Linkages Between Habitats Are Essential for Reef Fishes

Conexiónes Entre Hábitats Son Esenciales para Peces del Arrecife

Linkages Entre Habitats Sont Essentiels pour Poissons de Récif

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EXTENDED ABSTRACT

In coral reef ecosystems, numerous habitat types support key life stages of juvenile fishery species and other nekton (mobile fishes, shrimps, crabs, and lobsters). Seagrass beds, mangroves, sand and mud bottoms, algal plains, and coral reefs are connected by hydrodynamics, nekton movements, and other forms of energy flow (Ogden and Gladfelter 1983). Quantitative comparisons of nekton densities in adjoining habitat types are useful for estimating habitat use and supporting delineation of essential fish habitat (EFH). Most comparative studies, however, examine only a few habitat types potentially available to nekton (Friedlander and Beets 2008), focus only on SCUBA-depth strata, or use different assessment methods in different habitats that cannot be readily compared.

We used two methods, visual transects and lift nets, concurrently, to compare nekton densities and size classes during two temporally separate periods, June and October, in four adjoining shallow water coral reef habitat types in waters bordering the Virgin Islands National Park and Coral Reef Monument, St. John, USVI (Hill and Minello, unpublished manuscript). Lift nets were bottomless and rectangular in shape, with mesh walls. Mesh walls had a channel hemmed into the bottom to contain a chain that sealed the net to the bottom and were topped by a half-pipe of 10 mm PVC. The net was placed on the bottom, left for three to four hours, and then raised manually to capture all nekton within its $4m^2$ area. Approximately one hour prior to raising the net, a visual point count survey was conducted to identify, enumerate, and estimate fork length of all nekton within the net area. Visual net surveys were part of extended 30 x 2 m transect surveys conducted over every net possible.

Density measures and species compositions differed between sampling methods although some consistencies were seen (Hill and Minello, unpublished manuscript). Species richness and densities varied by habitat, and size-specific habitat use was documented. Combined lift net and transect surveys were particularly useful at quantifying entire size ranges and size differences in species showing ontogenetic shifts in sampled habitats, although lift nets were not particularly good at sampling commercially important species. As an example, 21 yellowtail snapper *Ocyurus chrysurus* were sampled with densities of 0.018 ± 0.009 (SE)/m^2 (size range 1.9 - 5.3 cm) in lift nets, 0.004 ± 0.004 (SE)/m^2 (size 5 cm) in visual surveys of net areas, and 0.005 ± 0.002 (SE)/m^2 (size range 4-15 cm) in complete visual transect surveys. A total of 91 schoolmaster *Lutjanus apodus* were sampled with densities of 0.031 ± 0.017 (SE)/m^2 (size range 4.7 - 10.5 cm) in lift nets, 0.058 ±

