Easter Island: Model for Environmental History?

Easter Island (called Rapa Nui by many of its Polynesian inhabitants) is a celebrated historical illustration of the causes and results of environmental degradation. Jared Diamond, and others have portrayed it as a cautionary tale of a human society that destroyed its renewable resources and in the process was reduced to a fragment of the population and a shadow of the culture that had marked its zenith. The history of the island remains in major part a mystery, since the famous rongo-rongo script carved on its wooden tablets, the only indigenous writing in Oceania, has not been satisfactorily deciphered, and the oral tradition was impoverished by the death of the wise elders entrusted with it due to raids by slavers and epidemics that reduced the population to little more than a hundred individuals in the late nineteenth century. Recently, however, archaeologists and other scholars have come up with pieces of evidence that make the outlines of the cultural and environmental process clearer.

Believing that to see a place is a valuable aid for an environmental historian, I volunteered for an Earthwatch team that went to Easter Island in December 2002 to assist Dr. Christopher Stevenson in his archaeological investigation of two sites there. Under his expert direction, I dug and got dirty, screened the soil, floated samples, measured and mapped, worked in the library, and on weekends visited the great ancestral statues and the volcano from which they were quarried. Professional ethics forbid me from saying exactly what he found last year until it is published, but Chris has worked on Easter

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Island for more than a dozen seasons and has published a lot, and the major lines of his research on the agricultural history of Easter Island are clear. I can talk about the work we did in general terms.

I will always remember the amazement I felt when I saw the strata that a bulldozer had laid open in a hillside pit. I am sure the operator of the machine had no idea of archaeology in mind while doing it. From the base of the pit rose a layer of thick, tangled roots, most of them looking like they had supported palm trees, incontrovertible evidence that the island had been covered by forest for millennia before the first human inhabitants arrived. Above that was a narrower stratum containing evidence of digging, fires, and intensive agricultural activity during perhaps the last thousand years, the period of Polynesian settlement and occupation. On top of that, the thinnest layer of the three, was the soil of grassland and the grass itself, not to mention the cows that are helping to remake the present-day landscape.

Easter Island is the most isolated single island in the world. Located in the southeastern Pacific, it has for its closest inhabited neighbor Pitcairn Island, the refuge of the Bounty mutineers, 1260 miles to the west and in itself an epitome of isolation. The coast of the Chilean mainland lies 2300 miles to the east. Also, the island is little, fourteen miles long and seven wide, with an area of only 64 square miles (smaller than Ni'ihau, the smallest inhabited Hawaiian Island). So it is not surprising that it was among the last to be found by human beings, and one of the last noticed by European explorers. At 27 degrees south latitude, it is just beyond the tropics, comparable with Brisbane, Australia, or if it were in the northern hemisphere, Okinawa or Midway.

What was it like before the Polynesians arrived? The question has not been an easy one to answer, since the landscape and biota were so thoroughly altered by the human inhabitants. It is a volcanic island with three major calderas; all the plants and animals were progeny of a few that happened to arrive by air or sea. It was forested, but scientists have only recently reached a degree of understanding of the character of the forest ecosystem. The first Europeans to arrive found almost no trees. The native palm, the dominant species of primeval times, was by then extinct. It is known from fossil roots and tree trunks, some preserved in lava flows, and from tiny coconuts, about an inch to 1.3 inches in diameter, found on the floor of a cave. The Easter Island palm appears similar to another species that still grows in Chile. Another tree, the sophora, an attractive legume with yellow flowers and high quality wood, is virtually extinct although efforts are being made to preserve it. As recently as 1991, evidence of few other trees or large
shrubs was known, and the vegetation of the island before Polynesian settlement could be described as “palm forest with sophora and shrubs” with some areas of grassland.\textsuperscript{3} It was suggested by some that the palm trees were widely spaced — something I found hard to believe after viewing the closely packed roots in the site I helped to study. But in the mid- to late 1990s, Catherine Orliac investigated carbonized remains of wood at several sites on Easter Island and was able to identify the species, or at least the genus, of many woody plants.\textsuperscript{4} Some of these still grow as relics in places like the volcanic crater of Rano Kau, but in addition Orliac identified fourteen taxa that had never been found on Easter Island before, including some known on other Pacific Islands as large trees. The picture that is emerging is one of a complex vegetative cover including high forests containing a variety of species, with the Easter Island palm the most numerous and conspicuous.

