Advanced Technologies in Marine Science Symposium

GULF STATES MARINE FISHERIES COMMISSION
70th ANNUAL SPRING MEETING
MARCH 11, 2020
THE LODGE AT GULF STATE PARK
GULF SHORES, ALABAMA

Advanced Technologies in Marine Science
Wednesday, March 11, 2020
Gulf Shores, Alabama
Gulf Ballroom II
8:30 a.m. – 12:00 p.m.

1. Using Saildrones for Remote Ocean Mapping and Characterization – Captain Brian Connon, University of Southern Mississippi, Hydrographic Science Research Center

2. Reef Fish Management Is Tough – Can Fisheries Acoustics Help? – Dr. Kevin Boswell, Florida International University

3. Using Marine Animal Tracking Data to Help Inform Management in the Gulf of Mexico – Dr. Susan Lowerre-Barbieri, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute and the University of Florida

4. Artificial Intelligence and Machine Learning Innovation in Fisheries and Protected Species Monitoring in the Gulf of Mexico – Dr. Elizabeth Scott-Denton, NOAA Fisheries

5. Advanced Technology Approaches to Quantifying Reef Fish and Sea Turtle Abundance and Habitat Types on the West Florida Shelf – Dr. Steve Murawski, University of South Florida

The symposium started with a presentation by Brian Connon, the director of the Hydrographic Science Research Center at the University of Southern Mississippi. He discussed the use of autonomous 7 m, wind propelled, solar powered drones in mapping the ocean floor. He stated that recent goals and objectives for using drones was to configure and demonstrate shallow water ocean mapping in remote areas and evaluate their potential use by NOAA. He reported that they recently completed two multibeam mapping missions in the Gulf of Mexico. The missions were successful with many lessons learned. He stated that in 2019 Saildrone successfully completed its second U.S. west coast survey for NOAA Fisheries that covered the entire west coast in sixty days. Drones have been used to track fur seals and map their prey, track king crabs, and monitor and track right whales.

Dr. Kevin Boswell discussed fisheries acoustics and stated his work was broadly focused on examining the habitat relationships with nekton and reef fish. In particular he was working to describe distributional dynamics, habitat effects as well as behavior and interactions among species. He stated that the primary drivers for acoustics in the marine environment was to understand factors that act to structure ecosystems, habitat associations and linkages, and behavior and trophic interactions. Dr. Boswell discussed the West Florida Shelf Acoustic/Optical Fisheries Independent Survey that examines the structure and biomass of reef communities at natural and artificial reef habitats. The survey uses an ROV, fisheries echosounders, and multibeam sonar to address critical information gaps in reef fish demographics. Results from this study will provide valuable information on reef fish community demographics, size, and trophic structure across the shelf off northwest Florida, but more importantly this work will test relationships between habitat variables and reef fish communities not previously possible.

Dr. Susan Lowerre-Barbieri discussed how researchers are developing networks to help synthesize movement data on marine predators and integrate it with environmental and habitat layers. She stated that researchers were using multiple methods to understand and ground truth fish movements including dart tags, electronic tracking, biogeochemical tracers, genetics, and eDNA. Researchers were trying to leverage ongoing or completed tracking research by bringing together PSAT/archival tag tracks or sharing data across acoustic telemetry arrays. She reported that researchers upload all non-target tags detected in their acoustic arrays at least once a year with their tag meta-data. If another researcher's tag was uploaded from someone else's array, the system generated an automated email to connect the array owner and tag owner to share data. Recently, tracking data have been used to examine long-distance nurse shark migrations, Gulf-Atlantic connectivity of tarpon, using movements to identify predation events, and long-distance migrations of multiple shark species from Alabama to the Florida Keys. She stated that researchers have an opportunity to build, test, and integrate new technology to build the research and data needed to lead the nation in integrating movement into management.

