

Movement of Reef Fishes Between Different Fishery Management Zones in the St. Croix East End Marine Park

Movimiento de Peces Arrecifales entre Diferentes Zonas de Manejo Pesquero en el Parque Marino Este en la Isla de Saint Croix

Mouvement des Poissons du Récif entre Différentes Zones de Gestion de la Pêche dans le Parc Marin est de l'Île de Saint Croix

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EXTENDED ABSTRACT

Marine protected areas (MPA) have been implemented throughout the world's oceans in hopes of sustaining and rebuilding fish populations. Several reviews of MPA effectiveness have found that fish abundance, biomass, and diversity increased rapidly within a few years of being established, had long-lasting effects and that MPA size had little influence (Halpern and Warner 2002, Halpern 2003). Less well understood is the role that fish movements, home range size and life history characteristics influence vulnerability in MPA's of different size (Sale et al. 2005).

Acoustic telemetry was used to quantify fish movements between St. Croix East End Marine Park (EEMP) no-take and recreational zones and connectivity between EEMP and Buck Island National Monument. In November 2016 an array of acoustic receivers was deployed along EEMP management boundaries (Figure 1) using concrete blocks, 3/16 in polypropylene line and a 7" polystyrene buoy to suspend receivers 5 m above the bottom. We targeted fish species known to undergo migrations for feeding or reproduction and examined frequency of boundary crossings, rates of movement and residency. The majority of tagged species (n = 52) were in four fish families: groupers, snappers, grunts and parrotfish with the remaining fish (n = 11) being triggerfish, jacks, sharks and goatfish (Table 1). Fish were caught using Antillean-style fish traps and hook and line baited with squid. Fish were held in 40 l tubs of fresh sea water, measured for total and fork length and surgically implanted with acoustic transmitters (Vemco V7, V9 or V13) depending upon fish species or size.

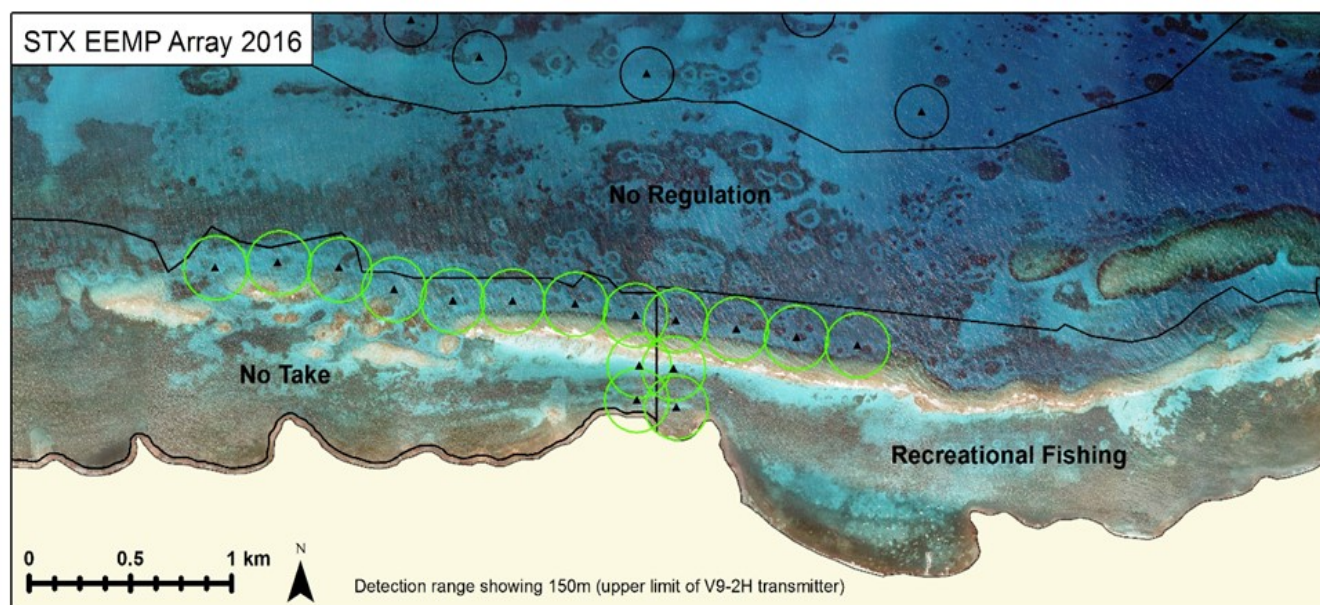


Figure 1. Acoustic array of 16 Vemco acoustic receivers positioned along the northern boundary of the St. Croix East End Marine Park and between the No-take and recreational fishing zones.

The majority of fish movements occurred between the fore reef protected and recreational zones (76.1%) followed by movements between the back reef protected and recreational zones (14.4%), indicating that fish movements were predominately linear and parallel to the reef crest. Some species also moved between the fore reef and back reef (8.2%). Red hind, coney and parrotfishes showed the lowest frequency of boundary crossings whereas snappers, grunts, queen triggerfish, bar jack, Nassau grouper and nurse sharks showed higher frequency of boundary crossings. Long distance movements from EEMP to Buck Island (1.5 km) and EEMP to Lang Bank (15 to 20 km) occurred less frequently, 1.25% and 0.11%, respectively. Large-scale movements were observed by Nassau grouper, red hind and queen triggerfish, species known to undergo spawning migrations, but also included lane and school master snappers. Diel movement patterns varied by species and included increased movements during day (Nassau, coney, red band parrotfish), night (nurse shark, lane snapper) or crepuscular (jacks, schoolmaster snapper, mahogany snapper) periods. These results will provide a measure of vulnerability among different trophic groups and guide adaptive management decisions regarding size and design of marine protected areas.

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Table 1. Target species tagged with acoustic transmitters within St. Croix East End Marine Park.

Species		Acoustic Tag (n)
Queen triggerfish	<i>Balistes vetula</i>	4
Bar jack	<i>Caranx ruber</i>	4
Coney	<i>Cephalopholis fulva</i>	3
Red hind	<i>Epinephelus guttatus</i>	12
Nassau grouper	<i>Epinephelus striatus</i>	1
Nurse shark	<i>Ginglymostoma cirratum</i>	2
White grunt	<i>Haemulon plumierii</i>	13
Mutton snapper	<i>Lutjanus analis</i>	1
Schoolmaster snapper	<i>Lutjanus apodus</i>	2
Mahogany snapper	<i>Lutjanus mahogani</i>	3
Lane snapper	<i>Lutjanus synagris</i>	2
Yellowtail snapper	<i>Ocyurus chrysurus</i>	5
Spotted goatfish	<i>Pseudupeneus maculatus</i>	1
Princess parrotfish	<i>Scarus taeniopterus</i>	1
Redband parrotfish	<i>Sparisoma aurofrenatum</i>	8
Stoptlight parrotfish	<i>Sparisoma viride</i>	1
	Grand Total	63