Community Metrics

Dates: February 26- March 1, 2018
Location: University of Haifa

Instructor: Professor Jamie Kneitel
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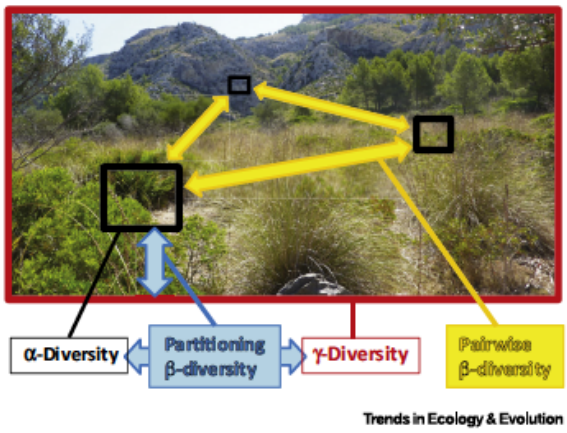

Overview

Diversity is one of the fundamental metrics in community ecology, including species richness, many taxonomic diversity indices, phylogenetic diversity, genetic diversity, and functional diversity; other community metrics include proportional abundances, similarity indices, evenness, and trophic structure. Each provides a different quantitative perspective of a community, which can be used to assess them at different spatial and temporal scales. Regardless of the metric, they are all influenced by many abiotic and biotic factors and can be used for comparative purposes and insight to underlying processes of community dynamics. Understanding community metrics, along with their strengths and weaknesses, is important for ecologists and conservationists interested in characterizing communities and critically evaluating studies. The course will cover these various metrics, as well as cover current concepts in the field of community ecology, including community assembly, neutral-niche theory spectrum, and spatial ecology (e.g., metacommunities).

This course will address these topics through lectures, readings, class discussions, presentations, and exercises. It will also emphasize critical evaluation of the metrics and the literature addressing community-level issues. Students will conduct an empirical study over the week, which will culminate in an oral presentation.

Course Objectives

This course is intended for graduate students in ecology, environmental studies, or related fields. The objectives of this course are that students will:

1. understand the major concepts in community ecology
2. identify and implement the tools for community metrics
3. critically evaluate the literature
4. convey their understanding through discussions and presentations
5. apply metrics to data sets to test hypotheses

Student Final Presentation Options:

1. Outcome of analyses of community data
2. Critical summary of 3 papers on approved topic

Tentative Course Schedule

	Topics	Reading
Day 1		
Morning	Introductions of Participants and Instructor; Introduction to the course; History of Community Ecology & Diversity	Vellend, M., 2010. Conceptual synthesis in community ecology. The Quarterly Review of Biology 85: 183-206.
Afternoon	Data introduction	
Day 2		
Morning	Community Assembly; Spatial scales and diversity	Fukami, T. 2015. Historical contingency in community assembly: integrating niches, species pools, and priority effects. *Annual Review of Ecology, Evolution, and Systematics* 46: 1-23 HilleRisLambers, J. et al., 2012. Rethinking community assembly through the lens of coexistence theory. *Annual Review of Ecology, Evolution, and Systematics* 43: 227-248
Afternoon	Discussion of methods; data exercises	Scheiner, S.M. et al. 2011. The underpinnings of the relationship of species richness with space and time. *Ecological Monographs* 81: 195-213.
Day 3		
Morning	Diversity metrics: local to regional to conservation; Student paper presentations	Chiarucci, A., Bacaro, G. and Scheiner, S.M., 2011. Old and new challenges in using species diversity for assessing biodiversity. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 366: 2426-2437. Anderson, M.J. et al. 2011. Navigating the multiple meanings of β diversity: a roadmap for the practicing ecologist. *Ecology Letters* 14: 19-28. Socolar, J.B., et al. 2016. How should beta-diversity inform biodiversity conservation? *Trends in Ecology & Evolution* 31: 67-80. + Letters/Reply
Afternoon	Analyses of data sets using Past	
Day 4		
Morning	Abundances, Evenness; Metacommunities; Phylogenetic and Functional Diversity	Hillebrand, H. et al. 2008. Consequences of dominance: a review of evenness effects on local and regional ecosystem processes. *Ecology* 89: 1510-1520. Henriques-Silva, R. et al. 2013. A community of metacommunities: exploring patterns in species distributions across large geographical areas. *Ecology* 94: 627-639. Tucker, C.M. et al. 2017. A guide to phylogenetic metrics for conservation, community ecology and macroecology. *Biological Reviews* 92: 698-715. Violle, C. et al. 2014. The emergence and promise of functional biogeography. *Proceedings of the National Academy of Sciences* 111:13690-13696.
Afternoon	Student presentations and discussions; Summary and conclusions	

Materials

A Drop Box file has been created for this course. It includes the reading material (see below). I encourage all students to download (and familiarize yourself) with Past: http://folk.uio.no/ohammer/past/

Course Readings

Anderson, M.J. et al. 2011. Navigating the multiple meanings of β diversity: a roadmap for the practicing ecologist. *Ecology Letters* 14: 19-28.

Chiarucci, A., Bacaro, G. and Scheiner, S.M., 2011. Old and new challenges in using species diversity for assessing biodiversity. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 366: 2426-2437.

Fukami, T. 2015. Historical contingency in community assembly: integrating niches, species pools, and priority effects. *Annual Review of Ecology, Evolution, and Systematics* 46: 1-23

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HilleRisLambers, J. et al., 2012. Rethinking community assembly through the lens of coexistence theory. *Annual Review of Ecology, Evolution, and Systematics* 43: 227-248

Scheiner, S.M., Chiarucci, A., Fox, G.A., Helmus, M.R., McGlinn, D.J. and Willig, M.R., 2011. The underpinnings of the relationship of species richness with space and time. *Ecological Monographs* 81: 195-213.

Socolar, J.B., Gilroy, J.J., Kunin, W.E. and Edwards, D.P. 2016. How should beta-diversity inform biodiversity conservation? *Trends in Ecology & Evolution* 31: 67-80.

> Bush, A., Harwood, T., Hoskins, A.J., Mokany, K. and Ferrier, S., 2016. Current uses of beta-diversity in biodiversity conservation: A response to Socolar et al. *Trends in Ecology & Evolution 31*: 337-338.
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> Socolar, J.B., Gilroy, J.J., Kunin, W.E. and Edwards, D.P., 2016. Sparse Data Necessitate Explicit Treatment of Beta-Diversity: A Reply to Bush et al. *Trends in Ecology & Evolution* 31: 338-339.

Tucker, C.M. et al. 2017. A guide to phylogenetic metrics for conservation, community ecology and macroecology. *Biological Reviews* 92: 698-715.

Vellend, M. 2010. Conceptual synthesis in community ecology. *The Quarterly Review of Biology* 85: 183-206.

Violle, C. et al. 2014. The emergence and promise of functional biogeography. *Proceedings of the National Academy of Sciences* 111:13690-13696.