PREHISTORIC AMERICA

An Ecological Perspective

(Third Expanded Edition)

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Introduction to the Transaction Edition

This book compares prehistoric cultural development in pairs of similar environments in the northern and southern hemispheres that were sufficiently isolated from one another geographically to minimize the possibility of communication and were surrounded by environments with different climates and natural resources that did not offer ideas suitable for adoption. The goal was to establish whether there is an intrinsic relationship between environmental conditions and cultural potential that would manifest itself in the independent emergence of similar adaptive configurations. The comparison documents the existence of cultural similarities too numerous and arbitrary to be the product of chance, implying independent convergence in adaptation to similar kinds of local resources during hundreds of years by learning, observation, and natural selection.

During the past 30 years, the relationship between humans and the environment has changed more drastically than during any previous period in human history. Local sustainable exploitation of natural resources has been overridden by global interests indifferent to the detrimental impact of their activities on local environments and their inhabitants. Increasingly efficient technology has reduced the need for human labor, but improved medical treatment favors reproduction and survival, creating a growing imbalance between population density and food supply. Rapid transportation is introducing alien species to distant terrestrial and aquatic environments, where they displace critical elements in the local food chain. The impact

of these and other "unnatural" activities has reached a level sufficient to disrupt the global climate and biota, with consequences that threaten the survival of the biosphere as we know it.

The extreme contrast between the cultural/environmental relationship that existed when this book was last published and what exists today raises the question whether the approach and content have more than historical value. Archeological fieldwork has proliferated throughout the hemisphere during the past 30 years and many of the gaps in regional cultural sequences have been filled. The origins and dispersals of domesticated plants, the invention of pottery and metallurgy, the elaboration of settlement and social behavior, trade relations, and the temporal and spatial distributions of many other tangible and intangible cultural features have been reconstructed. Hundreds of absolute dates make it possible to align developmental sequences, not only in the nuclear areas, but in previously little-known regions. An unexpected result is displacement of the earliest evidence for urban settlement and social stratification from Mexico to coastal Peru, where the planned city of Caral emerged in the Supe Valley about 3000 B.C. (Figs.1a-3a).

More significant than the contrast between the archeological evidence available 30 years ago and today is the difference in the theoretical perspective with which it is being interpreted. Then, most of us were cultural ecologists who took for granted that the subsistence potential of the environment played a significant role in the level of complexity achieved during prehistoric cultural development. We interpreted the archeological evidence in the objective context of evolutionary theory rather than the anthropocentric context of human will. Now, many anthropologists identify themselves as historical ecologists, whose basic premise is that humans "did not adapt to nature, but rather they created the world that they wanted through human creativity, technology and engineering, and cultural institutions.... Rather than passive responders or adaptors to a given environment ..., historical ecologists view humans as active agents in their interaction with nature who promote change and continuity through culture" (Erickson 2003:456). There are no environmental constraints to intensive agriculture that cannot be eliminated or natural disasters that cannot be overcome. Everything from the collapse of complex societies to the abandonment of settlements is attributed to social conflict rather than climate change or environmental degradation.

Another important theoretical reversal is the denial of the existence of prehistoric transoceanic contact. When the evidence that the earliest

