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Qiang Yang

My research interests lie broadly in community ecology, in particular in biodiversity, ecosystem functioning, and stability. I am fascinated by the nature of the relationships among these properties, how they scale trophically and spatially, and how they are regulated by environmental change and stochasticity.

EDUCATION

19 Feb 2018 (PhD viva)
Ph.D. Candidate in Ecology
Trinity College Dublin
Supervised by Dr. Ian Donohue

Thesis: the multidimensionality of ecological stability.

- Used theoretical simulations to investigate how different stability components and the relationship between them are regulated by the intensity of external perturbations (Q Yang *et al*. in review in Ecology Letters).
- Explored the effect of the environmental autocorrelation and correlation on the predictability of various components of ecological stability (Q Yang *et al.* in preparation).
- Verified empirically the decoupling effect of perturbations on the relationship between ecological stabilities using the dataset of the NutNet - a global grassland experimental system (Q Yang *et al.* in preparation).
- Developed an R package to quantify the multiple components of ecological stability for biological organizations at different levels.

July 2012
MSc in Hydrobiology
Institute of Hydrobiology
Chinese Academy of Sciences
Supervised by Prof. Ping Xie

Thesis: Formation and hydrological control of diatom blooms in Hanjiang River. I investigated the effect of climatic and hydrological conditions on the formation of diatom blooms, and put forward a feasible strategy for algal bloom control (Q Yang *et al.* 2012).

July 2008
BS in Marine Biology
Ocean University of China

I received systematic training in marine biology and marine ecology.
Thesis: The effect of the ocean current on the diffusion of marine aquaculture pollutants.

AWARDS & SCHOLARSHIPS

March 2017
Ecological Society of America

Innovation in Sustainability Science Award
The award is given to the authors of a peer-review paper published in the past five years that exemplifies leading edge work on solution pathways to sustainability challenges. The award recognizes that the application of sustainability science is enabled by linking ecological science with advances in other biophysical disciplines, engineering, the social sciences (e.g., economics, anthropology, public policy, governance), and other fields. - cited from ESA webpage

September 2013
Irish Research Concil

Government of Ireland Postgraduate Fellowship

2012
Chinese Academy of Sciences

- **Chang Hua Award** (*award rate < 1%, evaluated by research performance*)
- **Di Ao Award** (*award rate < 1%, evaluated by research performance*)
- **Haida Award** (*award rate < 5%, evaluated by research performance*)

2007
Ocean University of China

Learning Excellence Award (*award rate < 10%, evaluated by course scores*)

2006
Ocean University of China

Learning Excellence Award

SKILLS

Quantitative and Computer Skills

Dynamical System Modeling

I conducted extensive simulations of food-web dynamics for my Ph.D. project.

Data Analysis

- GLMs, GLMMs, GAMs (used in Q Yang *et al*. 2012), and MCMCGLMM
- Causality exploration with Structure Equation Modeling (teaching experience)
- Causality and prediction with Convergent Cross Mapping for nonlinear dynamical systems (used in Q Yang *et al*. in review with Ecology Letters)
- Community Ordination with CANOCO and R package 'vegan' (teaching experience)
- Individual Based Modeling using R and Netlogo software
- Species Distribution Modeling (active member in the biweekly TCD Biogeography workshop)

Programming

- R (I am an advanced R user. All of my simulation work and data analyses were done with R. My R package EcoSta, which is designed to quantify multiple components of ecological stability, will be open to the public soon.)
- Matlab and Mathematica (intermediate level)
- Bash (used to interact with the supercomputer in Trinity College Dublin for my simulation task)

Computer Skills

- Text and coding formatting with Latex and R Markdown
- Version control with Github
- Image and animation production using Adobe Illustratør, and Abobe Flash.

