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Testing an ethnographic analogy through geometric morphometrics: A comparison between ethnographic arrows and archaeological projectile points from Late Holocene Fuego-Patagonia

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ABSTRACT

Under certain conditions, ethnographic analogies can help to shed light on past behaviors registered in the archaeological record via observation and model-building from modern societies. In this context, ethnographic weapons are often used as morphometric models to assign a given function to archaeological projectile points. For southern Patagonia, J. Bird proposed a functional analogy between arrows used by the Ona (also known as Selk'nam), a hunter-gatherer group that inhabited northern Tierra del Fuego during historical epochs, and the type V Late Holocene projectile points from southern continental Patagonia. Based on the similarity in terms of small size and shape attributes between the type V archaeological points and Ona (Selk'nam) ethnographic arrows, Bird proposed that the former were arrow points. Here we test the morphometric analogy based on comparisons of size and shape variables defining Ona (Selk'nam) arrows from museum ethnographic collections, and type V projectile points from southern Patagonia archaeological sites. Then, we assess the relative importance of projectile point reduction as a source of morphometric variation. We compared both, archaeological and ethnographic points using geometric morphometrics and multivariate statistical analyses. Results showed significant shape differences between ethnographic and archaeological samples before and after controlling for size and reduction parameters, suggesting that both kinds of points had different designs and life histories. However, when spear-like points are included in the comparison, Ona (Selk'nam) and type V points tend to cluster together. The results obtained from this broader comparison framework suggest that, when functional diversity and reduction effects are taken into account, ethnographic weapons can be considered as useful morphometric models to infer the function of archaeological points. Our results highlight the importance of considering similarities in environment, subsistence, mobility, tool design constraints, and lithic characteristics prior any extrapolation based on ethnographic analogies.

1. Introduction

Ethnographic analogies are based on the analysis of variation patterns known from ethnographic or historical sources to infer or reconstruct technological behaviors that evolved on a different group, whose characteristics can only be inferred from archaeological evidence. Nevertheless, comparisons between contemporary and prehistoric societies cannot be made without caveats (Wobst, 1978; Binford, 1967; Spence, 2011; Currie, 2016, among others). As Wobst (1978) pointed out, the anthropological literature may be partly determined by constraints on ethnographic fieldwork and its particular boundaries of space, time and behavior patterns. Therefore it may be insensitive when dealing with behavioral variability in the archaeological record, which is expressed across larger units of space and time, a problem labeled as "the tyranny of the ethnographic record" (Wobst, 1978).

To cope with some of the abovementioned limitations, at least two conditions must be achieved. Firstly, some degree of historical continuity between the archaeologically-observed unit and the ethnographically referenced society must exist. Secondly, environmental similarity is important to maximize the utility of the analogy, under the basis that similar environments are likely to be exploited in similar ways (Binford, 1967). One way of ensuring that analogy-driven reconstructions are useful is to ask whether the behavior that one is trying

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to reconstruct has been previously documented in the ethnographic record, and if so, under what circumstances. These general criteria, whose significance has been addressed by archaeologists from different backgrounds, can be further explored using ethnographic weapons as a study case. Specifically, since preservation problems of the perishable materials (e.g. wooden shafts and bows) impede the archaeological recovery of the complete lithic point's technical system, ethnographic analogies become a very valuable, alternative source of information to infer the function of archaeological projectile points (Ratto, 2003; Shott, 1997; Thomas, 1978, among others). Moreover, fundamental similarities in subsistence, mobility, tool-design constraints, and lithic technology, for instance, generally enhance the linkage between the ethnographic model and the concomitant archaeological record (Hayden, 2015). As Hutchings (2016, 9) pointed out, the historical approach may reasonably be employed to construct functional hypotheses when, for instance, the breakage patterns associated with thrusting- and projectile-weapons are also observed in point types already reported as weapon tools.

Among weapon systems, bow and arrow technology is a relatively recent innovation, despite of its ubiquitous use in historical times (Ames et al., 2010; Hughes, 1994; Shott, 1997, among others). Archaeologists are usually interested in addressing questions such as when and why this technology was adopted, whether it was enough efficient to replace spear systems, if the replacement was abrupt or gradual, or if both kinds of technologies were used for different targets and/or contexts (Shott, 1997, see references therein). For this reason, the identification of arrowheads in the archaeological record is a fundamental issue, as well as a problematic one when the whole weapon system is unpreserved. In this context, ethnographic models are useful to estimate some parameters that could serve as proxies to assign a function to archaeological points. Such estimations must follow a careful, deductive procedure, thus avoiding straightforward and reductionist extrapolations from ethnographic data to the archaeological record (Binford, 1967).

