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13,000 years of forest history in the Río Manso Inferior Valley, Northern Patagonia. Fire-vegetation-humans links

Yamila S. Giaché[a,*], María Martha Bianchi[a,b]

[a] Instituto Nacional de Antropología y Pensamiento Latinoamericano, 3 de Febrero 1370,Caba C1426BJN, Argentina
[b] CONICET, Argentina

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ABSTRACT

Paleoenvironmental studies provide both climate and habitat scenarios for Archeology. The archaeological background of the Argentine Patagonian forest environments is still not well-known. However, thanks to the undertaken palaeoenvironmental studies some processes are now much better understood. This paper focus on the forest history of Río Manso valley during the last 13,000 years, with special reference to the dynamics of humid forest structure and composition, depicted from pollen and charcoal analyses. Subsequently, the archaeological records are considered to investigate the human occupation of the valley. Our evidences showed that during Late-Glacial and Early Holocene a highly diverse humid *Nothofagus* forest was frequently disturbed by high severity fires. The change to a closed forest with a reduced understory began at ca. 10,600 cal yr BP under less severity fires. The expansion of *Austrocedrus chilensis* with the establishment of the mixed forest under a regime of more frequent fires occurred at ca. 3500 cal yr BP. Scrubland expanded favored by frequent and high severity fires dramatically changing the landscape appearance by ca. 750 cal yr BP. Although archaeological data indicate human presence in the valley since ca. 8200 cal yr BP it is not until Late Holocene that a clear occupation is detected. Groups of hunter-gatherers with high mobility started a more intense use of the forest at ca.1700 cal yr BP. Throughout the Holocene the forest appears to be sensitive to fire perturbations, making it difficult to discern between climatic or anthropic causes. Therefore, the influence of native people in the vegetation dynamic of the Río Manso valley is still under debate. Clear evidence of human impact is observed later on, when European colonization started at the end of 19th century.

1. Introduction

The challenges that forest ecosystems pose to Archeology have been experienced for decades in Northern Patagonia. Numerous publications point to the methodology, intended to deal with the archaeological site formation process from prospection stages to management practices (Bellelli and Fernández, 2010). Studies initiated in 1994 between 41°–42° S and 71°–72° W, focused on the role of forest and steppe environments in the adaptation strategies of hunter-gatherers by means of evaluating archaeological sites distribution and present - time resources availability (Bellelli et al., 2000a, 2000b; Scheinsohn and Szumik, 2007). One of the recurring questions in archaeological literature focused on how the space within the forest and the steppe was used.

Although ancient occupations have been registered in forested areas of Northern Patagonia, Monteverde in Chile, (Dillehay, 1997; Dillehay et al., 2015), El Trébol site (Hajduk et al., 2006) and Cueva Traful in Argentina (Crivelli Montero et al., 1993), it is only since the Late Holocene that a clear archaeological occupation is detected (Bellelli et al., 2007, 2008; Scheinsohn and Szumik, 2007). Archaeological records indicate different modes of occupation and/or exploitation of the Sub-Antarctic forest over time and space. One approach states that forests are exploited from the steppe. A logistic occupation through mobility including the steppe and the steppe-forest ecotone is proposed for example, in the areas of Traful and Los Alerces. A second approach states that some populations lived in the forest permanently. This approach involves the presence of populations from the western slope of the Andes and the use of plants in the area of Meliquina (Fernández et al., 2013; Pérez and Aguirre, 2013). Investigations carried out in southwestern Río Negro and Chubut provinces indicate a progressive increase in the number of cultural contexts after 3500 cal yr BP Fernández et al., 2013). For this period, populations associated with the steppe would have increased their permanence in the forests (Bellelli et al., 2003; Fernández et al., 2013).

Paleoenvironmental studies at the forest and the steppe-forest boundary contributed with both, climate and habitat scenarios for Patagonian Archeology. In early fossil pollen studies developed in the

* Corresponding author.
E-mail address: administracion@inapl.gob.ar (Y.S. Giaché).

