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# NEW STUDY REVEALS EXISTENCE OF "COMPARTMENTS"—LIKE SOCIAL CLIQUES—IN NATURAL FOOD WEBS

## *Innovative research published this week in the journal* Nature

ANN ARBOR, MI—A new study, published this week in the journal *Nature*, has revealed the existence of what in human interactions would be referred to as "cliques" in natural food webs. This research examined what ecologists have previously theorized: that plants and animals organize themselves into cliques, just as humans do. These cliques, also known as compartments, are groups of species in a food-web that interact more frequently with each other than with species outside of that compartment. Strong interactions exist among species within compartments and weaker interactions exist between individual compartments. This research contributes to a more sophisticated understanding of food web dynamics by illustrating how species interact and, thus, how they impact each other. This better understanding of food webs will help natural resource managers make better management decisions that affect food webs.

Food webs are multiple interconnecting food chains. Predators are likely to have more than one prey and prey are likely to have more than one predator, thereby creating a web of interactions, not a chain. A common approach of understanding how species interact in food webs is to categorize them into trophic—or hierarchical—levels, where groups of species with similar food resources and predators are associated with each other. The trophic level concept alone, however, provides an incomplete understanding of food-webs, because it only provides one view of the picture; it looks at which species are competitors, but not at the other associations species make in the food web. For example, in economics, people's purchasing decisions are not solely influenced by the decisions made by their

neighbors, who are likely in the same economic bracket (or same hierarchical level). Rather, people are also influenced by their friends, who may be in another economic bracket, but in a same clique or compartment.

The discovery of compartments within food webs provides a more advanced understanding of species interactions with each other in the environment. The research, published this week in *Nature*, applies principles for describing social systems to food webs—an exciting new way to view food web structures and to identify compartments in food-webs. The scientists employed a recently developed social network method. "It has been proposed that social systems are more efficient and durable when composed of subgroups in which interactions are concentrated," said Dr. Ken Frank of Michigan State University and member of the research team. "This appears also to be the case for food-web compartments in ecology, and this method identifies compartments in which interactions are concentrated." Dr. William Taylor of Michigan State University and a member of the research team added: "This study highlights the importance and necessity of interdisciplinary science and problem solving."

A simple illustration of the trophic and compartment concepts is to consider state governments. The trophic level model would put the US governors in a category, the state representatives in another category, and the people in a third category. The compartment model, however, groups people by state, so a state would be one compartment, with a governor, the representatives, and people having strong interactions with each other, and weaker interactions with other compartments, the other states.

"The compartment method of measuring species interactions in an ecosystem has its benefits," said Ann Krause of Michigan State University, a member of the research team. "This method is more systematic and rigorous, as it assigns species to certain compartments based on observed research—not based on a researcher's guess—and tests the results for significance. Moreover, if compartments can be found to enhance stability in nature like they were found to do in theoretical research, we now have another tool with which to better understand stability in ecosystems. Stability is important for maintaining ecosystem health."

"This study will provide a mechanism for others to study and measure the stability of food-webs," added Dr. Doran Mason of the Great Lakes Environmental Research Laboratory, a member of the research team. "Understanding food web stability significantly enhances our understanding of ecosystems which, of course, helps biologists and managers in their efforts to protect and improve the system. With future applications based on this research, we may find that managers should also focus on maintaining compartments in food webs, which are whole groups of species, not just maintaining the population of a single species, to maintain ecosystem health and integrity."

This research is a collaborative among scientists Ann E. Krause, Kenneth A. Frank, and William W. Taylor from Michigan State University's Department of Fisheries & Wildlife; Robert E. Ulanowicz from the University of Maryland; and Doran M. Mason of the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory. This research was funded by the Great Lakes Fishery Commission, the National Institute of Child Health and Human Development, and the National Science Foundation. Contact information for members of the research team is as follows:

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