

Florida Integrated Science Center

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Keystone predators and aquatic invasive species: The case of the Eastern Newt

Keystone species can strongly influence the diversity of their communities, typically resulting in greater diversity as a result of their presence. Now that so many communities have become invaded by nonindigenous species, an important question is: Do keystone species have similar effects in invaded communities as in communities without invasives? This previously unanswered question is addressed by Kevin Smith's research on the presence of Eastern Newts on some aquatic invasive species in the southeastern US. Through experimental replication of natural conditions the study explored whether the presence or absence of Eastern Newts altered the effect of invasive species within an aquatic community, specifically competition between native and nonindigenous tadpoles.

It is believed that invasive species can compete with native species for ecosystem resources, potentially resulting in a loss of diversity in the native community. If these communities also contain keystone predators, however, these important predators may contribute to maintaining and enhancing species diversity in invaded communities as they do in native communities. Keystone predators such as the Eastern Newt typically operate through a competitive hierarchy among the prey species, selectively preying on the most dominant species resulting in a "leveling of the playing field" in the community. Given the global dispersion of nonindigenous species, keystone predators may play an invaluable role in reducing or mitigating the impacts of invasive species in some communities.

Smith's study design was a complete, randomized block experiment using two treatment factors to assess

Management Implications:

- Eastern Newts preyed preferentially on invasive Cuban Treefrog tadpoles, resulting in increased survival of Southern Toads.
- These results suggest that keystone species may enhance or maintain diversity in invaded communities as well as native communities.
- Biotic resistance to invasive species may not be the result of native diversity per se, but rather the result of the presence of specific community members, in this case a keystone predator.
- Additional research may show that well-managed native communities are less affected by invasive species since these communities are more likely to contain important species such as keystone predators.

the influence of newt predation on the competitive effects of two nonindigenous tadpoles—Cane Toad and Cuban Treefrog. Although survival of the individual native species was highly variable, species-specific survival of native tadpoles was significantly affected by the interaction of the invasion treatment and presence of the Eastern Newt, suggesting that predation by newts affected the competitive dynamics of the study system. In the treatments including the Cuban Treefrog, but no newts, there was decreased survival and growth rates of the dominant native species, the Southern Toad.

However, when Eastern Newts were present, there was high survival of Southern Toad larvae whether Cuban Treefrogs were present or not. In the treatments where newts, Southern Toads and Cuban Treefrogs were all

present, the occurrence of newts enhanced the survival of the Southern Toads. In the invasion treatments newts preyed heavily on Cuban Treefrogs, reducing their survival rate by approximately 50% over both treatments where Cuban Treefrogs were present. In those treatments only Cuban Treefrogs experienced a decrease in survival rate as a result of the presence of newts.

Unlike Southern Toads, the other native species (Squirrel Treefrogs, Eastern Narrowmouth Toads, and Southern Leopard Frogs) were not significantly affected by the experimental treatments, although evidence of a trend toward reduced survival of Squirrel Treefrogs when Cuban Treefrogs were present and newts were absent. Presence of larval Cane Toads did not significantly affect the native species.

*Smith. K. G. (2006). Keystone predators (eastern newts, *Notophthalmus viridescens*) reduce the impacts of an aquatic invasive species. *Oecologia* 148:342-349*