shallow	Early
Cardiidae (cockles)				
<i>Trachycardium</i>	cockle	Pirincay Loma Alta	mod. shallow	Late Early
<i>Trachycardium senticosum</i>	cockle	Valdivia	mod. shallow	Early

Fauna, taxon, and common name		Site	Habitat	Formative context
Mollusca Bivalvia (bivalves) (cont.)				
Mactridae				
<i>Mactra augusta</i>	mactra clam	La Emerenciana	mod. shallow	Early
<i>Mactra velata</i>	surf clam	Valdivia	mod. shallow	Early
Tellinidae				
<i>Tellina ecuatoriana</i>	tellin	La Emerenciana	shallow	Early
Sanguinolariidae				
<i>Tagelus</i>	jackknife clam	La Emerenciana, Valdivia	intratidal shallow mud	Early
<i>Tagelus irregularis</i>	jackknife clam	La Emerenciana, Hormiga Shelter	intratidal shallow mud	Early
Semelidae				
<i>Semele tortuosa</i>	semeles	Hormiga Shelter	shallow mud	Early
Corbiculidae				
<i>Polymesoda inflata</i>	marsh clam	La Emerenciana	shallow mud	Early
Veneridae				
<i>Anomalocardia subimbricata</i>	Venus clam	Valdivia	mod. shallow	Early
<i>Anomalocardia subrugosa</i>	Venus clam	El Encanto, Valdivia, La Cabuya	mod. shallow	Early/Middle
<i>Chione</i>	Venus shell	Loma Alta	intertidal	Early
<i>Chione subimbricata</i>	Venus shell	Hormiga Shelter	intertidal	Early
<i>Chione subrugosa</i>	pointed venus	Punta Brava, La Emerenciana	intertidal	Early/Late
<i>Dosinia dunckeri</i>	disk dosinia	La Emerenciana	shallow mud	Early
<i>Pitar concinnus</i>	Venus clam	Valdivia	shallow	Early
<i>Protothaca ecuatoriana</i>	protothaca	Punta Brava, La Emerenciana, Guanal	intratidal mud	Early/Late
<i>Protothaca grata</i>	Venus clam	Valdivia	intertidal mud offshore	Early
Corbulidae				
<i>Panamicorbula inflata</i>	basket clam	Valdivia	shallow rocks	Early
Gastropoda (univalves)				
Archaeogastropoda				
Fissurellidae				
<i>Fissurella atrescens</i>	limpet	Valdivia	shallow rocks	Early
Trochidae				
<i>Tegula reticulata</i>	reticulate top	Valdivia	shallow rocks	Early
Turbinidae				
<i>Astraea buschi</i>	busch's turban	Valdivia	shallow rocks	Early
<i>Turbo squamiger</i>	turban	Valdivia	shallow	Early
Neritidae				
<i>Neritina latissima</i>	virgin nerite	La Emerenciana	shallow	Early
Mesogastropoda				
Turritellidae				
<i>Turritella radula</i>	turret shell	El Encanto	mangrove	Early
Littorinidae				
<i>Littorina</i>	periwinkle	Valdivia	intertidal	Early

(cont.)

Table 1 (cont.)

Invertebrate Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context
Gastropoda (univalves) (cont.)			
Potamididae			
<i>Cerithidea</i>	horn shell	Loma Alta	intertidal mud
<i>Cerithidea pulchra</i>	<i>concha prieta</i>	Hormiga Shelter	intertidal mud
<i>Cerithidea valida</i>	horn shell	Punta Brava, La Emerenciana, Guarmal, Hormiga Shelter, Valdivia, Real Alto	intertidal mud
			Early
			Early
			Early/Late
Cerithiidae			
<i>Cerithium</i>	horn shell	La Emerenciana	shallow
<i>Cerithium adustum</i>	horn shell	La Emerenciana, Valdivia	shallow
<i>Cerithium stercusmuscarum</i>	horn shell	El Encanto	shallow
			Early
			Early
			Early
Strombidae (conchs)		Valdivia, La Cabuya, La Chimba, Salango	mod. shallow
			Early/Middle/Late
<i>Strombus galeatus</i>	winged conch	La Emerenciana, Valdivia	mod. shallow
<i>Strombus granulatus</i>	conch	Valdivia	shallow
			Early
			Early
Calyptraeidae			
<i>Crepidula marginalis</i>	slipper shell	La Emerenciana	shallow
			Early
Triviidae			
<i>Trivia radians</i>	sea button	Valdivia	intertidal
			Early
Cypraeidae (cowries)			
<i>Cypraea arabicula</i>	little Arabian cowry	Valdivia	shallow
<i>Cypraea robertsi</i>	cowry	Valdivia	shallow
			Early
			Early
Atlantidae (Atlantas)		Loma Alta	pelagic
			Early
Naticidae			
<i>Natica</i>	moon shell	Loma Alta	shallow
<i>Natica chemnitzii</i>	moon shell	El Encanto, Valdivia	shallow sand
<i>Polinices</i>	moon shell	La Emerenciana	shallow
			Early
			Early
			Early
Ficidae			
<i>Ficus</i>	fig shell	San Pablo	mod. shallow
			Early
Tonnidae			
<i>Malca ringens</i>	tun shell	El Encanto, Real Alto, San Pablo	mod. deep
			Early
Neogastropoda			
Muricidae			
<i>Phyllonotus regius</i>	rock shell	Valdivia	shallow
			Early
Thaididae			
<i>Thais crassa</i>	dye shell	Valdivia	shallow
			Early
Columbellidae			
<i>Columbella major</i>	dove shell	Valdivia	shallow
			Early
Buccinidae			
<i>Triumphis distorta</i>	whelk	El Encanto, Valdivia	intertidal mud
			Early
Nassariidae			
<i>Nassarius</i>	dog whelk	La Emerenciana	variable
			Early

