

The meaning of niche: Cause or consequence of food-web structure?

Virginia Domínguez García* ¹, Sam Johnson ² and Miguel A. Muñoz ¹

¹ *Departamento de Electromagnetismo y Física de la materia, and instituto carlos I de Física Teórica y Computacional, universidad de Granada, 18010 Granada, Spain.*

² *Oxford Centre for Integrative Systems Biology, and Department of Physics, University of Oxford, clarendon Lab, OX1 3QU, United Kingdom*

The research in the field of ecological networks is becoming more and more relevant given the increasing pressure the ecosystems are facing, which makes the study of their topology specially interesting due to its interconnectance with the dynamical processes taking place in it.

Food webs - networks of predators and prey - have long been known to exhibit intervality: species can be ordered along a single axis in such a way that the prey of any given predator tend to lie on unbroken intervals. Although the meaning of this niche dimension has remained a mystery, it is widely assumed to be the reason behind the highly non-trivial structure of food webs. For decades, therefore, most food-web modelling has been based on assigning species a niche value by hand, with the niche model, one of their main exponents, becoming a kind of a benchmark for the study of food-webs.

However, going on empirical evidence and a simple self-assembling network model, in which species are added sequentially to the network and prey are selected according to their trophic level, a purely structural property, it can be shown that realistic intervality - and other features of general interest in the study of trophic networks - can come about as a consequence of biologically plausible mechanisms that do not require an a priori ordering.

With this in mind we can conclude therefore that the niche dimension is probably an artefact, which calls for a fundamental change in perspective as to how ecosystems arise and persist.

* virginia@onsager.ugr.es