

New Zealand International Doctoral Research Scholarship - Research Proposal

Fernando Cagua

28/05/2015

Ecosystem responses to escalating drivers

Species in an ecological community form networks of interactions that determine the functioning of the ecosystem. Those interactions are of tremendous importance for example for the provision of ecosystem services, and the maintenance of global biodiversity and biogeochemical cycles. On the other hand, human generated impacts—like climate change, land use modification, overexploitation, nutrient enrichment, and invasive species—are heavily modifying the functioning of many of the ecosystems we depend on¹. The intensity of those drivers is increasing, and that trend is likely to continue.

Despite the fact that the effect of those drivers permeates across entire communities, our understanding of their impacts is mostly based on studies of one or a few species. Contrastingly, a network approach in ecology recognises that species live within a community and the interactions between them. This approach—built upon tools from statistical physics and the social sciences—has been key in revealing structural patterns that transcend specific ecosystems. For instance, we have recently learnt that the architecture of empirical interaction networks not only determines the ecosystem functions but, in fact, is also able to mediate its response to disturbances. We still don't understand, however, the mechanisms that link species interactions with the ecosystem's resilience.

The overall objective of my proposed research is to improve our current understanding of the ecosystems response to multiple anthropogenic drivers and their cumulative impacts. In particular, I propose to focus on the role that networks of species interactions have in modulating those responses. I will use models

This is the best shit in the world for me and for the world itself

References

1. Large, S. I., Fay, G., Friedland, K. D. & Link, J. S. Quantifying Patterns of Change in Marine Ecosystem Response to Multiple Pressures. *Plos One* **10**, e0119922 (2015).