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Nature and culture in the Pacific islands

Donald Hughes

Oceanic islands offer unique laboratories for the historical study of the relationship between nature and culture because of their isolation, small size, and limited biodiversity in terms of numbers and types of species. Before the arrival of humans, these islands were worlds unto themselves. Each one was unique, with animal and plant species that had arrived on the currents of air or sea. On each island, as Darwin eventually recognised, they evolved with one another into assemblages of odd, striking, and naïve creatures unparalleled anywhere else. This evolution took place without any reference to humans, because there were as yet none in those environments. Even islands near one another were singular; Bali and Lombok, twenty miles apart on the opposite sides of 'Wallace's Line', delineated by Alfred Russel Wallace in the mid-nineteenth century, have contrasting biota. The singularity of ecosystems on isolated islands was even more marked. On the Hawai'ian Islands, splendidly remote in the central Pacific, gems of animals and plants evolved, the nene goose and silversword plant among countless others, peerlessly adapted to local conditions. Changes continued, but these were guided by local conditions. On Tahiti, so to speak, they were 'Tahitian' changes, unmatched elsewhere. Species arrived from abroad, by accident, but only rarely successfully. Then humans landed.

Distinctive challenges presented by islands

Richard Grove, in *Green Imperialism*¹, suggests that islands offer a series of microcosms where ecological processes can be observed more clearly than in continents due to their circumscribed areas and relative isolation. Small islands like Nauru or Rotuma, and even relatively large ones such as New Zealand, present those who come to inhabit them with special limitations not only of space but also of subsistence and time. From the viewpoint of humans, they are severely finite and their resources are consequently limited. The humans who arrived in these places, therefore, had to deal with the problem of shrinking resources much sooner than those who lived on

¹ Richard Grove, *Green imperialism. Colonial expansion, tropical island Edens and the origins of Environmentalism, 1600-1860* (Cambridge 1995).

the greater landmasses of the earth. The pattern of human occupation in such places follows a similar, but not identical trajectory. What is that trajectory?

Tim Flannery, in *The Future Eaters*², maintains that human groups arriving in new environments use the resources they find available, granted their level of technology, without thought of sustainability, until they approach the limits of those resources. Thus they have a tendency to consume what they, or their descendants, would need for the future. This is notably true of the peoples who arrived on islands, such as the Polynesians. Archaeological investigations in the past few decades have made it clear that they exploited whatever edible plants and unsuspecting animals they found, making many of them extinct.³ In Hawai'i, for example, the Polynesians eliminated about 40 of the 110 native species of land birds before the first European showed up. In New Zealand, the Maoris quickly wiped out a dozen species of giant wingless birds called moas.

Initial survival and population growth depended on native resources, usually birds, fish, and sea mammals. As a rule there were enough of these to feed the new arrivals with abundant protein, and to support rapid population growth. There were limitations, however. Almost no land mammal species except for bats had managed to establish themselves on the more distant islands. Few native plants provided a plentiful food source for humans.

The settlers, however, were usually not castaways or victims of storms. They had set out deliberately to find new islands, and they carried useful species with them, introduced animals and plants that flourished after an initial period of difficulty and provided resources for rapid population growth. In the Pacific, they brought dogs, pigs, and chickens, while rats and geckos stowed on board, or perhaps were thought useful, too. Elsewhere, colonists introduced goats and larger domestic animals. The voyagers packed dozens of plant species to bring with them; they spread the coconut palm widely, and in the tropical Pacific, they carried useful seeds and shoots for horticulture such as taro, yams, breadfruit, and bananas. Once these productive introductions had propagated enough to provide dependable sources of food, the numbers of humans and their settlements could

² Tim Flannery, *The future eaters. An ecological history of the Australasian lands and people* (New York 1995).

³ Patrick V. Kirch and Terry L. Hunt eds., *Historical ecology in the Pacific islands. Prehistoric environmental and landscape change* (New Haven 1997).

increase further. Forests fell in the path of expanding agriculture, with erosion as a result.⁴ During this time of rapid expansion, the most productive land was fully occupied, and even marginal lands began to be used. At that point, further expansion was unsustainable. Competition for food and other resources became keen, and after having lived out the time of abundance, island societies generated ways of dealing with a new situation of shortages.

Jared Diamond, in *Guns, Germs, and Steel*, proposed that technological modifications in relation to the environments occupied by societies enable some of them to move to a new level of more effective interaction with those environments. Various adaptations allowed the period of rapid population growth to continue, but only to the point that the circumscribed environments of the islands could endure.

New technologies of horticulture increased food production. For instance, the sweet potato ('kumara') was brought from its original centre of domestication in South America by far-ranging Polynesian vessels, and became a staple food even in colder islands like New Zealand, where most tropical food plants would not grow. But there these horticultural adaptations faced limitations of soil, climate, and available space.

Emigration to other islands was possible, even to hitherto undiscovered ones, but this rarely relieved the pressure for long. The size of vessels was not large enough, and the social and resource cost of building and provisioning the craft so high that not many vessels could leave, so the resident population could not be stabilised in that way alone.

