U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center

3209 Frederic St
Pascagoula, MS 39564

Cruise Report

Date Submitted: 11/12/2019

Platform: NOAA Ship PISCES

Cruise Number: 761906

Project Title: South Atlantic and Gulf Mapping Survey

Cruise Dates: 07/30/2019 - 08/13/2019

Submitted by: CAMPBELL.MATTHEW.DENIS.1404115657 Digitally signed by CAMPBELL.MATTHEW.DENIS.1404115657 Date: 2019.11.12 13:21:58 -06'00'
Field Party Chief

Date: 11/12/2019

Approved by: DESFOSSE.LISA.L.1365834519 Digitally signed by DESFOSSE.LISA.L.1365834519 Date: 2019.11.12 17:43:21 -06'00'
Lab Director

Date: 11/12/2019

Approved by: BRAINERD.THEOPHILUS.R.DR.1365819285 Digitally signed by BRAINERD.THEOPHILUS.R.DR.1365819285 Date: 2019.11.13 11:37:18 -05'00'
Director, SEFSC

Date: 11/13/2019

Introduction

NOAA Ship *Pisces* departed Morehead City, NC on July 30th, 2019 to conduct an Acoustic Survey of natural hard bottom areas located on the continental shelf and shelf edge of the U.S. South Atlantic Bight (SAB) and Gulf of Mexico (GOM). Two weeks of sea time was made available due to the closure of the acoustic range (AUTEC) and the mapping survey mission was selected because of the quick deployment/turnaround capability of NMFS Mississippi Laboratories (MS-Labs) personnel and the potential utility of the mapping products for use in the Atlantic MPA Survey (NMFS Panama City), SEFIS Survey (NMFS Beaufort), and the SEAMAP-RFV Survey (Mississippi Laboratories). Funding was provided for overtime and travel costs by NMFS Mississippi and Panama City Laboratories. Originally the survey was assigned 761904 which is reflected in cruise instructions but was later assigned 761906.

Objectives

1) Collect bathymetric data with the ME70 multi-beam sonar at select locations in the SAB and GOM.
2) Test deep water beam configurations for the ME70 and for streamlining into Hypack Survey Software.
3) Collect conductivity, temperature, dissolved oxygen, fluorescence, and transmissivity data profiles of water column to obtain speed of sound for processing acoustic data.
4) Prepare and test shipboard winches for use during the SEAMAP Plankton Survey.
5) Conduct training sessions with new OMAO Officers to learn Bongo net deployment and operations in preparation for the SEAMAP Plankton Survey.
6) Prepare the Continuous Underway Fish Egg Sampler (CUFES) system for use in the SEAMAP Plankton Survey.

Cruise Participants:

Leg 1: 07/30/2019 – 08/13/2019 (15 sea days) – Morehead City, NC to Pascagoula, MS

Name	Title	Organization
Matthew D Campbell	Field Party Chief	NMFS - Pascagoula, MS
Charles Thompson	Physical Scientist	NMFS/Stennis Space Center, MS

Methods

Bathymetric mapping and beam configuration testing was conducted with the ME70 and focused on finding natural hard bottom habitats located on the continental shelf to increase the sampling universes for the Atlantic MPA, SEFIS, and SEAMAP-RFV surveys. HYPACK software 2018 (Middletown, CT) was used to plan the survey transects over target areas and was also used for real-time visualization. Andy David and Stacy Hargrove with the PC Lab selected four locations in the SAB to map (Figure 1). Matthew Campbell and Brandi Noble with the MS Labs selected three GOM locations (Figure 1). One SAB and two GOM locations were opportunistically mapped after primary locations were finished. The SAB adaptive mapping location in Florida was chosen due to observations of interesting bathymetry during ship transit. The extra GOM

