

Preliminary results from the Caribbean Acoustic Tracking Network (CATn):

**A data sharing partnership for acoustic tracking and movement ecology of
marine animals in the Caribbean Sea**

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***Purpose:** A multi-institutional network of collaborators sharing and integrating expertise, equipment and data on marine animal movements from a network of acoustic arrays in the U.S. Caribbean and neighboring regions.*

Network participants and target organisms:

NOAA CCMA: Fish tracking (multiple species)
http://ccma.nos.noaa.gov/ecosystems/coralreef/acoustic_tracking.html
Mark Monaco
Chris Caldwell
Randy Clark
Matt Kendall
Simon Pittman

NOAA NMFS Galveston: Conch
<http://galveston.ssp.nmfs.gov/research/fisheryecology/currentresearch/QueenConch/index.html>
Ron Hill
Jennifer Doerr

NOAA's NMFS Apex Predator Investigations (juvenile sharks)
<http://na.nefsc.noaa.gov/sharks/>
Bryan DeAngelis (NMFS NOAA)
Greg Skomal (Massachusetts Fisheries)

USGS/UHawaii: Fish tracking (multiple species)
Alan Friedlander (Biogeography Branch partner)

USGS/Florida: Turtles
Kristen Hart
https://profile.usgs.gov/kristen_hart

National Park Service: Multiple species/phyla
<http://www.nps.gov/viis/index.htm>
Rafe Boulon (St. John)
Ian Lundgren (St. Croix)

University of the Virgin Islands: Fish & turtles
http://www.uvi.edu/sites/uvi/Pages/CMES-Research_Projects_epp.aspx?s=RE
Rick Nemeth & Shaun Kadison (groupers/snappers/ spawning aggregations)
Bryan Legare (juvenile sharks with DeAngelis & Skomal) <http://uvi.academia.edu/BryanLegare>
Paul Jobsis (turtles)

University of Puerto Rico: Fish (multiple species)
Richard Appeldoorn
Others?

University of Rhode Island & Guy Harvey Research Institute: (Sharks)
Brad Wetherbee (URI) <http://www.uri.edu/cels/bio/wetherbee/p/frames.html>
Mahmood Shivji (GHRI) <http://www.nova.edu/ocean/profiles/shivji/shivji.html>

Existing Data Integration

We have recently exchanged and integrated into a single database tag detections for conch, teleost and elasmobranch fish from four separately maintained arrays in the U.S. Virgin Islands including the NMFS queen conch array (St. John nearshore), NOAA's Biogeography Branch array (St. John nearshore & midshelf reef); UVI shelf edge arrays (Marine Conservation District, Grammanik & other shelf edge); NOAA NMFS Apex Predator array COASTSPAN (St. John nearshore). The integrated database has over 7.5 million hits. Data is shared only with consent of partners and full acknowledgements. Thus, the summary of integrated data here uses data from NOAA and UVI arrays under a cooperative agreement.

The benefits of combining and sharing data have included increasing the total area of detection resulting in an understanding of broader scale connectivity than would have been possible with a single array. Partnering has also been cost-effectiveness through sharing of field work, staff time and equipment and exchanges of knowledge and experience across the network. Use of multiple arrays has also helped in optimizing the design of arrays when additional receivers are deployed. The combined arrays have made the USVI network one of the most extensive acoustic arrays in the world with a total of 150+ receivers available, although not necessarily all deployed at all times. Currently, two UVI graduate student projects are using acoustic array data.

Some summary info:

- 8000+ conch hits from NMFS tagged queen conch were received on the NOAA Biogeography Branch array and the NMFS Apex Predator array on St. John. This data was compiled by UVI graduate student Bryan Legare and shared with Ron Hill & Jennifer Doerr
- 22 Biogeography Branch tagged fish (7 species) were detected by the NMFS Galveston array and the NMFS Apex Predators array combined including *Acanthurus coeruleus* (3 individuals), *Calamus calamus* (7), *Caranx ruber* (3), *Haemulon sciurus* (3), *Lutjanus analis* (4) *Lutjanus synagris* (1), and *Mulloidichthys martinicus* (1)
- 11 grouper (3 species) tagged by UVI were detected by NMFS Galveston & NOS Biogeography Branch arrays including *Epinephelus stratus* (7 individuals), *Epinephelus guttatus* (1), and *Mycteroperca venenosa* (2)
- 9 adult sharks tagged by URI were detected by NMFS Galveston & NOS Biogeography Branch arrays including 2 lemon sharks and 7 tiger sharks
- 2 *Lutjanus analis* tagged by Biogeography Branch were detected on the UVI array
- 4 juvenile sharks were detected on the UVI array and 17 juvenile sharks including black tip and lemon sharks were detected on the Biogeography Branch array

Results

1. At least three species of shark move between the shelf-edge spawning aggregations and the nearshore coral reef ecosystems of the VI National Park on St. John.

