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Human-birds interactions during the Pleistocene in Southern Europe. An updated review

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Investigations into hominin diets, specifically those of the Neanderthals, ineluctably feed into debates that revolve around the presumed capabilities, or lack thereof, of these hominins in the exploitation of small game as a food resource [1]. This is the case of the human-bird relationship, so common nowadays but which provides a fascinating and somewhat controversial debate if we look back to the past. Birds appear to have always played a marginal or even non-existent role as a food source among the hominins that preceded anatomically modern humans. This is due to the birds' characteristics as small prey that is difficult to capture essentially due to their ability to fly and their elusiveness. Nevertheless, the fact is that in the late Palaeolithic (and before the emergence of productive economies), the presence of fast small mammals and quick-flying small animals appears to multiply in sites with anthropic presence. This led us to associate the intensive exploitation of these animals with anatomically modern humans, offering a variety of answers to this change in the selection of resources derived from parameters such as population growth and environmental, hunting and/or technological pressure [1]. However, these principles are based on theoretical and predictive models of human behaviour and the environment and they suggest further research to explore other possible variables that may cause certain alterations in the selection of resources, e.g. factors related to nutritional ecology, site functionality, mobility of human groups and/or sociocultural factors. In addition, the animals do not only provide meat but also other edible and non-edible resources that could substantially alter the predictions within the Optimal Foraging Theory [2] at certain times.

In the last few years, several studies have shown direct evidence of the anthropogenic use of birds prior to the arrival of anatomically modern humans in Europe, and especially from Late Pleistocene sites associated with Middle Palaeolithic industries. This evidence includes avian exploitation not only as a food source –either to complement the diet or as occasional sources– but also for the presumably ornamental use of their feathers, and the talons of large raptors [3]. These recent findings not only raise the possibility that other species of the *Homo* genus were able to occasionally vary the selection of resources according to certain variables (ability to adapt to the environment), but also reopen debates on cognitive, behavioural and symbolic skills among hominids of Neanderthal lineage.

Aside an ethnographic and historical perspective in bird studies, as well as on their potential to carry out palaeoclimatic and biogeographical reconstructions [4], the topics of our contribution mostly concern taphonomic studies (also based on experimental tests) of avian sets from the Middle Pleistocene and early Late Pleistocene, focusing on those generated in Neanderthal contexts of the Mediterranean Rim [5]. In all of them we observe the aforementioned dichotomy of human use of birds compared with anthropogenic sets in which no marks have been detected to link them to human activity.

The role of birds in assessing the complexity of Hominin subsistence and symbolic behavior plays an indisputable role, especially when the evidence of avifaunal resource exploitation occurs in different periods and cultures. Although their contribution in the diet balance is far from the amount of protein provided by herbivore prey, birds in the sites surroundings might be not an elusive resource, possibly favored by the ecological conditions. These conditions are not unique in the contexts taken into account and stimulate future investigations.

References: [1] Stiner, M.C., Munro, N.D., 2002. Approaches to prehistoric diet breadth, demography, and prey ranking systems in time and space. *Journal of Archaeological Method and Theory* 9, 181-214. [2] Smith, E.A., 1983. Anthropological applications of optimal foraging theory: a critical review. *Current Anthropology* 24, 625-651. [3] Romandini, M., Peresani, M., Laroulandie, V., Metz, L., Pastoors, A., Vaquero, M., Slimak, L., 2014. Convergent evidence of Eagle talons used by Late Neanderthals in Europe: a further assessment on symbolism. *PLoS One* 9 (7), e101278. [4] Negro, J.J., Blasco, R., Rosell, J., Finlayson, C., in press. Potential exploitation of avian resources by fossil hominins: An overview from ethnographic and historical data. *Quaternary International*, <http://dx.doi.org/10.1016/j.quaint.2015.09.034> [5] Blasco, R., Peresani, M. (eds), in press, Human-bird interactions in Prehistory. The humankind and the avian world: zooarchaeological evidence for inferring behavioural evolutionary signatures. *Quaternary International*.