Fauna, taxon, and common name	Site	Habitat	Formative context
Gastropoda (univalves) (cont.)			
Fascioliariidae			
<i>Fasciolaria</i>	tulip shell	San Pablo	intertidal mud
<i>Opeatostoma pseudodon</i>	tulip shell	Hormiga Shelter	intertidal rocks
Olividae			
<i>Oliva</i>	olive shell	Loma Alta	intertidal
<i>Oliva callosa</i>	Pacific white Venus	La Emerenciana	intertidal
<i>Oliva peruviana</i>	olive shell	Valdivia	intertidal
<i>Olivella</i>	olive shell	La Emerenciana, Loma Alta	shallow
Vassidae			
<i>Vasum muricatum</i>	vase shell	Valdivia	intertidal
Conidae (cone shells)			
<i>Comus</i>	cone shell	San Pablo	shallow
<i>Comus purpurascens</i>	purple cone	Valdivia	mod. shallow
Cephalaspidea			
Bullidae			
<i>Bulla aspera</i>	true bubble shell	Valdivia	intertidal mud
Stylommatophora			
Strophocheilidae			
<i>Strophocheilus</i>	land snail	La Emerenciana, Loma Alta	terrestrial
<i>Naesiotus quitensis</i>	land snail	La Chimba	terrestrial
Crustacea			
Decapoda (crabs)			
	crab	Hormiga Shelter, Loma Alta, San Isidro	Early/Late
Calappidae	box crab	Loma Alta	intertidal mud
Majidae	spider crab	Loma Alta	intertidal mud
Xanthidae	mud crab	Loma Alta	intertidal mud

Notes: taxon = a listing by zoological category and common name. Nomenclature and habitat conform to a number of authoritative reference sources (Keen 1971; Morris 1966; Olsson 1961; Turgeon et al. 1988).

Table 2

Fish Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context
Chondrichthyes (cartilaginous fishes)			
Lamniformes			
Orectolobidae (carpet sharks)	Real Alto	shallow	Early
Carcharhinidae (requiem sharks)	OGCH-20, Real Alto, Valdivia, Loma Alta, La Ponga, Salango	variable	Early/Middle/Late
Sphyrnidae <i>Sphyrna</i>	hammerhead shark Loma Alta	inshore, offshore	Early
Rajiformes			
Dasyatidae (stingrays)	Real Alto, Loma Alta	variable	Early
Myliobatidae <i>Aetobatus narinari</i>	spotted eagle ray Salango	inshore, offshore	Middle
Osteichthyes (bony fishes)			
Elopiformes			
Albulidae <i>Albula vulpes</i>	bonefish OGSE-62	brackish, inshore	Early
Anguilliformes			
Anguillidae (eels)	Salango	variable	Middle/Late
Clupeiformes			
Clupeidae (herrings)	Salango	shallow schools	Middle/Late
Siluriformes			
Ariidae (sea catfishes)	OGCH-20, Real Alto, OGSE-62, OGSE-46, OGSE-42, Valdivia, Loma Alta, La Ponga, Río Chico, Salango	estuarine	Early/Middle/Late
<i>Arius</i>	sea catfish OGCH-20, Real Alto, OGSE-62, OGSE-46, Valdivia, Buena Vista, La Ponga	estuarine	Early/Middle
<i>Arius seemani</i> <i>Bagre</i>	sea catfish chihuil OGSE-62, Valdivia, Buena Vista, La Ponga, Río Chico	estuarine estuarine	Early Early/Middle
<i>Bagre panamensis</i>	chihuil OGCH-20, Real Alto, OGSE-62, OGSE-46, Buena Vista, Valdivia, Loma Alta, Río Chico, Salango	estuarine	Early/Middle
Ophidiiformes			
Ophidiidae (cusk-eels/brotulas)	Salango	variable	Middle
<i>Brotula</i>	brotula Salango	variable	Middle
<i>Brotula clarkae</i>	brotula Salango	variable	Middle

