Tracking Parrotfishes (*Scarus rubroviolaceus* and *Scarus psittacus*) Using Acoustic Telemetry on a Hawaiian Coral Reef System

Loro Seguimiento (*Scarus rubroviolaceus* y *Scarus psittacus*) Utilizando Telemetría Acústica en un Sistema de Arrecifes de Coral de Hawai

Suivi Perroquets (*Scarus rubroviolaceus* et *Scarus psittacus*) en Utilisant la Télémétrie Acoustique sur un Système de Barrière de Corail Hawaïen

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EXTENDED ABSTRACT

Parrotfishes (family Scaridae) are important to coral reef ecosystems as bioeroders via production and distribution of coral sand and as herbivores controlling algal overgrowth. Scarids and other herbivores are negatively impacted when coral colony health is diminished by outside stressors (Cole et al. 2008). Some species are required to alter their ecological behavior by moving between habitats, whether on a diurnal, seasonal, or permanent basis, in order to survive (Crosby and Reese 2005). As the human population and development continue to increase along Hawaiian coastlines, there is a need for baseline studies to monitor and track coral health in coastal marine areas. Coral reefs are considered one of the most impacted marine ecosystems on earth and are in need of proper management. These impacts can have detrimental effects to coral reef fish populations, such as scarids. In Hawai'i, scarids are also highly prized by both commercial and recreational fishermen, and recent population declines indicated that improved management is needed to maintain scarid stocks. Passive tracking using acoustic telemetry has not been widely used on parrotfish on Hawaiian coral reefs; however, this method can provide managers a more comprehensive understanding of fine-scale habitat use and movement of parrotfishes. In this study, acoustic telemetry was used to describe fine-scale movements of two species of parrotfish (*Scarus rubroviolaceus* and *Scarus psittacus*) and habitat use within a coral reef ecosystem at Puakō, Hawai'i.

Puakō is located in South Kohala on the leeward side of the Island of Hawai'i. Nearshore waters of the leeward coast of Hawai'i contain some of the richest coral reefs along with associated fish and invertebrate species in the Hawaiian Islands (Smith et al. 2008). Female *S. rubroviolaceus* (n = 8) and terminal male *S. psittacus* (n = 8) were tagged externally with coded acoustic transmitters (Vemco, V8-4H) on the dorsal musculature immediately below the dorsal fin as described by Furey et al. (2013). A VR2W Positioning System (VPS) consisting of an array of VEMCO (VR2W) acoustic receivers (n = 14) was placed within the study area to examine fine scale habitat use patterns (resolution < 3 m). Tracking data were collected over a 4-week period from June 13th to July 15th, 2012. Benthic habitats were mapped within the VPS array covering an area of 1000 m^2 with depths ranging from 0 to 13 m. These surveys were conducted using a variety of scuba-based survey techniques included benthic percent cover, rugosity, and coral health. Fish surveys using strip-transect method were also conducted to calculate overall fish abundance and diversity within the study area. Surveyed area covered both shallow (< 6 m) and deep (≥ 6 m) reef. Data were analyzed in the statistical program, R (version 3.0.2). Preliminary tracking data on a single individual *S. rubroviolaceus* (SR1) was examined using Arc GIS 10.1. Average location was calculated every hour using presence/absence data collected by each receiver within the array (Simpfendorfer et al. 2002).

Acoustic tracking on SR1 shows evidence of a fairly consistent movement pattern in relation to both habitat type and time of day. Scarids made up a low percentage of the total fish community (3.28%); however, this individual showed that they may remain in small localized areas on the reef, with similar daily foraging and resting patterns. SR1 was less active and occupied deeper reef habitats during nighttime hours (8pm - 5am) potentially seeking refuge from high wave energy in areas with more shelter. Dawn and dusk (5am - 8pm and 5pm - 8am, respectively) appeared to be a transitioning period between day and night hours at a moderate level of activity, staying within a close proximity to their resting areas. During daylight hours (8am - 5pm), SR1 was highly active occupying shallower reefs, indicating a possible food source in these areas. Preliminary analysis shows these specific locations of high levels of activity have > 70% coral and algal cover. There was no significant difference in the overall benthic composition and rugosity between shallow and deep reefs. Coral (40%) and algae (25%) were the most dominant substrate types with *Porites lobata* and turf algae as the most commonly observed species. Further investigation is warranted to better determine the food and shelter preferences of parrotfishes on the reef. Tracking data shows strong clustering within each time period (day, night, and dawn/dusk); however, results are preliminary and will be further analyzed using multivariate spatial models to relate fish locations to corresponding

benthic data. Because parrotfish are important dominant herbivores, understanding their movement behavior and habitat use will allow managers to better assess their populations and overall coral reef health.

KEY WORDS: Parrotfish, acoustic telemetry, Puakō, VR2W Positioning System, *Scarus rubroviolaceus, Scarus psittacus*

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