



Using combined biomolecular methods to explore whale exploitation and social aggregation in hunter–gatherer–fisher society in Tierra del Fuego



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ABSTRACT

Cetaceans were an important food and raw material resource for the South American hunter–gatherer–fisher (HGF) communities of Tierra del Fuego. Historic ethnographic evidence suggests that relatively mobile HGF groups came together in large numbers to exploit carcasses from individual cetacean stranding events. Substantial accumulations of whale bones within shell middens in the Lanashuaia locality of the Beagle Channel suggests that these social aggregation events may also have occurred in pre-historic periods. The difficulty in assigning taxonomic identifications to the fragmentary whale remains, however, made it difficult to explicitly test this hypothesis. Here, we applied two different biomolecular techniques, collagen peptide mass fingerprinting (ZooMS) and ancient mitochondrial DNA analysis to 42 archeological bone fragments from the Lanashuaia locality to provide accurate species identifications. There was a clear correspondence between ZooMS and DNA results, identifying five different cetacean species (Southern bottlenose, blue, humpback, right, and sei whale) as well as human and sea lion remains. The biomolecular results were not conclusively consistent with HGF social aggregation, revealing an unexpectedly diverse range of cetaceans within the Lanashuaia middens. However, the results could not fully refute the hypothesis that cetacean remains can be used as anthropic markers of aggregation events, as the observed species and haplotypes revealed potential shared exploitation of some whale resources between midden sites.

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1. Introduction

Cetaceans constituted a significant resource for hunter–gatherer–fisher (HGF) societies who lived at the uttermost tip of South America (Tierra del Fuego). Whale meat and blubber provided important nutritional sources, while whale bone was used as a raw material for tool manufacture (Borella, 2004; Piana, 2005; Scheinsohn, 2010). Fuegian societies, however, had not developed specific technology to hunt these mammals in the open sea; instead they primarily exploited individuals that drifted ashore (Gusinde, 1937). According to historical

sources when a beached whale was discovered, an aggregation event occurred, bringing people together to share the meat in a feast and to distribute other cetacean resources (Gusinde, 1937). Thus, whale remains provide a potential anthropic marker of aggregation processes in the HGF societies of Tierra del Fuego.

The presence of abundant cetacean remains at the sites of Lanashuaia I and II, two pre-contact shell middens located on the northern coast of Beagle Channel (Tierra del Fuego, South America) (Fig. 1), potentially reflects aggregation events focused on the exploitation of a single stranded animal. Fragmentation of the cetacean remains as a result of human activities precluded accurate taxonomic identifications based on traditional osteological techniques, thus an accurate assessment of the whale taxa present, and the minimum number of individuals (MNI) represented, could not be made. Consequently, in this study we applied biomolecular methods, based on collagen peptide mass fingerprinting (ZooMS) and ancient DNA, to achieve a twofold objective: a) to explore the cetacean species exploited by HGF groups;

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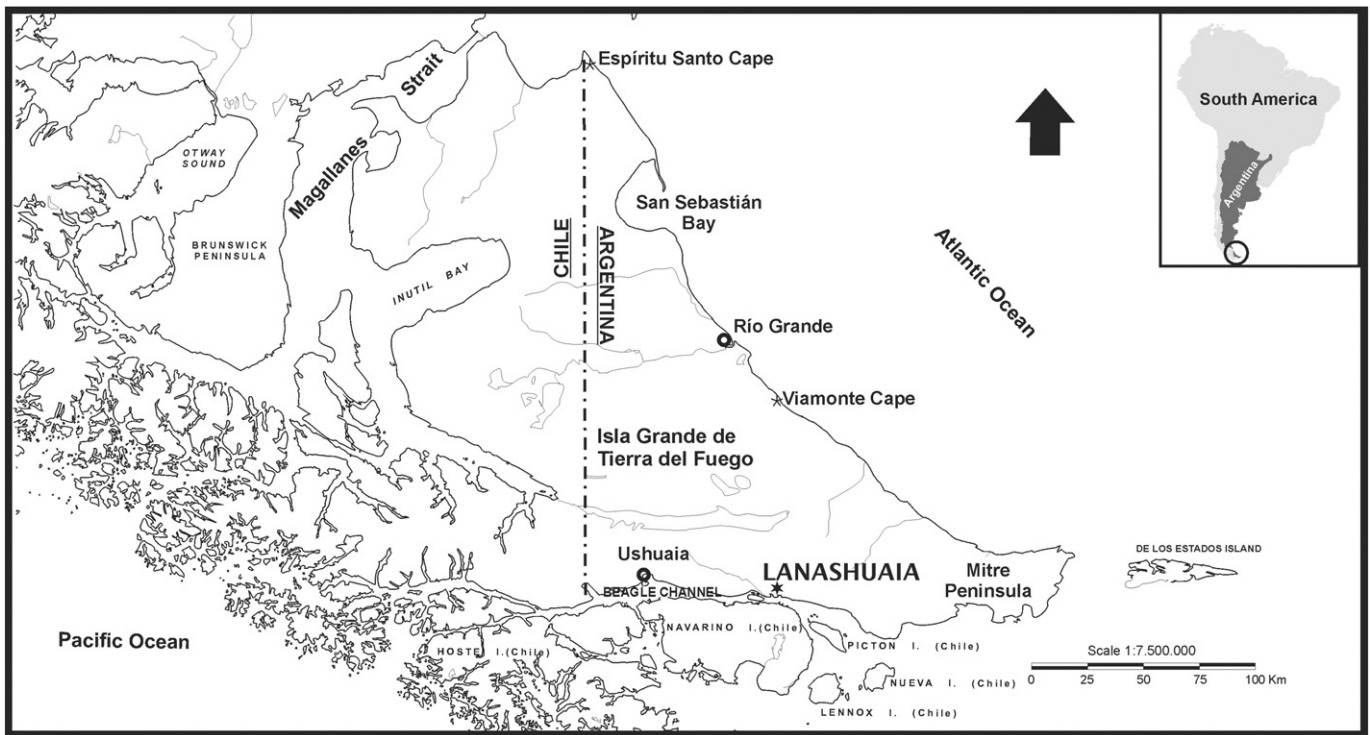