As for animals, there were no land mammals: no bats, no rats, and no reptiles either, although insects, spiders and snails occurred. Marine mammals such as seals, sea lions, and dolphins were present. There were a few land birds including parrots, rails, a heron species and an owl species, all known now only from bones. Millions of migratory sea birds found abundant nesting sites on the rocky cliffs: terns, albatrosses, seagulls, frigate birds, tropicbirds, and others. Only a few survive today on offshore islets. There were shellfish and crustaceans such as lobsters, but the fish were not as numerous as around other Pacific islands, nor was as great a variety of species present, because Easter Island’s topography and climate prevented the establishment of a coral reef and lagoon. Around most of the island, the cliffs fall straight into the sea and receive the force of the waves, including the occasional tsunami.

There is no doubt that the Easter Islanders were Polynesians. Thor Heyerdahl\textsuperscript{5} tried to prove that they came from South America, but the weight of scholarly opinion has demolished his theory. The Easter Islanders speak a Polynesian language, and their DNA is of Polynesian type. Still, the arrival of Polynesians on such a tiny, distant island is a

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\textsuperscript{3}Georg Zizka, “Flowering Plants of Easter Island,” Frankfurt am Main, Palmengarten der Stadt Frankfurt, \textit{Scientific Reports PHF} 3, p. 16.
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wonder of human history. It was not an accident of a fishing boat swept away by a hurricane. The Polynesians deliberately explored the Pacific, sending forth large double-hulled canoes bearing enough people, domestic animals, and useful plants to make a successful colony on any suitable island they found. They sailed eastward against the prevailing winds, so that if necessary they could return. One or more of these amazing craft reached Easter Island. We do not know the date; it has been variously estimated from AD 300 to AD 1000 (the latter is Orliac’s educated guess). Radiocarbon seems to indicate a date between AD 615 and AD 860.

Where did they come from? Judging from language and material culture such as stone statues, it seems that the Marquesas are the most likely place of origin. Easter Island tradition calls the ancestral land “Hiva,” and the largest islands of the Marquesas are Hiva Oa and Nuku Hiva. But scholars also suggest the Society Islands and the Australs, which include Rapa. The name “Rapa Nui,” however, was applied to Easter Island only in the time after European discovery.

What did they bring with them? The domestic animals carried by most Polynesian expeditions included pigs, dogs, and chickens. Of these, only chickens became established on Easter Island. Did the colonists fail to bring dogs and pigs, or did they eat the ones they had brought soon after arrival? We do not know. Two other animals arrived, either by the Polynesians’ deliberate choice or as stowaways on the great canoes: gecko lizards and the Polynesian rat (the latter immediately began its depredations on birds and vegetation). The list of plants that came with the voyagers is longer: taro, yam, sweet potatoes, sugar cane, bananas, gourds, and various shrubs useful for dyes, paints, high quality wood, and cloth, such as the Mako’i or paper mulberry tree.

In the early period, the Polynesians settled along the coast. They had to depend on the resources they found on the island, since it would have taken a number of years before the introduced crops could increase enough to feed the people. Fortunately for them, there were fish, birds and their eggs, and sea mammals in abundance. Unfortunately the indigenous vegetation had few edible plants, but they began to clear the forest by slashing and burning, and placed the familiar food plants in the soil. There was useful wood as well. Like Polynesians elsewhere in the Pacific, they shaped large stones and built temple platforms, called ahu on Easter Island, for sacrifice and worship of the spiritual powers.

An expanding agriculture made population increase possible in a second phase of the Polynesian occupation. The number of inhabitants
increased to about 9,000 by AD 1500. This necessitated the expansion of agriculture into most parts of the island, including the hilly interior. It was a period of the erection of monumental architecture as well, which reflects the development of a marked social hierarchy. The nobles were responsible for the direction of agriculture. The famous statues, or moai, huge figures of aristocratic ancestors as much as 30 feet high carved from volcanic stone, were set up on the ahu. There may have been a competition in size among the rival communities on the island, since there was a progressive increase in height and weight of the moai. (One, never removed from the quarry, would have been 71 feet high and weighed 200 tons; the largest actually erected was less than half that size). Many of them had great crowns of red scoria stone set atop their heads, and eyes of white coral with pupils of darker stone set into their faces. Meanwhile, the upper classes required the erection of houses whose foundations consisted of large, heavy stones called paenga. Moving all these masses of stone required the use of the trunks of palm trees, a major cause of forest destruction.

