How do different kinds of societies cause and mitigate environmental change?

The case of the lost woodlands of ancient Nasca

DR DAVID BERESFORD-JONES

EVERY YEAR thousands of tourists fly over the great landscape of geoglyphs that lie marked upon the surface of the vast desert Pampa de San José on the south coast of Peru. Some are beguiled by spurious fabrications that these were made by alien visitors or by other products of the New Age fantasy. The truth behind the so-called 'Nazca Lines', however, turns out to be far more interesting. For this was a sacred landscape: a palimpsest of ancient pathways followed during the fertility cult rituals of a confederation of societies that flourished brilliantly for the first half millennium AD along the riverine oases that cross this painted desert.

We may read something of ancient Nasca in the iconography of its artefacts – truly beautiful ceramics and textiles, almost miraculously preserved in this arid desert climate – which display a famously naturalistic artistic canon 'celebrating the abundance of all life forms and the factors underlying agricultural fertility', as two of the most prominent scholars of Nasca studies, Helaine Silverman and Donald Proulx, put it (see Figure 1). Yet, much else remains obscure about the society that made this wonderful material culture. Little of the huge corpus of Nasca material that resides now in museums worldwide was excavated scientifically. Almost all comes from looted tombs. Until recently Nasca was, as Silverman and Proulx note, a society as 'invisible in life as it is visible in death'. And there is a bitter irony in Nasca's fame by virtue of the ritual space of its geoglyphs on the empty desert, when the people who used them actually *lived*, farmed and collected elsewhere: amid a riverine forest ecology, of which little trace remains today (see Figure 3). This is the theme of research supported by the British Academy and published now in the British Academy Postdoctoral Monograph, *The Lost Woodlands of Ancient Nasca*.

The research focuses on the Ullujaya and Samaca Basins of the lower Ica Valley, today depopulated and bereft of cultivation, and yet whose extensive archaeological remains attest to substantial ancient populations, thereby presenting a *prima facie* case for changed ecological and landscape conditions (see Figure 2). It seeks to answer the questions of when and how these changes took place, and, most vexed of all, why did they occur? For classic (or so-called 'Early') Nasca seemingly suffered a facture and collapse into internecine warfare, ultimately to vanish from the archaeological record some five hundred years before the Incas came to incorporate the south coast into the huge empire that Europe encountered here in 1532.

Archaeological interpretations of Nasca's demise have long invoked past El Niño events and subsequent droughts, because there are hints of such climate perturbations in ice-cores from the Quelccaya glacier, high in the Andes far to the east near Cuzco. Although actual evidence on the ground for these ancient flood events has been difficult to pin down, geomorphological survey of the lower Ica Valley does indeed record a mega-El Niño at around the end of the Early Nasca period. Yet there is also evidence that the impact of these climatic events was only precipitated by other, much more gradual changes – a sequence of human-induced events that underlay the so-called 'collapse' of the Nasca culture.

Excavation and archaeobotanical analysis of ancient rubbish middens – which enjoy extraordinary desiccated preservation in this arid climate – provide indications of what people ate and farmed here in the past. Along with

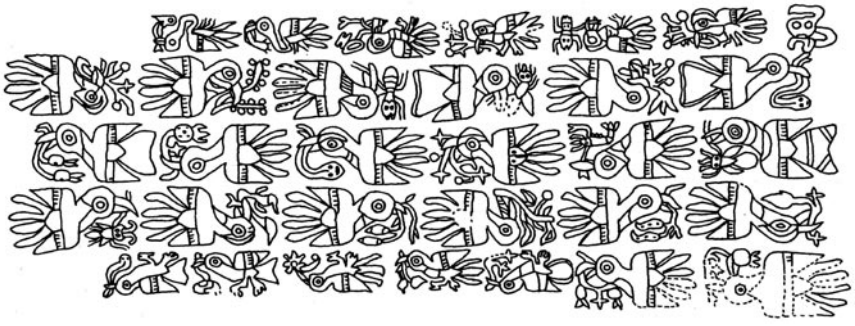

Figure 1. *Detail of Early Nasca embroidered textile with birds, carrying in their beaks ant, wasp, beetle, root crops, cactus, fresh water shrimp, snake, chilli pepper, germinating bean, wild tomatoes, fish and possibly cotton, peanut, and achira. Drawing from 'Early Nasca Needle-work' by Alan Sawyer, courtesy of Lawrence King Publishing.*

