

## Of Rats and Men

Commentary on *Revisiting Rapa Nui (Easter Island) “Ecocide” in Pacific Science* (2009) and *Ecological catastrophe, collapse, and the myth of “Ecocide” on Rapa Nui (Easter Island)*, a chapter in *Questioning Collapse. Human Resilience, Ecological Vulnerability, and the Aftermath of Empire* (2010).

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### INTRODUCTION

IN TWO RECENT PUBLICATIONS, (2009, 2010) Hunt and Lipo have returned to their apparently obsessive attack on the “environmental destruction” model of Easter Island’s prehistory, despite the fact that their main arguments have already been rebutted (Flenley and Bahn 2007; Flenley, et al. 2007), and without presenting anything new to support themselves. The 2010 chapter is reviewed earlier in this issue, and we do not propose to devote much time or space to the 2009 paper, except insofar as it gives us the opportunity to highlight the contribution of a more interesting piece of new work (Mieth and Bork 2010) as well as present some more general thoughts on the much-debated concept of “collapse” in relation to Rapa Nui.

Regrettably, Hunt and Lipo’s 2009 paper continues to combine sleight of hand with tilting at windmills. On the positive side, they appear to have abandoned their ill-founded claims that the island showed little evidence of violence, and that all the *mata’a* were for food preparation. On the negative side, they persist in ignoring the crucial role of language in dating, and they also fail to note the enormous implications of the burning of grass as fuel long before the European arrival (Orliac 2000). Moreover, their table (2009:603) lumps together all kinds of topics, some valid and others not – such as purely speculative earthquakes.

One new phenomenon is their attempt (2009: 609) to cast doubt on the accuracy of obsidian hydration dates, using the critique by Anovitz et al. (1999). However, as Mulrooney et al. (2009: 99) have pointed out, with careful consideration of environmental factors including relative humidity and temperature, and through isolation of intrinsic water content, the rate of hydration for individual artifacts can be accurately estimated; and additional advances in the method have been made with the development of increased precision in infrared spectroscopy, which allows researchers to determine dates to within 21 years.

### RATS

Hunt and Lipo deny (2009:607) that Hunt ever claimed that rats alone deforested the island – and indeed nobody has ever made such a ridiculous claim; nevertheless, he has repeatedly claimed that their role far outweighed that of humans: e.g.

“These prolific rodents may have been the primary cause of the island’s environmental degradation...I believe that there is substantial evidence that it was rats, more so than humans, that led to deforestation (Hunt 2006:413, 419). Far more egregious, however, is their own claim (2009:608) that we have implied “that direct human actions were the sole source of ecological change” – this is an outrageous untruth, as any reader of our books or our earlier responses to Hunt and Lipo will be well aware.

One factor which has been repeatedly emphasized by Hunt and Lipo in their articles – and the two new texts are no exception – is the presence of rat tooth marks on many palm nuts found in caves. They believe that rat predation of this kind may have helped to prevent some trees from regenerating, especially as the rats must have infested the island in vast numbers and destroyed the woodland. However, a valuable new study by Mieth and Bork (2010) provides solid data which emphatically refute that hypothesis. It follows on from their earlier work on the island (e.g. Bork and Mieth 2003; Mieth and Bork 2003, 2004), and fully supports the scenario of human deforestation which we have presented.

Mieth and Bork (2010) have recorded numerous burned palm stumps, and widespread burned soil layers containing charred palm nuts. Rats do not cut or burn trees! Moreover, very few of these burned nuts bear tooth marks. They examined 18 soil profiles in all parts of the island, and found numerous palm nuts of which less than 10% were rat-gnawed. This figure is supported by the finding of palm nuts preserved under clayey sediments on Rapa Nui (Vogt 2009). The finding of 100% rat-gnawing was restricted to nuts in a single excavation at ‘Anakena and to findings of rat-emplaced caches in cliff crevices. It therefore seems clear that the plagues of rats envisaged in the rat theory as destroying the palm woodlands never actually happened on Rapa Nui.