Feild, and Laboratory Skills

- Sampling, identification, and quantification of the plankton, invertebrate, and macrophytes in both marine and freshwater ecosystems
- Field survey of grassland experiment plots
- Lab culture of zooplankton (daphnia) and phytoplankton (diatom and cyanobacteria)
- Nutrient analysis: nitrogen, phosphorus, silicon, carbon, etc.

TEACHING

- 2017 - taught **Structural Equation Modeling with R** and **Data Wrangling with R** to the R Users Group in Trinity College Dublin.

- 2015, 2016 - demonstrated **Data Handling and Analysis** to Master students in Environmental Science and Biodiversity & Conservation, Trinity College Dublin.

- 2011, 2012 - taught **ANOVA and Community Ordination Analysis** to first-year postgraduates in Donghu Experimental Station for Lake Ecosystem, Chinese Academy of Science.

- 2010 - demonstrated **Aquatic Sampling and Determination** to technicians of environmental monitoring stations of Hubei Province, China.

CONFERENCE & SYMPOSIUM *TALKS*

August 6-11, 2017 Portland, USA	Attended the Annual Meeting of Ecological Society of America. I presented my talk **"Perturbation intensity and the stability of ecological networks"**.
April 14, 2016 Trinity College Dublin, Ireland	Gave a talk **"The effect of environmental stochasticity on ecological stability"** in the TCD Zoology and Botany Postgraduate Symposium.
13-16 December 2016 Edinburgh, UK	Attended the British Ecological Society Annual Meeting. I talked on **"Stronger perturbations increase the complexity of ecological stability"**.
16-17 February 2015 Trinity College Dublin, Ireland	Gave a talk **"Perturbations decouple relationships among ecological stability components"** in the TCD Zoology and Botany Postgraduate Symposium.
20-21 February 2014 Trinity College Dublin, Ireland	Presented a talk **"The multidimensionality of ecological stability: A theoretical study"** in the TCD Zoology and Botany Postgraduate Symposium.

# Publication list

Peer-reviewed

- I. Donohue, O.L. Petchey, S. Kefi, A. Genin, A.L. Jackson, **Q. Yang,** N.E. O'Connor. (2017) Loss of predator species, not intermediate consumers, triggers rapid and dramatic extinction cascades. **Global Change Biology**. 23: 2962-2972.
- I. Donohue, H. Hillebrand, J.M. Montoya, O.L. Petchey, S.L. Pimm, M.S. Fowler, K. Healy, A.L. Jackson, M. Lurgi, D. McClean, N.E. O'Connor, E.J. O'Gorman, **Q. Yang.** (2016) Navigating the complexity of ecological stability. **Ecology Letters**, 19(9): 1172-1185.
- P.L. Shi, H. Shen, W.J. Wang, **Q. Yang,** P. Xie. (2016) Habitat-specific differences in adaptation to light in freshwater diatoms. **Journal of Applied Phycology**, 28(1): 227-239.
- **Q. Yang,** P. Xie, H. Shen, J. Xu, P. Wang and B. Zhang. (2012) A novel flushing strategy for diatom bloom prevention in the lower-middle Hanjiang River. **Water Research**, 46(8): 2525-2534.
- D.W. Zhang, **Q. Yang,** P. Xie, X.W. Deng, J. Chen, and M. Dai. (2012) The role of cysteine conjugation in the detoxification of microcystin-LR in liver of bighead carp (Aristichthys nobilis): a field and laboratory study. **Ecotoxicology**, 21(1): 244-252.
- J. Xu, **Q. Yang**, M. Zhang, P. Xie, and L.A. Hansson. (2011) Preservation effects on stable isotope ratios and consequences for the reconstruction of energetic pathways. **Aquatic Ecology**, 45(4): 483-492.

