

EECB Colloquium Sample Journal Entry

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Dr. Jim Grace

USGS National Wetlands Research Center, Louisiana

Experimental Ecology: Is it Time for a New Paradigm?

Summary

Current statistical methods in ecology are limited in their ability to examine system processes. There is a mismatch between scientific intuition and the ability of our statistical analyses. Dr. Grace introduced Structural Equation Modeling (SEM) as a means of developing and analyzing multivariate relationships in natural systems. His research on biodiversity of coastal vegetation and the effect of grazing demonstrates the utility of SEM. Univariate analyses would find no effect of fencing (i.e. removal of disturbance) on vegetation diversity; however, when mediated through biomass, disturbance has a strong effect on plant diversity. Classic univariate methods would not reveal such indirect relationships. Structural equation modeling is advantageous because (1) it is model-oriented not hypothesis-oriented, (2) it provides a flexible model structure that closely matches the structure of the natural processes, (3) it can be confirmatory or exploratory, and (4) there are a variety of estimation approaches. Dr. Grace provided several examples of how scientists have applied SEM to various systems in order to demonstrate the flexibility of the method. He further described the importance of considering the multiple interactions among the components of natural systems and how the system as a whole will interact to different biotic and abiotic factors.

Critique and Comments

Dr. Grace demonstrated the importance of understanding the processes that drive the patterns we see in natural systems. He employed simple and unambiguous examples of how univariate statistics may miss important relationships in ecology. I found these examples helpful for my understanding of a rather complex method. This research is important because ecologists may misinterpret observed patterns if they rely upon statistical methods that do not consider multiple influences. I have learned about several scientific studies that focused on only a few factors hypothesized to influence a species or community. For example, perhaps only biotic conditions are considered without regard to how abiotic factors are also influencing the patterns. The SEM provides an insightful technique for including multiple factors in a study.

Although Dr. Grace provided a few examples, he did not discuss the limitations of this method. I question whether there is a point at which too many variables included in the model may hinder one's ability to interpret the patterns. Furthermore, this method appears to rely on correlations and it was not clear as to whether the method can address the actual "cause" of certain responses.

Overall I enjoyed this presentation regardless of the difficulty of the content. Dr. Grace enthusiastically presented this method using several examples and a well-organized presentation. Occasionally Dr. Grace spoke fast, which distracted from our understanding of some of his points.