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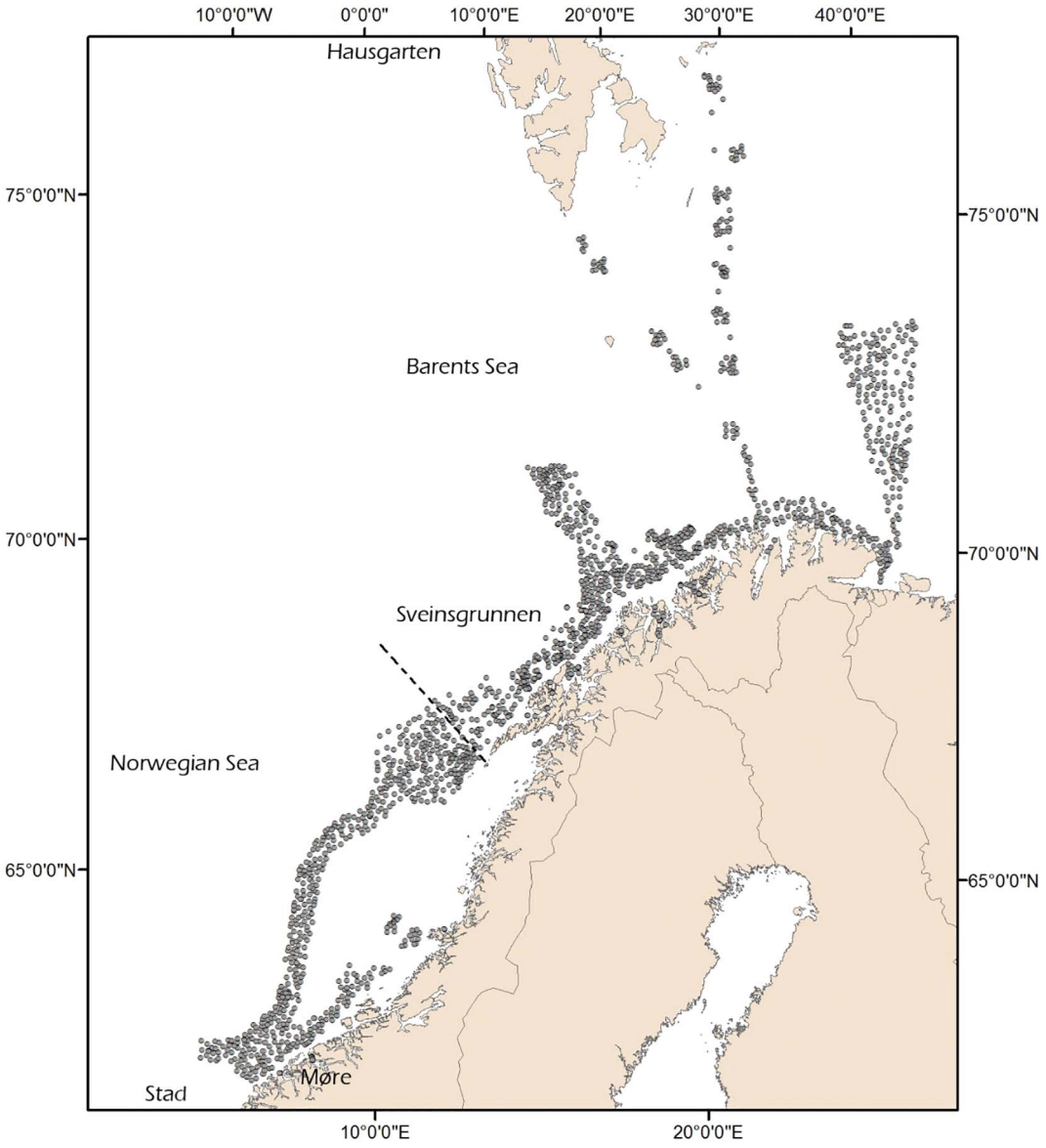

Fig. 1. Geographic location of the study area, paleoecological sites and archaeological sites.

Chilean Lake District (Heusser et al., 1996; Heusser, 2003 Villagrán, 1988) and in the area of Nahuel Huapi National Park (NHNP) (Markgraf, 1983, 1984), both vegetation and glacial histories have been taken as evidence of the timing, magnitude, and frequency of latitudinal changes in the westerly winds since the Late-glacial times (Heusser et al., 1996). In addition, the pollen-vegetation links studied from shelters, and caves, as well as peat bogs, ravines and outcrops associated to archaeological sites provided scenarios to the dwelling sites of native populations (de Porras, 2010; Mancini et al., 2008; Páez, 1991; Páez et al., 1999).

This paper present our first results for El Valle del Río Manso history since late Glacial times, with special reference to the dynamics of humid forest structure and composition, depicted from lake sediment pollen and charcoal analyses. The long-term history of humid forest is contrasted to published archaeological evidence in an attempt to understand the natural and antropogenic causes of landscape transformation.

2. Site location and field work

El Laguito del Morro (41° 31′ 54.0 S, 71°48′ 25.2 W) is a 6 m deep small lake located in the humid forest of the Río Manso Inferior valley (Fig. 1). At least 2000 mm annual precipitation coming from the South Pacific Ocean allows the ingression of Valdivian forest elements to the westernmost portion of the valley. *Fitzroya cupressoides*, *Weinmannia trichosperma*, *Podocarpus nubigenus* and a variety of vines and ferns coexist with dominants of tree and understory *strata, Nothofagus dombeyi* and *Chusquea culeou*, respectively. The lake is surrounded by a *Sphagnum* peat bog with shrubs of *Escallonia virgata*, *Gaultheria mucronata,* saplings of *Austrocedrus chilensis* as well as a variety of ferns.

Sediment cores were extracted from the lake using a Livingstone corer and sampled for radiocarbon dating, pollen and charcoal analyses. Cores correlation was done by magnetic susceptibility analysis.

3. Materials and methods

3.1. Lithology

Core lithology showed a sequence of organic-rich sediments (gyttja) with several interspersed tephra layers, beginning with greyish-brown organic clay (700–800 cm), overlain by dark brown organic silt (0–700 cm). Volcanic ash layers variate in thickness (0.5–8 cm), grain size (pumiceous-silt) and color (dark grey-white) (Fig.3). Several