locations at the head of De Soto Canyon were chosen from a combination of historic mapping, VMS data, and a request to obtain multi-beam overlap with previously side-scanned regions (Florida Fish and Wildlife Commision). To prevent gaps in mapped areas, transect line spacing was set based on the formula 2.8(D) = LS, where D is water depth in meters, and LS is distance between lines. At some sites, data were collected on every other line, effectively doubling the planned spacing, to initially scout a larger area more quickly. The remaining lines were then surveyed if time allowed and observed features indicated that further effort was warranted. At most sites, ME70 data were collected using a configuration having 33 beams in a 64º sector that was developed by MS-Labs and used since 2014 on the SEAMAP Reef Fish Video Survey of the Gulf of Mexico (i.e. consistent across survey efforts). A deep water configuration was tested during transit from the southern to northern GOM sites and used at one of the northern GOM sites to evaluate different settings for future mapping in deeper water. Because patch tests were conducted during the SEAMAP-RFV survey in May we did not opt to conduct any during this mapping survey.

ME70 data were processed during operations on the ship using two methods to import data into Caris HIPS software for bathymetry analysis. A Matlab utility developed by Tom Weber at the University of New Hampshire, referred to as the ME70_Raw2GSF converter, was used to process Simrad .RAW format files and output bottom detections in .GSF format files. The Hypack Hysweep driver for ME70 (a real-time implementation of Tom Weber's algorithms) was used to collect HSX format files with Hypack. Bottom detections in either .GSF or .HSX files imported into Caris HIPS were spatially corrected using sound speed profiles from CTD casts and vessel navigation and motion data from *Pisces* PosMV IMU. Caris HIPS facilities for Total Propagated Uncertainty (TPU) and Combined Uncertainty and Bathymetry Estimator (CUBE) were used to create bathymetry surfaces from the corrected soundings, typically with 4 m horizontal resolution. Raw and processed data was returned to MS-Labs for archive and for any future processing or refinement of the results.

Results

During the survey NOAA Ship *Pisces* mapped 1021 linear nautical miles, of which 315.2 were in the Atlantic and 705.8 were in the Gulf of Mexico (Figure 1 and Table 2). Within each selected mapping area a minimum of two CTD casts were conducted and 31 total were conducted during the survey (Table 1). CTD data were processed at sea and uploaded into an access database (CR761906-VLBR56.mdb) for ingestion and archival in the MS Labs Oracle dataset. Raw and processed data was returned to MS-Labs for archival and for any future processing and cleaning up the data. Preliminary maps in select mapping regions are attached. All maps and associated data were delivered to participating laboratories including NMFS MS-Labs, NMFS PC-Lab, and NMFS Beaufort. We only included mapping regions containing high-relief features in this report. All other data or imagery from the surfaces can be made available upon request.