In review

* **Q. Yang,** J.M. Montoya, A.L. Jackson, I. Donohue. Perturbation intensity determines the predictability of ecological stability. (In review in **Ecology Letters**)

We found higher perturbation intensity decreases the predictability of ecological stability. This decreasing pattern is universal across different network structures.
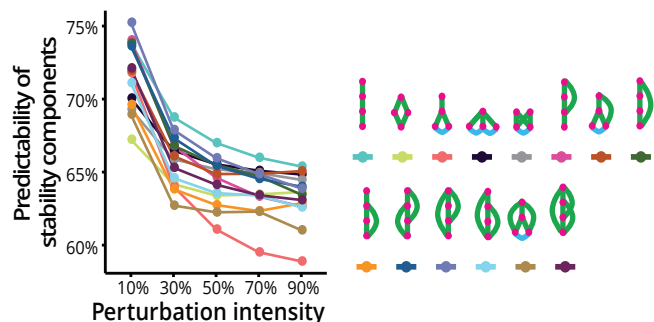

In preparation

* **Q. Yang,** A. Jackson, M. Fowler, and I. Donohue. Predictability of ecology stability in a noisy world. (target journal: Nature Ecology and Evolution).

We found environmental redding (higher environmental autocorrelation) increases the variability and resistance of ecological networks but boosts their recovery following perturbations.
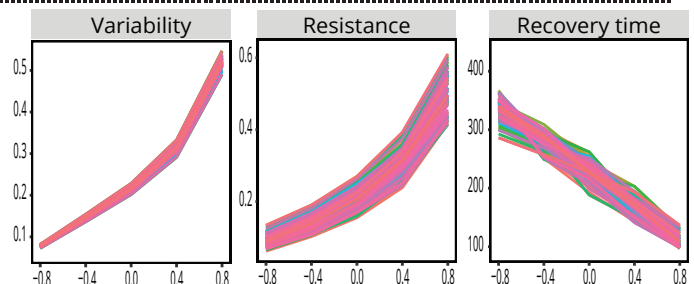
* **Q. Yang** *et al*. Perturbations increase the complexity of ecological stability at the global scale. (target journal: Nature Ecology and Evolution)

Using a global grassland experimental dataset NutNet, we verified our theoretical finding that perturbations decrease the correlation between different stability components.
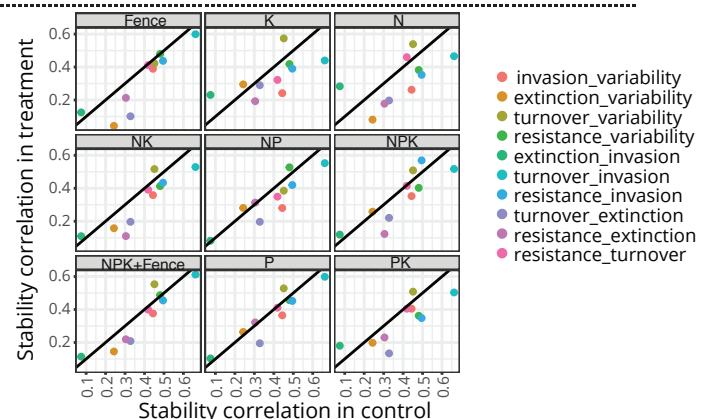
* **Q. Yang,** A.L. Jackson, I. Donohue. EcoSta: an R package for quantification of ecological stability. (target journal: Methods in Ecology and Evolution).

This is a newly built R package for quantifying different components of ecological stability, including variability, resistance (the maximum change of the population or community), resilience (engineering resilience), robustness (invasion and extinction), etc.

L.G. Shoemaker, L.L. Sullivan, I. Donohue, *et. al*. Integrating stochasticity into community ecology. (target journal: Trends in Ecology and Evolution)

I contributed to session writing in this review paper.

I. Donohue, L. Coscieme, G. Gellner, **Q. Yang,** I. Kubiszewski, R. Costanza, K.S. McCann. Does reliance on fossil fuels undermine the resilience of economic networks? (target journal: Nature Sustainability).

I contributed to the quantification of the resilience of each country after the economic risk.

* Full draft available upon request.

Referees

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