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Experimental and observational research in Zooarchaeology: Scopes, limitations and future perspectives



The symposium *The contribution of actualistic studies in zooarchaeological analyses: scope, limitations and future perspectives* (“El aporte de los estudios actualísticos en los análisis arqueozoológicos: alcances, limitaciones y perspectivas” in its original language), was part of the V Congreso Nacional de Zooarqueología Argentina that was held on April 2019 in Catamarca, Argentina. In agreement with the relevance that these types of studies have reached in the zooarchaeological research in the last 30 years, the aims of the symposium were to generate a place of critical reflection on the different perspectives of analysis and on the limitations of their application, to learn novel methodological designs and to analyze diverse study cases. The symposium had a precursor one: *New Perspectives in Actualistic Taphonomy in Argentina: Limitations, Contributions, and Archaeological Implications*, chaired by [Alunni and Álvarez \(2017\)](#) during the IV Congreso Nacional de Zooarqueología Argentina Ushuaia, 2016. It was a significant starting point focused on the advances in taphonomy in Argentina. In our proposal, we broaden the scope to all studies within the frame of experimental and observational research that contribute to understanding the origin and modifications suffered by bone in archaeological sites. As a result, fifteen contributions were presented during this symposium and seven of them are published in the present Special Issue as selected papers. We added an invited paper ([Scheifler et al., 2020](#)) for its relevance to the issue.

The observation of modern processes in action, the inference of causal relationships between processes and the identification of patterns for generalizations are the bases of these studies ([Binford, 1981](#); [Lyman, 1994](#); [Marean, 1995](#)). The models that arise become interpretative tools for understanding the fossil record ([Marean, 1995](#)). These approaches are based on uniformitarianism, that is to say, the existence of invariable physical laws through time. Thus, it is possible to link present experiments and observations to actions and processes that occurred in the past ([Gifford-Gonzalez, 1991, 2018](#)). Reasoning from analogue is the logical rule behind the uniformitarianism; it is a type of reasoning which produces an inference about an unknown property or phenomena (Lyman and O'Brien 2001). Nevertheless, as was pointed out by [Pobiner and Braun \(2005\)](#), there are some risks from the direct application of experimental studies to the archaeological record because it is impossible to reproduce. Instead, experimental and observational information should be a guide to interpret the record.

Three main lines are included: experimental and naturalistic taphonomy, experimental archaeology and ethnoarchaeology. Each of them have broad backgrounds that come not only from Archaeology, but also from other sciences such as Paleontology, Biology, Anthropology and Geology (e.g. [Alunni and Álvarez, 2017](#); [Andrews, 1990](#); [Borrero, 1988](#); [Behrensmeyer and Kidwell, 1985](#); [Fernández-Jalvo et al., 2011](#); [Gifford-Gonzalez, 1991, 2018](#); [Gutiérrez et al., 2018](#); [Martínez et al., 2020](#)). In

the framework of taphonomy, the researcher observes or replicates natural processes and agents in action and registers their material results for establishing general patterns. Experimental archaeology offers an empirical approach to the archaeological record through the controlled reconstruction of processes and practices through a dynamic and hypothetical work. Experiments applied on archaeological research contribute with the generation of new data and questions, broaden our interpretative skills and also are models of contrasting hypotheses enunciated from previous knowledge ([Pijoan López, 2001](#); [Vila and Estévez, 1999](#)). Ethnoarchaeological research conducted within different societies, based on several models about the processing, transportation, social meanings, cooking – among other issues – of fauna (e.g. [Binford, 1981](#); [Gifford-Gonzalez, 1989](#); [Lupo, 2001](#); [Politis, 2007](#)). These models are used to understand and to make inferences upon the archaeofaunal record worldwide and herein to interpret site functionality.

This Special Issue brings together original research derived from diverse zooarchaeological questions, including the analysis of natural agents and environmental processes related to bone accumulation and dispersion; modern human-animal interaction used to model this relationship in the past; experimentation dedicated to replicate butchering process and techniques of manufacture and wear of bone tools. This research was performed in Argentina; notwithstanding, the methodologies and frames of references they propose are worthy of extensive application worldwide.

The role of different predators in site formation processes are assessed by three articles. [Scheifler et al. \(2020\)](#) deal with the identification of digestive traces produced by *Leopardus geoffroyi*. Results obtained showed that bones digested by this small-sized predator are extensively fragmented, showing light to heavy categories of digestion, and scarce tooth marks. These are key traits in order to identify the action of small-sized predators, however authors also handle equifinality problems when no tooth marks are present.

The article authored by [Montalvo et al. \(2020\)](#) analyzes the taphonomic attributes of digested bones recovered from pellets from the opportunistic raptor *Athene cunicularia* in central Argentina. The results allowed the assignment of this species to the category of moderate modifier, but with several attributes located in a different category with respect to the previous classification. Moreover, they emphasized the need for large fossil samples to enable a good evaluation of taxonomic diversity and consequently of prey body mass representation. Finally, they applied a new categorization of rodent skull breakage.