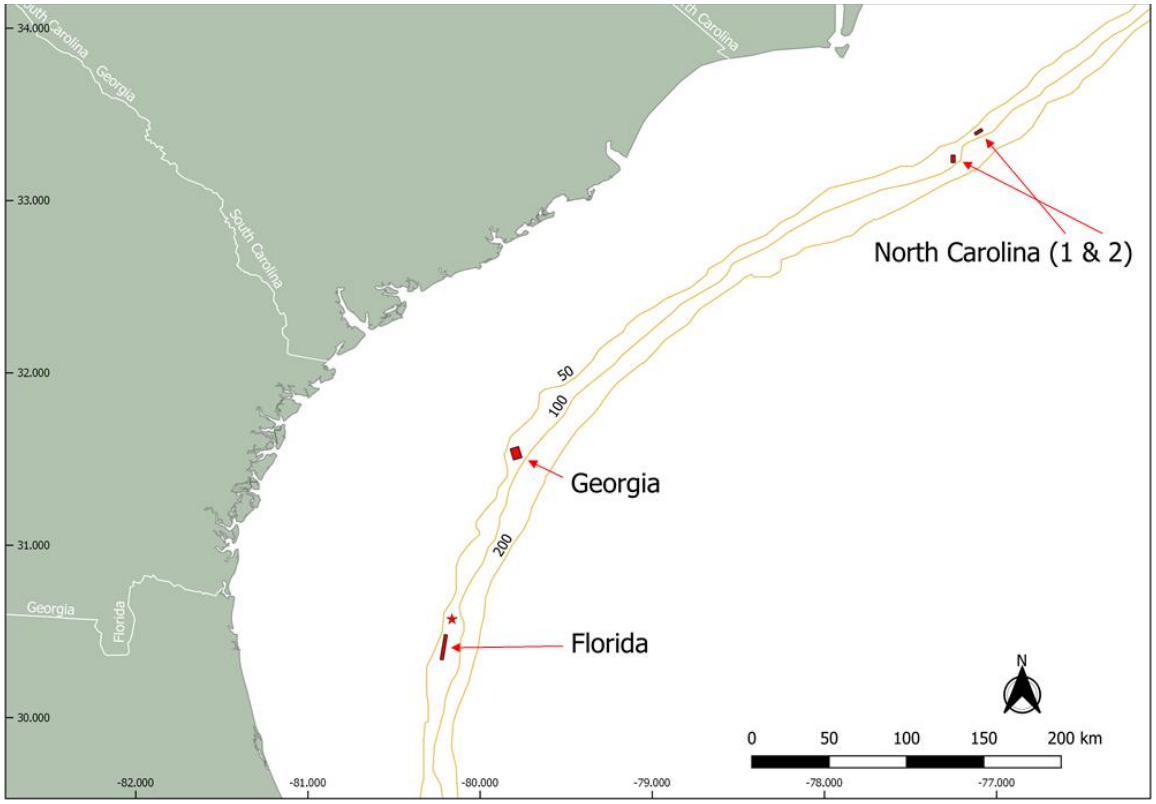
The Atlantic's first North Carolina mapping region (NC1) and Georgia (GA) sites were composed of low-relief sea floor with no obvious features (Figure 1). The second North Carolina site (NC2) appears to be composed of hard bottom features emerging from surrounding

soft bottom seabed (Figure 2). This was determined from the distinct sand wave patterns observed in the northwest and southern sections of the map. In addition there appears to be scouring occurring around a distinct feature to the south and around some of the ridge features in the center of the map as well. The primary Florida mapping location appeared to contain some low-relief features but it is difficult to determine if those were hard-bottom or sand-shoal features (no image attached). On approach to the primary Florida location we transited across a small ridge feature and conducted adaptive mapping operations to supplement data collection in the region (Figure 3). We identified a narrow, but high-relief (3-5 m) ridge feature running from the southwest to the northeast. This ridge was determined to already be included in the SEFIS survey however this effort could provide improved bathymetric data for that sampling universe.

In the Gulf of Mexico the sites were labeled from 1-5 starting in the southern and moving to the northern mapping location (Figure 1). The GOM1, and GOM4 locations were flat over the mapping domain with a few scattered low-relief features that are likely composed of sand. Multibeam bathymetric maps of the GOM2 and GOM3 mapping regions, known as 'The Sticky Grounds' by fishermen local to the central Florida coast, are given in Figures 4 and 5. This region showed many prominent high-relief features (2-8 m) of unknown origin. These could be large boulders or remnant coral heads from a period of time when the sea level was lower. Targets located in this region will be moved into the SEAMAP-RFV sampling universe as soon as possible (e.g. 2020-2021). These features also appear to continue to the north of GOM3 and we suggest further exploration on future surveys in this region. The final mapping location was GOM5 and this location showed significant relief (2-3 m) but those features are likely sand-shoals rather than hard bottom due to the gradual increase in relief rather than abrupt changes. The GOM2, GOM3, and GOM5 regions will be compared with side-scan sonar mapping conducted by the Florida Fish and Wildlife Commission (FWC) mapping conducted in the region for inclusion in the combined reef fish survey design targeted for FY20.

