The type of interaction between species might play a fundamental part in the stability of ecological communities

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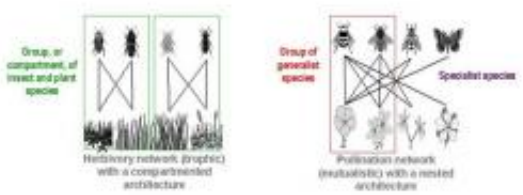

Elisa Thébault and Colin Fontaine, with a research carried out at Imperial College London, Wageninen University and the Museum National d'Histoire Naturelle, have shown that the network architectures which favor the stability of ecological communities differ between trophic webs ("who eats who") and mutualistic webs ("who pollinates who").

Their theoretical results reveal that, in order to be stable, mutualistic interaction webs should present a nested architecture whereas trophic webs should adopt a compartmented architecture. This difference in

architecture can be found in a large number of empirical pollination (mutualist) and herbivory (trophic) webs. This work is a major breakthrough for a better understanding of the functioning and stability of communities. These results are published in the *Science* issue of 13 august 2010.

Networks of ecological interactions describe the relations between species within a community: for example “who eats who” for a trophic web1 or “who pollinates who” for a plant-pollinator mutualistic web2. The architecture of these networks describes the way the interactions are distributed among species; an architecture is compartmented when a network is built of different groups of species which interact more within groups than between groups (figure 1), while a nested architecture corresponds to a network that is organized around a unique group of generalist species interacting between themselves and with more specialist species (figure 2). As for the stability of a community (i.e. all the species of the network), it characterizes the ability of the community to resist to perturbations.

To date research on the relations between the architecture of ecological networks and the stability of communities had focused on one type of interaction at a time (mainly trophic interactions), making difficult the comparison between different types of networks.

In this study, the authors have realized a comparison between trophic and mutualistic networks and have investigated if the type of interaction (mutualistic or trophic) affects the relation between network architecture and community stability. They compared the results of a theoretical approach (dynamical model) with the architecture of a large dataset of published empirical networks describing 34 pollination networks (mutualist) and 23 herbivory networks (trophic).

Results show that the network architectures which favor the stability of

ecological communities differ between trophic and mutualistic networks. Indeed a highly connected and nested architecture, i.e. with many generalist species interacting both between themselves and with specialist species, stabilize mutualistic networks; whereas a weakly connected and highly compartmented architecture, i.e. with few generalist species and species that interact within delimited groups, stabilize trophic networks.

This research brings important perspectives for a better understanding of the functioning of ecosystems and their response to environmental disturbances:

- How to define relevant and functional indicators of ecosystem stability with the architecture of interaction networks?
- How networks of different interaction types with different architectures can be combined together to form the large network that link all the species in an ecosystem? And how does it interact with ecosystem functioning and stability?

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