Nocturnal migration patterns of two Caribbean reef fishes, *Haemulon sciurus* and *Lutjanus apodus*

Steven Hitt

Center for Marine and Environmental Studies, University of the Virgin Islands, St. Thomas, Virgin Islands (U.S.)

**Introduction**

In the Caribbean, many coral reef associated fishes have been observed making diel migrations, yet little is known about the detailed movement pathways and space use patterns of individual fish. Often these migrations occur along temporally or spatially constant corridors that connect proximal resting and foraging habitats. Recent analyses of gut contents from *Haemulidae* and *Lutjanidae*, has provided evidence that these species forage in seagrass beds and other habitats near their coral reef refugia. Few studies have provided direct and spatially explicit evidence of nocturnal migrations and detailed day and night space use patterns for individual fish.

This study integrated manual acoustic telemetry to track two common reef species, the bluestriped grunt (*Haemulon sciurus*) and schoolmaster snapper (*Lutjanus apodus*) throughout their daily home ranges. Space use patterns of these species were then examined using Geographical Information System (GIS) tools to link movement behavior to landscape structure derived in a habitat map.

This study represents a novel integration of spatial technologies to enhance our understanding of the movement ecology of adult *H. sciurus* and *L. apodus*.

**Methods**

- Two bays chosen for study in the USVI
  - Brewer’s Bay, St. Thomas
  - Lameshur Bay, St. John
- Data collected between July 2008 and March 2010
- *H. sciurus* and *L. apodus* were tagged at Brewer’s Bay and used for majority of day and night, which may indicate a requirement for shelter in structurally complex habitats. Conversely, *L. apodus* used several habitats more evenly, both during the day and at night
- *H. sciurus* increased their usage of seagrass habitats from 1% during the day to greater than 60% than during the day
- Night activity space areas were at least 2x larger than day activity space areas for 10 of the 11 fish tracked (Fig 6)
- 75% of the night activity spaces that overlapped day activity spaces did so by more than 60% (Fig 7)

**Major findings**

- Night activity space areas were at least 2x larger than day activity space areas for 10 of the 11 fish tracked (Fig 6)
- 75% of the night activity spaces that overlapped day activity spaces did so by more than 60% (Fig 7)

**Conclusions**

- By tracking and mapping *Haemulon sciurus* and *Lutjanus apodus* migration patterns with quantitative techniques the results of this study demonstrated that these species performed diel migrations, in many cases to discreet nocturnal habitats that were several hundred meters from diurnal habitats, which confirmed qualitative observations from other studies (e.g. O’Donal & Ziemann 1977)
- These data revealed that nocturnal activity spaces for nearly all of the fish tracked were considerably larger than diurnal activity spaces
- Diurnal and nocturnal activity spaces overlapped for several fishes. In some cases, these overlaps were created as individuals returned to activity spaces (i.e. site fidelity) or ventured farther away from diurnal habitats
- An increase in the number of habitats visited at night, including an increase in the percentage of time spent over seagrass habitat is likely to result from active searching for prey, however, field verification is required
- *H. sciurus* used patch reefs throughout the majority of the day and night, which may indicate a requirement for shelter in structurally complex habitats. Conversely, *L. apodus* used several habitats more evenly, both during the day and at night
- *H. sciurus* increased their usage of seagrass habitats from 1% during the day to greater than 60% than during the day

**Next steps**

- Comparison of residence times for specific habitat types among individuals within each species
- In depth characterization of *H. sciurus* and *L. apodus* habitat use and movement ecology
- Examination of interactions and linkages between animal movement and seascape composition and configuration using landscape ecology techniques

**Contact information**

Please contact steven.hitt@gmail.com. More information on this and related projects can be obtained at [http://ccma.nos.noaa.gov/ecosystems/coralreef/usvi_pr_mapping.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/usvi_pr_mapping.html) and [http://ccma.nos.noaa.gov/ecosystems/coralreef/acoustic_tracking.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/acoustic_tracking.html)

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**Literature Cited**


Bluestriped grunt photo obtained from [http://www.coralreefconservation.org/transportation/haemulon-sciurus](http://www.coralreefconservation.org/transportation/haemulon-sciurus)

Schoolmaster snapper photo obtained from [http://www.coralreefconservation.org/transportation/lutjanus-apodus](http://www.coralreefconservation.org/transportation/lutjanus-apodus)

**Figure 1:** Day and night activity spaces of *H. sciurus* in Brewer’s Bay. Night activity space only (top right). Day activity space only (bottom right).

**Figure 2:** Day and night activity spaces of *L. apodus* #3 in Great Lameshur Bay. (a) Night activity space only (top right). Day activity space only (bottom right).

**Figure 3:** Night time footprint for both *H. sciurus* (left) and *L. apodus* (right) tracked.

**Figure 4:** Day and night activity spaces of *H. sciurus* #1 in Brewer’s Bay. Night activity space only (top right). Day activity space only (bottom right).

**Figure 5:** Day and night activity spaces of *L. apodus* #5 in Great Lameshur Bay. Night activity space only (top right). Day activity space only (bottom right).

**Figure 6:** Area of day and night activity spaces.

**Figure 7:** Activity space overlap between day and night activity spaces.

**Figure 8:** Daytime and nighttime habitat use of all *H. sciurus* (left) and *L. apodus* (right) tracked.