While underway several other mission objectives were included to prepare the ship for the upcoming SEAMAP Plankton Survey to be conducted on NOAA Ship *Pisces* in August and September. One objective was to test the Continuous Underway Fish Egg Sampler (CUFES) system. Ship personnel were able to get the pumps to flow seawater through the system and gave a brief demonstration of the system. After running CUFES for ~30 minutes it was determined that the system was leaking and a new gasket would be required that could only be fixed upon return to MS-Labs once new parts are delivered. In order to accomplish the Plankton survey mission the ship must also be capable of deploying Bongo nets. At the start of the mission the ships second winch was determined to be inoperable and would require a specialized technician from RAPP (winch manufacturer) to fix it. On the 10th of August we transited in to ~12 nm of Clearwater Beach and the RIB boat was launched to transport the RAPP tech to the ship to attempt a repair on the winch while underway. The winch was initially thought to require a part that would have to be ordered but later it was determined a similar part could be salvaged from a separate winch associated with the ballast system. Once that repair was made the ship transited to deep water (~500 m) and deployed the winch under strain. Once it was determined the winch was operational the Bongo nets were attached and the system tested again and ship personnel conducted practice deployments while transiting to MS Labs on the 12th of August. Parts were ordered to replace those adapted from other winches and any further repairs will take place during inport between surveys.

Figure 1. Areas mapped during the South Atlantic – Gulf of Mexico Mapping Survey (761906) conducted on NOAA Ship *Pisces* July 30th – August 13th. Atantic mapping locations including two North Carolina, a Georgia, and two Florida mapping sites. Adaptive mapping location in Florida indicated with red star.



