An approach to the predator-prey power law in past ecosystems and the reconstruction of early human populations in Western Europe

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Introduction

- Knowing the characteristics of past ecosystems is of great interest because it allows us to gain deeper insights into how species evolved and what parameters may have conditioned them.

- We developed a paleosynecological model (PSEco) that estimates the production of meat from prey mammals and the densities and biomasses of secondary consumers that could sustain these resources.

- We applied PSEco to the rich fossil record of the archaeological sites of Orce (Granada, SE Spain) and Sierra de Atapuerca (Burgos, N Spain), which offers an exceptional opportunity to analyze the paleocommunities of early humans in the Iberian Peninsula.

- In a study of modern ecosystems, Hatton et al. (2015) (DOI: 10.1126/science.aac6284) observed that predator biomass scales to a power close to ¾ of prey biomass.

Figure 1. Relevance of the Orce and Sierra de Atapuerca sites in the first human dispersal in Europe, with a representation of their geographical location (from Google Earth), photographs of some of the sites analyzed in this work and a selection of the most representative hominin fossils.

PSEco

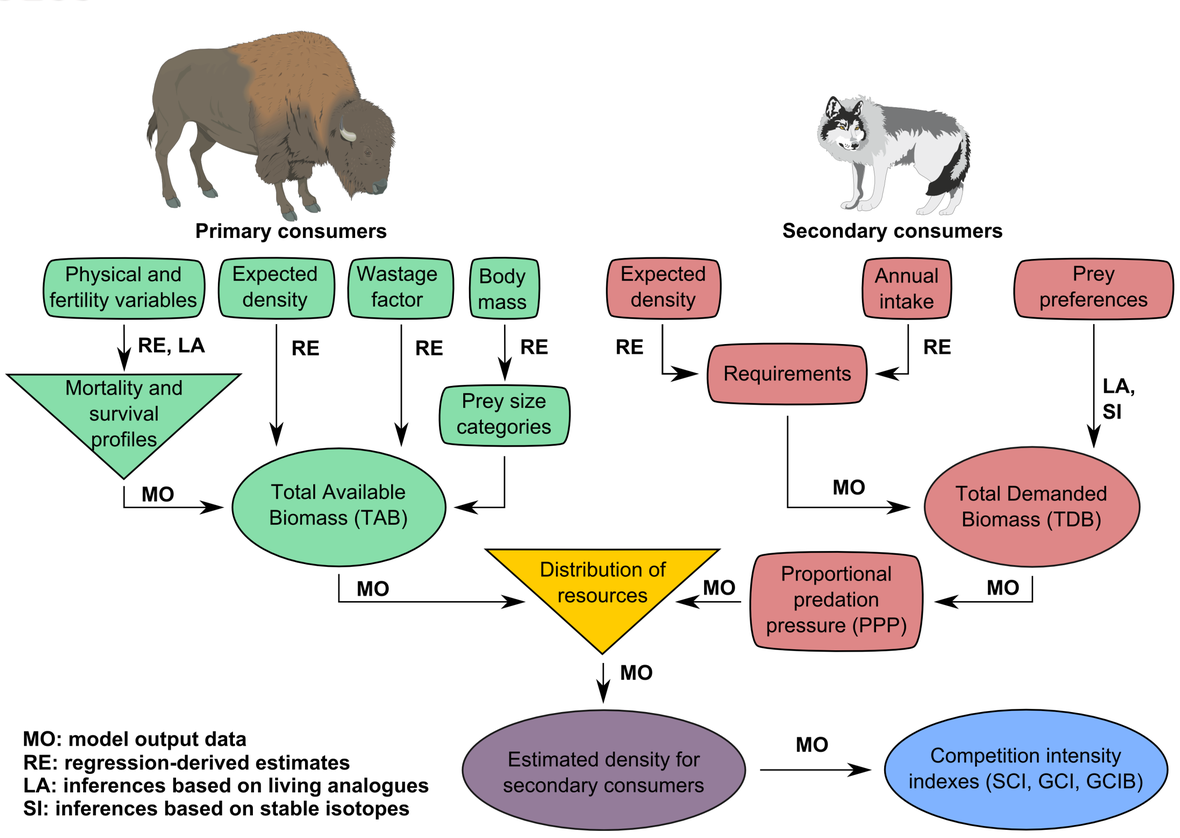

Figure 2. Flowchart diagram showing the components of PSEco used to evaluate meat resource availability of carnivores and hominins and intraguild competition

Aims

Test whether PSEco results for multiple faunal assemblages from Orce and Sierra de Atapuerca sites follow a predator-prey biomass ratio similar to Hatton et al. (2015).