One blacktip, two lemons and several tiger sharks) tagged and detected at the MCD and subsequently detected in shallow nearshore waters of St. John inside the VI National Park (Figure 1).

2. Several species of large-bodied grouper and snapper movements connect the VI National Park to the shelf-edge spawning aggregations at the MCD and Grammanik Bank.

One yellowfin grouper and one red hind tagged at the shelf-edge spawning aggregations were detected on the nearshore St. John array. Two mutton snapper tagged inside the VI National Park were detected at the shelf edge at spawning time (Figure 3). Furthermore, a Nassau grouper travelled from nearshore St. Thomas to the MCD spawning aggregations.

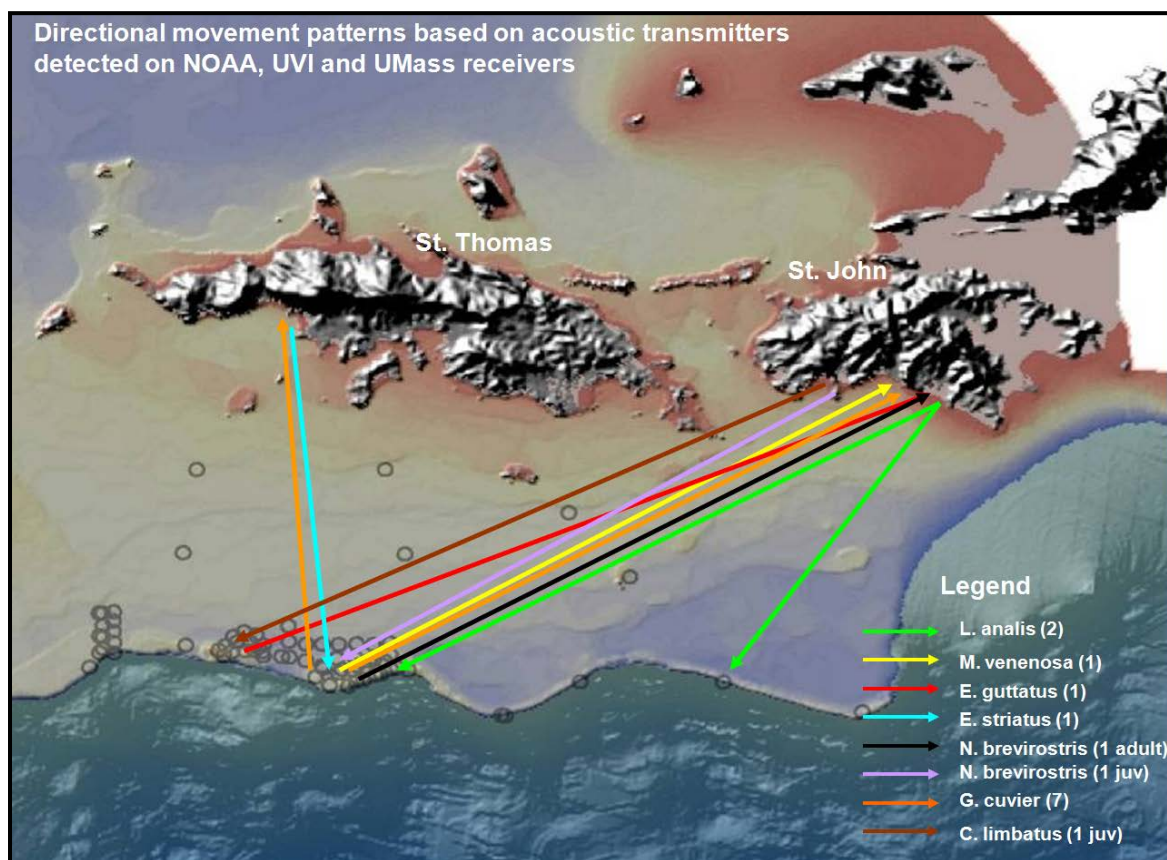


Figure 1. Patterns of detected between shelf-edge and nearshore acoustic arrays for large-bodied groupers, snappers and sharks.

