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Modern and archaeological owl pellets as paleoenvironmental and taphonomic markers in human occupation contexts in the Ongamira Valley, Córdoba, Argentina

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ABSTRACT

The presence of microvertebrates in archaeological sites can be attributed to a variety of causes, including natural ones, such as the regurgitation of microvertebrates consumed by various predators. Determining the origin of these remains is therefore of great importance to our understanding of site formation processes. In addition, the detailed study of these remains can provide complementary data on such topics as the composition of biocenoses, palaeoenvironments and the seasonality of deposits. In this study, we analyzed modern sets of regurgitated pellets of the barn owl (*Tyto alba*) from the Alero Deodoro Roca site (ADR), Ongamira, Córdoba, Argentina. We compared the results with those from archaeological microvertebrates from excavations at ADR, dating to the Late Holocene (ca. 1900–3600 years BP). Most of the archaeological assemblages show the same composition as those of the modern pellets produced by Strigiformes. However, we observed variation in the representation of taxa, reflecting environmental changes over time. Using current temperature and humidity data to compare the assemblages, we observed that some results could be related to Holocenic climatic variations, already described by other studies. Furthermore, this research suggests that Strigiformes may occupy the rockshelters in Autumn-Winter, at which time the site (ADR) would not have been occupied so intensely by human populations.

1. Introduction

The study of hunter-gatherer societies that inhabited caves and rockshelters in the province of Córdoba (Argentina) allows us to analyze the relationship between humans and other inhabitants of those spaces, namely the barn owl (*Tyto alba*). Like other Strigiformes birds, the barn owl is one of the main predators of small mammals, birds and arthropods. The actualistic study of their feeding habits by examination of their regurgitated pellets can be used for multiple lines of research. Firstly, by studying these predators' preferred environments, their hunting behaviors, how they eat and digest their prey, and how they modify their diet today, we can gain a better understanding about these same processes in the past. That is, examination of the preferential environments of modern predators will help us to make more precise paleo-ecological interpretations.

Secondly, analyzing the taphonomic condition of microvertebrates recovered in archaeological contexts helps us understand the origin of their deposition (anthropic, bird regurgitation, or death in caves and/or burrows), and also contributes to an understanding of archaeological site formation processes.

Thirdly, in prehistoric assemblages, studying the taxonomic variability represented in the *Tyto alba* diet will provide us with information and new interpretations on the seasonality of human occupation. Furthermore, a better understanding of the variation of the barn owl diet complements other environmental fine grain data, facilitating development of more precise paleoenvironmental models.

In particular, *Tyto alba* trophic habits and feeding behaviors have been studied throughout the Southern Cone of South America (e.g., Bellocq, 2000; Pardiñas and Cirginoli, 2002). In Argentina, for example, research productivity in paleontology and biology is greater in the central and southern regions of the country (Pardiñas and Cirginoli, 2002 and references there mentioned), and to a lesser degree, in the northwest and northeast (Pardiñas and Cirginoli, 2002; Bó et al., 2007; Nanni et al., 2012). Although the present-day provincial territory of

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Córdoba, which is part of Argentina's central region, was an area of active research until the late 1990s, a decrease in such work over the past two decades indicates a necessity to deepen and update these studies in our region (e.g., Kravetz, 1978; Massoia et al., 1987; Nores and Gutiérrez, 1990; Diéguez and Corbella, 1997).

Moreover, there is a dearth of research on archaeological sites in Argentina in which microvertebrate skeletal remains of taphonomic origin have been identified in owl pellets (e.g., Fernández et al., 2011a, 2011b, 2012; Fernández and De Santis, 2013; Mignino, 2017).

From an archaeological and taphonomic perspective, owl pellets have been considered good estimates of the current taxonomic composition of small vertebrates and invertebrates in a region, offering the possibility of obtaining parameters for comparative actualistic frameworks and for paleoenvironmental studies (e.g., Teta et al., 2005; Ortiz and Jayat, 2007; Fernández et al., 2011a, 2011b; Santiago, 2012; López et al., 2016; Mignino, 2017). This implies that, given certain stenoic features, such as high sensitivity to environmental changes, the small vertebrates have been configured as (bio)indirect indicators of environmental contexts, allowing one to generate climate reconstruction models and articulation with other proxy data of this nature (e.g., Andrews, 1990, 1995; Betancourt et al., 1990; Crivelli-Montero et al., 1996; Fernández-Jalvo, 1996; Pardiñas, 1998; Ortiz and Jayat, 2007; Fernández et al., 2011a, 2011b, 2012; Santiago, 2012; López et al., 2016; Mignino, 2017).