pollen evidence, these also provide proxy evidence of wider ecological changes, thereby tracking cycles of agricultural intensification. For instance, a number of broad-leafed cultivars such as manioc, coca, indigo, guava and pacay occur in this archaeobotanical record and yet cannot be grown today in the lower Ica Valley because of its wind regime. Meanwhile, geomorphological study helps decipher the long-term histories of sediment deposition and erosion that have shaped the landscape of the lower Ica Valley today,

Figure 2. *An ancient Nasca canal crosses a desertified modern landscape in the Samaca Basin, lower Ica Valley, south coast Peru.*

and which can be dated by their associated archaeology.

Together, these data show how gradually, over the course of many generations, the natural riverine (or 'riparian') woodlands of the lower Ica Valley were cleared to make way for agriculture of maize and cotton, among other crops. In time, this gradual woodland clearance crossed an ecological threshold, sharply defined in such desert environments, exposing the landscape to the region's extraordinary desert winds and the effects of El Niño floods. For those woodlands were dominated by a remarkable leguminous tree of the genus *Prosopis*, the huarango. The huarango, which lives for over a millennium, is the ecological 'keystone' species in this environment – enhancing soil fertility and moisture, ameliorating desert extremes beneath its canopy and underpinning the river floodplain with one of the deepest and most extensive root systems of any tree. Without sufficient protection by huarango woodland, it is quite simply impossible to carry out sustainable agriculture here.

So while the lower Ica Valley case-study shows that a mega-El Niño may have pushed Nasca society across a tipping point, it also shows that its impact would have been far less devastating had the forests that protected the fragile desert ecology of these riverine oases not already been cleared. In the absence of woodland cover, the river down-cut into its floodplain, damaging irrigation systems and leaving the area unworkable for agriculture. It seems therefore that ancient society here partly wrought its own demise, thus contradicting the popular (and patronising) perception that native American peoples inflicted barely perceptible disturbance upon a New World Eden. Perhaps more interestingly, however, the lower Ica Valley case-study allows inferences to be made about those specific contexts in which significant human environmental impacts in the New World did, and did not, arise. For aside from being essential to sustainable agro-ecology, huarango woodlands provided a host of invaluable resources including fruit that were processed into flour and beer, fodder for llamas, fine quality timber for construction, weapons and tools and a high-temperature steady-burning fuel. All of which begs the question of *why* people would so deplete woodland cover in the lower Ica Valley as to induce irreversible environmental change?

The archaeological record of the Early Nasca period describes a regionally constrained group of societies with little evidence of social hierarchy. Settlements were small and scattered throughout a landscape, which, whilst certainly agricultural, continued to be dominated by woodland. By far the greatest Nasca site was Cahuachi on the Río Nasca, some 25 monumental platforms built upon natural hills. Yet Cahuachi was no city or focus of large-scale integrated power, for archaeological investigations reveal that it held no significant permanent population. Rather, it was a sacred pilgrimage and burial place serving a number of independent societies participating in and sharing a single Nasca cultural religious tradition.

The iconography of that tradition beautifully depicts the fecundity of nature and agriculture on the south coast. Indeed, it suggests a world-view of little difference between the two: the bifurcation between 'nature' and 'culture' lying instead within our own philosophical tradition. The flora and fauna of the riparian woodlands are clearly and accurately depicted in all their rich variety: including felines and foxes, hummingbirds and all the creatures of the river and its banks such as swifts, egret, crayfish, frogs, catfish, tadpoles and even the wasps that gather mud at the river's edge (see Figure 1). The tree itself is depicted in one of the famous geoglyphs, while the distinctive forms of the huarango woodland subtly pervade the *entire* Early Nasca artistic canon – a canon that would seem to proclaim a profound 'riparian consciousness'. Early Nasca then would seem to mirror Jared Diamond's observation that 'small, long-established, egalitarian societies tend to evolve conservationist practices'.