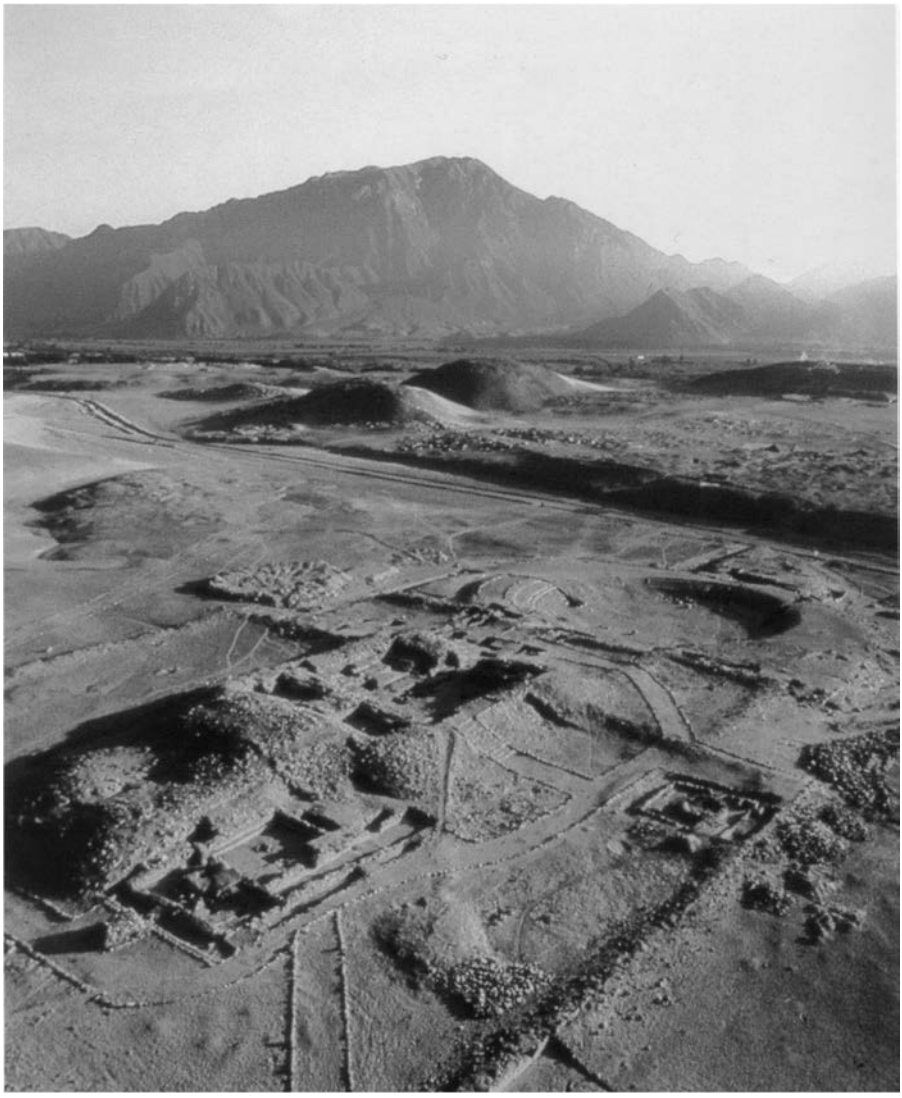

Fig. 1a. Excavation of the amphitheater and associated structures in the planned city of Caral on the north-central coast of Peru, the earliest urban settlement in the New World, founded about 3000 B.C. Sectors were devoted to administrative and ceremonial structures, elite and commoner residences, workshops, and other activities. After flourishing peacefully for more than a millennium, the city was abandoned by the inhabitants after covering all of the structures with soil, as shown in the distance.

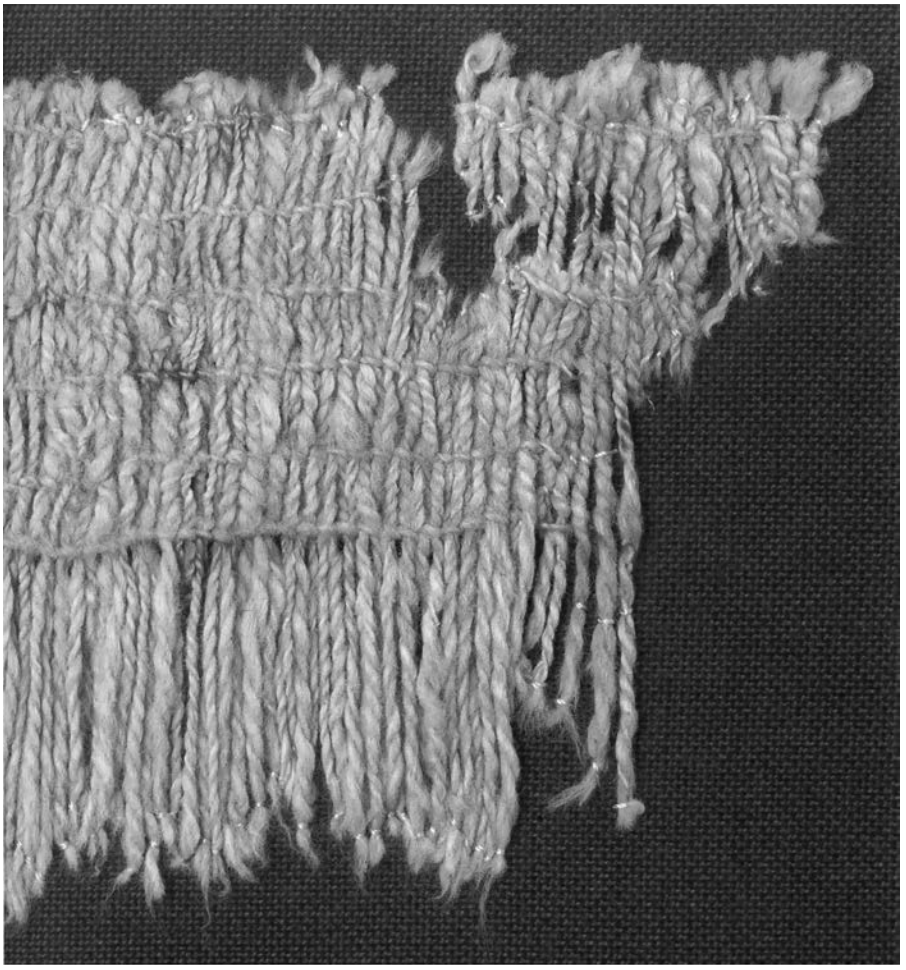

Fig. 2a. The arid climate of the Supe valley permitted remarkable preservation of a variety of cordage and textiles from cotton raised in the valley, as well as bones and plant remains.

Fig. 3a. Although there is no pottery, unbaked clay was used to model male and female figurines, which are typically nude but often have elaborate head coverings.

