

**Alterations in Home Range Space Use over a Multi-year Study  
of Nassau Grouper (*Epinephelus striatus*)**

**Cambios en el Uso Del Hábitat del Mero de Nassau (*Epinephelus striatus*)  
a Través de un Estudio Multi-Annual**

**Les Changements dans l'Usage d'Espace de Gamme de Maison sur une  
Étude de Multi-An de Mérou de Nassau (*Epinephelus striatus*)**

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**EXTENDED ABSTRACT**

Characterizing long-term movement patterns and space use is vital for developing a robust understanding of spatial ecology and for informing effective spatial management. Short-term active tracking has shown that a diverse array of coral reef fishes have predictable daily movement patterns within well-defined home ranges. While short-term tracking is informative regarding daily movement patterns, long-term data provide insight into the stability of these spatial use patterns. In this study, we examine the long-term (multi-year) variation in home range space use and movements of a top-predator on Caribbean coral reefs, the Nassau grouper (*Epinephelus striatus*). For most of the year adult Nassau grouper are territorial and solitary, however they migrate around winter full moons to form massive spawning aggregations. Nassau grouper are currently listed as endangered by the International Union for the Conservation of Nature due to overfishing of their spawning aggregations throughout their range. Short-term tracking shows that Nassau groupers are site attached, occupying relatively confined home ranges, making them good candidates for spatial protections. We examine the movements of Nassau grouper in the Cayman Islands by examining the frequency of acoustic detections and depth recordings at hydrophones located within the home range of tagged fish. Changes in the number of detections through time indicate alterations in the home territories. We propose three hypothetical movement patterns:

- i) Constant movement within a home range,
- ii) Short-term (daily-every few days) movement between activity centers within a home range, and
- iii) Short term movement within territories and longer term (weeks-months) movement of territories within a larger home range.

All of our study showed daily variations indicating movement between activity centers on a short-term time scale. All of our fish also exhibited changes in detection rates over the course of weeks to months, suggesting that these fish routinely alter their core territories within a larger home range. We used a time series analysis (Fast Fourier Transformation (FFT)) to identify cyclical patterns in frequency of tag detections. FFT breaks down time-series data into component frequencies and indicates temporal patterns as peaks within a frequency power spectrum. The FFT analysis showed marked peaks in the number of detections per day at 24-hour cycles for seven of the eight fish that were consistently within the detection range of hydrophones. This further supports the movement between activity centers. Fifty percent of our fish also showed broad peaks at larger time scales further confirming the idea of movement of territories within a home range. The fish that did not show this pattern moved along more inconsistent time scales preventing the movement from showing in the FFT analysis, although we do it in the frequency data. The idea of shifting activity centers within territory and shifting territories within a larger home range is further supported by our depth data. Two of our 7 fish with depth coded tags made major and persistent shifts in the depth of occupied habitat during our study. This study is novel because the length of our data set allows us to tease apart the difference between activity centers, territories and home ranges in a way short-term studies cannot. Evidence for long-term shifts in home range cores could have implications for the management of this endangered species by changing our understanding regarding the space required for effective spatial management. Further work is needed to quantify the reef space regularly used by Nassau grouper and to understand what is driving these changes. Fish in this study showed distinctly different depth use patterns when compared to the only other long-term acoustic study of this species, suggesting that movement patterns and space use of this species may depend greatly on local habitat characteristics and oceanic conditions.

**KEY WORDS:** Spatial ecology, grouper, *Epinephelus striatus*, home range, acoustic telemetry, territory