By contrast, the subsequent Late Nasca period (*c*. 450–600 AD) shows great social changes. Cahuachi's cosmological hegemony broke down and it was abandoned. Settlement patterns were rearranged and the number of habitation sites fell. The long, conservative Early Nasca iconographic tradition fractured into competing sub-styles in which dramatic new iconography appeared, including more trophy-heads and other depictions of warfare. It is here then, in the Late Nasca Period, that we might look to see the first repercussions of the gradual process of landscape change traced in the archaeology of the lower Ica Valley. The scene was being set for a tipping point: which may well have come in the form of a mega-El Niño. Perhaps this set loose the

dogs of internecine 'resource wars', for which we can glimpse hints in the Late Nasca archaeological record. Moreover, this coincides too with the rise in south coast's highland hinterlands of one of the largest ancient cities in the Americas, and the dawning of the Middle Horizon.

In the Middle Horizon (*c*. 600–1000 AD) an expansionist empire, centred in the Ayacucho highlands, arose to establish suzerainty over a huge swathe of modern Peru, much like the Inca Late Horizon some five centuries later. Its capital at Wari was vast, covering some 15 square kilometres, and had an estimated population of as much as 100,000 people (even five hundred years later, Venice, the largest city in Europe, had a population of perhaps 50,000). On the neighbouring south coast this Ayacuchano Horizon reverberated particularly, where, as John Rowe observes, the archaeological record seemingly 'marks the virtual replacement of one culture by a radically different one'.

And there is evidence, not least in the archaeobotanical record of the lower Ica Valley, that Wari's expansion onto the south coast may have been driven in part by a desire to secure lands on which to grow crops such as cotton and coca which could not be grown in its Ayacucho heartland. Clearance of woodlands and conversion of the lower Ica Valley landscape to such monocrops would have been enacted by a distant highland elite, as part of some state-imposed Middle Horizon policy to serve distant urban demands. It would therefore have been contrary to the traditional agricultural practices of the south coast and in ignorance of the prevailing biophysical characteristics that gave rise to those practices. That such a conversion would have had short-lived and disastrous results if carried out on any scale is implicit in what we know of the role of the huarango in maintaining the viability of the agro-ecosystems in this environment.

Figure 3. *An ancient huarango (Prosopis limensis) in Usaca, Río Poroma, Nazca, the last remaining fragment of old-growth woodland on the south coast of Peru.*

So it turns out that if we are to understand *why* environmental change occurred in the past we must understand the 'cultural' component within an ecological approach: how did different kinds of societies cause, mitigate and mediate environmental change through time? For certainly, serious impact upon the ancient woodlands of the lower Ica Valley culminates with the social changes wrought widely on the south coast of Peru by the Middle Horizon.

A final coda to this archaeological story is its powerful contemporary resonance. For today three-quarters of the population of the south coast are recent economic migrants. Populations have exploded through massive migration from the adjacent Ayacucho highlands. The consequences are falling water tables and tremendous pressure upon fragile natural and agricultural biomes, all of which increase vulnerability to extreme climatic perturbations. The last remaining 'old-growth' forest relicts on the south coast resound to the chain saws of illegal charcoal-burning operations. Floodwater irrigation systems have been neglected with disastrous consequences when El Niño floods do arrive. Common local plant names have fallen into disuse and the suite of pre-Columbian cultivars traditionally grown here is being impoverished, or lost. The result is a society dislocated from its local traditions of environmental and resource management. Indeed, just as it did in the archaeological record, today a new cultural 'Horizon' is unfolding on the south coast of Peru. We have, therefore, important lessons to learn here for the future from rediscovering past human relationships with their environment, through different social structures.

Dr David Beresford-Jones is Fellow of the McDonald Institute for Archaeological Research, University of Cambridge (dgb27@cam.ac.uk). He was a former British Academy Postdoctoral Fellow from 2005 to 2008.

The Lost Woodlands of Ancient Nasca: A Case-Study in Ecological and Cultural Collapse, by David Beresford-Jones, was published in June 2011 as a British Academy Postdoctoral Fellowship Monograph.