INTRODUCTION

NOAA Ship *Oregon II* departed Pascagoula, MS on October 9, 2019 for the 32nd Fall Shrimp/Bottom Fish Survey, conducted under the auspices of the Southeast Area Monitoring and Assessment Program (SEAMAP). SEAMAP is a state-federal-university program for the collection, management and dissemination of fishery independent data.

The primary objectives of this survey is to monitor the relative abundance, spatial distribution, and size composition of penaeid shrimp stocks and other demersal organisms across the northern Gulf of Mexico (GOM) in water depths from 5 to 60 fm.

NOAA Ship *Oregon II* was scheduled for 41 days at sea (October 8 – November 22, 2019), which was divided into three legs: Leg 1) October 8 – 22; Leg 2) October 24 – November 7; and Leg 3) November 12 - 22. The first leg departed October 9th and steamed SW towards Brownsville, TX. Leg I was delayed due to mechanical issues. Sampling began on October 11th. Leg II of the survey was delayed in Galveston, TX for two days due to weather. The ship departed Galveston, TX on October 26th to begin Leg II. Leg III of the survey was delayed one day and departed on November 13th due to weather. The ship returned to Pascagoula, MS on November 22nd. There were two scheduled port calls to exchange scientific personnel (Galveston, TX October 24th and Pascagoula, MS November 7th. There was a total of 4 days lost throughout the survey resulting in 37 successful sea days.

Summary of Objectives

1. Primary Objectives
    a. Sample the northern GOM with SEAMAP standard trawl sampling gear to determine the abundance and distribution of benthic fauna.
    b. Collect size measurements to determine population size structures.
    c. Record profiles through the water column for temperature, salinity, fluorescence, dissolved oxygen, and turbidity using a Conductivity/Temperature/Depth (CTD) unit at SEAMAP stations.
    d. Attach GoPro cameras to CTD unit at all trawl stations to assess bottom type during SEAMAP Stations.
    e. Transmit the processed CTD profiles to a previously setup FTP site as often as time permits to NOAA National Center for Environmental Information (NCEI) at Stennis Space Center, MS.
    f. Conduct bottom mapping using an Edgetech sidescan sonar, EK-80 depth sounder, and a real-time bottom tracking program to determine trawlable habitat on all East Delta stations shallower than 35 m.
    g. Use the NOTUS Trawlmaster Gear System to monitor the trawl's performance during the tow in real-time.

2. Secondary Objectives
    a. Opportunistically attach GoPro cameras to the trawl net to monitor gear performance.
    b. Attach the Eureka Manta multiprobe to all trawls.
    c. Conduct opportunistic towed camera sampling on previously towed sites where excess sponge was encountered.
    d. Conduct additional CTD casts when data looks questionable after a tow.

MATERIALS AND METHODS

The sampling gear consisted of a 12-m (40 ft) shrimp net with 2-m by 1-m chain bracketed wooden doors towed with 54-m bridles and a single warp. A standard free tickler chain cut 106 cm shorter than the footrope was used to stimulate organisms out of the substrate and into the path of the oncoming net. Sample sites (206) were randomly selected between 5 and 60 fm within Gulf Coast shrimp statistical reporting zones 5-21. Bathymetric data were obtained from NOAA's Environmental Satellite, Data, and Information Service (NESDIS) website. Sampling sites were proportionally allocated according to surface area of statistical zones and two depth allocation units, 5-20 and 21-60 fm. Tow durations were 30 min at a targeted speed of 2.5 kt with tow direction left to the discretion of the bridge watch.

The NOTUS Trawlmaster Gear System was used at as many stations as possible to monitor the trawl gear performance. The NOTUS system assessed in real-time the accuracy of the trawl's deployment, as it is being towed, and during its retrieval. With sensors attached to the doors and footrope, the system calculated how far the doors were spread and monitored the trawl's position in reference to the sea floor using an inclinometer. The sensors and hydrophone communicates to a command center that collects and displays all of the appropriate data. Along with determining the functionality of the trawl, a Eureka Manta multi probe was attached to one of the doors to determine the feasibility of collecting fine scale dissolved oxygen measurements throughout an entire tow. In addition to these other gear types, two GoPro cameras were also attached to the head rope on selected trawls where water clarity was good enough to see the gear as well as the bottom during daylight trawls. At the completion of each trawl, the GoPro cameras were removed and the videos were downloaded. The cameras were then re-attached for the next trawl.