Trees became scarce. Along with the deforestation came soil depletion and erosion, water contamination, and loss of bird habitat. The native resources that had supported the early expansion of the Easter Islanders began to disappear, and they depended on the further extension and intensification of agriculture to support their increasing numbers. The technology used to support agriculture is not as startling as the ceremonial architecture, but it was just as important. With few trees, or none, the winds had nothing to moderate their force, so farmers dug pits and surrounded them with walls to protect the taro and bananas. They placed stones in the fields, forming “lithic mulch” that protected plants and conserved moisture. These methods were labor intensive, and the common people had to provide the labor.

In the latter half of the seventeenth century, a convergence of crises occurred. One day the last palm tree was cut down. The statues could no longer be moved, which may help to explain the strange appearance of the quarry at Rano Raraku, with sculptures in every stage of preparation, looking as if the order “tools down” had been given and all the laborers departed. The population had reached the limit of environmental support, with food shortages as a result. It was not possible for an out-migration to relieve population pressure, because no

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materials remained for the construction of canoes large enough for inter-
-island voyages. Conflict increased as groups attempted to seize
resources from others. The population crashed. Chickens, the major
source of protein, were now housed in fortress-like stone coops called
hare moa. With starvation an ever-present reality, the common people
began to question the order of things. The direction of agriculture by the
nobles had failed to provide the people with ample food. The great stone
statues, whose watchful presence was supposed to ensure safety and
abundance, had also symbolically failed. There was inter-class war — a
strong element in the oral tradition — and the hierarchy was
overthrown. The commoners pushed down some of the statues. There
were a few still standing when the Europeans arrived, but eventually all
of them would be toppled. What role drought, crop failure, or climatic
disturbances such as El Niño played in all of this is a matter for debate
and further research, but surely human impact on the natural
environment was the leading cause. The natural cycles of weather and
climate may have added stress and exacerbated the crisis.

The environmental and social disaster made a new order necessary,
intellectually and economically. This was provided by the birdman cult.
All the details are not known, but it seems that worship and labor were
redirected from the veneration of the ancestors and their statues to
emphasis on the creator god, Make-Make, whose image decorated
Orongo, the village of the new leading coterie. The major ritual
expression of this new religion was the cult of the Birdman (tangata
manu). Carvings of men with heads of the sooty tern, a migratory sea
bird that by then nested only on the rocky offshore islet of Motu Nui,
cover the lava exposures around Orongo. In an annual contest, young
men swam out to the islet when the birds arrived and awaited the first
egg to be laid. The one who brought back the egg became the birdman
of the year, endowed with political and economic privileges but kept in
a special house and subjected to strict taboos. Also, agricultural
technology began to revive and the decimated population survived,
although within a severely impoverished landscape.

That was the situation when the Europeans began to arrive. The
Dutch commander Jacob Roggeveen was first to arrive in 1722. His
men killed a dozen Easter Islanders, unfortunately setting the precedent
for many Europeans and Americans to follow in the next century and a
half. Spaniards came in 1770, raised the flag of Carlos III, and departed.
The British Captain James Cook visited in 1774; he was too sick to go
ashore and noted only the lack of wood, water and provisions. The
French under the Comte de La Pérouse came by in 1786 and measured
some of the statues. That ended the comparatively benign period of
explorers in the Age of Enlightenment.

The nineteenth century brought horrors that almost destroyed the Easter Islanders. American seal hunters and whalers, and Peruvians seeking slaves for the guano mines, killed or carried off half the population. The bishop of Tahiti, Tepano Jaussen, managed to save a few of the captives and arranged their return to Easter Island, but they carried smallpox and tuberculosis that infected those who had remained. All but 111 died. The present Easter Islanders that are descendants of that remnant now number about 4000. The birdman cult survived until about 1867, perishing not from missionary opposition but simply from lack of young men to perform it. Chile annexed the island in 1888 and turned it over to a sheep-herding business. Today most of the sheep are gone; there are cattle and eucalyptus plantations, and tourism dominates the economy, although the number of tourists is still comparatively small.

What is the lesson of Easter Island? Is it lack of foresight? Human societies organize themselves to optimize their use of natural resources, and this makes population growth possible. Consumption increases to the point where diminishing resources interfere with population growth. Faced with starvation, people devise new technologies to extract more production from the land. In times of crisis, social organizations collapse and are transformed. But there is always a bottom line, and that is what may be called the ecosystem: the landscape itself with its living and non-living components. After depleting their renewable resources, the Easter Islanders used clever stone-based technologies to raise sweet potatoes and sugar cane on a windswept island. But they could never bring back the palm trees and the rest of the humid high forest. The birds would never nest again in great numbers on the cliffs. And without trees for building boats, the sea would never be a highway again, but a prison. Indeed, the conviction may have grown up through long isolation that Easter Island was the only land in the world... until the strangers came.