Dating reveals that intensive slashing and burning activities occurred mainly between AD 1250 and 1520 (Mieth and Bork 2010). In addition, one area of the island revealed evidence for regeneration of palm woodland after the initial clearing, which again argues against any major impact by rats, while the existence of *Jubaea chilensis* woodland in central Chile shows that rats and palms can co-exist.

Some of the burned palm stumps had clearly been used as ovens for cooking. Charcoal layers inside the stumps were disturbed and included food remains such as bone. Interestingly, the range of dates is similar to the range from the rat-gnawed palm nuts found in caves. This suggests that the storing and eating of nuts in caves by rats was taking place at the same time as the slash and burn agriculture.

### “COLLAPSE” – EVALUATING THE EVIDENCE

Hunt and Lipo’s recent works (2009, 2010) have questioned the whole concept of a “collapse” brought about by the deforestation of Rapa Nui. In particular they challenge the idea of “ecocide” (ecological collapse) used by Diamond (2005). Such challenges are certainly to be welcomed, and considered

seriously. Everyone agrees that there was a collapse of Rapa Nui population and culture in the 19th century. The question is, was there a separate, earlier collapse shortly after the deforestation was nearly complete, and before the contact with westerners?

First of all it is necessary to define 'collapse'. Diamond takes it to mean a simultaneous reduction in population and breakdown of pre-existing social and material culture. Then we need to evaluate critically the different strands of evidence which have led to the formation of this particular 'collapse' construct.

## DEFORESTATION

On Rapa Nui the evidence of deforestation is primarily palynological, and comes from three different volcanic craters on the island (Rano Kau, Rano Raraku and Rano Aroi), but the clearest stratigraphy and dating are derived from Rano Kau Core 2 (Butler and Flenley 2001; this issue). This core was taken from near the middle of the large caldera, and therefore has the best chance of giving an island-wide (rather than local) picture. It is clear from the diagram that the first major decline of forest happened around 1900 BP. This was accompanied by a rise of charcoal above background levels, and the first substantial rise of grasses (*Poaceae*). The forest partially recovered, but further declines occurred at intervals, getting closer and closer together in time, until the forest was completely eliminated in the last 400 years, with charcoal rising to the highest levels.

The main cause of the deforestation was almost certainly the felling and burning of forest by people – as mentioned above, the possibility of introduced rats being a major factor has now been eliminated by the work of Mieth and Bork (2010); the deforestation has been going on for around two millennia, probably caused primarily by human activities. Initially these were apparently purely agricultural, leaving little archaeological trace. The possibility that the early deforestation was caused by climate change or volcanism is unlikely, but has not yet been completely eliminated.

## CANOES AND FISHING

The only large tree on the island was apparently the palm, *Paschalococos disperta*, related to the Chilean *Jubaea chilensis*. It has been estimated that there were 16 million of these on the island (Mieth and Bork 2010). Casts of their trunks in lava on the north coast suggest they were tall straight trees, ideal for canoes. Canoes were made from coconut palms in Mangareva Island (R. Green, pers. comm.) so there seems no doubt this would have been done on Rapa Nui. Porosity of the palm wood could have been countered with beeswax. Early large fish-hooks suggest deep-sea fishing from large canoes. Later fish-hooks are smaller and suggest inshore or shore-based fishing (Flenley and Bahn 2003).

## POPULATION

The only actual early estimates of population are "thousands" (Roggeveen in 1722), 600-700 (excluding women and children - Cook in 1774), and 2000 (La Pérouse, in 1786) (see Flenley and Bahn [2003] for details). So the question is whether there was a decline in population between c.1650 (when Orliac [2000] dates the changeover from burning wood to burning grass in cooking fires) and 1722.