Owl pellets, or regurgitation balls, are hair, bones, teeth, feathers, and insect cuticle accumulations (i.e., those parts not processed) that birds of prey expel through the mouth after digestion of softer parts. Pellets can be found in abandoned buildings, warehouses, at the foot of light poles, in creek gully caves, or in any space occupied by owls or diurnal raptors. Their study represents a minimum-intervention, non-invasive methodology, without environmental impacts (Pardiñas and Teta, 2012). The systematic collection of pellets produced by modern birds of prey provides a good understanding of the seasonal variation in the diet of these animals. At the same time, and from a taphonomic point of view, it allows us to reduce an implicit bias related to the presence of small animals in archaeological sites associated with the trophic habits of this type of bird (e.g., Andrews, 1990, Montalvo et al., 2014, Lloveras et al., 2012).

Both qualitative and quantitative variations represented by the regurgitated pellets are subject to a number of exogenous and endogenous factors. The former involves the main modeling forces of numerical variations in small vertebrate populations in different geographical contexts (e.g. Gutiérrez et al., 2010), such as climate and availability of resources.

On the other hand, some endogenous or intrinsic factors (e.g., prey plasticity, reproduction) also show not only quantitative and qualitative variation in the diet of these birds, but also changes in the frequency of regurgitations in sectors where there is continuous sampling (Nores and Gutiérrez, 1990; Bellocq, 2010).

However, when making inferences about paleoenvironmental contexts, we must be careful to consider ethological habits such as hunting behaviors or stages of reproduction linked to climatic factors, that may significantly impact the dynamics of bird population, small mammals and insects, among others (e.g., Leirs et al., 1997; Forchhammer et al., 1998; Grenfell et al., 1998; Loeville and Ghil, 2004; Bellocq, 2010).

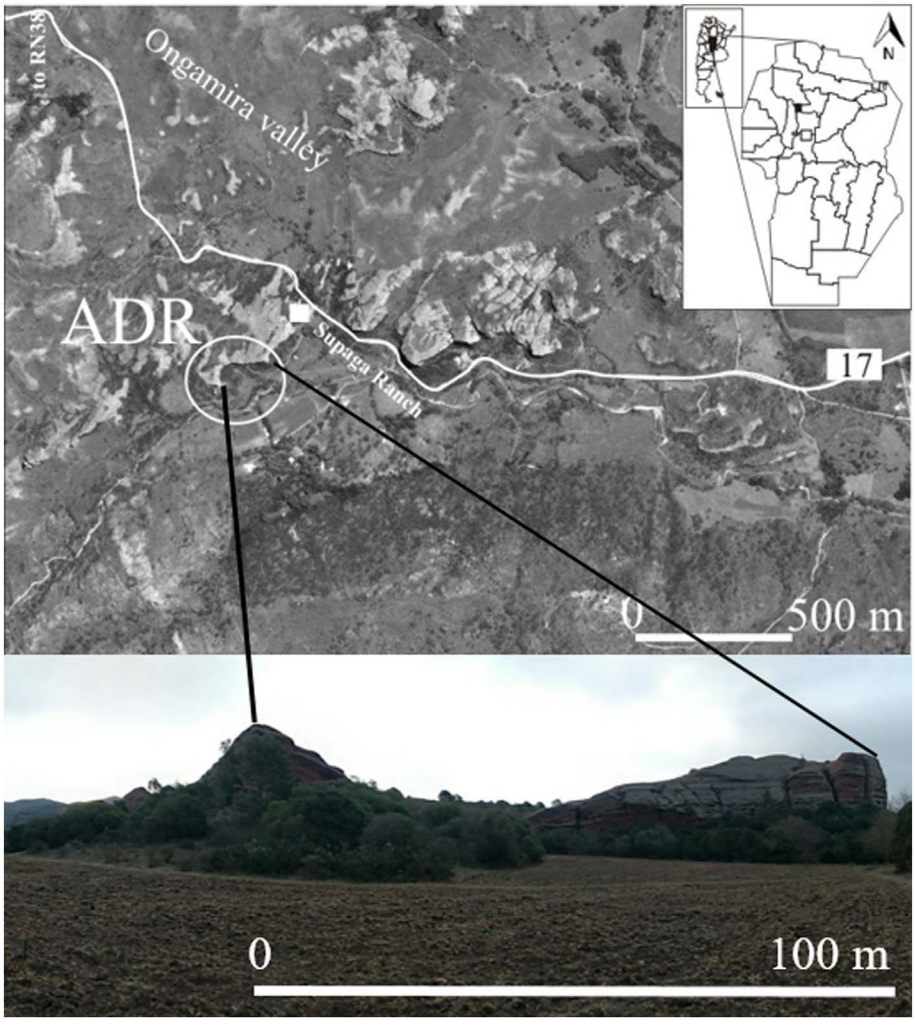

Fig. 1. Location of the archaeological and actualistic sample area and general view of the Rockshelter.

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