Fauna, taxon, and common name	Site	Habitat	Formative context
Osteichthyes (bony fishes) (cont.)			
Batrachoidiformes			
Batrachoididae (toadfishes)	OGCH-20, Real Alto, OSGE-46, Loma Alta	inshore	Early/Middle
<i>Batrachoides pacificum</i>	toadfish Salango	inshore	Middle
<i>Daector</i>	toadfish Salango	inshore	Middle
<i>Daector reticulata</i>	toadfish Salango	inshore	Middle
Atheriniformes			
Exocoetidae (flyingfishes/ halfbeaks)	Salango	surface, offshore, schools	Middle
Belonidae (needlefishes)	Salango	surface, nearshore, schools	Middle/Late
<i>Strongylura</i>	needlefish Salango	surface, nearshore, schools	Late
<i>Strongylura exilis</i>	California needlefish Salango	surface, nearshore, schools	Middle
<i>Strongylura stolzmanni</i>	needlefish Loma Alta	surface, nearshore, schools	Early
<i>Tylosurus</i>	needlefish Salango	surface, nearshore, schools	Middle
<i>Tylosurus fodiator</i>	needlefish Salango	surface, nearshore, schools	Middle
Gasterosteiformes			
Fistularidae (cornetfishes)	Salango	concealed reefs	Late
<i>Fistularia</i>	cornetfish Salango	concealed reefs	Middle/Late
<i>Fistularia corneta</i>	cornetfish Salango	concealed reefs	Middle
Scorpaeniformes			
Scorpaenidae (scorpionfishes)	Río Chico, Salango	shallow rocks	Early/Middle
<i>Scorpaena</i>	scorpionfish Río Chico, Salango	shallow rocks	Early/Middle
Perciformes			
Centropomidae			
<i>Centropomus</i>	snook OGCH-20, Real Alto, OGSE-62, OGSE-46, OGSE-42, Valdivia, Buena Vista, Salango	brackish, inshore	Early/Middle/Late
<i>Centropomus armatus</i>	snook Río Chico	brackish, inshore	Early
<i>Centropomus nigrescens</i>	snook Salango	brackish, inshore	Middle
<i>Centropomus pectinatus</i>	tarpon snook Río Chico	brackish, inshore	Early
Serranidae (sea basses)	OGCH-20, Real Alto, OGSE-62, OGSE-46, Valdivia, La Ponga, Salango	inshore	Early/Middle/Late
<i>Epinephelus</i>	grouper Salango	inshore	Middle/Late
<i>Epinephelus acantistius</i>	grouper Salango	inshore	Middle
<i>Epinephelus analogus</i>	spotted cabrilla Salango	inshore	Middle
<i>Epinephelus multiguttatus</i>	grouper Río Chico, Salango	inshore	Early/Middle
<i>Hemilitjanus</i>	grouper Río Chico	inshore	Early
<i>Mycteroperca</i>	grouper Real Alto, OGSE-62, Valdivia, Salango	inshore	Early/Middle/Late
<i>Mycteroperca xenarcha</i>	broomtail grouper OGSE-62, Río Chico, Salango	inshore	Early/Middle
<i>Paralabrax</i>	sea bass Salango	inshore	Middle/Late
<i>Paralabrax callaensis</i>	sea bass Salango	inshore	Middle/Late
Malacanthidae (tilefishes)	Río Chico	shallow, offshore	Early
<i>Caulolatilus affinis</i>	tilefish Río Chico, Salango	shallow, offshore	Early/Middle/Late
<i>Caulolatilus princeps</i>	ocean whitefish Salango	shallow, offshore	Middle

(cont.)

Table 2 (cont.)