Catch data were electronically recorded at-sea with the Fishery Scientific Computing System (FSCS), version 1.6, developed by NOAA's Systems Development Branch of the Office of Marine & Aviation Operations. The FSCS was used in conjunction with the Southeast Advanced Logger (SEAL, version 4.0.1) which recorded position, depth, date, time, and meteorological data. Catches were either processed in their entirety or subsampled, depending on the total catch weight. If catches exceeded 22.7 kg (50 lb), then at least 10% was taken as a subsample. Catches (or subsamples) were sorted to the lowest taxonomic level possible then enumerated and weighed. Taxa that were not identified to species level were returned to the laboratory for additional taxonomic resolution. Weights were collected using Marel motion compensating M1100 scales. Large capacity scales (30 kg max, 10 gm resolution) were used to obtain total catch weights and small capacity scales (6 kg max, 1 gm resolution) for individual species weights. Scales were calibrated before every station. Lengths were recorded using Limnoterra Limited electronic measuring boards. A maximum of 20 individuals per species of snapper, grouper, triggerfish, and lionfish per station were selected for individual size measurements, weight, and sex. For all other species, a maximum of 20 individuals were selected per station for size measurements and every fifth individual collected weight and sex in that series of 20.

Vertical profiles of temperature, conductivity, dissolved oxygen, percent light transmission and fluorometer values were recorded with a Seabird SBE 911. Water color and percent cloud cover observations were also taken during daylight hours. Second CTD casts were conducted when catches indicated tows most likely transited hypoxic boundaries (little to no catch is expected where DO concentration falls below 2.0 mg/L). CTD profiles were transmitted to a FTP website hosted by the NCEI.

To better characterize bottom habitat, a Sony action camera and a LED light system was attached

to the carousel of the CTD profiler to illuminate bottom substrate at every station. When the CTD cast was complete, the camera was removed and downloaded.

Due to the high occurrence of live bottom (sponges and corals) in the East Delta, mitigation measures were used prior to and during the survey to avoid these areas.

Prior to leaving the dock:
All previously known untrawlable areas including non-flat hard bottom areas, hydrophones, seagrass, reef sites, previous hang locations, wrecks, artificial reefs, Marine Protected Areas, and anything else deemed as untrawlable areas were taken out of the sampling universe. All stations selected for this survey fell in areas believed to be trawlable.

At Sea:
An Edgetech 4125 dual frequency Side Scan Sonar, an EK-80 bottom depth sounder, and a Real Time SCS program were all used to help identify and avoid any habitat or obstructions along the sea floor. Every station in depths less than 35 m was surveyed at least once at a target speed of 5.0–6.0 kt. Watch Leaders (WL) and/or the Field Party Chief (FPC) used all methods in combination with one another to designate whether a station was trawlable. If a transect was deemed untrawlable, more transects would be run until either a trawlable transect was found or an hour of attempting to find one had passed. If no transects were deemed trawlable after one hour, the station was dropped. When a transect was deemed trawlable, a CTD and a trawl were completed.

Any movement of a station had to maintain the targeted starting depth of the original station and shrimp statistical zone prior to relocation.

In addition to an Edgetech 4125 dual frequency Side Scan Sonar, an EK-80 bottom depth sounder, and a Real Time SCS program, a towed camera system was deployed at historic trawl paths where more than 50kg of sponge were collected to visually assess habitat in these previously towed areas.

RESULTS AND DISCUSSION

One hundred and seventy-five stations were planned for NOAA Ship *Oregon II* to complete. In addition to the stations assigned to NOAA Ship *Oregon II*, eight stations were sampled for our SEAMAP partners. One hundred eighty-three stations were completed, 11 were given an operational code for gear problems (e.g. torn net, broken tickler chain, etc.), and eight were dropped by the WL using the coral/sponge mitigation measures. In addition, five video transits were conducted to assess the impact of trawling on sponge communities in the east GOM. Therefore, 188 stations were completed over the three legs of the survey (Figure 1).

The CTD camera system was used at 152 stations where a trawl was conducted to characterize the bottom habitat type. In addition to the CTD camera system, the Side Scan Sonar tow fish was deployed at all stations less than 35 m in the Eastern GOM to determine trawlable bottom (Figure 2).

The Eureka Manta multiprobe was deployed on 59 trawls, on legs I and III. During leg I, the multiprobe was damaged and was not used on leg II. The NOTUS Trawlmaster Gear System was deployed on 133 trawls. Due to safety issues, the towed hydrophone was not deployed in rough seas. Finally, the trawl cameras were placed on 36 trawls, primarily in the eastern GOM where the water quality was favorable (Figure 3).

Fish and invertebrate samples were frozen and returned to staff members at NOAA Fisheries Pascagoula, MS and Panama City, FL; University of Southern Mississippi-GCRL, Texas A&M

University, Tulane University, and Florida Fish and Wildlife Conservation Commission.

