



Comment to Rull et al. (2013) – Challenging Easter Island's Collapse: the need for interdisciplinary synergies

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A commentary on

Challenging Easter Island's collapse: the need for interdisciplinary synergies

by Rull, V., Cañellas-Boltà, N., Sáez, A., Margalef, O., Bao, R., Pla-Rabes, S., et al. (2013). *Front. Ecol. Evol.* 1:3. doi: 10.3389/fevo.2013.00003

The road to deforestation and its social feedback on Rapa Nui is a fascinating and a possibly important parable; one with symbolic implications for how the rest of the world views environmental change and human impact. Rull et al. (2013) present a compilation and critique of Rapa Nui's paleoecological and archeological data that is critical for progressing further work on the island, and state that Rapa Nui was subject of a gradual environmental change instead of rapid deforestation. The authors interpret the slower pace of deforestation as evidence for gradual social change, supported by Mulrooney (2013) recent archeological investigation in La Pérouse Bay (Figure 1), therefore contradicting the hypothesis of an abrupt ecocidal collapse of Easter Island's prehistoric society (Diamond, 1994). In order to advance their interpretations, the authors suggest a closer collaboration between archeology and paleoecology and propose a research agenda.

It is important to understand that past environmental change provides limited conclusions in regards to societal change, as societies have the ability to adapt.

However, paleoecological information derived from the island's lake records (Rano Aroi, Rano Raraku, and Rano Kau; Figure 1) is well established and used as the main evidence to support the island's proposed collapse (Bahn and Flenley, 1992; Diamond, 2005). But, the limitations of palynological interpretation are well known and widely discussed in the scientific community (Flenley et al., 1991; Ritchie, 1995; Hunter-Anderson, 1998; Blarquez et al., 2013). Thus, a call for closer collaboration between archeology and paleoecology is somewhat surprising. Instead, we suggest that a widening of disciplines in order to use a varied range of interpretive techniques, and a multiplicity of environmental and archeological archives, would be of much greater advantage in order to understand the heavily discussed past of Rapa Nui (Förster et al., 2013).

Rull et al. (2013) set up a research agenda which presumes common questions between archeology and paleoecology based on a summary of previous work. However, this summary seemed to be focused on selected archeological publications, and furthermore dismissed paleoecological data from archives other than lake records. As a result, the authors:

1. Point out that there is new evidence for a gradual deforestation of the island, instead of abrupt ecological change. To our knowledge however, the

majority of scientists have not actually proposed rapid deforestation, but for the process lasting ~400 of years or longer (Hunter-Anderson, 1998; Orliac, 2000; Mieth and Bork, 2004, 2005; Mann et al., 2008; Hunt and Lipo, 2010). In addition, there is strong evidence in Poike (Figure 1) for a slash-and-burn gardening culture, co-existing with palm dominated forests which pre-dates deforestation (Mieth and Bork, 2005, 2010).

2. Set the island's original colonization, based on the indirect evidence of the presence of *Verbena littoralis*, some ~1500 years before the currently held dates between AD 1100–1200 (Mulrooney et al., 2011; Weisler and Green, 2011). Rull et al. (2013) proposed colonization date is also in direct contradiction of refined dating through the radiometric hygiene protocol (Spriggs and Anderson, 1993; Hunt and Lipo, 2007; Wilmshurst et al., 2011), where most Polynesian archeologists agree that almost all islands were navigated to and settled much later than initial dispersal models have indicated (Kirch, 1984). While we agree that more data should be used to corroborate initial settlement (and not ceramics as they do not exist on Rapa Nui), using only one botanical proxy which is indirect at best, to determine the complex timing and process of Pacific island colonization (Irwin, 1992), is tenuous.