Dr. Elizabeth Scott-Denton discussed how artificial intelligence (AI) was being used to perform tasks that normally require human intelligence. She stated that machine learning (ML) was the application of AI that provided systems the ability to automatically learn and improve from experience without being explicitly programmed. In fisheries, she reported that there was an increasing need for industry and marine researchers to build collaborative partnerships to optimize AI/ML capacity for multiple uses. These projects build upon previous developments made by the Alaska Fisheries Science Center and the Southeast Fisheries Science Center. These projects focus on the application of a newly released open-source Video and Image Analytics for Marine Environments (VIAME) toolbox, a tool used widely in ML analytics for automated object detection, tracking, and classification of marine species. VIAME was initially applied to underwater fisheries surveys to improve the effectiveness and quality of abundance indices for stock assessments. VIAME's computer vision library and ML algorithms streamlined the processing of still photos and video imagery data, resulting in up to 75% cost-savings for some survey programs. Dr. Scott-Denton showed an example of how AI/ML has been used in the Gulf of Mexico shrimp fishery to observe bycatch and protected species. She stated that AI/ML has the ability to be used in several fisheries and could provide significant cost savings over human observers.

Dr. Steve Murawski stated that reef fish species occur on the West Florida Shelf on carbonate reefs that cannot be easily quantified with traditional sampling gears like nets, traps, hooks, trawls, and fixed baited cameras. The long-term goal for his project was to design a sampling system to estimate absolute biomass and length composition of reef fish populations. His group developed a towed camera to count fish. He stated that there were several obstacles to overcome with using a camera. The obstacles were attraction and avoidance of the camera system by fish, visibility problems in murky or cloudy water, calibration of view to estimate density (numbers/area), habitat-stratified abundance (mapping w/fish counting), and processing of video imagery. Dr. Murawski discussed some of the work that had been completed with the towed video gear. Dr. Murawski hoped to extend high-resolution mapping in the eastern Gulf of Mexico to an additional 15,000 km^2 of important offshore reef fish and sea turtle habitat, classify the habitat types and biota in areas surveyed, archive data collected for efficient discovery, engage regulatory agencies in prioritizing and protecting valuable habitats, and perform cross-calibration studies with NMFS and FWRI video camera systems.

A video of the presentations can be watched at https://youtu.be/49BK_I_Mj8g.

Attendees	Affliation
Jason Froeba	LDWF, Baton Rouge, LA
Dan Ellinor	FWC, Tallahassee, FL
Joe Jewell	MDMR, Biloxi, MS
Matt Hill	MDMR, Biloxi, MS
John Mareska	ADCNR/MRD, Gulf Shores, AL
Chris Denson	ADCNR/MRD, Gulf Shores, AL
Darin Topping	TPWD, Rockport, TX
Christopher Mace	TPWD, Rockport, TX
Roy Crabtree	NOAA Fisheries, St. Petersburg, FL
Glenn Constant	USFWS, Baton Rouge, LA
Beverly Sauls	FWC/FWRI, St. Petersburg, FL
James Ballard	GSMFC, Ocean Springs, MS
Joe Ferre	GSMFC, Ocean Springs, MS
Jeff Rester	GSMFC, Ocean Springs, MS
Dave Donaldson	GSMFC, Ocean Springs, MS
Steve VanderKooy	GSMFC, Ocean Springs, MS
Gregg Bray	GSMFC, Ocean Springs, MS
Donna Bellais	GSMFC, Ocean Springs, MS
Ali Wilhelm	GSMFC, Ocean Springs, MS
Paul Mickle	MDMR, Biloxi, MS
Lance Robinson	TPWD, Austin, TX
Edward Swindell	Marine Process Service, LLC, Hammond, LA
Susan Lowerre-Barbieri	FWC/FWRI, St. Petersburg, FL
Steve Murawski	University of South Florida, St Petersberg, FL
Kevin Boswell	Florida International University, Miami, FL
Elizabeth Scott-Denton	NOAA Fisheries, Galveston, TX