Fish Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context	
Osteichthyes (bony fishes) (cont.)				
Nematistidae (roosterfish)				
<i>Nematistius pectoralis</i>	roosterfish	Río Chico Río Chico, Salango	shallow sand, inshore shallow sand, inshore	Early Early/Middle
Coryphaenidae (dolphins)				
<i>Coryphaena hippurus</i>	dolphin	Salango Salango	surface, inshore and pelagic surface, inshore and pelagic	Late Middle/Late
Carangidae (jacks and pompanos)				
		OGCH-20, Real Alto, OGSE-62, OGSE-46, Valdivia, Buena Vista, Loma Alta, La Ponga, Salango, San Isidro, Río Chico	shallow, nearshore	Early/Middle/Late
<i>Alectis ciliaris</i>	pompano	Salango	shallow, nearshore	Late
<i>Caranx</i>	jack	Valdivia, Loma Alta, Río Chico, Salango	shallow, nearshore	Early/Middle
<i>Caranx caballus</i>	green jack	Río Chico, Salango	inshore and pelagic, schools	Early/Middle
<i>Caranx caninus</i>	jack	Río Chico, Salango	brackish and inshore, schools	Early/Middle/Late
<i>Caranx hippos</i>	crevalle jack	Real Alto, OGSE-62	shallow, nearshore	Early
<i>Caranx otrynter</i>	jack	Río Chico, Salango	shallow, nearshore	Early/Middle
<i>Caranx speciosus</i>	jack	Salango	shallow, nearshore	Middle
<i>Caranx vinctus</i>	jack	Salango	shallow, nearshore	Middle
<i>Hemicaranx</i>	bluntnose jack	Loma Alta	shallow, nearshore	Early
<i>Oligoplites</i>	leatherjacket	Salango	shallow, nearshore	Middle
<i>Oligoplites altus</i>	leatherjacket	Salango	shallow, nearshore	Middle
<i>Selar crumenophthalmus</i>	bigeye scad	Salango	shallow, nearshore	Middle
<i>Selene</i>	lookdown	Real Alto, Río Chico, Salango	shallow, nearshore	Early/Middle/Late
<i>Selene brevoorti</i>	lookdown	Río Chico, Salango	shallow, nearshore	Early/Middle
<i>Selene peruviana</i>	lookdown	Salango	inshore schools	Middle
<i>Seriola</i>	amberjack	Río Chico	shallow, nearshore	Early
<i>Seriola lalandi</i>	jack	Salango	inshore schools	Middle
<i>Seriola rivoliana</i>	almaco jack	Salango	brackish inshore, pelagic	Middle
<i>Tachinotus kennedyi</i>	pompano	Salango	shallow, nearshore	Middle
<i>Tachinotus paitensis</i>	paloma pompano	Salango	inshore sand	Middle
<i>Tachinotus rhodopus</i>	gafftopsail pompano	Salango	inshore sand	Middle
<i>Vomer</i>	moonfish	OGSE-62, Loma Alta	shallow, nearshore	Early
<i>Vomer declivifrons</i>	Pacific moonfish	OGSE-62	shallow, nearshore	Early
Lutjanidae (snappers)				
<i>Lutjanus</i>	snapper	Río Chico, Salango OGCH-20, Real Alto, OGSE-62, OGSE-46, Valdivia, Loma Alta, Río Chico	shallow inshore reefs shallow inshore reefs	Early/Middle/Late Early/Middle/Late
<i>Lutjanus apatus</i>	snapper	Salango	shallow inshore reefs	Middle
<i>Lutjanus argentiventris</i>	snapper	Salango	shallow inshore reefs	Middle
<i>Lutjanus colonado</i>	snapper	Río Chico, Salango	shallow inshore reefs	Early/Middle
<i>Lutjanus guttatus</i>	snapper	Río Chico, Salango	shallow inshore reefs	Early/Middle
<i>Lutjanus inermis</i>	snapper	Salango	shallow inshore reefs	Middle
<i>Lutjanus novemfasciatus</i>	snapper	Salango	shallow inshore reefs	Middle
<i>Lutjanus peru</i>	snapper	Salango	shallow inshore reefs	Middle
Lobotidae				
<i>Lobotes pacificus</i>	tripletail	Salango	brackish	Middle
Gerreidae				
<i>Eugerres brevimanus</i>	mojarra	Salango	shallow brackish inshore, sand, mud	Middle
Pomadasyidae (grunts)				
		OGCH-20, Real Alto, OGSE-62, OGSE-46, Valdivia, Buena Vista, La Ponga, Salango	shallow schools	Early/Middle/Late
<i>Anisotremus</i>	grunt	OGSE-62, La Ponga, Río Chico	shallow schools	Early/Middle
<i>Anisotremus dovii</i>	grunt	Salango	shallow schools	Middle
<i>Anisotremus pacifici</i>	grunt	Salango	shallow schools	Middle
<i>Haemulon</i>	grunt	OGSE-62, OGSE-46	shallow schools	Early/Middle/Late
<i>Haemulon scudderii</i>	grunt	Río Chico, Salango	shallow schools	Early/Middle

Fauna, taxon, and common name	Site	Habitat	Formative context	
Osteichthyes (bony fishes) (cont.)				
Pomadasyidae				
<i>Haemulon steindachneri</i>	grunt	Río Chico, Salango	shallow schools	Early/Middle
<i>Orthopristis</i>	pigfish	Real Alto, OGSE-62, Río Chico, Salango	shallow schools	Early/Middle
<i>Orthopristis chalceus</i>	pigfish	Río Chico, Salango	shallow schools	Early/Middle
<i>Pomadasys</i>	grunt	Río Chico, Salango	shallow schools	Early/Middle
<i>Pomadasys bayanus</i>	grunt	Salango	shallow schools	Middle
<i>Pomadasys branicki</i>	grunt	Río Chico	shallow schools	Early
<i>Pomadasys leuciscus</i>	grunt	Salango	shallow schools	Middle
<i>Pomadasys macracanthus</i>	grunt	Salango	shallow schools	Middle
<i>Pomadasys nitidus</i>	grunt	Salango	shallow schools	Middle
<i>Pomadasys panamensis</i>	grunt	Salango	shallow schools	Middle
Sparidae (porgies)				
<i>Calamus</i>	porgy	Río Chico, Salango	nearshore, sand, bottom	Early/Late
<i>Calamus brachysomus</i>	Pacific porgy	OGCH-20, OGSE-46, La Ponga	nearshore, sand, bottom	Early/Middle/Late
		OGSE-62, OGSE-46, Valdivia, Río Chico, Salango	nearshore, sand, bottom	Early/Middle/Late
Sciaenidae (drums)				
		OGCH-20, Real Alto, OGSE-42, Loma Alta, La Ponga, Río Chico	estuarine, shallow, brackish, inshore, bottom	Early/Middle/Late
<i>Bairdiella</i>	bairdiella	Real Alto	estuarine, shallow, brackish, inshore, bottom	Early
<i>Bairdiella ensifera</i>	bairdiella	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Cynoscion</i>	sea trout	OGCH-20, OGSE-62, OGSE-42, OGSE-46, Loma Alta, La Ponga	estuarine, shallow, brackish, inshore, bottom	Early/Middle/Late
<i>Cynoscion albus</i>	sea trout	Río Chico	estuarine, shallow, brackish, inshore, bottom	Early
<i>Cynoscion phoxocephalus</i>	sea trout	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Cynoscion stolzmanni</i>	sea trout	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Larimus</i>	drum	OGCH-20, Real Alto, Loma Alta, Río Chico	estuarine, shallow, brackish, inshore, bottom	Early/Middle
<i>Larimus gulosus</i>	drum	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Menticirrhus</i>	kingfish	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Menticirrhus elongatus</i>	kingfish	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Menticirrhus nasus</i>	kingfish	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Menticirrhus panamensis</i>	kingfish	Salango	estuarine, shallow, brackish, inshore, bottom	Early/Middle
<i>Micropogon</i>	croaker	OGCH-20, Real Alto, Loma Alta, La Ponga	estuarine, shallow, brackish, inshore, bottom	Early/Middle
<i>Micropogon fusiari</i>	croaker	La Ponga	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Micropogonias</i>	drum	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Micropogonias altipinnis</i>	drum	Salango	estuarine, shallow, brackish, inshore, bottom	Middle/Late
<i>Paralanchurus</i>	drum	Real Alto, La Ponga	estuarine, shallow, brackish, inshore, bottom	Early/Middle
<i>Paralanchurus dumerilii</i>	drum	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Paralanchurus goodei</i>	drum	Salango	estuarine, shallow, brackish, inshore, bottom	Middle

