

Ecological Impacts of Climate-related Ichthyofaunal Shifts and Invasive Lionfish Upon Gulf of Mexico Reef Fishes

Impactos Ecológicos del Clima- relacionados con Cambios Ictiofaunos y el Invasor Pez León Sobre los de Arrecife en el Golfo de México

Impacts Écologiques Liés au Changement Climatique et Ictiofauna Lionfish Invasive sur les Poissons de Récif dans le Golfe du Mexique

ANTHONY MARSHAK^{1*} and KENNETH HECK²

¹NOAA Fisheries, Office of Science and Technology, 1315 East-West Highway, Silver Spring, Maryland 20910 USA.

*tony.marshak@noaa.gov.

²Dauphin Island Sea Lab, University of South Alabama, 101 Bienville Blvd., Dauphin Island, Alabama 36528 USA.

EXTENDED ABSTRACT

In northern Gulf of Mexico (nGOM) seagrass habitats, large and potentially unprecedented increases in the abundance of juvenile Gray Snapper (*Lutjanus griseus*), Lane Snapper (*L. synagris*), and other tropically-associated species have been recently documented (Fodrie et al. 2010). Their increased abundance reflects regional warming trends, and has resulted in higher numbers recruiting to offshore adult habitats (Marshak and Heck, *In review*). Additionally, recent successful invasion by Indo-Pacific Red Lionfish (*Pterois volitans*) into the nGOM has occurred (Dahl and Patterson 2014), and together with tropically-associated snappers, these factors could affect nGOM reef fishes and juvenile Red Snapper (*L. campechanus*), potentially including competitive exclusions. The objectives of our study were to investigate the distribution, abundance, and spatiotemporal associations of juvenile and early adult tropically-associated snappers, and other numerically abundant fishes in nGOM offshore habitats using chevron traps, and examine their trends over time in commercial and recreational landings data. In addition, two major experiments were conducted in experimental mesocosms to examine competitive displacement vulnerabilities of native red snapper to the increased abundance of tropically-associated snapper species and invasive lionfish in nGOM habitats. Specifically, documentation of behavioral and competitive interactions (1) between juvenile Lane, Gray, and Red Snapper, and (2) between these snapper species and invasive red lionfish. In offshore surveys, no gray snapper were collected in traps, while red snapper were most dominant in lower relief rock and shell hash habitats. Highest offshore collections of lane snapper occurred in deep reef habitat at comparable abundances to Red Snapper and Rock Sea Bass (*Centropristis philadelphica*). These findings suggest that increased structural complexity may facilitate increased species recruitment of their juveniles, while mitigating competitive dominance of juvenile and early adult Red Snapper. Over time, no significant increases in rank of importance for Lane or Gray Snapper were observed in commercial or recreational landings. Experiments found increased roving behavior, habitat use, and predatory activity by juvenile Red Snapper compared to Lane Snapper, but not Gray Snapper. But, when Red Lionfish were paired with snappers, lionfish partially exceeded Red and Gray Snapper in swimming activity and prey consumption, respectively, and Lane Snapper by both factors. Our findings suggest that while nGOM red snapper may be more active and aggressive than their tropically associated counterparts, gray snapper are highly active and could present pronounced competitive pressures to Red Snapper, while Lane Snapper may have partial advantage when coexisting with Red Snapper in more complex habitats. Additionally, lionfish appear to have differential competitive advantage over the three snapper species, with less pronounced effects on Red Snapper consumption, but higher impacts on their swimming activities and habitat use. Ultimately, Red Snapper vulnerability to displacement by tropical confamilials and lionfish may increase with regional warming, but it is likely to be habitat specific and to occur at smaller scales. This work contributes to the assessment of the impacts of warming-related species shifts and marine invasions upon nGOM reef fishes.

KEYWORDS: Climate change, competition, lionfish, range shifts, Red Snapper

LITERATURE CITED

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