Fig. 1. Map of the Lanashuaia locality.

and b) to assess if whale bones are suitable material markers for identifying aggregation events in the region.

1.1. Aggregation in HGF societies of the Beagle Channel

Aggregations, or short-term gatherings of otherwise dispersed groups, are an important element in the social life of hunter-gatherers. Communal aggregations are an arena for dynamic social interaction and the promotion of cooperative activities (Conkey, 1980; Friesen, 1999; Hayden, 1993; Hofman, 1994; Kelly, 1995; Weniger, 1987). Ritual celebrations, economic cooperation, information exchange and exploitation of windfall resources (among others) bring people together in temporary concentrations. The situations under which an aggregation might occur are quite variable, and thus, the material correlates of an aggregation process are difficult to identify. The archeological record of the Beagle Channel in general, and the Lanashuaia site in particular, offers an extraordinary context to investigate aggregations as well as to explore novel methodologies in the archeology of HGF societies. The particular advantages of the pre-contact Lanashuaia site are: a) the excellent preservation of bone provided by shell midden layers due to the presence of calcium carbonate; b) the high-resolution stratigraphy of these kind of contexts; c) the rich archeological and ethnographic record of HGF societies of Tierra del Fuego, who called themselves Yámana or Yaghan during historical times (Gusinde, 1937, p. 986).

Using nautical technology, Yámana society developed an intensive exploitation of maritime resources (Gusinde, 1937, p. 986; Lothrop, 1928; Orquera et al., 2011). Ethnographic accounts of Yámana society from the 19–20C (Bridges, MS: 05-05-1872; 01-15-1872, 03-19-1872; Lothrop, 1928; Gusinde, 1937) indicate that sporadic episodes of social aggregation occurred following windfalls, including mass strandings of Fuegian sardines (*Sprattus fuegensis*, Jenyns), termed *aicasi* in the Yámana language (Bridges, 1933), or when a whale came ashore. When a stranded cetacean was found, the discoverer was to send specific smoke signals to notify nearby people; if the signals were detected, a social aggregation event took place (Gusinde, 1937, p. 990; Martial, 1888, p. 181) (Fig. 2).

These events had unique importance to Yámana people for two reasons: they provided an exceptional accumulation of food and afforded the conditions to enhance social capital through a public demonstration of generosity (Briz et al., 2014; Gusinde, 1986, pp. 789–790). Nevertheless, although aggregation episodes are clearly documented in historical sources, their material remains are difficult to identify in the archeological record. This problem is compounded by the fact that there are over 500 shell middens recorded along almost 200 km of coast in the Beagle Channel area, representing more than 7000 years of occupation (and potentially re-occupation) (Orquera et al., 2011); therefore, identifying simultaneously occupied structures and shared social practice can be challenging. This project sought to identify the species of cetaceans exploited by HGF groups, and explore whether accurate biomolecular identification of cetacean taxa could provide a new anthropic marker of social aggregation in these pre-historic societies. The archeological expectations, according to the ethnographic accounts, would be that the majority of identified cetacean bones occurring within contemporaneous deposits within particular middens would belong to the same animal, and thus the same species.



Fig. 2. Drawing of Yámana people butchering a whale (19C), by Giacomo Bove (1883). (Legoupil, 2003, p. 133).

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