Hunt and Lipo (2009, 2010) suggest a population of c. 5000 in 1650. Had there been a reduction by 1722? If Roggeveen's "thousands" meant 5000, then there was no reduction. If it meant 2000, there had been a massive reduction. If we took a figure of 10-15,000 in 1650, as suggested by Diamond (and by Flenley and Bahn), then there was pretty clearly a reduction by 1722, though not absolutely certainly so. The figure of 10-15,000 was an estimate based partly on the total deforestation of the island. Given that stone mulching was well established by this time (Stevenson et al. 1999), most parts of the island were fairly productive of food in a reliable way. In fact 80% of the land was stone mulched (Bork et al. 2004; Mieth and Bork 2005:62), and it is difficult to see why people would go to the trouble of first deforesting the land and then moving tons of rock to stone-mulch it if there was not a population large enough to require the resulting produce. By contrast, the inhabitants of Tahiti (numbering 3000 at contact) had bothered to deforest only 10% of their land at the time of contact. Because of their more reliable rainfall regime, they did not practice stone mulching either.

Our conclusion, however, must be that the population change is not proven either way until we have further evidence. The evidence based on number of habitations quoted by Hunt and Lipo is difficult to interpret. There appears to have been a reduction in the 16th century, and another in the 18<sup>th</sup>-19<sup>th</sup> centuries. But did house size stay the same during these periods? Some former houses in Rapa Nui had a capacity of over 100 people (see Flenley and Bahn 2003), and population may also have fluctuated in response to internal warfare or other causes (Cole and Flenley 2008).

## CULTURAL CHANGE

The other aspect of "collapse" is change in the material or social culture of the people, and on Rapa Nui there is considerable evidence for this. Firstly, although some *moai* continued to be carved, their appearance changed. The large, 50-ton statues with topknots ceased to be carved. Instead, much smaller ones were sculpted (several are still in situ in the quarries), and if they were large they were much thinner than before, and apparently intended to be erected adjacent to the quarries and never to have a topknot (Love n. d.).

Secondly, the style of the *ahu* changed. The traditional *ahu* with many large *moai* was replaced by the semi-pyramidal *ahu* with fewer, smaller *moai*, and with crematoria adjacent to them where human bones were burnt. This all

suggests a change in rituals and possibly in beliefs (Love, *ibid.*).

Thirdly, there is evidence of social unrest. Skeletons dated to this period have wounds of the type inflicted by obsidian *mata'a*, and legends support this (Flenley and Bahn, 2003; 2007).

Fourth, this period saw the rise of the bird-man cult at 'Orongo, the annual egg-hunting competition between tribes to select the leader who would be the "bird-man" for the following year and would be greatly revered. This continued until the 19<sup>th</sup> century.

All these changes may reasonably be construed as the collapse of one social system and its replacement with another. Both the initial *ahu* construction and the final 'Orongo cult can be explained as ingenious ways to sublimate the competitive warlike energy of the different tribes into peaceful competition. The *ahu* style had to change as the availability of trees for moving *moai* was reduced. There was a changeover warring period c.1650-1680 while the new bird-man cult was established.

Inevitably much of this is speculative. We must therefore conclude that the concept of an ecologically-caused "collapse" – ecocide if you like – is still not completely established. But that there was some kind of serious decline after deforestation seems beyond dispute. We ourselves have chosen to adopt the less dramatic term "decline" instead of "collapse" in the forthcoming 3<sup>rd</sup> edition of our book, *Easter Island, Earth Island*, but nevertheless it is clear that the island was no longer a thriving concern when Europeans arrived – the islanders had achieved remarkable success in maintaining some aspects of their way of life in the face of massive environmental degradation, but it is unlikely that they could have sustained their economy in the long term, had Europeans not arrived and inflicted so much further damage.

Where the claims by Hunt and Lipo are concerned, we conclude that revisionist arguments relating to Easter Island will need considerably better factual evidence before they can be taken seriously. We do, however, welcome all such challenges. They are the bumpy road along which science progresses.

## REFERENCES

Anovitz, L. M., J. M. Elam, L. R. Riciputi and D. R. Cole, 1999. The failure of obsidian hydration dating: sources, implications and new directions. *Journal of Arch. Science* 26:735-52.

Bork, H-R. and A. Mieth, 2003. The key role of *Jubaea* palm trees in the history of Rapa Nui: a provocative interpretation. *Rapa Nui Journal* 17(2):119-22.

