

NCCOS Marine Debris Capabilities

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ABOUT NCCOS

- Mission statement
 - *NCCOS' mission is to deliver ecosystem science solutions for stewardship of the Nation's ocean and coastal resources to sustain thriving coastal communities and economies.*
- Other relevant general background info
 - Supports RESTORE Science Program and Competitive Research Program
 - Focus areas include Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA), Mussel Watch, Marine Spatial Ecology, Stressor Detection and Impacts, Coastal Change, Social Science



NCCOS Interests in Marine Debris

- **Microplastics in Key Species**
 - Enumeration in cetaceans, bivalves, corals
 - Place-based and regional differences
 - Effects on biota (phthalates and POPs)
- **Microplastics in sediments and water**
 - Classification and enumeration
- **Macroplastics and ALDFG**
 - Entanglement and ingestion with cetaceans
 - Fouling of aquaculture
 - Derelict trap detection
 - Detection following storms/disasters

Activities Related to Marine Debris in NCCOS

- Engage in intramural or extramural research
 - Enumeration and characterization of microplastics in water and sediment
 - Analytical chemistry of phthalates and persistent organic pollutants
 - Ecotoxicology testing of acute and chronic effects of microplastic ingestion in estuarine organisms
 - Enumeration and characterization of microplastics in marine mammal GI tracts
 - Geographical differences in microplastic burden in marine mammals
 - Monitoring MD entanglement and ingestion prevalence
 - Derelict trap detection, trap fouling rates, decomposition, and resource impacts
 - Surveillance of shellfish aquaculture debris

Marine Debris Detection

Objectives

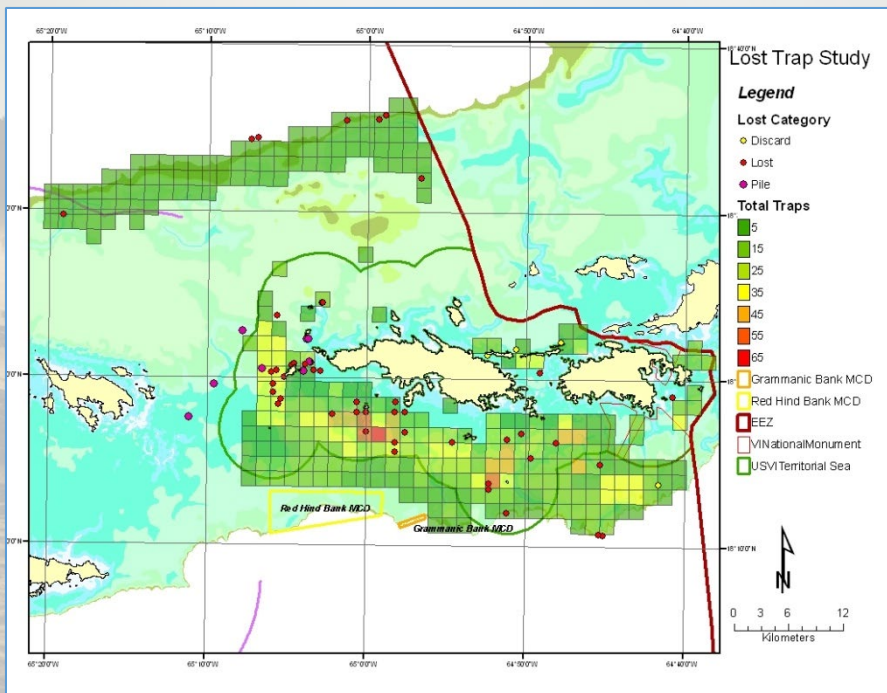
- Create database of fishing effort and lost traps
- Using database, conduct pilot study using AUV to locate and quantify lost traps
- Broad-scale study using AUV throughout region
- Trap experiments: fouling rates, decomposition over time, resource impacts

Projects

- Hydroid Remus - 100
 - Derelict Fish Trap Detection: U.S Virgin Islands. Two week Pilot Project, Two AUV's

Status

- Amend NOAA/Navy MOA to encompass project activities. Year 1 Pilot Project and Year 2 full survey
- Soliciting additional funding to cover AUV component. Partial funding was received from NOAA Marine Debris Program



Partners:

- NOAA Marine Debris Program
- NOAA Biogeography Program
- NMFS SEFSC
- St. Thomas Fisherman's Association
- US Navy ONR Panama City, FL
- National Park Service
- USVI DFW