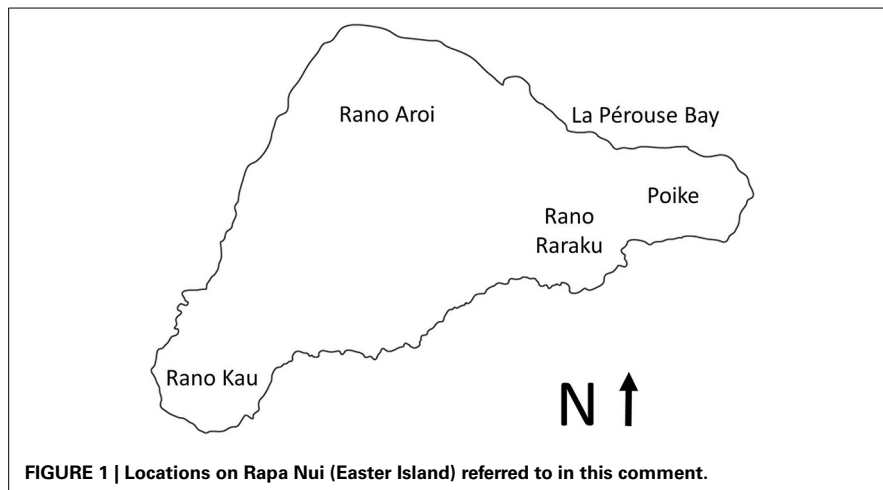


FIGURE 1 | Locations on Rapa Nui (Easter Island) referred to in this comment.

3. Fail to mention Mulrooney et al. (2009, 2010) earlier work which outlines the archeological fallacies of the collapse model.
 4. State that: “archeological and anthropological research has rarely addressed the potential role of environmental changes, specifically climatic, as potential drivers for social transformations on the island” (Rull et al., 2013; P. 3). While Orliac and Orliac (1998) suggested that climatically induced drought and subsequent fires were important factors in the island’s prehistory, Hunt and Lipo (2001) used archeological and ecological data to position Rapa Nui in an “unpredictable environment” which encouraged prehistoric inhabitants to practice “wasteful” bet-hedging behavior. Hunter-Anderson (1998) presented a “geo-climatic” model where climatic deterioration was characterized by prolonged and severe droughts during the Little Ice Age (see also McCall, 1993), and late Holocene migration across the Pacific Ocean might be related to ENSO (El Niño-Southern Oscillation) (Anderson et al., 2006).
 5. Provide no discussion about the island’s paleodemography and the peak number of prehistoric inhabitants. While this number is debated, the difference between 3000 (Hunt, 2006) and ~20,000 (Bahn and Flenley, 1992) occupants has huge connotations for synergetic interpretations of land and resource use and the relationship between the ancient Rapanui and their island environment.
 6. Ignore the role that disasters such as tsunamis, earthquakes, flooding, Pacific volcanism and sea level changes could have played in acerbating social and environmental transformation (Nunn, 2000; Dickinson, 2003; Goff et al., 2012; Pakarati, 2014).
 7. Omit the role the Polynesian rat (*Rattus exulans*) played in dampening tree regeneration (Hunter-Anderson, 1998; Bork and Mieth, 2003; Hunt and Lipo, 2007) and the possible appearances of fungus and tree and plant diseases which might have also stunted regeneration and growth (Shepardson, 2013), and finally.
 8. Do not consider the catastrophic impact brought to the island by early visitors and colonizers in the form of social change, disease, kidnapping, and murder (Peiser, 2005).
- We fully agree with the call of this paper for more scientific fields to collaborate together to help better interpret the (pre)history of Easter Island. However, with the limitations of Rapa Nui’s lake records and an already intensive archeological data collection in a high temporal and spatial resolution, the engagement of all abundant archives (such as soils, fluvial and marine sediments, and records of disasters) with paleoenvironmental proxies (such as geochemistry and geophysics) has huge potential to overcome shortcomings of the existing paleo-records. An involvement of more research fields will therefore reveal more than an intensive communication between paleoecology and archeology and might demonstrate

that although the (pre)historic Rapanui are alleged to be a collapsed culture bounded by socio-political competition, ecological overexploitation and megalithic overproduction, the discussion would be better served if it recognized the Rapanui as a Polynesian island culture of adaptation and survival that has thrived for almost a millennium (Simpson, 2013).

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