(cont.)

Table 2 (cont.)

Fish Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name		Site	Habitat	Formative context
Osteichthyes (bony fishes) (cont.)				
<i>Umbrina</i>	croaker	Río Chico, Salango	estuarine, shallow, brackish, inshore, bottom	Early/Middle/Late
<i>Umbrina roncador</i>	yellowfin croaker	Salango	estuarine, shallow, brackish, inshore, bottom	Middle
<i>Umbrina xanti</i>	croaker	Río Chico, Salango	estuarine, shallow, brackish, inshore, bottom	Early/Middle
Kyphosidae (sea chubs)				
<i>Kyphosus elegans</i>	sea chub	Real Alto	inshore reefs, schools, rocks	Early
<i>Sectator ocyurus</i>	sea chub	Salango	inshore reefs, schools, rocks	Middle
		Salango	inshore reefs, schools, rocks	Middle
Ephippidae				
<i>Chaetodipterus</i>	spadefish	La Ponga	inshore reefs, schools, rocks	Middle
<i>Chaetodipterus zonatus</i>	Pacific spadefish	Salango	inshore reefs, schools, rocks	Middle
Cirrhitidae (hawkfishes)				
<i>Cirrhites</i>	hawkfish	OGSE-46 Loma Alta	reefs, rocks reefs, rocks	Late Early
Mugilidae (mullet)		OGCH-20, Río Chico, Salango	brackish, estuarine, inshore, schools	Early/Middle/Late
<i>Mugil</i>	mullet	Real Alto, OGSE-62, Loma Alta, Salango	brackish, estuarine, inshore, schools	Early/Middle/Late
<i>Mugil carena</i>	mullet	Río Chico	brackish, estuarine, inshore, schools	Early
<i>Mugil cephalus</i>	striped mullet	OGSE-62	brackish, estuarine, inshore, schools	Early
Sphyraenidae (barracudas)				
<i>Sphyraena</i>	barracuda	Río Chico, Salango	nearshore, surface, schools	Early/Late
<i>Sphyraena barracuda</i>	great barracuda	Salango	nearshore, surface, schools	Middle
<i>Sphyraena ensis</i>	barracuda	Loma Alta, Salango	nearshore, surface, schools	Early/Middle
		Río Chico, Salango	nearshore, surface, schools	Early/Middle/Late
Polynemidae (threadfins)				
<i>Polydactylus</i>	threadfin	Salango	inshore, mud	Middle
<i>Polydactylus approximans</i>	blue bobo	Salango	inshore, mud	Middle
<i>Polydactylus opercularis</i>	yellow bobo	Salango	inshore, mud	Middle
Labridae (wrasses)		OGCH-20, Real Alto, OGSE-46, Valdivia, Río Chico, Salango	shallow sand	Early/Middle
<i>Bodianus</i>	hogfish	Salango	shallow sand	Middle
<i>Bodianus diplotaenia</i>	hogfish	Salango	shallow sand	Middle
Scaridae (parrotfishes)				
<i>Scarus perico</i>	parrotfish	Salango	reefs, schools reefs, schools	Middle/Late Middle
Acanthuridae (surgeonfishes)				
<i>Prionurus</i>	surgeonfish	Río Chico, Salango	variable variable	Early/Middle Middle
Scombridae (mackerels and tunas)		OGCH-20, OGSE-62, OGSE-46, Valdivia, Loma Alta, La Ponga, Salango	inshore, offshore, epipelagic, schools	Early/Middle/Late
<i>Acanthocybium solanderi</i>	wahoo	La Ponga, Salango	inshore, offshore, epipelagic, schools	Middle/Late
<i>Auxis</i>	mackerel	Loma Alta, Salango	inshore, offshore, epipelagic, schools	Early/Middle
<i>Auxis thazard</i>	frigate mackerel	Salango	inshore, offshore, epipelagic, schools	Middle
<i>Euthynnus</i>	skipjack tuna	La Ponga, Salango	inshore, offshore, epipelagic, schools	Middle/Late

