The value of variation: Ecologists consider the causes and consequences

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Consider the case of the three-spine stickleback. These tiny fish that thrive in oceans and in fresh water might appear to be the same, yet ecologists are finding that they are actually a diverse collection of very specialized individuals.

Understanding the ecological causes and consequences of such ecological variation is the goal of a group of scientists meeting at the National Institute for Mathematical and Biological Synthesis (NIMBioS) at the University of Tennessee, Knoxville, July 27-29.

Population and Community Ecology Consequences of Intraspecific Niche Variation is the topic of a NIMBioS Working Group comprised of biologists and mathematicians from universities and other academic institutions across North America and Europe.

Traditionally, ecological theory has treated a population as a homogeneous set of individuals, implicitly assuming that individuals within a population are ecologically interchangeable, but individuals are often quite diverse, said Daniel Bolnick, Working Group co-organizer and assistant professor of biology at the University of Texas, Austin.

"Very little is known about how niche variation affects the ecological dynamics of a species or a community, and yet it is important to understand it in order to make accurate predictions about a population," he said.

In order to make effective management decisions, for example, conservation biologists need to know under what conditions a predator and its prey can co-exist together. "The problem is that a lot of the ecological models say that predator/pray populations are unstable, and yet we know that they can co-exist. So, what we want to know is how does variation in a population change what we know about population dynamics," Bolnick said.

One of the unique aspects of the Working Group is its interdisciplinary approach involving both biologists and mathematicians to studying the issue.

"By establishing connections between these usually separate fields, we hope to initiate a new field of mathematical ecology that melds genetics, evolution, and dynamic foraging behavior into ecological models that will determine how intraspecific variation affects ecological dynamics and community structure," Bolnick said.

"At present, mathematical theory is our only tool to determine the ecological effects of niche variation and make recommendations for empiricists," Bolnick added.

Source: National Institute for Mathematical and Biological Synthesis