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New insights into the marine contribution to ancient Easter Islanders' diet

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ABSTRACT

Easter Island (or Rapa Nui), internationally renowned for its megalithic statues, is the most isolated inhabited island of the Pacific. Archaeological surveys undertaken from the end of the 19th century led to the discovery of the remains of several hundred human individuals. The majority were buried in monuments (funerary stone platform called *ahu*) or in caves. This paper presents a study of the ancient Easter Islanders' diet through carbon and nitrogen stable isotope analysis of human tooth and bone collagen and, more particularly, evaluates the impact of gender, age, social status and location of burials. The 125 studied individuals are from 16 sites, which date mainly from the 17th to the 19th centuries. This anthropological material is housed at the Royal Belgian Institute of Natural sciences and the Father Sebastián Englert Anthropological Museum of Easter Island. One hundred and seven individuals showed well-preserved collagen. The stable isotope data provide new information on ancient Easter Islander dietary habits. They demonstrate gender disparity in access to food resources and show that children were breastfed until 3 years of age. Furthermore, the isotopic signatures cluster according to the place of burial (*ahu*) indicating family dietary specificities. Finally, our study reveals influences of social status on food intake: individuals from *Ahu Nau Nau*, which is said to be the royal *ahu*, display the highest nitrogen and carbon isotope values. A greater consumption of marine products may explain this distinction.

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1. Introduction

The aim of this paper is to bring new insights into the ancient¹ Easter Islanders' diet. Dietary reconstructions have already been performed at the population scale but dietary differences between groups in the Easter Island population have not yet been investigated. We therefore applied stable isotope analysis to more than 100 human samples to test if parameters such as gender, age at death and social status influenced food intake.

1.1. Easter Island and the origin of its inhabitants

Easter Island (or Rapa Nui), internationally renowned for its megalithic statues (*moai*), is the most isolated inhabited island of the Pacific (Fig. 1). It is located 3600 km from the Chilean coasts and 4200 km of Tahiti. Today, its closest populated neighbour is Pitcairn Island, 2075 km to the west. Easter Island has a volcanic origin and a land area of 160.5 km² (Fischer and Love, 1993).

According to some authors, the initial human settlement of Easter Island took place between the 8th and the 10th century A.D. (Bahn,

1993). For others, it occurred more recently, dating to the 12th century AD (Hunt and Lipo, 2006). Anthropological (Turner and Scott, 1977; Gill and Owsley, 1993), palaeogenetic (Hagelberg et al., 1994), ethnographic (Métraux, 1971) and linguistic (Du Feu and Fischer, 1993) research showed that Easter Islanders had a Polynesian origin.

1.2. History, chronology, social organisation and burial practices of the ancient Easter Islanders

The history of Easter Islanders was far from peaceful. They had to face deforestation (the island had, until the beginning of the 17th century, a forest cover where palm trees dominated; Flenley and King, 1984; Orliac and Orliac, 1998), slave raids in the 19th century (Lavachery, 1935; Maude, 1981; Fischer, 2005) and then, epidemics and colonialism (Fischer, 2005; Métraux, 1971).

Several chronologies have been proposed for the Rapa Nui cultural sequence (Mulrooney et al., 2010). Biological anthropologists generally use a chronology combining the systems presented by McCall (1979) and Mulloy (1961), divided in five phases (Shaw, 2000)²:

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E-mail address: caroline.polet@sciencesnaturelles.be (C. Polet).¹ We mean by "ancient", the human populations who have lived on Easter Island, regardless of whether they were Prehistoric (precontact) or more recent.² The date AD 1680 is based on oral tradition: it relates to a shift in the socio-political structure of the society (cessation of statue carving, shift in burial practices, etc.). AD 1722 is the first recorded European contact and AD 1864, the arrival of the first missionary.