QUALITY CONTROL

As part of a study to determine 100% accuracy of our identifications, five specimens of each species from both day and night watches were identified, saved and frozen. Specimens were a representation from each newly encountered species within each Shrimp Stat Zone. These samples were brought back to NOAA Fisheries in Pascagoula, MS to verify for accuracy.

ACKNOWLEDGMENTS

On behalf of the Mississippi Laboratory and the scientific party, we would like to thank the Commanding Officer and crew of NOAA Ship *Oregon II* for a job well done.

Cruise Participants

Leg I: October 9 - 22

Name	Title	Organization
Andre DeBose	Field Party Chief	NMFS
Taniya Wallace	Watch Leader	Riverside Technology, Inc.
Alonzo Hamilton	Watch Leader	NMFS
Chrissy Stepongzi	Watch Stander	Riverside Technology, Inc.
Mark Grace	Watch Stander	NMFS
Joseph Salisbury	Watch Stander	Riverside Technology, Inc.
Noah Mathe	Intern	Texas A&M University
Kristin Hannan	Watch Stander	Riverside Technology, Inc.

Leg II: October 26 – November 7, 2019

Name	Title	Organization
Taniya Wallace	Field Party Chief	Riverside Technology, Inc.
Chrissy Stepongzi	Watch Leader	Riverside Technology, Inc.
Alonzo Hamilton	Watch Leader	NMFS
James Johnson	Watch Stander	NMFS
John Moser	Watch Stander	NMFS
Kevin Rademacher	Watch Stander	NMFS
Warren Brown	FMES	NMFS
Paul Felts	Watch Stander	NMFS
Walter Ingram	Watch Stander	NMFS

Leg III: November 13 – 22**, 2**019

Name	Title	Organization
Andre DeBose	Field Party Chief	NMFS
Brandi Noble	Watch Leader	NMFS
Kevin Rademacher	Watch Leader	NMFS
Kenny Wilkinson	Watch Stander	NMFS
Eric Hoffmayer	Watch Stander	NMFS

William Tarver	Watch Stander	Alabama DCNR
Nick Hopkins	FMES	NMFS
Julia Goodman	Watch Stander	Florida FWC
Rafael Ortiz	Watch Stander	NMFS
Andy Millet	Watch Stander	Riverside Technology, Inc.

Figure 1: 2019 SEAMAP Trawl Survey stations that were successful, where there was bad bottom, where OpCodes were used, and where video transits were conducted.

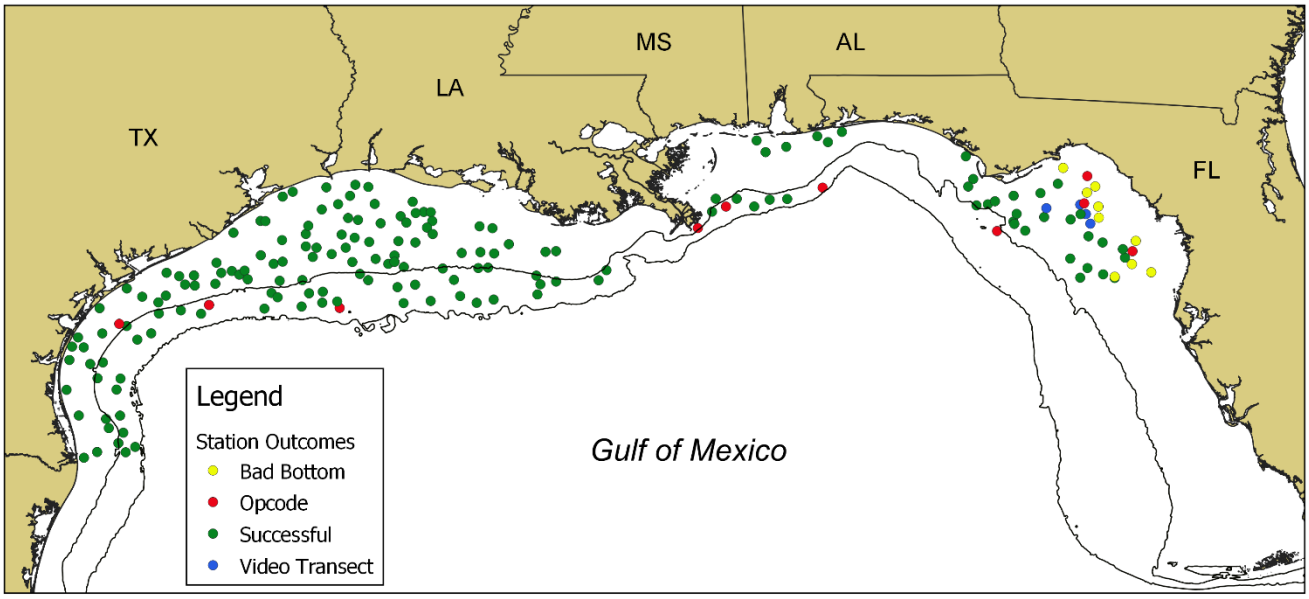

Figure 2: 2019 SEAMAP Trawl Survey stations where a) CTD cameras and b) Side Scan Sonar were deployed.