[López et al. \(2020\)](#) applied previous observational models to the study of an archaeofaunal collection of small mammals from Northern Mendoza (Argentina), in order to assess the cultural or natural origin of

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the deposit and to make inferences about paleoenvironmental conditions during the late Holocene. Through different methodologies, they concluded that the analyzed sample has a mixed origin, since both owls and humans were agents of accumulation. Based on the representation of mammals from different environmental areas they also interpreted the existence of greater environmental heterogeneity in the past.

Observations of naturally accumulated bones in different environments are tools for setting expectations about archaeological bone preservation and thus to identify possible biases in the archaeological record. This issue is assessed by two papers. Cruz and Muñoz (2020) developed taphonomic observations of modern bones of lesser rhea to evaluate the sequence of disarticulation and destruction of bone elements, as a means to understand the anatomical frequencies in zooarchaeological assemblages. They combined their results in a wide spatial scale with those of longitudinal or long-term observations. Taking into account archaeological data of this species, they concluded that two different processes, natural recycling and the human action of selective transport, can result in the same representation pattern of skeletal parts of this species; setting an equifinality problem.

Marchionni et al. (2020) contribute with fine-grained information from Patagonia comparing the potential of bone preservation in different geomorphological units through a predictive model using GIS. They proposed a hierarchy of the geomorphological units in relation to the conditions of preservation, from the units with high bone preservation (alluvial plains) to low potential of bone preservation (high plateaus); with intermediate units such as lagoon basin, hill, low basaltic plateau, plateau slopes.

The observation and measure of the role of burrowing fauna as disturbance agents of archaeological sites is another naturalistic approach included in this Virtual Special Issue. The paper from Álvarez et al. (2020) analyzes the action of armadillos (*Dasyproctidae*), as a frequent taphonomic agent in the Pampas region of Argentina. Authors evaluated the impact of armadillo burrows on the Hangar site, identifying the mix of archaeological and non-archaeological materials. The information generated from their study can be used in the interpretation of other sites affected by armadillos in similar habitats.

The replication of past human actions through experimental archaeology is shown by two papers. Pal et al. (2020) present an experimental program through the replication of archaeological bone tools and the application of a functional analysis framework with the aim of identifying, describing and differentiating the production traces from use-wear traces on bone artifacts from the Fuegian steppe. The results enable them to differentiate and define the microscopic traces related to the manufacturing techniques implemented in the production sequence: scraping, abrasion and sawing, as well as identify and describe the use-wear traces of different resources (wood, hide, bark, soft vegetable).

Coypu butchering process and cut marks derived from different actions involved in the processing is assessed by Escosteguy (2020) from five events of experimental butchery. These events were carried out by *nutreros* (coypu hunters) and hunters from Buenos Aires Province (Argentina). From these experiments stands out the significance of the butcher's skill in the processing of small mammals and its value in the generation of cut marks. Additionally, this study supports previous interpretations made from the archaeological record, while questioning others and alerting readers about equifinality.

All the results obtained in this VSI helped to identify functional or causal relationships between agents or processes and modified bones or carcasses and improve the accuracy of interpretation. Different causes may, however, produce the same effects, thus leading to equifinality problems. All the articles deal with these problems and reflect the limitations of experimental and observational studies. This situation highlights a real problem to zooarchaeologists, which requires further research to sort out actors and their final effects (Gifford-Gonzalez, 2018).

It is important to recognize the potential of the different

experimental and observational studies that are being developed in Argentina. This situation reflects the growth of this kind of research, which contributes globally to understanding modern dynamics for developing inferences about past events. Therefore, articles in this VSI involving agents such as raptorial birds, small burrowing mammals or small carnivores could be compared with the impacts of similar animals from other localities, worldwide. In this sense, the experimental exploitation of mammals, for consumption or technological purposes, could also yield results useful for the understanding or interpretation of the archaeological record of other prey. On the other hand, naturalistic observations on a variety of environments contribute to comprehending diverse bone preservation. Some parallelism could be established between environments that have similar conditions.

Finally, we consider that including new experimental studies on our future agenda, will improve our knowledge of the genesis of bones recovered from archaeological sites with different chronologies and worldwide locations. There is still much work to do; we are convinced that the studies presented in this Virtual Special Issue are not finished, but constitute a solid basis for further research since new questions emerged. These, and future methodological developments and conceptual schemes, will be essential to the accurate understanding of past human-animal relationships. Other questions constitute searches of reference frameworks and conceptual schemes to produce models to allow the explanation of the social dynamics of the past, and / or to articulate the corpus of information obtained from other contexts and archaeological problems.

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