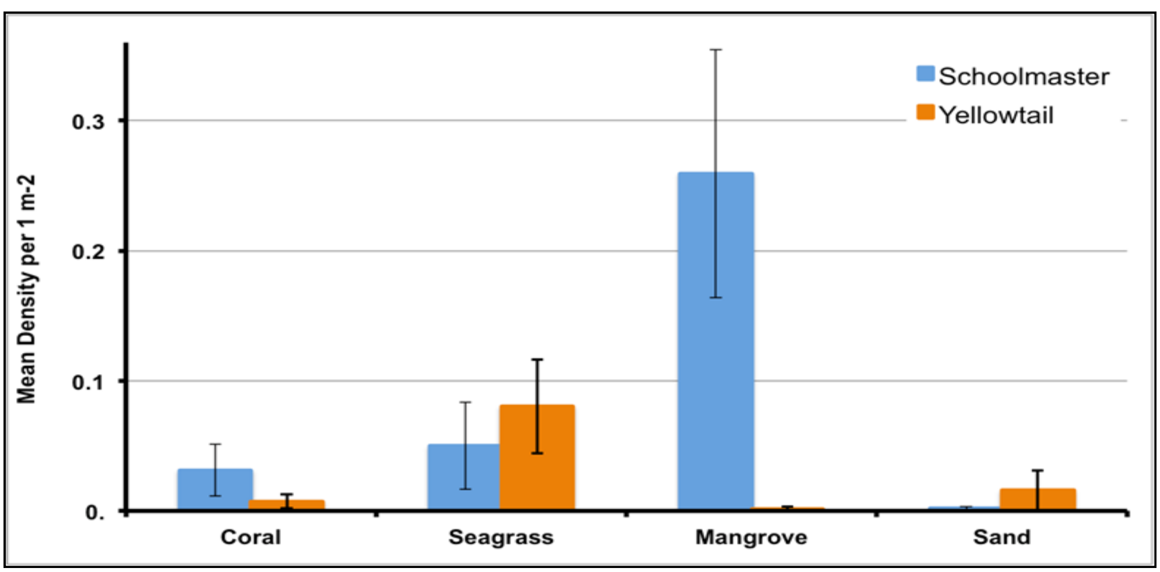

Figure 1. Mean density by habitat (fish per 1 m^2) for two Lutjanidae species. Error bars are SE.

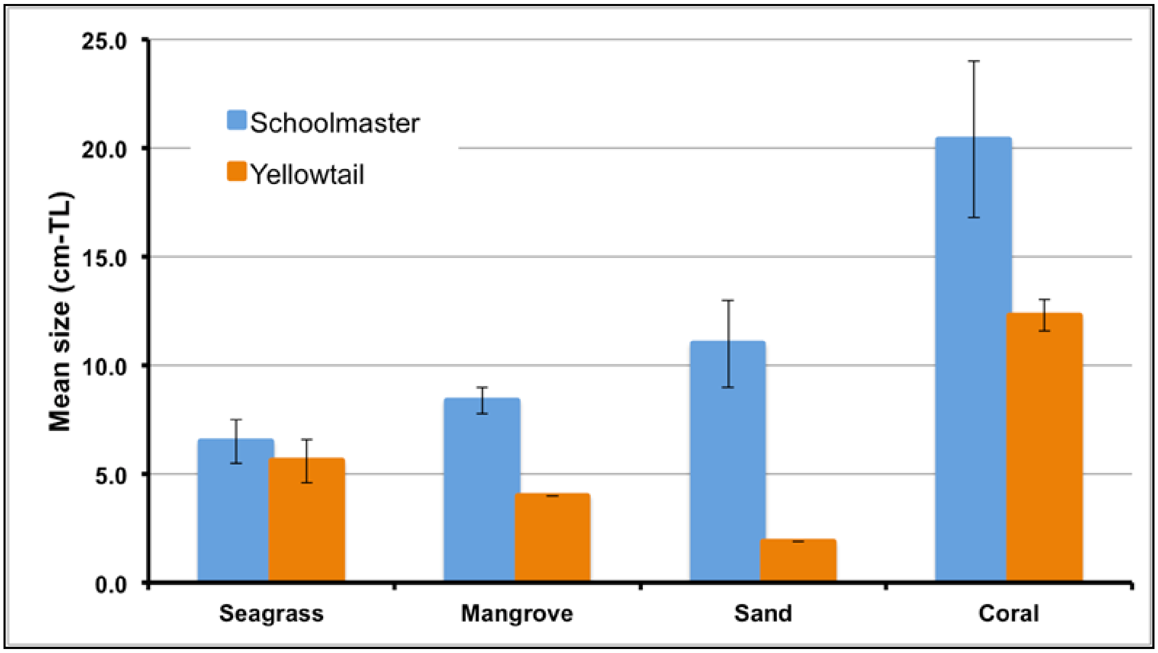

Figure 2. Mean size (FL) by habitat for two Lutjanidae species. Habitats arranged by increasing size of schoolmaster. Error bars are SE.

0.03 (SE)/m^2 (size range 5 - 12 cm) in visual surveys of the net areas, and 0.026 ± 0.01(SE)/m^2 (size range 1 - 26 cm) in complete visual transect surveys. Mean densities and fork lengths from the complete visual transect and lift net surveys of these two lutjanids are presented to illustrate slightly differing habitat affinities and potential ontogenetic shifts. Measures of density by habitat (Figure 1) suggest differences in habitat use, seagrass for yellowtail and mangrove for schoolmaster. Mean sizes by habitat (Fig.ure 2) show differences in habitat use with increasing size for schoolmaster and for yellowtail, each progressing to coral but through a different sequence of habitats. Blending of sampling approaches can provide more comprehensive data than either method separately, but the key is to understand the limitations and biases when selecting sample methods.

LITERATURE CITED

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