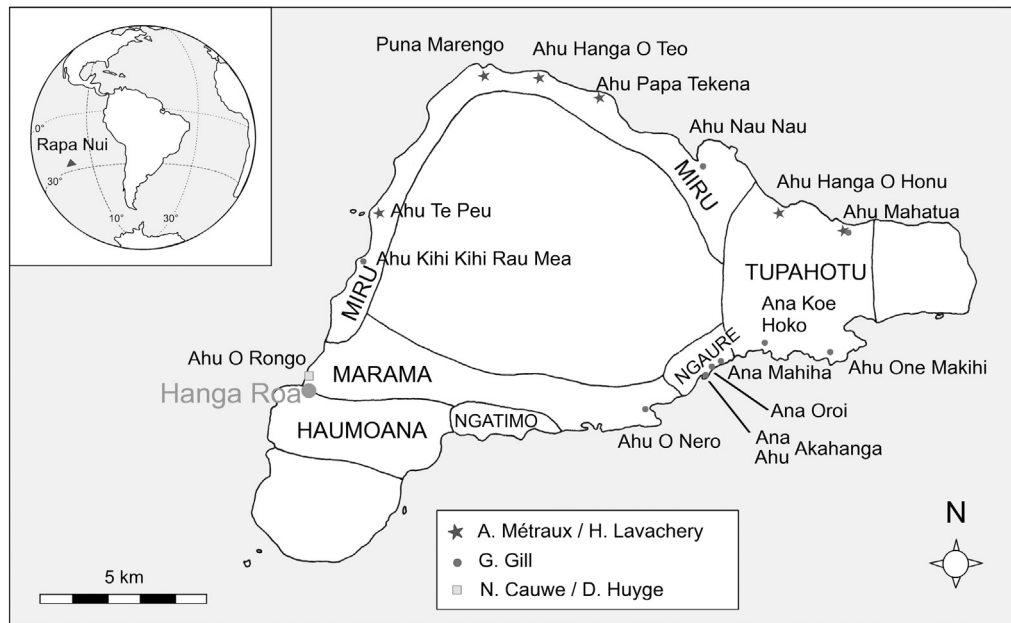


Fig. 1. Location of Easter Island (Rapa Nui). Map of the island with its capital (Hanga Roa), the reported clan divisions in capital letters (after Routledge, 1919) and the different studied sites.

- Early Prehistoric Period = AD 400–1100 (absent in Hunt and Lipo (2006)'s late colonisation model)
- Middle Prehistoric Period = AD 1100–1680
- Late Prehistoric Period = AD 1680–1722
- Protohistoric Period = AD 1722–1864
- Historic Period = 1864–present.

The Rapa Nui people were organised in 'kinship groups' called *mata* (tribes) (McCall, 1979) made up of descendants of a common ancestor (Métraux, 1971, p. 123). During her stay on the island in 1913–1915, the British archaeologist K. Routledge recorded ten tribes, which were associated with different parts of the island (Routledge, 1919, p. 221–224; Fig. 1). One tribe, named *Mirú*, ranked above the other tribes (Routledge, 1919, p. 240–243). The *ariki-mau* or king of Easter Island was a member of the *Mirú* tribe. He had *mana* (supernatural power) and his power was manifested through a system of restrictions (*tapu*), which governs the right to use various resources (Métraux, 1971, p. 130–132).

Rapa Nui society was essentially patriarchal and the place of women was secondary to men. Women were subject to the authority of their father and their husband (Métraux, 1971, p. 98, 111–113). They appear to have been bound to domestic chores, crop harvesting, motherhood and the care of children (Arredondo, 2000a, 2000b). Children were under paternal authority. They were always welcome but sons were preferred (Métraux, 1971, p. 101; Arredondo, 2000a).

Various burial practices have been recorded on Easter Island. The majority of the deceased were buried in monuments (*ahu*). In Prehistoric period (mainly 13–15th centuries), the dead were generally incinerated and their ashes gathered in stone-lined cists located at the rear of the *ahu* (Ayres and Saleeby, 2000; Huyge et al., 2002; Polet, 2003). After deforestation, the progressive abandonment of *moai* cult and their overthrow, Easter Islanders continued to bury their dead in the *ahu* but, this time, mostly in niches dug in the platform or under lying *moai* (Seelenfreund, 2000; Cauwe, 2011). In addition, there were also burials in caves that seem to have taken place after the discovery of the island by the Europeans (Shaw, 2000), some of which may have contained individuals who died during the great epidemics of the 19th century.

1.3. Stable isotopes and dietary reconstruction

Stable isotope analyses have proved to be efficient methods for reconstructing palaeodiets (Brown and Brown, 2011; Schwarcz and Schoeninger, 2011). They are based on the fact that the differences in isotopic composition between different categories of food are reflected in the bones or teeth of the consumer. There is an isotopic enrichment in the animal relative to its diet: this is called the trophic level effect. The magnitude of this increase depends on the isotope in question (Post, 2002).

The contribution of these isotopic analyses to the knowledge of past populations' lifestyles is invaluable because they give a direct measure of diets at individual level and consequently enable associations to be highlighted between subsistence and other attributes such as social status, age at death or sex (Katzenberg, 2000).

Stable isotopes have been used to assess the marine contribution to ancient diet (Mays, 1997; Richards and Hedges, 1999; Richards et al., 2005), which is peculiarly relevant for the insular Rapa Nui sample. They have also been applied to study changes in eating behaviour according to age, such as weaning (Fogel et al., 1997; Fuller et al., 2006, Tsutaya and Yoneda, 2015).

2. Easter Island subsistence in its Pacific context

Documenting ancient Easter Islanders' diet is interesting for several reasons. Firstly, it presents a good opportunity to reconstruct aspects of the past lifeways of this poorly documented population. It also provides an example of a culture in isolation where plant and animal dietary components were limited. At a wider scale, it contributes to the knowledge of Pacific past food culture.

Some general assumptions about Rapa Nui subsistence can be made. As Easter Islanders were living in an oceanic insular context, a mixed diet including terrestrial and marine food is to be expected. Given their Polynesian origin, their diet is supposed to display similarities with other Pacific Islanders. Nevertheless, due to their marginal location in Polynesia, their isolation and the environmental changes (deforestation) they underwent, some dietary peculiarities linked to a reduced biodiversity can be predicted.

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