New World pottery was introduced to the coast of Ecuador by transpacific voyagers from southern Japan was published more than 40 years ago (see p. 35, Figs. 14-15), it was accepted by some archeologists and viewed with skepticism by others, but rarely rejected. Now, most scholars consider technological convergence or parallelism a "more parsimonious explanation" for the similarities in spite of increased evidence for trans-Pacific diffusion (see below). A frequently advanced reason for denying the existence of transoceanic introductions is the assumption that their acceptance implies that "native Americans were incapable of developing even simple technologies or art forms and so must have had help from culturally more 'advanced' peoples." On the contrary, they were exercising the unique human capacity to benefit from inventions made elsewhere rather than reinvent them.

These theoretical reversals do not negate the thesis of this book that we are a recent product of biological evolution and many aspects of our behavior are the result of millennia of natural selection and evolutionary drift. Like other species, hominids that were able to adapt to new opportunities survived as the environment changed and those that could not became extinct. What facilitated their adaptation was acquisition of the capacity for culture, which removed the immediate focus of selection from inherent biological to modifiable learned behavior. The most important characteristic of culture is the capacity to communicate using symbols. Ideas and observations can be modified and transmitted from one individual or community to another without restrictions of heredity, age, sex, race, language, culture, or proximity. The fact that modern humans retain instinctive behavioral features inculcated during millennia of biological evolution that exercise unconscious influence on adaptive success is usually disregarded, but can no longer be ignored if we wish to understand the basis for our detrimental impact on the global ecosystem today.

Prehistoric America is an ideal laboratory for developing this understanding. Whereas desert, forest, and plains environments in the eastern hemisphere have poorly defined boundaries and have been modified in a variety of ways throughout human history, those in the western hemisphere remain divided into isolated patches, many of which retain indigenous populations that preserve aspects of their prehistoric behavior. The similarities in cultural development observed 30 years ago have been supported by new archeological evidence, but the availability of more detailed chronological information, especially radiocarbon dates, has revealed discontinuities in many sequences and the improved knowledge of climatic fluctuations

makes it possible to identify critical factors in the success or failure of the response. Review of the differential success of prehistoric Amazonians and Mayans in adapting to episodes of severe drought illustrates the kind of evidence that may help us understand our failure to overcome the detrimental impact of climatic change today.

Although indigenous Amazonians are often considered decultured remnants of dense populations, paleoclimatological and archeological research during the past 30 years indicates that they constitute a successful adaptation to intrinsic environmental constraints and repeated disruption of subsistence resources during episodes of short-term drought. The lowlands were occupied by mobile hunter-gatherers for millennia prior to 4000 B.C., when the domestication of manioc provided the basis for small semipermanent settlements supported by slash-and-burn cultivation, similar to those occupied by surviving unacculturated groups (Figs. 4a-5a). The perishable composition of everything they used makes details of their way of life invisible prior to the adoption of pottery about 2000 B.C. Thereafter, it is possible to identify endogamous communities and reconstruct their territorial boundaries, social organization, and village movement. Comparing regional sequences across the lowlands from eastern Bolivia to the lower Orinoco revealed simultaneous replacement of an earlier community by a later one at approximately A.D. 400, 700, 1000, and 1500, implying temporary basin-wide abandonment of sedentary life (Fig. 6a). Since the northern and southern hemispheres have different rainfall regimes, the cause had to be more general.

Review of the evidence for climatic fluctuation elsewhere in South America showed that the northern coast of Peru suffered devastating flooding during these times as a consequence of mega-Niño episodes and that the region east of the Andes experienced simultaneous long-term droughts, each of which lasted about a decade. The 300 to 500 year hiatus between the mega-Niño events was broken at intervals of about seven years by brief droughts, whose impact on the prehistoric Amazonian inhabitants is suggested by the recent experience of Yanomami communities in southern Venezuela. During the year-long El Niño episode in 1972, their gardens ceased to produce and fires set in newly cleared fields spread to adjacent forest. Streams dried up, killing fish. Wild plants failed to flower or fruit, causing the death of animals dependent on them. The people survived by abandoning their villages and reverting to hunting and gathering until normal conditions returned, but if the drought had continued, infants and elderly individuals would have succumbed to starvation (Meggers 1994).

Fig. 4a. A WaiWai communal house in the Guyana rainforest during a festival. Houses are moved about every 10 years, when soil in the vicinity for gardens is exhausted, hunted animals become scarce, or thatch decays and palms suitable for replacement are depleted.

Fig. 5a. Recently cleared field ready for planting. Small branches have been eliminated but large trunks have been left to shield the ground from erosion and return nutrients to the soil as they decay. A producing field is visible in the background.