3. Lemon sharks visit known spawning aggregations sites at spawning time (to fatten up?) before visiting nearshore habitats in the VI National Park during birthing season (to pup?).

One large female (2.5 m length) lemon shark tagged at the MCD in 2007/8 was annually detected at the MCD during grouper spawning season and also visited nearshore Lameshur Bay during summer birthing season over a three year period.

4. Juvenile black tips and lemon sharks undertake broad-scale movements into and out from NPS nearshore waters of St. John including movements from Fish Bay to Coral Bay and from Coral Bay to northside St John (Figure 2).

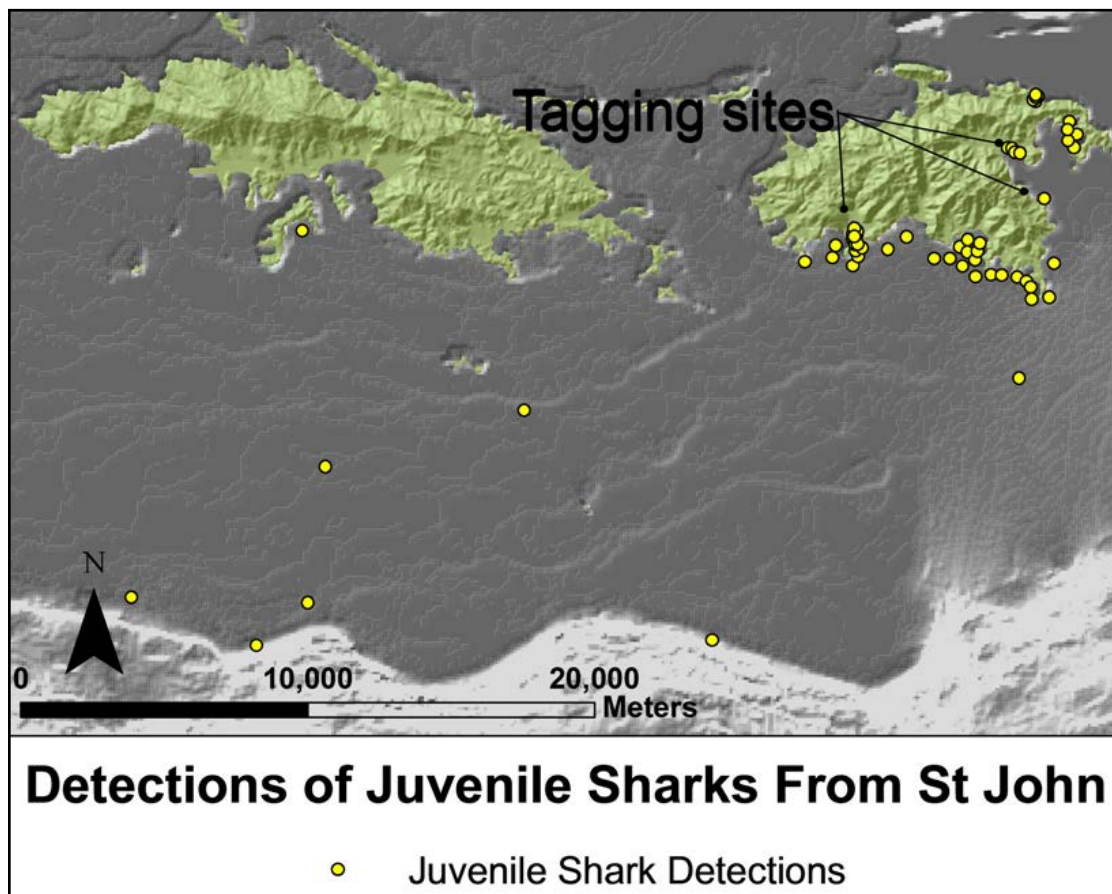
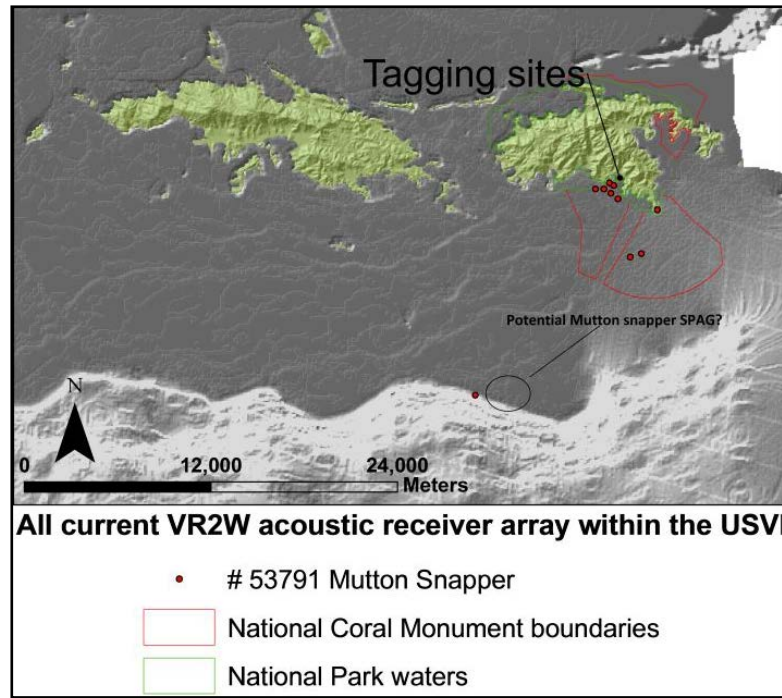