Aggressive sub-groups with strong leaders arose and fought one another over access to land and resources. This was a dominant pattern on many islands, including the Marquesas, Hawaii, and New Zealand. In much of Polynesia, it was accompanied by a social stratification in which the chiefs and nobles ('ariki, ali'i') laid prior claim on the preferred resources, which they forced the commoners ('menehune') to provide. Much energy was used in erecting monuments that emphasised their political and religious power, and by extension the economic affluence, of the ruling class. Measures to prevent population growth are noted, and these are often connected with social privilege; for example, on some islands such as Tahiti infants born of relations between nobles and commoners were killed.

⁴ Barry Vladimir Rolett, *Hanamiai. Prehistoric colonization and cultural change in the Marquesas islands (East Polynesia)* (New Haven 1998) 10.

⁵ Jared Diamond, *Guns, germs, and steel* (New York 1999).

Methods of contraception and abortion were practised. Deaths in battle, and cannibalism to ingest the vigour of brave opponents, were also an influence on population. Patrick V. Kirch, in a paper on subsistence and ecology, summed it up well: 'The prehistoric cultural sequences of Polynesia present the same scenario over and over: initial settlement by a numerically restricted group, rapid population growth, expansion into all habitable biotypes, and – frequently – inter-group conflict and degradation of the natural environment.'⁶ In very small atolls, competition between chiefdoms was absent, and extremely scarce resources delimited subsistence.

Cultural responses to islands challenges

Societies often made cultural adjustments that encouraged more careful use of resources. Taboos amounting to a tradition of conservation can be identified. These prohibitions, carrying religious and legal sanctions, protected certain species and resources. Tribes were often forbidden to hunt their totem animals. In Hawai'i, certain fish species were regarded as sacred to individual gods, and catching them was forbidden during the time of year when those gods were honoured. In consequence, those species could recover their numbers during critical times. Certain forests in the mountains were regarded as holy places, where spirits resided, and their use was strictly limited. The Hawai'ians treated the highlands with the traditional ethic of 'aloha aina', based on love and reverence for nature, and especially the awe felt for 'mana', the living spiritual energy shared by living beings. These are instances of attitudes and practices found on many islands. The New Zealand Maori also had methods of protecting aspects of nature and conserving resources for future use. Their songs and legends express great love for the land and sea, celebrating the outstanding features of nature in the islands. They had a sense of relatedness to other forms of life: 'All creatures are regarded as kin, related through the *whakapapa* or genealogi[es] that trace all beings back to Papa and Rangi, Earth and Sky.'⁷ The concept of 'tapu' (taboo), a recognition of inherent power so strong that the entities that possessed it could not be touched or approached, may have served as a force for conservation. Mountains were likely to be 'tapu',

⁶ Patrick V. Kirch, 'Subsistence and ecology' in: Jesse D Jennings ed., *The prehistory of Polynesia* (Cambridge 1979) 286-307, there 304.

⁷ John Patterson, 'Respecting nature. The Maori way', *The Ecologist* 29-1 (January 1999) 33-38.

along with forests where ancestral spirits were perceived to roam.⁸ Some special trees were so 'tapu' that they served as shrines or sacred groves.⁹ The chiefs could impose 'a *rahui*, a form of temporary special *tapu*, for example when a species or place needed to recover from material, biological or spiritual damage, or when it had special spiritual or cultural significance.¹⁰ 'Tapu' restricted the exploitation of eel weirs, shellfish beds, and certain ocean fish; for example, in one Maori tribe shark-fishing enterprises were annually limited to two days.¹¹ There were also dietary restrictions. These are a few instances of an adaptive elaboration of a life style that encouraged conservation.

Forms of adjustment to resource scarcity were different on different islands, and the long-term results also varied. Some island societies suffered disaster. Easter Island (called Rapa Nui by many of its Polynesian inhabitants) is a celebrated historical illustration of the causes and results of environmental degradation. Clive Ponting,¹² Jared Diamond,¹³ 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.

Christopher Stevenson has done this in his archaeological investigation of sites there. As a volunteer, I assisted him in two of these

⁸ Margaret Orbell, *Natural world of the Maori* (Dobbs Ferry 1985) 84-87.

⁹ Geoff Park, *Ngā Uruora (The groves of life). Ecology and history in a New Zealand landscape* (Wellington 1995) 137-138, 157-159, 212, 222-223, 270.

¹⁰ Patterson, 'Respecting Nature', 44.

¹¹ Tom Brooking, *Milestones. Turning points in New Zealand history* (Lower Hutt 1988) 21; Gary A. Klee, 'Oceania' in: idem ed., *World systems of traditional resource management* (London 1980) 245-281, 255; and James Belich, *Making peoples. A history of the New Zealanders. From Polynesian settlement to the end of the nineteenth century* (Auckland etc. 1996) 74.

¹² Clive Ponting, *A green history of the world* (New York 1991) 1-7.