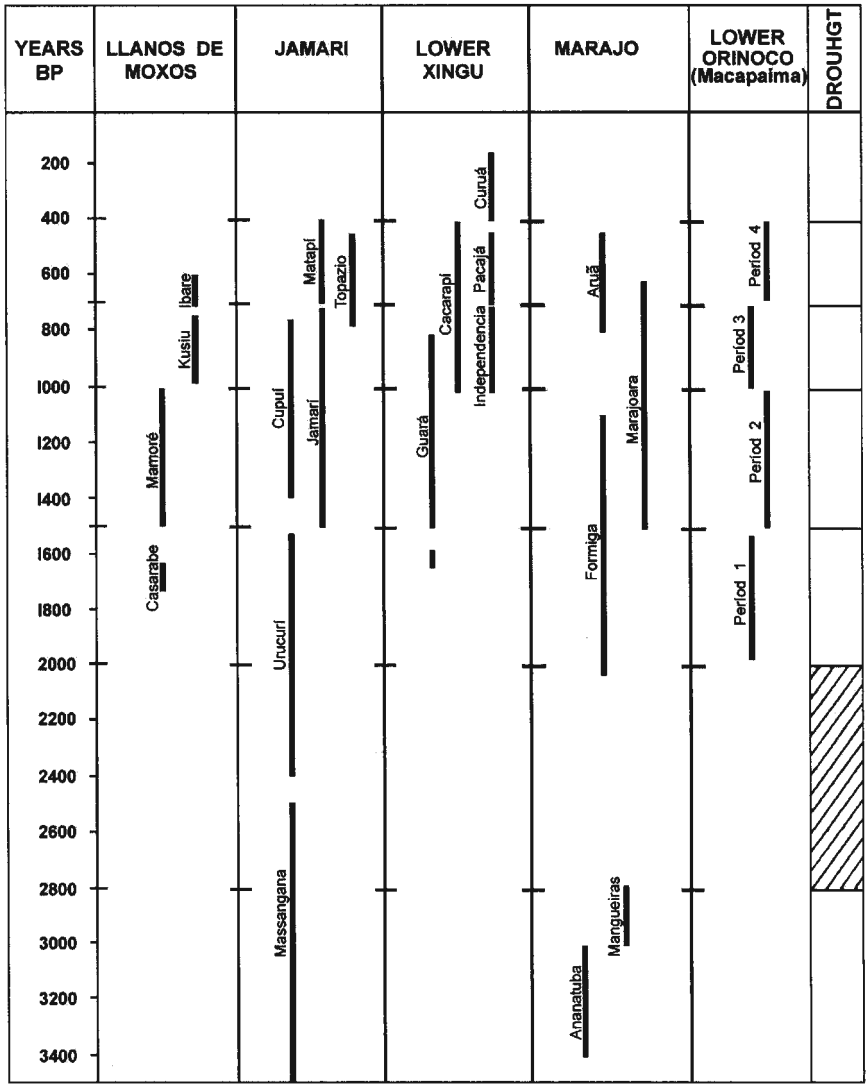

Fig. 6a. Prehistoric cultural sequences across the lowlands from eastern Bolivia (llanos de Moxos) to the upper Rio Madeira, eastern Amazon (lower Xingu), Marajó Island (mouth of the Amazon) and eastern Venezuela (lower Orinoco) show replacement of an earlier by a later phase ca 1500, 1000, and 700 years ago (B.P.) or A.D. 500, 1000, and 1250, correlating with mega-Niño droughts. The absence of a hiatus in the upper Madeira during the A.D. 1000 episode suggests the drought was less severe in that region.

Centuries of observation of the impact of these brief episodes on the biota is reflected in the exhaustive knowledge possessed by contemporary indigenous groups of the properties of plants and their differential susceptibility to drought. Today children learn at an early age to identify all wild plants from a leaf, seed, or branch, as well as their uses and the animals that fed on them, as they must have done in the past. This not only minimized subsistence stress, but stimulated adoption of cultural practices that maintained their population density at a level compatible with sustainable exploitation of subsistence resources. Other adaptive behavior includes continuous search for new edible plants, avoidance of some edible tubers until traditional resources fail, comprehensive knowledge of ecological relationships, planting multiple varieties of cultigens with different tolerances, taboos against total or temporary consumption of tapirs, deer, and other game, and population control by contraception, abortion, infanticide, and sexual abstinence.

The archeological and ethnographic evidence for successful adaptation to permanent and temporary environmental limitations is supported by independent biological evidence. Biologists concerned over the detrimental impact of the increasing intensity of commercial hunting have estimated the sustainable offtake by humans of the principal game animals based on rate of reproduction, size of the litter, longevity, natural mortality, and non-human predation. Their estimate of 0.2 individuals/km^2 is matched by the population densities of eight contemporary Amazonian communities that maintain their indigenous subsistence and settlement behavior. Whether their successful adaptation to the impact of short-term drought was the product of unconscious natural selection, conscious observation, or a combination of the two has yet to be established. The archeological evidence that these communities could not maintain their sedentary behavior during mega-Niño episodes warns us that the intensive long-term exploitation of the environment that would have been required to sustain large permanent settlements of the kind described by the historical ecologists would not have been feasible in the past and will not be sustainable in the future.

A different culture-environment relationship developed in the Yucatan peninsula, where archeologists attribute the collapse of the spectacular Classic Maya civilization to social problems inherent in competitive divine kingship, including endemic warfare, elite competition, intensification of rituals, social inequality, and demographic growth (e.g., Demarest 2004), rather than excess population and severe drought.