In his seminal works in Fuego-Patagonia, Junius Bird (1938, 1946, 1988) indicated a large form similarity between historical Ona (i.e. Selḱnam) arrows from the Isla Grande of Tierra del Fuego (southern insular Patagonia) and projectile points recovered in Late Holocene archaeological sites located on mainland (southern continental Patagonia). According to this ethnographic analogy, and considering the smaller size of type V points in relation to older archaeological points such the type IV ones (see Charlin and González-José, 2012 for a comprehensive review on both types), Bird suggested that type V points were used as arrows. Further reports based on functional models and mophofunctional expectations suggested the simultaneous use of arrows and spears during the Late Holocene (Banegas et al., 2014; De Azevedo et al., 2014; González-José and Charlin, 2012; Ratto, 1994). A recent date of 1670 ± 30 BP for a bone spear thrower hook from Fell cave, recovered in 1959 and stored in the Instituto de la Patagonia (Magallanes University, Punta Arenas, Chile. Prieto and Mena, 2016) bring support to these suggestions. Even though several of the above-mentioned studies were focused on identifying functional variations on late archaeological projectile points of southern Patagonia, the size and shape similarities between Ona (Selk'nam) arrows and type V projectile points is a common assumption that is still to be formally tested. As Binford (1967) has emphatically argued archaeologists have generally used the analogy with ethnographic data as a means of "interpreting" archaeologically observed phenomena, rather than as a way to fuel new research avenues. Therefore, our aim here is threefold. Firstly, we aim to assess the Bird́s suggestion of similarity between archaeological and ethnographic points by comparing size and shape variables measured on Ona (Selk'nam) arrows from museum ethnographic collections, and type V projectile points from southern Patagonia archaeological sites. Secondly, we estimate the potential impact of projectile point reduction in the observed morphometric variation. Finally, we discuss the utility of ethnographic models to estimate projectile point's past functions. In this context, we will highlight the importance of taking into account similarities in environment, subsistence, mobility, tool design constraints and lithic technology characteristics prior to any extrapolation based on ethnographic analogies.

2. Materials and methods

2.1. Regional background

After the pioneering archaeological research in Fell and Pali Aike caves (Magallanes, Chile), which provided solid evidence of ancient human occupation, J. Bird defined a regional, southern continental Patagonia settlement sequence from ca. 11,000 BP to historical times (18th century). It distinguishes five prehistoric periods prior to the European contact according to artifact types and faunal remains (Bird, 1938, 1946, 1988). Among stone tools, projectile points and scrapers' shape and size were the key traits used to discriminate among periods (Bird, 1946). Thus, periods IV and V, corresponding to the end of the prehistoric (Late Holocene) sequence, were defined on the basis of the presence of two specific projectile point types: IV or Patagonian- and V or Ona-points, respectively. Both point types were named according to the ethnographic groups known in historical times for southern continental and insular Patagonia, respectively.

The Ona (Selk'nam) were hunter-gatherers specialized in land resources, mainly guanaco (*Lama guanicoe*), who occupied northern Tierra del Fuego at the arrival of Europeans (Borrero, 2001; Chapman, 1986 [1982]). "Ona" was the name used by the Yámana, a marine hunter-gatherer group settled in the coast of the Beagle channel and southernmost islands of the archipelago of Tierra del Fuego, to refer to their northern land neighbors, who, in turn, recognized themselves as Selk'nam (Bridges, 1952). Some of the Ona (Selk'nam) weapons, as well as other kinds of artifacts, are currently stored in several museums across Argentina, Chile and Europe (see Charlin et al., 2016; Prieto and Cárdenas, 2002, 2006). Based on the morphological similarity between the archaeological projectile points belonging to the Period V (ca. 700 BP) and the ethnographic Ona (Selḱnam) arrows stored in museums, Bird labeled the Period V archaeological projectile points as "Ona points" (Bird, 1983, 1988). Such similarity also led him to note that "Small arrow points of a type characteristic of the *Ona* associated with other typical *Ona* artifacts (…) show the relative late presence of this tribe on the mainland" (Bird, 1946, 20). Hence, Bird proposed that this group had inhabited mainland areas during prehistoric times, a claim strongly questioned by other authors (Borrero, 1989–1990; however see Goñi, 2013). It is worth mentioning that during the Pleistocene and Early Holocene, the Isla Grande of Tierra del Fuego was connected to the continent due to lower sea-levels (McCulloch et al., 1997, 2005). This and other data suggest that early southern Patagonian hunter-gatherer populations shared a common population origin (González-José et al., 2001, 2002, 2004, 2008), a subsistence strategy based on guanaco hunting (Borrero, 2003; Massone, 1987, 2004; Mengoni Goñalons, 1987), and a lithic technology for weapons known as Fishtail projectile points (Bird, 1946, 1988; Jackson, 1987; Massone et al., 1993; Nami, 1985–1986; Prieto, 1991, among others). However, after the formation of the Magellan strait, ca. 8000 BP (McCulloch et al., 1997, 2005) mainland and Fuegian populations remained divided and isolated, an event that triggered a long-term cultural divergence process (Borrero, 1989–1990).

In order to assess the incidence of this process on stone tool evolution at both sides of the Magellan strait, Cardillo et al. (2015) compared the composition of late lithic assemblages, and detected significant differences in tool types abundance and occurrence between southern continental Patagonia and northern Tierra del Fuego samples. An important result of this work was that the assemblage composition was not related to environmental variations, a common assumption held on inter-regional comparisons (Cardillo et al., 2015). In parallel, Charlin et al. (2013) explicitly tested the null hypothesis of