Bork, H-R., A. Mieth and B. Tschochner, 2004. Nothing but stones? A review of the extent and technical efforts of prehistoric stone mulching on Rapa Nui. *Rapa Nui Journal* 18(1):10-14.

Butler, K. R. and J. R. Flenley. 2001. Further pollen evidence from Easter Island. *Proceedings of the Fifth International Conference on Easter Island and the Pacific*. C. M. Steven-

son, G. Lee and F. J. Morin eds. :79-86. Los Osos: Easter Island Foundation.

Butler, K. and J. Flenley. 2010. The Rano Kau 2 pollen diagram: Palaeoecology revealed. *Rapa Nui Journal* 24(1):5-10.

Cole, A. and J. Flenley. 2008. Modelling human population change on Easter Island far-from-equilibrium. *Quaternary International* 184:150-65.

Diamond, J. 2005. *Collapse: How Societies Choose to Fail or Succeed*. Viking: New York.

Flenley, J. and P. Bahn. 2003. *The Enigmas of Easter Island. Island on the Edge*. Oxford University Press: Oxford.

Flenley, J. and P. Bahn. 2007. Conflicting views of Easter Island. *Rapa Nui Journal* 21(1):11-13.

Flenley, J., K. Butler, and P. G. Bahn. 2007. Respect versus contempt for evidence: Reply to Hunt and Lipo. *Rapa Nui Journal* 21(2):98-104.

Hunt, T. L. 2006. Rethinking the fall of Easter Island. *American Scientist* 94:412-19.

Hunt, T. L. and C. P. Lipo. 2009. Revisiting Rapa Nui (Easter Island) "Ecocide". *Pacific Science* 63(4):601-16.

Hunt, T. L. and C. P. Lipo. 2010. Ecological catastrophe, collapse, and the myth of "Ecocide" on Rapa Nui (Easter Island). *Questioning Collapse. Human Resilience, Ecological Vulnerability, and the Aftermath of Empire*. P. A. McAnany and N. Yoffee eds. :21-44. Cambridge: Cambridge University Press.

Love, C. M. n.d. The Easter Island cultural collapse. Paper presented at the VII International Conference on Easter Island and the Pacific, Gotland, Sweden, 2007.

Mieth, A. and H-R. Bork. 2003. Diminution and degradation of environmental resources by prehistoric land use on Poike Peninsula, Easter Island (Rapa Nui). *Rapa Nui Journal* 17(1):34-41.

Mieth, A. and H-R. Bork. 2004. *Easter Island - Rapa Nui. Scientific Pathways to Secrets of the Past*. Kiel: Christien-Alberts-Universität.

Mieth, A. and H-R. Bork. 2005. Traces in the soils: interaction between environmental change, land use and culture in the (pre)history of Rapa Nui (Easter Island). *Proceedings of the VI International Conference on Rapa Nui and the Pacific*. C. M. Stevenson, J. M. Ramirez, F. J. Morin and N. Barbacci eds. :55-65. Los Osos: Easter Island Foundation.

Mieth A. and H. R. Bork. 2010. Humans, climate or introduced rats – which is to blame for the woodland destruction on prehistoric Rapa Nui (Easter Island)? *Journal of Archaeological Science* 32(2):417-426.

Mulrooney, M. A., T. N., Ladefoged, C. M. Stevenson, and S. Haoa. 2009. The myth of AD 1680: new evidence from Hanga Ho'onu, Rapa Nui (Easter Island). *Rapa Nui Journal* 23(2):94-105.

Orliac, C. 2000. The woody vegetation of Easter Island between the early 14th and the mid-17th centuries AD :211-20. *Easter Island Archaeology. Research on Early Rapanui Culture*. C. M. Stevenson and W. S. Ayres, eds. Los Osos: Easter Island Foundation.

Stevenson, C., J. Wozniak, and S. Haoa. 1999. Prehistoric agricultural production on Rapa Nui. *Antiquity* 73:801-812.

Vogt, B. 2009. Wasserbau unterm Regenbogen. *Archäologie in Deutschland* 4:12-16.