The Maya lowlands are notoriously deficient in subsurface water and humans and plants depend on annual rainfall for survival. During the preclassic period, local centers began constructing reservoirs, underground storage pits, and wells to collect and store water during the dry season, as well as canals and dams to maximize input. These facilities were sufficient to maintain large populations for about 18 months if rains were delayed. In contrast to the egalitarian Amazonian societies, the Maya were divided into two autonomous classes: the dominant elite, who consumed the labor and resources, and the subservient commoners, who produced them. The existence of normal rainfall during the preclassic favored increased population density, which the elite encouraged and co-opted for construction of massive buildings and production of luxury items to compete with their counterparts in other centers. The resulting population density was unsustainable when the rainfall failed.

A detailed record of past climatic change in the southern Caribbean obtained from pollen cores in the Cariaco Basin off the coast of Venezuela identifies three periods of severe drought centered on A.D. 810, 860, and 910. Annual sediment layers indicate that the 810 drought lasted about 9 years, the 860 drought lasted about 3 years, and the 910 drought lasted about 6 years (Gill et al. 2007).

Inventory of the terminal dates on monuments erected at the major Maya sites reveals that they fall into three clusters that correlate with the droughts (Fig. 7a). The sites in the western group were abandoned between A.D. 760 and 810, those in the eastern group were abandoned between A.D. 811 and 860, and those in the central group were abandoned between A.D. 861 and 910. "Between AD 790 and 910, a demographic catastrophe, unparalleled in known human history, devastated the Maya and destroyed their Classic civilization. Millions of people died, major urban centers were abandoned forever, and the richest, most densely populated rural areas of the Petén were never repopulated" (Gill 2000:320). The paleoclimatic record shows that these droughts were the most drastic the Maya had experienced in the preceding 1500 years, "in the face of which no political system, no agricultural practices, no population density, no religious rituals had any effects or could have any effects. There was nothing they could do or could have done" (Gill et al 2007:299).

Unlike the Amazonians, who were able to increase their knowledge of the biota during brief droughts between the longer episodes and resume their way of life when normal conditions returned, the Maya could not. The Maya droughts were not interrupted by brief normal episodes that might

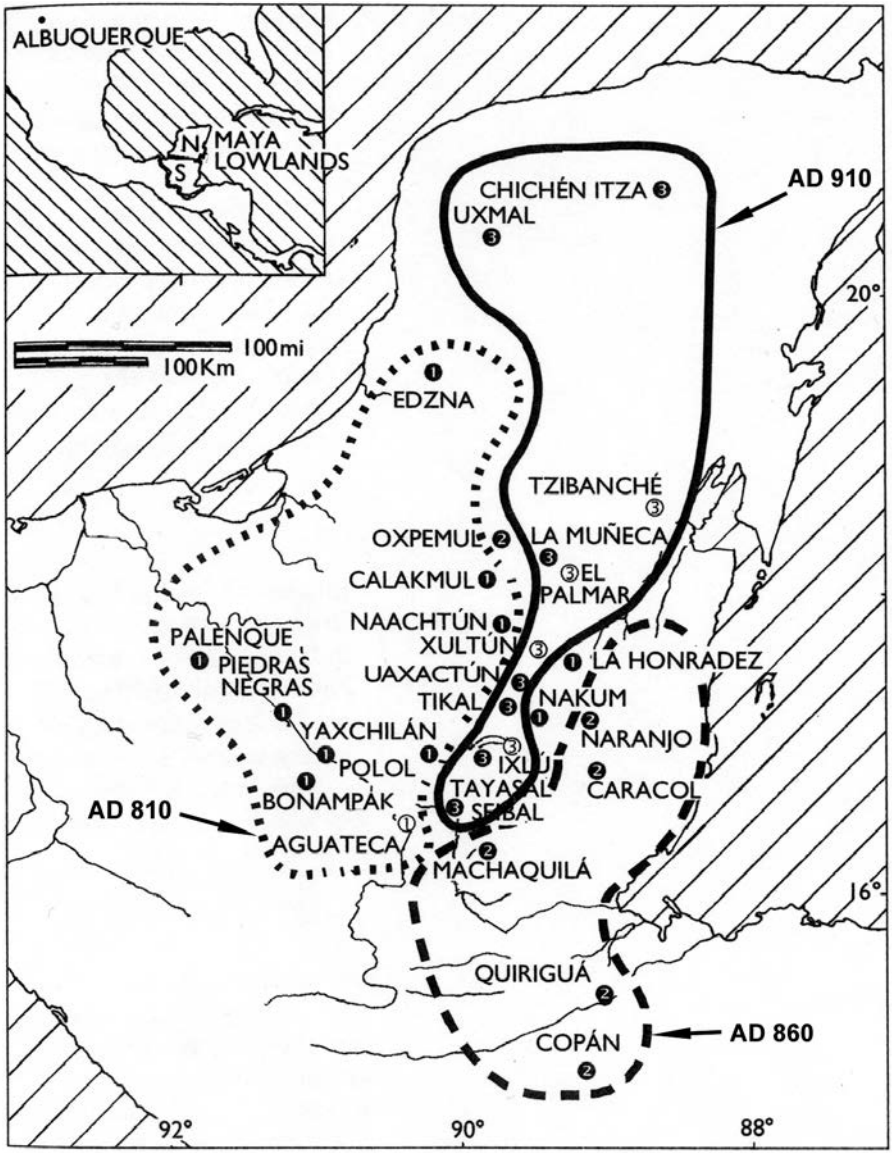

Fig. 7a. The peninsula of Yucatan showing the distribution of Maya sites with terminal dates on monuments clustering at A.D. 810, 860, and 910, implying cessation of ceremonial activities and sequential abandonment during three episodes of intensive drought.

