

## Juvenile Nassau Grouper (*Epinephelus striatus*) Utilization of Nearshore Habitats with Evidence of Adult Connectivity to a Spawning Aggregation Site

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## Menores Mero de Nassau (*Epinephalus striatus*) la Utilización de los Hábitats Cercanos a la Costa con Conexión a la Agregación de Desove

PALABRAS CLAVE: Mero de Nassau, *Epinephelus striatus*, hábitats cercanos a la costa, menores

## Juvenile Mérou Rayé (*Epinephalus striatus*) l'Utilisation des Habitats Côtiers avec une Connexion à l'Agrégation de Ponte

MOTS CLÉS: Mérous rayé, *Epinephelus striatus*, habitats côtiers, juvenile

### EXTENDED ABSTRACT

The Nassau grouper (*Epinephelus striatus*) is an important component of the reef community found throughout the western Atlantic and Caribbean (Sadovy and Eklund 1999). Once abundant, overfishing during the 1960s and 70s caused a region wide fisheries collapse (Olsen and LaPlace 1978, Sadovy and Eklund 1999, Ehrhardt and Deleveaux 2007). The Nassau grouper are known to form spawning aggregations over deep (40 m) shelf edges and mesophotic reefs (Colin 1992, Whaylen et al. 2006) when they are of mature size ( $\geq 35$ cm). After spawning larvae are known to recruit to nearshore macroalgae and seagrass beds, artificial reefs and rubble mounds of *Malacanthus plumieri* and then transition to rocky then reef habitats as they grow (Colin et al. 1997, Dahlgren and Eggleston 2000). Juveniles will spend the years prior to maturity within shallow nearshore habitats shifting slowly to offshore reefs as they mature (Dahlgren and Eggleston 2001).

The nearshore areas of St Thomas and St John provide habitat for recruitment and growth of juvenile Nassau grouper. The juvenile stage is particularly vulnerable due to its affinity for coastal habitat, which increases exposure to anthropogenic stresses (Bonfil 1997). To increase protection and conservation for the Nassau grouper, assessing how the Nassau uses nearshore habitat and the population's connectivity between the nearshore and offshore spawning aggregations is of critical importance. This study will evaluate movement patterns of juvenile Nassau grouper within nearshore areas and examine connectivity between offshore reefs and locally known spawning aggregations.

Surveys conducted via snorkel and scuba identified Nassau grouper ranging from 5 - 55 cm within Brewers Bay, St Thomas and Lameshure Bay, St. John. A size frequency distribution showed distinct zones occupied by the grouper in each bay. The benthic composition of each zone was calculated by using 40 photo quadrates randomly allocated. The % coral cover, % benthic cover and % bare cover was averaged from 25 points in each of the 40 quadrates per zone using CPCe software (National Coral Reef Institute, Dania Beach, FL). In each bay a number of grouper were manually tracked on snorkel and scuba using a handheld GPS where location, time, depth and behavior were recorded in five minute intervals and every time the fish traveled or changed behavior. All manual tracking information was used to create minimum convex polygons to describe the home range of each grouper. Home range analysis allows linkages between:

- i) The area used by each grouper,
- ii) The physical environmental conditions, and
- iii) How space use varies amongst grouper.

In addition, 10 juvenile grouper in Lameshure bay and Brewers bay were surgically implanted with Vemco (Model V7&V9, Halifax, Nova Scotia) acoustic transmitters. Acoustic telemetry will provide long term movement data within Lameshure bay and Brewers bay and the wider array (Model VR2W Hydrophone, Halifax, Nova Scotia) within in the waters of the USVI, as the transmitters have a field life of up to two years.

A clear segregation of mature and immature grouper was observed. Grouper under 35 cm were found only within shallow (< 4 m) rocky reef areas with sparse coral cover (2%/m<sup>2</sup>) whereas grouper of mature size, 35 cm or greater, were found in deeper areas (4 - 10 m) with higher coral cover (14 - 20%/m<sup>2</sup>). The mature grouper formed distinct home ranges

with little or no overlap whereas immature grouper home ranges had high to complete overlap with each other. In addition to the suggested nearshore habitat shifts, Nassau grouper acoustically tagged in Brewers bay St Thomas have been detected at least 16 km away near a known spawning aggregation site (Nemeth et al. 2006) suggesting that the nearshore fish may be able to find and utilize known spawning sites.

The results show clear habitat partitioning between mature and immature Nassau grouper within a nearshore habitat as well as the potential for ontogenetic habitat shifts. A connection between nearshore and local spawning aggregations was also made using acoustic telemetry. Juvenile Nassau grouper exhibit habitat shifts within nearshore reefs as they reach a mature size with the mature fish utilizing high coral cover and deeper waters. Nassau grouper exhibit stronger territoriality as they mature with larger fish less willing to share the habitat with other grouper when compared to smaller immature fish. Evidence through acoustic telemetry indicates that at least one residential Nassau has traveled from nearshore reefs of Brewers Bay to the spawning area 16 km south of St Thomas, demonstrating the linkage between nearshore reefs and known spawning areas.

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