Fauna, taxon, and common name	Site	Habitat	Formative context	
Osteichthyes (bony fishes) (cont.)				
<i>Euthynnus lineatus</i>	black skipjack	Salango	inshore, offshore, epipelagic, schools	Middle/Late
<i>Euthynnus pelamis</i>	skipjack tuna	Salango	inshore, offshore, epipelagic, schools	Middle/Late
<i>Sarda</i>	bonito	Salango	inshore, offshore, epipelagic, schools	Middle
<i>Scomber</i>	mackerel	Salango	inshore, offshore, epipelagic, schools	Middle
<i>Scomber japonicus</i>	mackerel	Salango	inshore, offshore, epipelagic, schools	Middle/Late
<i>Scomberomus sierra</i>	sierra	Salango	inshore, offshore, epipelagic, schools	Middle
<i>Thunnus</i>	tuna	Salango	inshore, offshore, epipelagic, schools	Middle/Late
<i>Thunnus albacares</i>	yellowfin tuna	Salango	inshore, offshore, epipelagic, schools	Middle/Late
Eleotriidae (sleepers)		Real Alto	brackish, inshore, mud	Early
Xiphidae (swordfishes)		Salango	shallow, offshore, deepwater	Middle
Tetraodontiformes				
Balistidae (triggerfishes/filefishes)		OGCH-20, OGSE-46, Río Chico, Salango	nearshore and pelagic	Early/Middle/Late
<i>Sufflamen verres</i>	triggerfish	Salango	nearshore and pelagic	Middle
Diodontidae				
<i>Diodon hystrix</i>	porcupinefish	Salango	inshore, bottom and shallow, bottom	Middle
Tetraodontidae (puffers)		OGCH-20, Loma Alta	nearshore	Early/Middle
<i>Sphoeroides</i>	puffer	Salango	nearshore	Middle
<i>Sphoeroides annulatus</i>	bullseye puffer	Salango	nearshore	Middle
<i>Sphoeroides lobatus</i>	puffer	Salango	nearshore	Middle

Notes: taxon = a listing by zoological category and common name. Nomenclature and habitat conform to a number of authoritative reference sources (Eschmeyer et al. 1983; Jordan 1963; Nelson 1994; Robins et al. 1980).

Table 3

Non-fish Vertebrate Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context	
Amphibia				
Caudata (salamanders)	Dos Caminos	terrestrial, semiaquatic	Late	
Anura (frogs/toads)	Hormiga Shelter, Loma Alta, Capaperro, Dos Caminos, San Isidro, El Mocerrol	terrestrial, semiaquatic	Early/Late	
Bufonidae (toads)	Loma Alta, El Mocerrol	terrestrial, semiaquatic	Early/Late	
Ranidae (frogs)	Loma Alta	terrestrial, semiaquatic	Early/Late	
Reptilia				
Chelonia				
Kinosternidae <i>Kinosternon</i>	mud turtle	Loma Alta, La Ponga	terrestrial, semiaquatic	Early/Middle
Emydidae	emydid turtles	Valdivia, La Cabuya, Loma Alta, La Ponga	terrestrial, semiaquatic	Early/Middle
<i>Rhinoclemmys</i>	brown land terrapin	Loma Alta, San Isidro	terrestrial, forest	Early
Cheloniidae (sea turtles)		OGCH-20, Real Alto, OGSE-46, OGSE-48, OGSE-42, Valdivia, Buena Vista	marine, aquatic	Early/Middle/Late
<i>Lepidochelys</i>	sea turtle	OGSE-46	marine, aquatic	Middle/Late
Sauria (lizards)		Hormiga Shelter, Dos Caminos, Cotocollao	variable	Early/Late
Iguanidae	iguanid lizards	Dos Caminos	variable	Late
Serpentes				
Boidae <i>Boa constrictor</i>	boa constrictor	Loma Alta	terrestrial, forest, variable, riverine	Early
Viperidae <i>Bothrops</i> <i>Crotalus</i>	fer-de-lance rattlesnake	Loma Alta La Ponga	terrestrial, variable terrestrial, variable, dry, semiarid	Early Middle
Aves				
Tinamiformes				
Tinamidae (tinamous)		Loma Alta	terrestrial, forest, secondary growth	Early
<i>Tinamou</i>	tinamou	La Chimba	terrestrial, forest, secondary growth	Late
Podicepediformes				
Podicepedidae	grebes	La Ponga	semiaquatic, riverine	Middle
Procellariiformes				
Diomedidae <i>Diomedea irrorata</i>	Galapagos albatross	Salango	marine aquatic, volant	Middle