have permitted constructing more numerous storage facilities, as well as recovery of the vegetation. The social structure was also unsustainable. Rather than reduce their demands when climatic conditions deteriorated, the elite intensified their efforts to maintain their status, removing farmers from agricultural activities for construction of fortifications and accelerating the growing imbalance between population density and the food supply.

The similarity between this situation and the growing imbalance between the demands of supranational interests and the needs of the growing underprivileged populations today makes understanding the dichotomy between the climatic context and cultural response during the Maya collapse of more than historical interest. Like the Maya, our society is divided into a dominant elite class, which consumes resources for its own benefit, and a subordinate worker class, which produces the goods and services they exploit. The principal difference seems to be that the Maya elite were victims rather than perpetrators of the climatic crisis.

Another new perspective on prehistoric cultural development in the Americas is provided by three well-documented examples of the transoceanic introduction of significant cultural innovations, which challenge the assumption that there were two independent evolutions of culture on this planet.

The evidence available 30 years ago indicated that humans entered the Americas from northern Asia via the Bering Strait as hunter-gatherers during the late Pleistocene and filtered south. The principal disagreement was whether this occurred 12,000 or 35,000 years ago. We now know that there were at least two biologically distinct sets of immigrants. The earlier one, which arrived in South America before 13,000 B.P., was derived from the pre-mongoloid population that predominated at that time in eastern Asia and was also ancestral to the early immigrants to Europe and Melanesia. The second wave, or waves, was composed of the mongoloids that constitute the surviving indigenous populations of the Americas, and who either absorbed or replaced the earlier immigrants as they moved rapidly south.

As the number of paleoindian lithic sites has proliferated in North America, it has become apparent that sites of the Clovis tradition, previously considered introduced by the first Asian immigrants and characterized by lanceolate fluted projectile points, become less common and more recent approaching Alaska and are absent in eastern Asia, contrary to what would be expected from a Siberian introduction. Furthermore, the detailed sequence for producing Clovis points is unique among New World lithic traditions, but identical to that used to produce similar artifacts during the

upper Paleolithic Solutrean tradition in western Europe (Fig. 8a; Bradley and Stanford 2004; Bonnichsen et al. 2005). According to Bradley and Stanford, "Many other Solutrean chipped-stone tool types resemble Clovis tools made on blades and over-shot flakes, among them distinctive end scrapers, retouched biface flakes, strangulated blades, borers and multiple gravers. Burins are rare in both Solutrean and Clovis assemblages, but occasionally appear ... [and] some Solutrean tools, such as the distinctive shouldered points and 'willow leaves', are not present in Clovis. However, all Clovis tool types including fluted bifaces occur in Solutrean assemblages. By contrast, only a few ubiquitous flaked tool types are shared between Clovis and any Siberian technology" (204:466). Bone, antler, and ivory tools are also similar. Unique non-tool features shared include flat fine-grained stones with geometric or zoomorphic designs (Fig. 9a) and small square crushed-stone pavements.

Paleoenvironmental evidence indicates that travel along the edge of the ice sheet that extended across the north Atlantic during the Last Glacial Maximum would have been facilitated by abundant marine life, including sea mammals, birds, and fish. Trawling along the continental shelf on the eastern coast of North America has dredged up mammoth bones and chipped artifacts, testifying to the existence of hunter-gatherers when sea level was 300 feet lower. Another significant clue is the presence in indigenous eastern North Americans of the mtDNA haplogroup X, which split from its European counterpart between 17,000 and 13,000 B.P. The earliest Clovis dates of 18,000 B.P. overlap with the upper Paleolithic late Solutrean period. As Bradley and Stanford assert "The hypothesis that a Solutrean Palaeolithic maritime tradition ultimately gave rise to Clovis technology is supported by abundant archaeological evidence that would be considered conclusive were it not for the intervening ocean" (2004:473). Nevertheless, many archeologists deny the existence of a Solutrean connection.