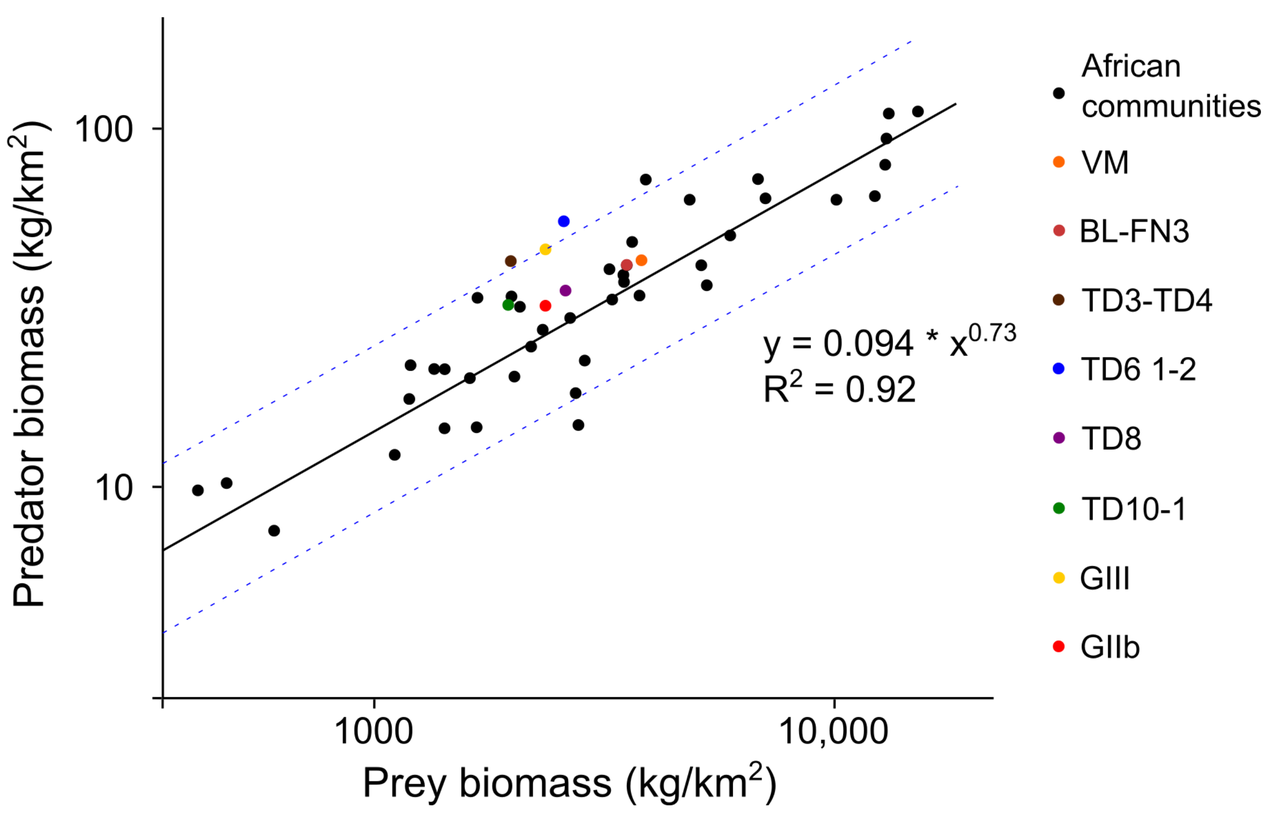

Figure 3. Scatter plots of prey-predator biomass ratios (kg/km²*year⁻¹) in the Orce and Sierra de Atapuerca faunal assemblages along with the African large mammal communities studied by Hatton et al. (2015).

Results

- Our paleosynecological model PSEco provides estimates of prey-predator biomass ratios similar to those observed in extant ecosystems.
- However, the estimates tend to be slightly higher than expected due to the weight of species that satisfy part of their nutritional requirements with resources other than the large herbivores.

Affiliations

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