Fauna, taxon, and common name	Site	Habitat	Formative context
Aves (<i>cont.</i>)			
Pelecaniformes			
Pelecanidae <i>Pelecanus occidentalis</i>	brown pelican	OGSE-46	marine aquatic Late
Ciconiiformes			
Threskiornithidae (ibises)		Loma Alta	semiaquatic, riverine Early
Anseriformes			
Anatidae (ducks)		Real Alto, Loma Alta, La Ponga, San Isidro	semiaquatic, riverine Early/Middle/Late
Falconiformes			
Accipitridae (hawks) <i>Buteo</i>	hawk	Loma Alta Loma Alta	variable variable Early Early
Falconidae (falcons) <i>Falco peregrinus</i>	peregrine falcon	Loma Alta Loma Alta	variable variable Late Early
Galliformes			
Cracidae (currasows)		Loma Alta	arboreal, forest, secondary growth Early
<i>Penelope</i>	guan	Loma Alta	arboreal, forest, secondary growth Early/Late
Grulliformes			
Rallidae (coots)		Loma Alta	semiaquatic, riverine Early
Charadriiformes			
Laridae (gulls) <i>Larus</i> <i>Sterna</i>	gull tern	Loma Alta, Salango Salango Salango	marine aquatic, variable marine aquatic, variable marine aquatic, variable Early/Middle Early? Late
Columbiformes			
Columbidae (pigeons/doves)		Hormiga Shelter, Loma Alta, La Ponga, Dos Caminos	variable Early/Middle/Late
<i>Columba</i> <i>Zenaida</i>	pigeon dove	La Chimba Loma Alta, Cotocollao	variable variable, open areas, croplands Late Late
<i>Columbina</i> <i>Clanavis</i>	ground dove dove	Loma Alta Loma Alta	variable, open areas variable, open areas Late Late
Psittaciformes			
Psittacidae (macaws/parrots) <i>Amazona</i>	parrot	Loma Alta Cotocollao	variable variable Early/Late Late
Strigiformes			
Strigidae (owls)		La Ponga	arboreal Middle

(*cont.*)

Table 3 (cont.)

Non-fish Vertebrate Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context
Aves (cont.)			
Piciformes			
Capitonidae (barbets)	Loma Alta	arboreal, forest	Early
Picidae (woodpeckers)	Loma Alta	arboreal, forest	Early
Ramphastidae (toucans)	Loma Alta	arboreal, forest, secondary growth	Early/Late
Passeriformes (passerine birds)	Horniga Shelter, Loma Alta	variable	Early
Mammalia			
Marsupialia			
Didelphidae (opossums)	Loma Alta, La Ponga, Cotocollo	arboreal, scansorial, terrestrial, variable	Early/Middle/Late
<i>Chironectes</i>	water opossum	La Chimba	Late
<i>Didelphis marsupialis</i>	common opossum	Loma Alta, La Chimba	Late
<i>Marmosa</i>	mouse opossum	Horniga Shelter, Loma Alta, Capaperro, El Mocorral	arboreal, terrestrial, forest, secondary growth
Xenarthra			
Bradypodidae (sloths)	San Isidro	arboreal, forest	Early
Dasypodidae			
<i>Dasyops novemcinctus</i>	nine-banded armadillo	Loma Alta, Capaperro, Dos Caminos, San Isidro, Finca Cueva, El Mocorral	terrestrial, fossorial, semifossorial, forest, open areas
Chiroptera			
Phyllostomidae			
<i>Artibeus</i>	fruit-eating bat	Capaperro	volant, arboreal, forest
Primates			
Cebidae (monkeys)			
<i>Cebus albifrons</i>	capuchin monkey	Loma Alta	arboreal, forest
<i>Saimiri</i>	squirrel monkey	Salango La Chimba	arboreal, forest arboreal, variable
Carnivora			
Canidae (dogs)			
<i>Canis</i>	dog	Horniga Shelter, Loma Alta, Capaperro, La Chimba	terrestrial, variable
<i>Canis familiaris</i>	domestic dog	OGSE-46, Loma Alta, Pirincay	terrestrial, variable
<i>Dusicyon</i>	fox	Real Alto, OGSE-46, Loma Alta Horniga Shelter, OGCH-20, Loma Alta, La Ponga, Pirincay	domesticated terrestrial, variable
<i>Dusicyon sechunae</i>	fox	OGSE-46, Loma Alta	terrestrial, variable, dry, semiarid
<i>Speothos</i>	bush dog	Loma Alta	terrestrial, variable, forest
Ursidae			
<i>Tremarctos ornatus</i>	spectacled bear	La Chimba, Pirincay	scansorial, terrestrial, forest, croplands
Procyonidae (raccoons)			
<i>Nasua</i>	coati	La Chimba	arboreal, terrestrial, forest, croplands
<i>Potus flavus</i>	kinkajou	La Chimba	arboreal, forest