Since the transpacific introduction of Valdivia pottery on the coast of Ecuador from antecedents in the Jomon tradition on the western Japanese island of Honshu was identified in the early 1960s (see Figs. 14-15), the supporting evidence has increased. Another early ceramic complex, identified at San Jacinto on the north coast of Colombia, shares a different set of distinctive decorative techniques with the well-known Jomon Flame Ware produced on the west coast of Honshu (Fig. 10a). In both cases, the similarities between the transpacific complexes are closer than either is to any other complex in the same hemisphere. Another probable Jomon introduction is implied by the similarities between the pottery figurines

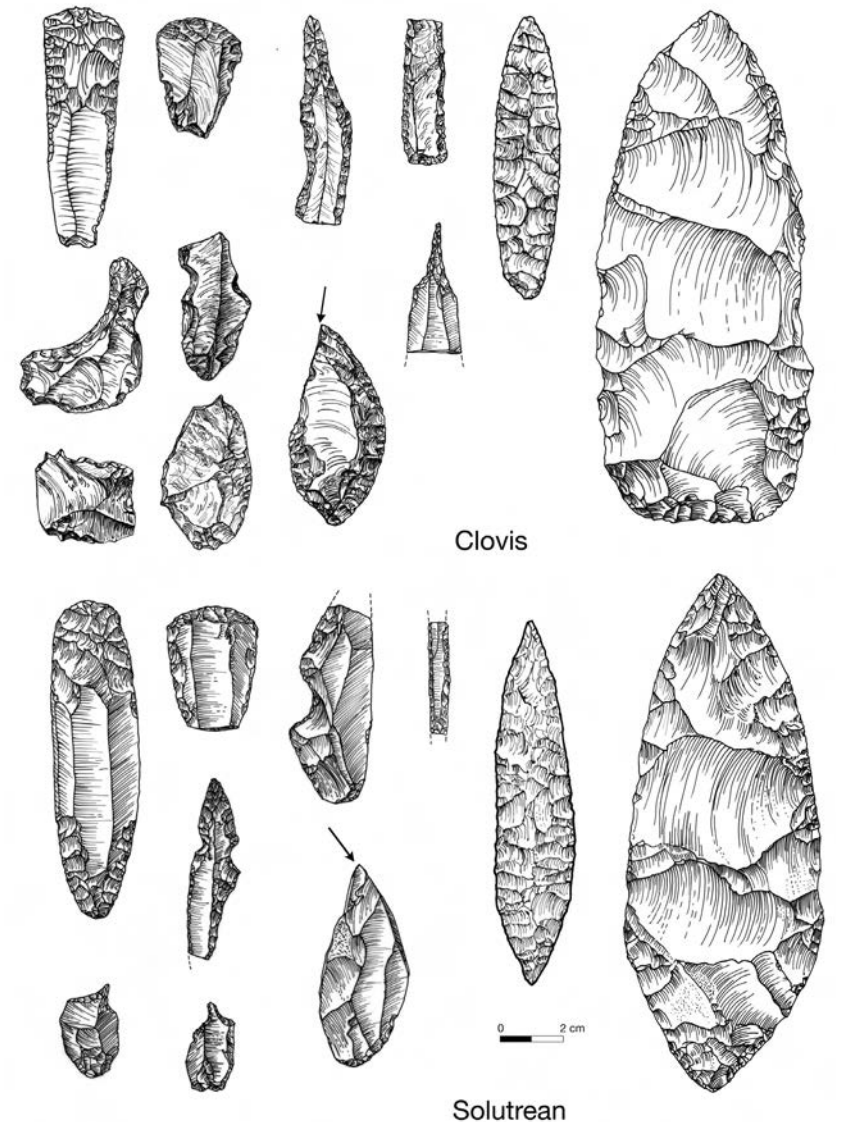

Fig. 8a. Similarity between technique of manufacture and function of Clovis (top) and Solutrean (bottom) stone tools. The bifaces on the right were produced by overshot flaking, a difficult technique in which flakes were struck horizontally across the entire width of the biface. Similarities on the working edges of small tools include end scrapers (upper left), notches (middle), and gravers (lower left).

