

Twilight of the pygmy hippos

Jared M. Diamond

WHO or what caused the late-Quaternary extinctions of many large mammals — were humans responsible, or climate change¹? For a long time, the best-known examples were provided by the Americas and Australia, to which more recently has been added every palaeontologically explored island of the Pacific. Surprisingly, European biologists and archaeologists have tended to ignore examples much closer to home, on the islands of the Mediterranean² and western Indian Ocean³. Discoveries about the extinct pygmy hippos of Cyprus⁴⁻⁷ and Madagascar⁸ are now yielding tantalizing new insights into the date, speed and cause of the extinctions.

Mediterranean islands such as Cyprus, Crete, Corsica and Sardinia are surrounded by such deep water that they remained unconnected to Europe even at Pleistocene times of low sea level. All were reached (by swimming or rafting) by flightless mammals, which then underwent striking evolutionary changes in body size⁹⁻¹². In general, big mammals became smaller, while little ones became larger. The islands developed pygmy elephants, hippos and deer, and even a paradoxically named pygmy giant deer (*Megaceros*). Leg bones indicate that these dwarfs had become slower-moving than their mainland ancestors, as would be expected given the absence of large predators⁹. Side by side with the dwarfs lived monsters: big shrews and voles, as well as giant dormice, owls, swans, lizards and tortoises.

All of these insular dwarfs are known only from subfossil bones, some of which were formerly believed to be remains of early Christian martyrs. The bones date to no more recently than the early or middle Holocene, which began about 10,000 years ago. Human settlement of Mediterranean islands did not begin until the early Holocene, and (as elsewhere in the world) this approximate coincidence between megafaunal extinction, human settlement and the end of the Pleistocene cries out for clarification. Were the extinctions due to climate and habitat changes at the Pleistocene/Holocene boundary, or to a *Blitzkrieg* of human hunting or habitat changes caused by humans and their domestic animals?

Until recently, the earliest known human occupation of Cyprus was by Neolithic herders and farmers¹¹. Their sites are marked by remains of stone houses, stone bowls and the bones of the sheep, goats and pigs that they brought with them. The sole remains of the extinct megafauna at these sites are two

debated scraps of hippo bones. Conversely, none of the previously known Cypriot sites with abundant bones of pygmy hippos and elephants yielded signs of human presence. That would seem to mean that the dwarfs succumbed to climate changes just before human arrival.

Discoveries⁴⁻⁷ at the Cypriot site of Akrotiri-Aetokremnos¹³ reverse this conclusion, however, and at last support the view that hippos and humans coexisted (even if only briefly). Simmons and Reese have unequivocally established the presence of humans at the site by identifying hearths, shell beads and stone artefacts very distinct from the Neolithic implements found on the island. There is no trace of domestic animals, suggesting that the people were hunter-gatherers.

The presence of the pig-sized hippos is also unequivocally established — their bones occur in prodigious quantities, and over 240,000 of them are known from at least 200 individuals. Along with the hippo bones are remains of lots of shellfish, crabs and sea urchins, many big birds, and at least three pygmy elephants, plus turtles and snakes. The bones are disarticulated and many are burnt, indicating that the people who left the stone tools cooked the animals that left the bones.

The age of the site is well supported by carbon-14 dates on various materials clustering around 8500 BC (uncalibrated). This makes the site 1,500–2,000 years older than Cyprus's Neolithic horizon, and possibly the oldest established site for human occupation of any remote Mediterranean island¹⁴. Interestingly, the proportion of hippo bones decreases, and the proportions of bird and mollusc bones increase, from deeper to shallower levels at the site, but both levels have indistinguishable carbon-14 dates. This implies that these first hunters to reach Cyprus quickly exterminated the pygmy hippos, which would have been conspicuous prey, easy to locate and kill down to the last individual.

It remains to be seen whether this human role in the extinction of Cyprus's pygmy hippos will apply to the miniaturized megafaunas of other Mediterranean islands. For Corsica and Sardinia, Vigne¹⁰ has summarized evidence that megafaunal species were alive when humans arrived, and vanished soon afterwards. My own guess is that all megafaunal species, on all remote Mediterranean islands, that survived into the Holocene, will prove to have become extinct through human agency.

Parallels and contrasts are presented by Madagascar's pygmy hippos, on which the Sun set long after their Cypriot brethren had vanished. Madagascar has yielded subfossil bones of giant lemurs and elephant birds, and of semi-pygmy (cow-sized) hippos³. The island has generally been believed to have been settled by humans around AD 500, and all these species were apparently extinct by the time that Europeans began describing Madagascar's animals in the seventeenth century. Very few human-modified bones of extinct megafauna are known from Madagascar, but MacPhee and Burney⁸ have now identified seven Madagascar hippo femurs bearing marks of having been cut and then snapped by humans. The cuts were apparently made by iron tools at a time when the bones were still fresh. Accelerator mass spectrometry carbon-14 dates on collagen from the bones fall between AD 0 and 300, pushing back the date of human occupation of Madagascar by a few centuries.

A possible contrast between Madagascar and Cyprus is the hint that the Cyprus megafauna succumbed quickly, whereas some of Madagascar's giant lemurs were still alive in the thirteenth century AD. The possibly slower pace of extinction on Madagascar may reflect its much greater area, and also a difference between the economies of the first Malagasy and Cypriot settlers¹⁵. The discoverers of Cyprus may have been full-time hunter-gatherers relying heavily on hippos for food, whereas Madagascar's first settlers were probably herders, farmers and fishermen for whom hunting was no more than a pastime. However that may be, the message of the new work is that zoology departments in Europe can dig into the reasons for extinctions on islands close to home. □

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