Science, Service, Stewardship

AQUADEBRIS

DRONE TECHNOLOGY IN SURVEILLANCE OF SHELLFISH AQUACULTURE DEBRIS

**Kenneth L. Riley and
James A. Morris, Jr.**

National Ocean Service

**Everette Newton and
David W. Johnston**

Duke University Marine Laboratory



Monitoring MD Entanglement and Ingestion



Activities Related to Marine Debris in NCCOS

Publications, workshop reports

- Participant/Collaborator in the NOAA Marine Debris Program. 2019. Southeast Marine Debris Action Plan. Silver Spring, MD.
- Claro, F, Fossi, MC, Loakeimidis, C, Bains, M, Lusher, AL, McFee, W, McIntosh, RR et al. 2019. **Tools and constraints in monitoring interactions between marine litter and megafauna: Insights from case studies around the world.** *Marine Pollution Bulletin* 141: 147-160.
- Isobe et al. 2019. **An interlaboratory comparison exercise for the determination of microplastics in standard sample bottles.** *Marine Pollution Bulletin* 146: 831-837.
- Battaglia, F. 2019. **Microplastics from the gut of a marine apex predator, the bottlenose dolphin (*Tursiops truncatus*): challenges of measurement and first results from South Carolina.** College of Charleston Graduate Program in Marine Biology Masters Thesis, 2019. 103 pp.
- **Marine Debris Impacts on Coastal and Benthic Habitats.** P.B. Key, S. McLaughlin (2016) National Oceanic and Atmospheric Administration Marine Debris Program. Silver Spring, MD <https://marinedebris.noaa.gov/reports/marine-debris-impacts-coastal-and-benthic-habitats>
- **Report on Marine Debris as a Potential Pathway for Invasive Species.** P.L. Pennington (2017) National Oceanic and Atmospheric Administration Marine Debris Program. Silver Spring, MD https://marinedebris.noaa.gov/sites/default/files/publications-files/2017_Invasive_Species_Topic_Paper.pdf
- Conway, J and W. McFee. 2015. **Defining and documenting marine debris interactions with wildlife.** U.S. Dep. Commerce, NOAA Technical Memorandum NOS NCCOS 199. 52 pp.
- **Report on the Entanglement of Marine Species in Marine Debris with an Emphasis on Species in the United States.** W. McFee. 2014. National Oceanic and Atmospheric Administration Marine Debris Program. 2014 Silver Spring, MD. 28 pp https://marinedebris.noaa.gov/sites/default/files/publications-files/mdp_entanglement.pdf
- **Report on the Occurrence and Health Effects of Anthropogenic Debris Ingested by Marine Organisms.** J. Ragland (2014). National Oceanic and Atmospheric Administration Marine Debris Program. 2014 Silver Spring, MD. 19 pp https://marinedebris.noaa.gov/sites/default/files/publications-files/mdp_ingestion.pdf
- Wertz, H., DeLorenzo, M.E., Weinstein, J.E. 2015. **Assessing the effects of polyethylene microbeads on juvenile hard clams (*Mercenaria mercenaria*).** 36th Annual Meeting, Society of Environmental Toxicology and Chemistry, Salt Lake City, UT. Nov. 1-5, 2015.
- Wertz, H. **Plastic debris in Charleston Harbor: Characterizing particles in the field and assessing their effects on juvenile hard clams (*Mercenaria mercenaria*).** College of Charleston Graduate Program in Marine Biology Masters Thesis, 2015.
- Regulatory work (if any)
 - State of Florida Aquaculture Debris BMPs
- International activities/collaborations
 - 6th International Marine Debris Conference
 - Marine litter and megafauna (France, Italy, Greece, Norway, Australia, Mexico)

Resources/Expertise Available at NCCOS

- Resources:
 - drones, AUVs, UAS, USV, ROV, Acoustic sonar (SBES, MBES, SSS, PDBS, SAS, sub-bottom); Lidar; down to 75um sieves, stacked sieve shaker, filtration manifolds and pumps, necropsy lab, stereo and epifluorescent microscopes, mesocosm toxicity facility, imaging software, vessels, archived samples; high performance server farm
- Expertise
 - environmental sample collection (wildlife and water), debris characterization (i.e., chemical analysis (phthalates and POPs), spectroscopy); cloud based computing; geospatial predictive modeling; advanced AI and machine learning for automation; commercial and NTM satellite imagery, UxS, acoustic sonar, airborne Lidar acquisition, processing and analysis; hazard/exposure/risk assessment, imagery analysis

Opportunities/Needs for Interagency Collaboration

- Resources:
 - Use/purchase of micro-Raman or FTIR
- Expertise – EPA? Contaminants potentially entering food chain via microplastics
- Joint/coordinated activities
 - Research: plastic pollution monitoring for Great Lakes Mussel Watch Program; organ system effects of ingested plastics
 - Workshops/Meetings/Studies: literature review for state of knowledge of microplastics; national mapping efforts for marine debris ‘hot spots’; Update of National Geodetic Survey emergency response imagery and aerial damage assessments to include marine aquaculture imagery
 - International outreach: broader coordination with wildlife issues, technological advancement, detection and monitoring
 - Sample processing: need to standardize processing
 - Sample collection: need to standardize collection
 - Database development/maintenance; Coordination with other agencies on wildlife effects/data management