Resource Use Overlap in a Native Grouper and Invasive Lionfish

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Graduation Year
2017

Document Type
Thesis

Degree
M.S.

Degree Name
Master of Science (M.S.)

Degree Granting Department
Marine Science

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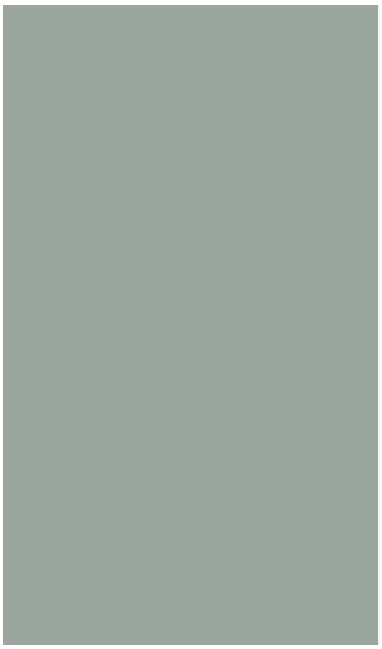
Keywords
Competition, Eye lens, Niche width, Reef ecology, Stable isotope

Abstract
Invasive species can severely disrupt biological communities through their interactions with native organisms, yet little is known about the response of marine predators to the establishment of a competitive invasive fish. In the western Atlantic, invasive Indo-Pacific lionfishes (Pterois spp.) may represent a novel competitor to several commercially and ecologically important native species. However, there is a scarcity of empirical research documenting comparative resource use of cohabitant lionfish and native fishes, as well the physiological consequences that may result from interspecific interactions with the invasive species. For this thesis, I conducted two studies designed to elucidate the strength of resource use overlap and potential competition among invasive lionfish and an ecologically similar serranid, the Graysby (Cephalopholis cruentata), along a contiguous coral-reef ledge in Biscayne National Park, South Florida.

My first study aimed to determine whether lionfish and Graysby could be classified as competitors through comparisons of Graysby population size, diet, and condition across a range of ambient lionfish biomass. Using stable isotope and gut content analyses, I measured a difference in Graysby diet on sites with larger populations of lionfish, specifically a smaller breadth of resource use and lower consumption of teleost fish prey. Despite a shift in diet, Graysby condition did not vary with lionfish biomass, and thus this study did not provide unequivocal evidence of competition between the two species. However, based on a high amount of apparent overlap in interspecific resource use, competitive interactions between lionfish and species such as Graysby remain likely in systems with more limiting prey or shelter.

For my second study, I measured stable isotope values of muscle, liver, and eye lens layers in lionfish and Graysby to further compare individual and population-level patterns of diet and habitat use. The use of eye lenses as metabolically stable chronological recorders of stable isotopes has vast potential to provide insight about animal life history, but has not yet been applied to describe trends in resource use among invasive and



native species. To aid these analyses I created a rudimentary map of spatial isotopic variation along the reef ledge of Biscayne National Park, which could serve as a frame of reference to study local-scale animal movements. Isotopic differences between liver and muscle samples suggested a broader range of movement in lionfish than Graysby, important for understanding the relative scale of habitat use in these species. In eye lenses, stable isotope values increased logarithmically with lens radius (i.e. fish size), likely reflecting patterns of trophic growth. There was a high amount of variability among the shapes of eye lens isotopic chronologies, particularly those of lionfish, yielding further information about movement and individual resource use specificity in these species.

The results of this thesis are the first to compare native predator diet and condition across a range of invasive lionfish biomass, as well as the first to measure size-structured trends in the resource use of individual lionfish. Together, these results enhance our understanding of the potential for competition among lionfish and native mesopredators, an important objective for researchers studying how this highly invasive species interacts with surrounding ecological communities.

NOTE: The full-text of this Thesis/Dissertation is currently under embargo. It will be available for download on Wednesday, November 29, 2017.