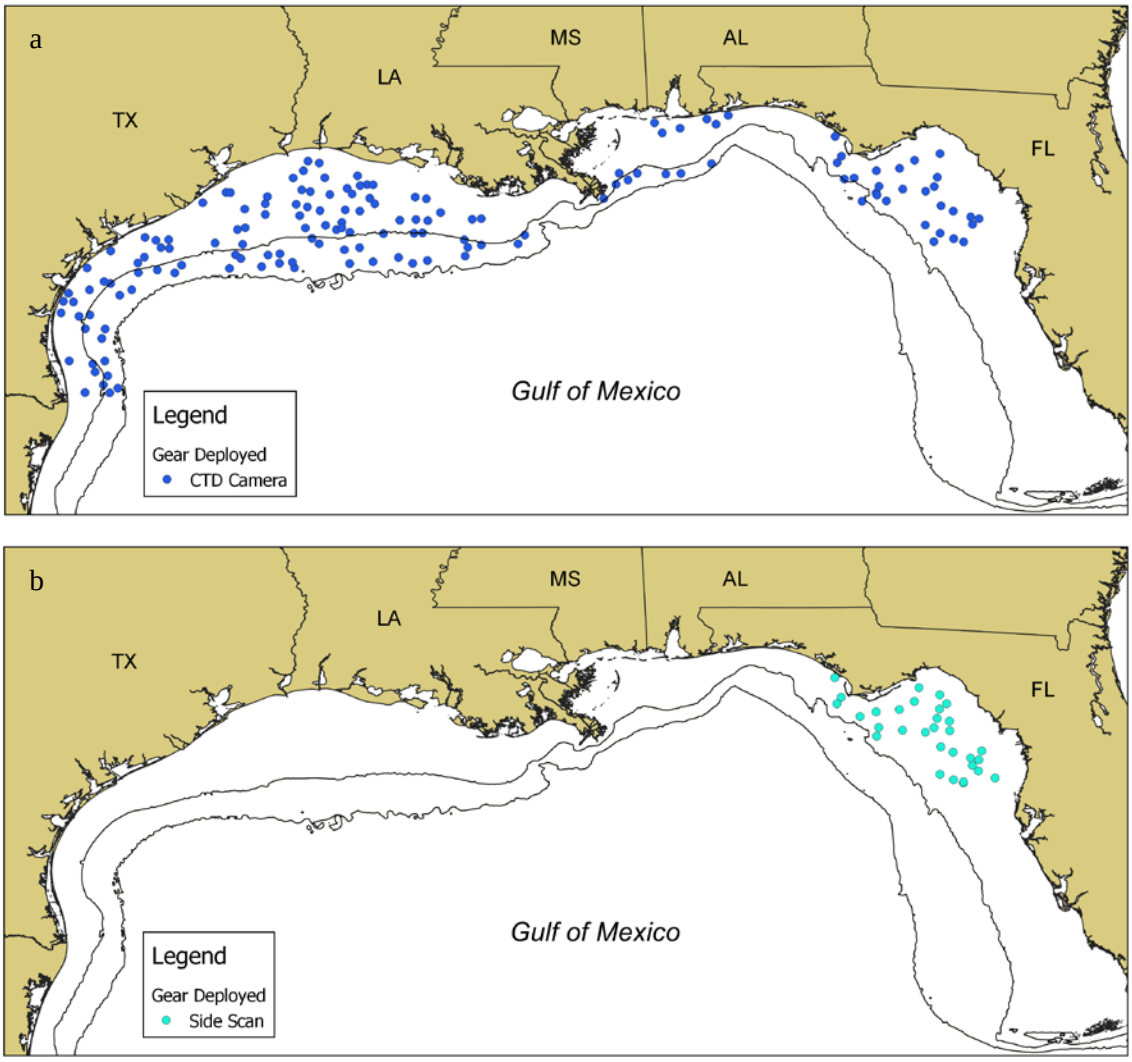

Figure 3: 2019 SEAMAP Fall Trawl Survey maps depicting the stations were the deployment of a) NOTUS trawl monitoring gear, b) trawl cameras, and the c) Eureka Manta multi probe were deployed.