Figure 2. Detections of juvenile black tip and lemon sharks between bays of St. John and between nearshore St. John, the mid-shelf reef and the shelf-edge sites.

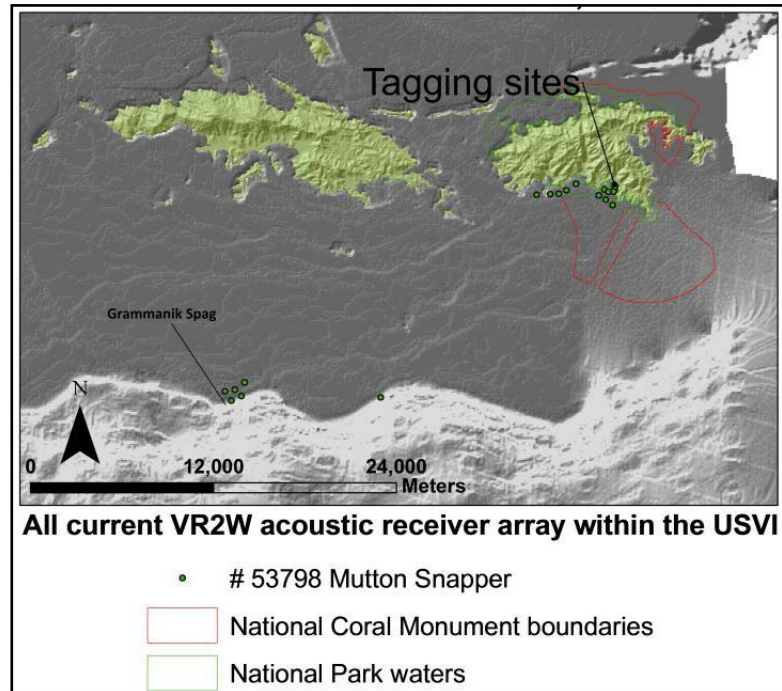
5. A mutton snapper (Tag ID 53791; Figure 3A) moved widely across the south shore St. John National Park and National Monument and at spawning time was detected at a suspected spawning aggregation on the shelf-edge south of St. John.

Another mutton snapper (Tag ID 53798; Figure 3B) moved widely inside and outside of the VI Park and Monument and visited the Grammanik Bank spawning aggregation at spawning time.

3A.



3B.



Recommendations to enhance the network:

- Continued data integration and collaborations
- Website to formalize the partnership and communicate results
- Online database with password protection to deliver data to the respective tag owners similar to Florida