Prey Preferences of Invasive Lionfish and Native Grouper for Competing Native Fishes

Preferencias Presa de Pez León Invasor y Mero Nativa para Competir Peces Nativos

Préférences Proie de Rascasse Volante Invasive et le Mérou Natif pour Concurrencer les Poissons Indigènes

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KEY WORDS: Predation, competition, invasive predator, prey preference

EXTENDED ABSTRACT

Native predators can influence prey competition by consumption, risk of mortality, or both (Connell 1975, Gurevitch et al. 2000). In particular, prey preference of a predator can influence overall effects of predation on competition depending on which competitor is the preferred prey and if the predator switches between prey species (Murdoch 1969, Roughgarden & Feldman 1975). Invasive predators often cause declines in native species (Mack et al. 2000) that are typically more severe than native predators (Salo et al. 2007), so it is likely invasive predators are capable of influencing competitive interactions among native species based on the invasive predator's prey preferences. This could enhance or moderate the effects of native predation based on whether the native and invasive predators share a similar prey preference or have differing preferences. To gain insight as to whether an invasive predator can alter competition between native prey, we performed a series of controlled experiments in aquaria to characterize and compare the prey preferences of the invasive red lionfish (*Pterois volitans*) and an ecologically-similar native mesopredator, the graysby grouper (*Cephalopholis cruentata*) between competing native fairy and blackcap basslets (*Gramma loreto* and *G. melacara*, respectively). We predicted that as generalist mesopredators, lionfish and graysby would have similar prey preferences. We predicted that neither predator would display a preference between basslet species but as gape-limited predators, would exhibit shifts in preference from small to large basslets with increasing predator size.

Tanks were divided in half with a removable central barrier of solid aluminum. We released a single predator into one side of the tank and placed two basslets in the other side. Basslets were held in identical small glass containers (~500 ml) with mesh covers (one basslet per container) positioned in each corner of the tank. With these prey containers, predators were able to receive both visual and chemical cues from basslets, but could neither make physical contact nor consume any basslets. We observed the behavior of each predator (n = 15 lionfish, n = 15 graysby) for 10 minutes in response to two individual prey fish that differed in species (fairy and blackcap basslets) and/or size (small and large), recording which basslet the predator hunted first, number of strikes, and hunting time.

We found strong initial preferences, with lionfish preferring fairy basslet and graysby preferring blackcap basslet (Figure 1). However, neither predator displayed a preference between basslet species in terms of the overall number of strikes and hunting time. Despite essentially identical size ranges of lionfish and graysby studied, graysby consistently preferred large basslet across all graysby sizes in initial preference (Figure 1) and in terms of the overall number of strikes and hunting time (Figure 2), whereas lionfish initially preferred large basslet (Figure 1), but subsequently shifted in preference from small to large basslets with increasing lionfish size (Figure 3). If the initial preferences of predators are indicative of overall predation intensity on basslet species and sizes on natural reefs, then invasive lionfish may enhance coexistence by preferentially consuming the less-preferred prey species of the native predator or by enhancing preferential predation on larger basslets, which are the dominant competitors among basslets. If predation intensity is approximately equal between basslet species, then local basslet populations could potentially be depleted from increased consumption of both species by invasive lionfish.

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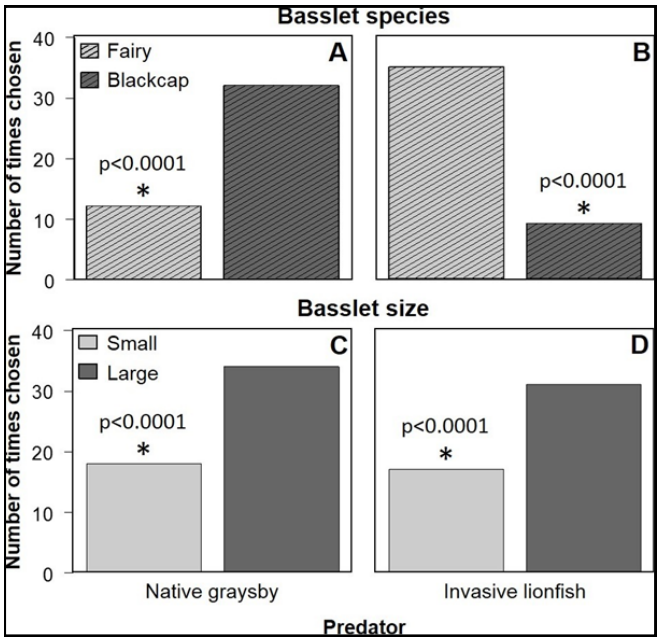

Figure 1. Initial hunting preference of (A, C) native graysby and (B, D) invasive lionfish between (A, B) fairy versus blackcap basslets (n = 11 graysby, n = 11 lionfish) and (C, D) small versus large basslets (N = 12 graysby, n = 13 lionfish). Bars represent the total number of times that each predator initially hunted each basslet during treatments consisting of two different basslet species (n = 4 per individual predator) and two different basslet sizes (n = 4 per individual predator).

