STOCHASTICITY AND EVOLUTION IN FOOD WEBS

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Food webs are the complex ecological networks of who eats whom. Current theoretical models—tailored for capturing *global* properties—fail to predict food webs structure at the level of single interaction between species. The patterns we notice are the outcome of the interplay between ecology and evolution. In empirical webs we observe species with closely related evolutionary history performing similar roles: they have similar degree and motifs distribution [1] and share a larger than random portion of interactions [2]. However, weighting the effects of evolutionary processes and ecological constraints in the assembly of food webs represents an open challenge. Moreover, neglecting interaction stochasticity impedes the advancement of evolutionary analysis in food webs. In fact, despite the classic framework considering food webs as purely deterministic objects, a growing body of evidence shows that species' interactions are better described in stochastic terms as they depend on local population abundances—determining species' encounter probability—and on the distribution of phenotypes among those populations—determining their interaction propensity [3]. In this talk we will show how modeling food webs as Random Dot Product Graphs enables us to incorporate their inherent stochasticity and to quantify the evolutionary processes imprint. Indeed, our results support the notion that food webs show a stronger phylogenetic signal in their stochastic backbones than in their fine wiring [2]. Finally, acknowledging stochasticity, our simple model outperforms existing food-web models in terms of both fitting and predictive accuracy.

[1] D. B. Stouffer et al. Science **6075**, 335 1489-1492 (2012).

[2] G. V. Dalla Riva and D. B. Stouffer. Oikos (*submitted*).

[3] T. Poisot et al. Oikos **124**, 3 (2014).