Fauna, taxon, and common name		Site	Habitat	Formative context
Mammalia (cont.)				
Mustelidae (weasels)				
<i>Mustela</i>	weasel	La Chimba	terrestrial, forest	Late
<i>Mustela frenata</i>	long-tailed weasel	Cotocollao	terrestrial, forest	Middle
Felidae (cats)				
<i>Felis pardalis</i>	ocelot	Capaperro	arboreal, terrestrial, variable	Early
<i>Felis concolor</i>	puma	Loma Alta, La Chimba, Cotocollao, Pirincay	terrestrial, variable	Late
<i>Panthera onca</i>	jaguar	Real Alto, San Isidro	terrestrial, scansorial, variable, dry, semiarid, forest	Early
Perissodactyla				
Tapiridae (tapirs)				
<i>Tapirus bairdii</i>	baird's tapir	Loma Alta, San Isidro	terrestrial, variable, forest	Early
<i>Tapirus pinchaque</i>	mountain tapir	La Chimba, Pirincay	terrestrial, páramo	Late
Artiodactyla				
Tayassuidae				
<i>Tayassu</i>	peccary	Valdivia, Loma Alta, Dos Caminos, San Isidro	terrestrial, variable, forest, croplands	Early/Late
Camelidae				
<i>Lama glama</i>	llama	Cotocollao, Putushío	domesticated	Late
<i>Lama pacos</i>	alpaca	Putushío	domesticated	Late
Cervidae (deer)				
		OGCH-20, Real Alto, OGSE-42, OGSE-46, Valdivia, Buena Vista, La Chimba, Loma Alta, La Ponga, San Isidro, El Mocerrol, Pirincay, La Chimba	terrestrial, variable	Early/Middle/Late
<i>Odocoileus virginianus</i>	white-tailed deer	Real Alto, OGSE-42, Valdivia, La Cabuya, Buena Vista, Loma Alta, La Ponga, Salango, Capaperro, Dos Caminos, San Isidro, Cotocollao, La Chimba, Pirincay, Putushío	terrestrial, variable	Early/Middle/Late
<i>Mazama</i>	brocket deer	Real Alto, OGSE-42, Valdivia, Loma Alta, El Mocerrol, La Chimba, Pirincay	terrestrial, forest, open areas	Early/Late
<i>Pudu mephistophiles</i>	northern pudu	La Chimba, Pirincay	terrestrial, forest	Late
Rodentia (rodents)				
		Hormiga Shelter, Loma Alta, La Ponga, Capaperro, San Isidro, Finca Cueva, El Mocerrol, La Chimba, Cotocollao, Pirincay	variable	Early/Middle/Late
Sciuridae (squirrels)				
<i>Sciurus</i>	squirrel	Loma Alta	arboreal, scansorial, forest	Early
Muridae (mice)				
<i>Oryzomys</i>	rice rat	La Ponga Loma Alta, Capaperro, Dos Caminos, San Isidro, Finca Cueva, El Mocerrol	variable arboreal, scansorial, terrestrial, commensal	Middle Early/Late
<i>Phyllotis</i>	leaf-eared mouse	Cotocollao	scansorial, variable	Late
<i>Akodon</i>	grass mouse	Dos Caminos, San Isidro	terrestrial, variable, open areas, grasslands	Late
<i>Sigmodon</i>	cotton rat	Hormiga Shelter, Loma Alta, La Ponga, Capaperro, Dos Caminos, San Isidro, Finca Cueva	terrestrial, open areas, grasslands, croplands, commensal	Early/Middle/Late

(cont.)

Table 3 (cont.)

Non-fish Vertebrate Fauna Identified in Formative Archaeological Provenances from Ecuador

Fauna, taxon, and common name	Site	Habitat	Formative context
Mammalia (cont.)			
Caviidae			
<i>Cavia porcellus</i>	cuy	La Ponga, Cotocollao, Putushío	domesticated Middle?/Late
Agoutidae			
<i>Agouti paca</i>	paca	Loma Alta, San Isidro	terrestrial, forest, croplands Early/Late
<i>Agouti taczanowskii</i>	mountain paca	La Chimba, Cotocollao, Pirincay, Putushío	terrestrial, forest Late
Dasyproctidae			
<i>Dasyprocta</i>	agouti	OGSE-46, Loma Alta, San Isidro	terrestrial, forest, dry deciduous forest Early/Middle/Late
<i>Dasyprocta punctata</i>	agouti	Loma Alta	terrestrial, forest, dry deciduous forest Early
Echimyidae			
<i>Proechimys</i>	spiny rat	Loma Alta, Salango, Dos Caminos	terrestrial, forest Early/Late
Lagomorpha			
Leporidae (rabbits/hares)			
<i>Sylvilagus</i>	rabbit	La Ponga Hormiga Shelter, Loma Alta, Pirincay	terrestrial, variable terrestrial, variable Middle Early/Late
<i>Sylvilagus brasiliensis</i>	rabbit	Hormiga Shelter, Loma Alta, Salango, Dos Caminos, San Isidro, La Chimba, Cotocollao, Pirincay, Putushío	terrestrial, variable Early/Middle/Late

Notes: taxon = a listing by zoological category and common name. Nomenclature and habitat conform to a number of authoritative reference sources (Albuja 1991; Eisenberg 1989; Emmons and Feer 1990; Freiberg 1981, 1982; Hilty and Brown 1986).

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