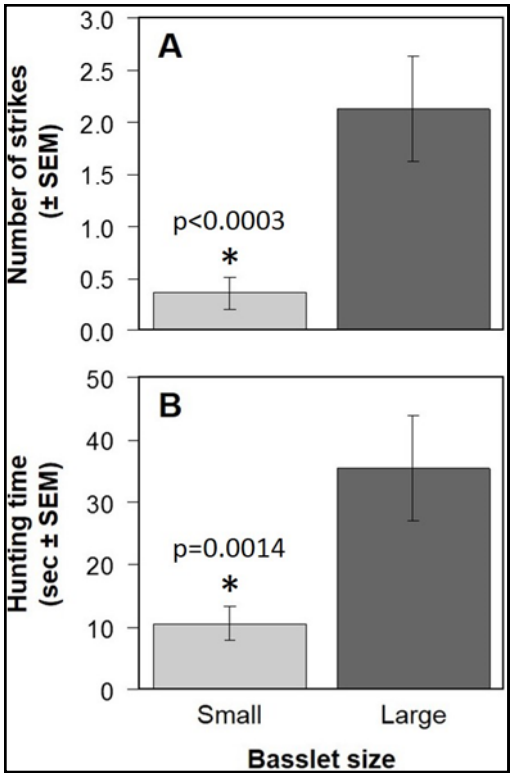

Figure 2. Mean (±SEM) number of strikes (A) and mean amount of time spent hunting (B) by native graysby (n = 12) in response to small versus large basslets during treatments consisting of two different basslet sizes (n = 4 per individual predator).

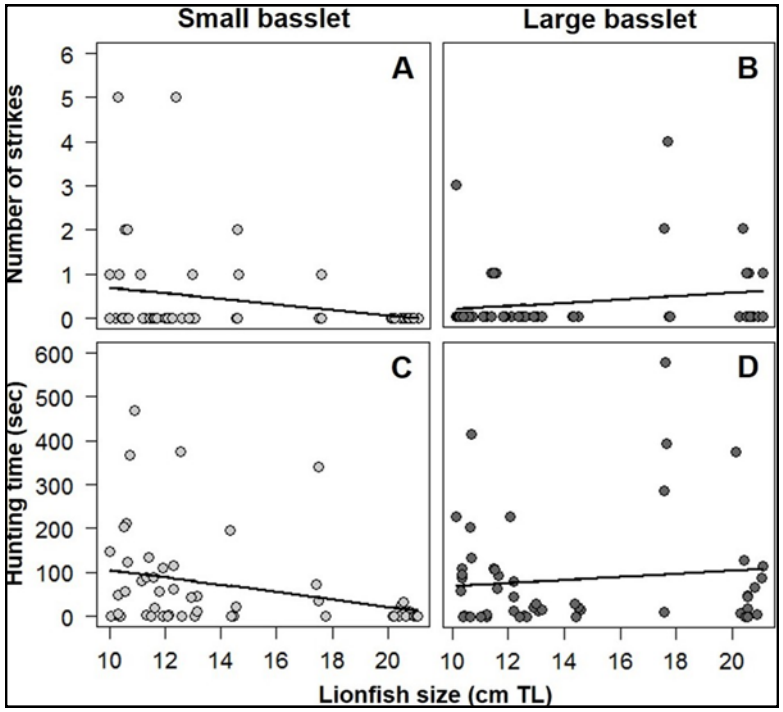

Figure 3. Number of strikes (A, B) and amount of time spent hunting (C, D) by invasive lionfish (n = 13) throughout a range of lionfish sizes (cm total length) in response to small (A,C) and large (B, D) basslets during treatments consisting of two different basslet sizes (n = 4 per individual predator). Regression lines are models with significant interactions between lionfish size and basslet size.