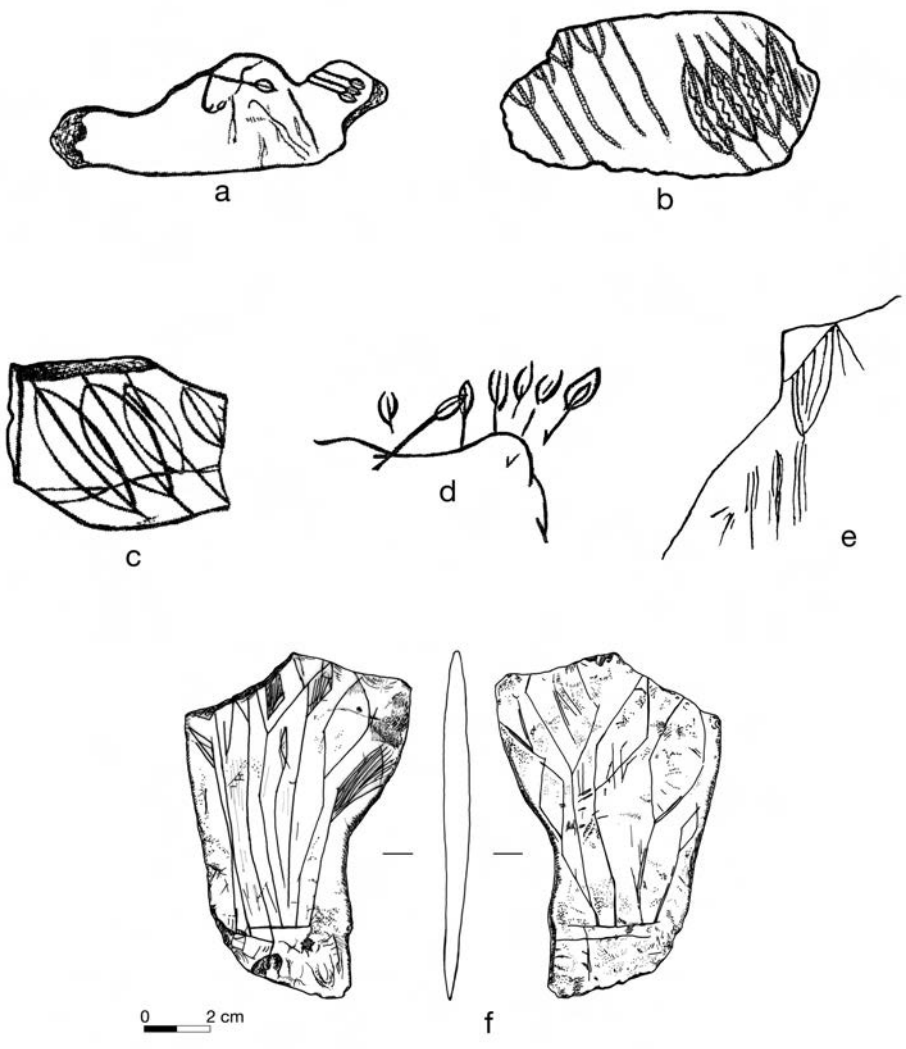

Fig. 9a. Small fine-grained stones with similar engraved images. a-e, Solutrean; f, Clovis.

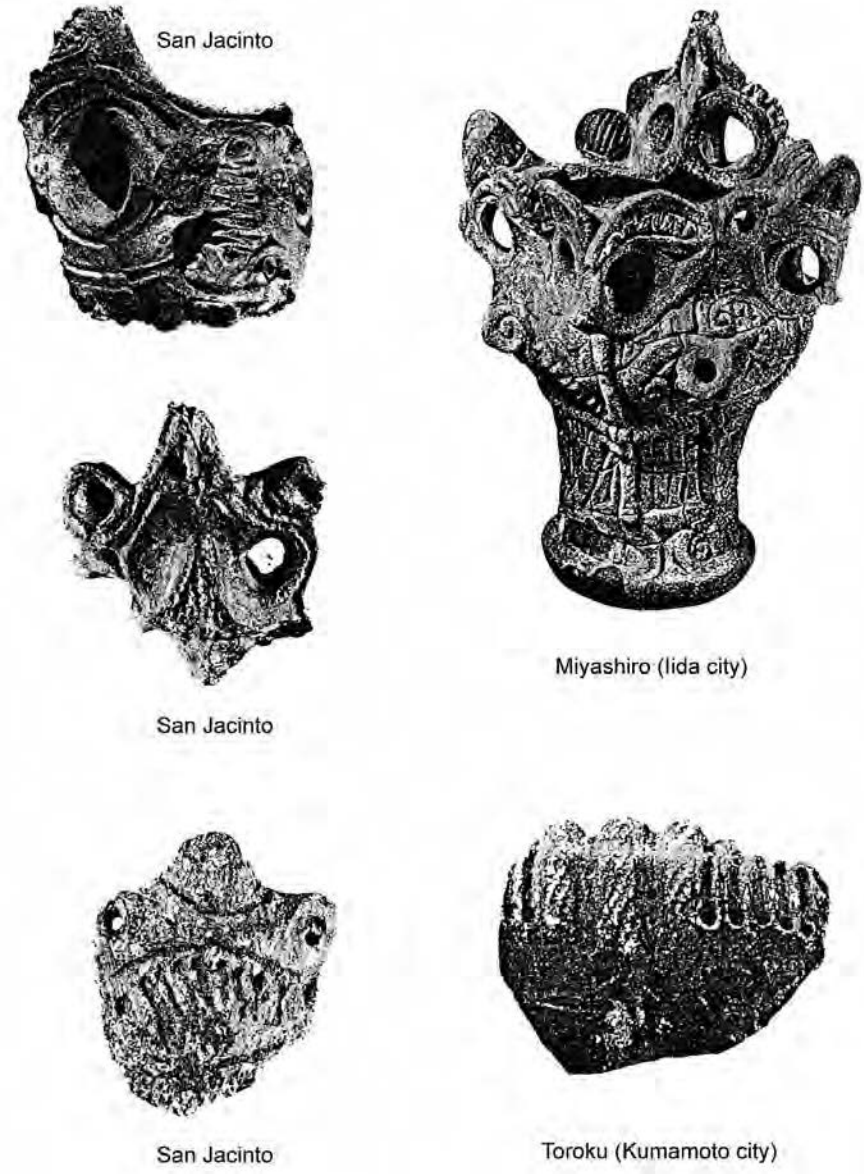

Fig. 10a. Similarities between decoration on the early Formative pottery from San Jacinto on the north coast of Colombia (left) and the Middle Jomon Flame Style from north central Honshu (right) include castellated rims, zigzag appliqué, and incisions ending in punctations.