¹³ Jared Diamond, 'Easter Island's End', *Discover Magazine* 16-8 (1995) 36-45.

sites. At Orito, a hill that was an ancient source of obsidian, a bulldozer had laid open a series of strata in a pit. Undoubtedly 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, its closest inhabited neighbour 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 small, fourteen miles long and seven wide, with an area of only 64 square miles (smaller than Niihau, 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.

Easter Island: primeval ecology

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.¹⁴ 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 carbonised 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.¹⁵ 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.

Easter Island: original settlement

There is no doubt that the first Easter Islanders were Polynesians. Thor Heyerdahl¹⁶ tried to prove that they came from South America, but the

¹⁴ Georg Zizka, *Flowering plants of Easter Island* (Frankfurt am Main 1991) 16.

¹⁵ Catherine Orliac, 'The woody vegetation of Easter Island between the early 14th and the mid-17th centuries AD' in: Christopher M. Stevenson and William S. Ayres eds., *Easter Island archaeology. Research on early Rapanui culture* (Los Osos, CA 2000) 211-220.

¹⁶ Thor Heyerdahl, *Aku-Aku. The secret of Easter Island* (Chicago 1958).

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 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' (Big Rapa) however, was applied to Easter Island only in the time after European discovery. Mangareva in the Australs, probably also settled by the Marquesans, may have been the more direct source of the population.

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.



Fig. 1: The largest ahu platform on Easter Island at Tongariki supports fifteen moai statues, approximately ten meters in height.

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.



Fig. 2: 'Manavai', stone-lined pits, were constructed to shelter plants from the winds after the trees were removed from the island.

Trees became scarce. Along with 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 or no trees, 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.¹⁷

¹⁷ Christopher M. Stevenson and Sonia Haoa, 'Diminishing agricultural productivity and the collapse of ranked society on Easter Island' in: *Archaeology, agriculture and identity* [Kon-Tiki Museum] (Oslo 1999).

These methods were labour intensive, and the common people had to provide the labour.

Easter Island: ecological crises

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 labourers 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 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. Not all details are known, but it seems that worship and labour 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.



Fig. 3: Some of the moai that were deliberately thrown down during the period of environmental crises.

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 King 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, 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.

Epilogue

What is the lesson of Easter Island? Is it lack of foresight? Human societies organise themselves to optimise 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 organisations 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.

Pitcairn Island was abandoned after its original Polynesian settlement. In cases such as these, the trajectory of human population and resource use ended in a crash not unlike that of other animal species when their numbers exceed the capacity of food resources.

On other islands, population remained at a fairly high but stable level, and resource use was sustainable after the initial period of depletion. This

seems to have been true of such islands as Samoa, New Zealand, and Hawai'i before the arrival of Europeans. The pattern in those places was vigorous competition between strong chiefdoms combined with a deep sense of reverence for the gods of nature and the creatures and elements that shared the islands with them and on whom they depended. The motto of Hawai'i, 'Ua mau ke ea o ka 'aina i ka pono', means 'The life of the land is sustained by a proper relationship'.

Even the Pacific islands that maintained a large population up to the time of European incursion suffered great changes, including damage to landscapes and biodiversity. But one may well ask what determined the difference between the trajectories of human occupation in 'successful' groups like the Marquesans as compared with 'failed' groups like the Easter Islanders. The question cannot yet be answered definitively, but I will offer a few observations. The cause cannot be ethnic; all the inhabitants were Polynesian. Easter Island was probably settled from the Marquesas, which did not share the disastrous decline of their colonies. Nor can it be intertribal warfare, since that was rampant on all islands and archipelagos except the smallest ones. There were no important differences in basic technology between 'successful' and 'failed' island inhabitants. The type of island was not the deciding factor – there were successes and failures on both high islands and atolls – although extremely small islands did not offer much space for success. The presence or absence of specific resources, and differences in the list of animals and plants introduced by settlers, or brought later, to specific islands is a matter that needs further careful study. The degree of contact between island groups may have played a role; there was trade between the closer ones, but when the first Europeans arrived, the Easter Islanders believed they were the only people in the world. Population pressure was a powerful driving force behind environmental degradation before European impact, so that people on islands where controls on population growth were effective probably had a better chance of conserving their renewable resources. I would like to think that wise traditional leaders who knew when to place taboos on critical resources made a difference in 'successful' communities, but traditional oral historical accounts are inadequate to establish that point.

The changes that take place on small islands are local in scale, although they reflect events worldwide in scope. A longer, more complex pattern of change occurred on the larger landmasses such as Pre-Columbian North America, as Flannery describes in his recent book, *The Eternal*

Frontier.¹⁸ Beyond that, with the worldwide expansion of industrial technology and the market economy, the Earth has become an island, and a pattern like the trajectories of population growth, resource exploitation, depletion of biota and inter-group conflict observed on islands is now occurring on a global scale. The question is just which island history the global trajectory will turn out to resemble most.

¹⁸ Tim Flannery, *The eternal frontier. An ecological history of North America and its peoples* (New York 2001).