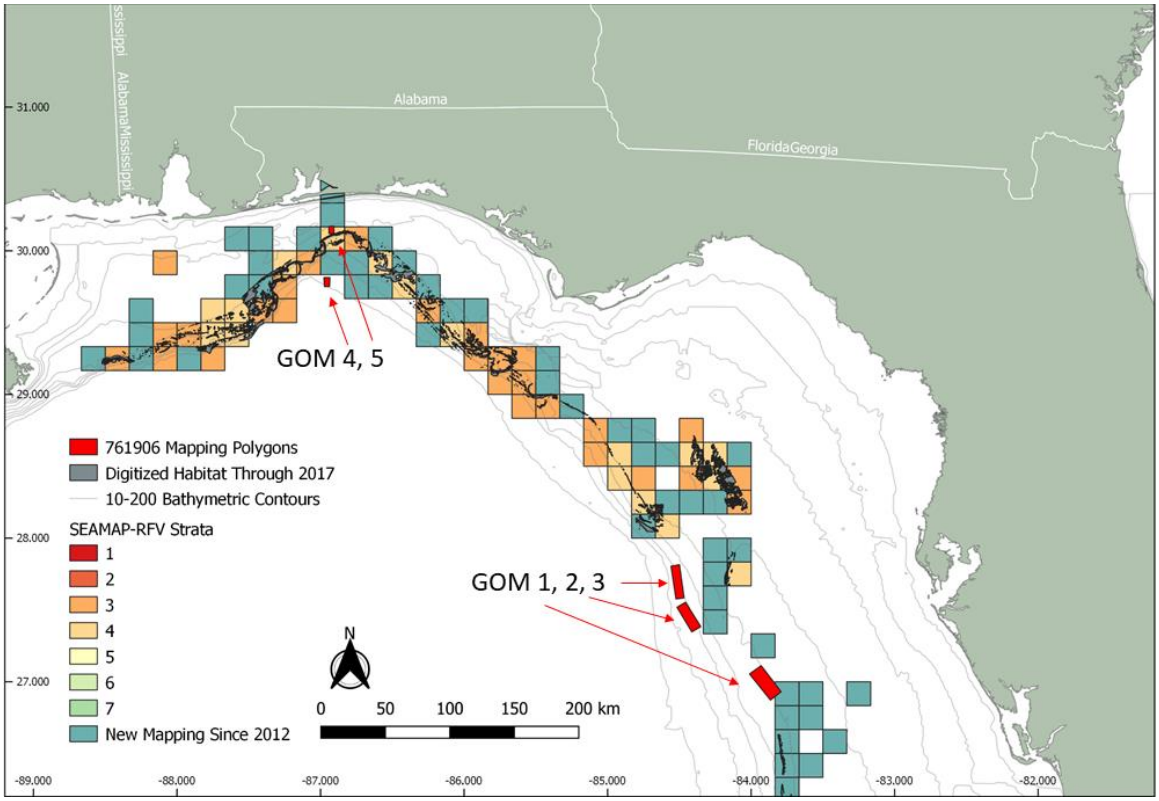


Table 1. CTD Stations sampled during the NOAA Ship *Pisces* South Atlantic – Gulf of Mexico Mapping Survey (761901).

Station Key	Event	Latitude (dd)	Longitude (dd)	Depth (m)
761906001	CTD	33.391	-77.126	51
761906002	CTD	33.392	-77.106	101
761906003	CTD	33.221	-77.241	157
761906004	CTD	31.505	-79.76	63
761906005	CTD	31.572	-79.796	46
761906006	CTD	31.567	-79.813	47
761906007	CTD	31.498	-79.805	50
761906008	CTD	30.487	-80.191	51
761906009	CTD	30.337	-80.23	58
761906010	CTD	30.477	-80.202	51
761906011	CTD	30.397	-80.201	72
761906012	CTD	30.413	-80.214	56
761906013	CTD	26.822	-83.874	78
761906014	CTD	26.898	-83.833	72
761906015	CTD	26.929	-83.832	68
761906016	CTD	27.387	-84.436	129
761906017	CTD	27.449	-84.453	129
761906018	CTD	27.518	-84.514	137
761906019	CTD	27.423	-84.418	126
761906020	CTD	27.484	-84.433	124
761906021	CTD	27.403	-84.41	126
761906022	CTD	27.655	-84.515	131
761906023	CTD	27.581	-84.499	129
761906024	CTD	27.677	-84.523	131
761906025	CTD	27.769	-84.515	119
761906026	CTD	29.707	-86.944	212
761906027	CTD	29.803	-86.964	187
761906028	CTD	30.121	-86.94	41
761906029	CTD	30.174	-86.932	31
761906030	CTD	30.123	-86.923	40
761906031	CTD	30.141	-86.922	36

Table 2. NOAA Ship *Pisces* Survey - 761906 bathymetric mapping statistics.

Date	DAS	Multibeam (nm)	CTD	ADCP (hrs)	Comments
7/30/2019	1	28.6	1	8	Depart Morehead
7/31/2019	2	38.2	2	12	Atlantic, NC
8/1/2019	3	115.4	2	4	Atlantic, NC
8/2/2019	4	64.5	3	8	Atlantic, GA
8/3/2019	5	45.4	4	0	Atlantic, FL
8/4/2019	6	23.1	0	23	Atlantic, FL
8/5/2019	7	0	0	24	Transit to GOM
8/6/2019	8	41.4	1	19	Gulf of Mexico, FL
8/7/2019	9	135.7	2	2	Gulf of Mexico, FL
8/8/2019	10	207.5	5	0	Gulf of Mexico, FL
8/9/2019	11	145.5	4	0	Gulf of Mexico, FL
8/10/2019	12	35.4	1	0	Board Rap Tech
8/11/2019	13	45.8	2	6	Gulf of Mexico, FL
8/12/2019	14	94.2	4		Gulf of Mexico, FL
8/13/2019	15				Pascagoula, MS
Totals	***15***	***1020.7***	***31***	***106***	

Figure 2. Multibeam bathymetric map of the southern North Carolina site (NC2) showing what appears to be hard bottom features emerging from surrounding soft bottom seabed. This was determined from the distinct sand wave patterns observed in the northwest and southern sections of the map. In addition there appears to be scouring occurring around a distinct feature to the south and around some of the ridge features in the center of the map as well.

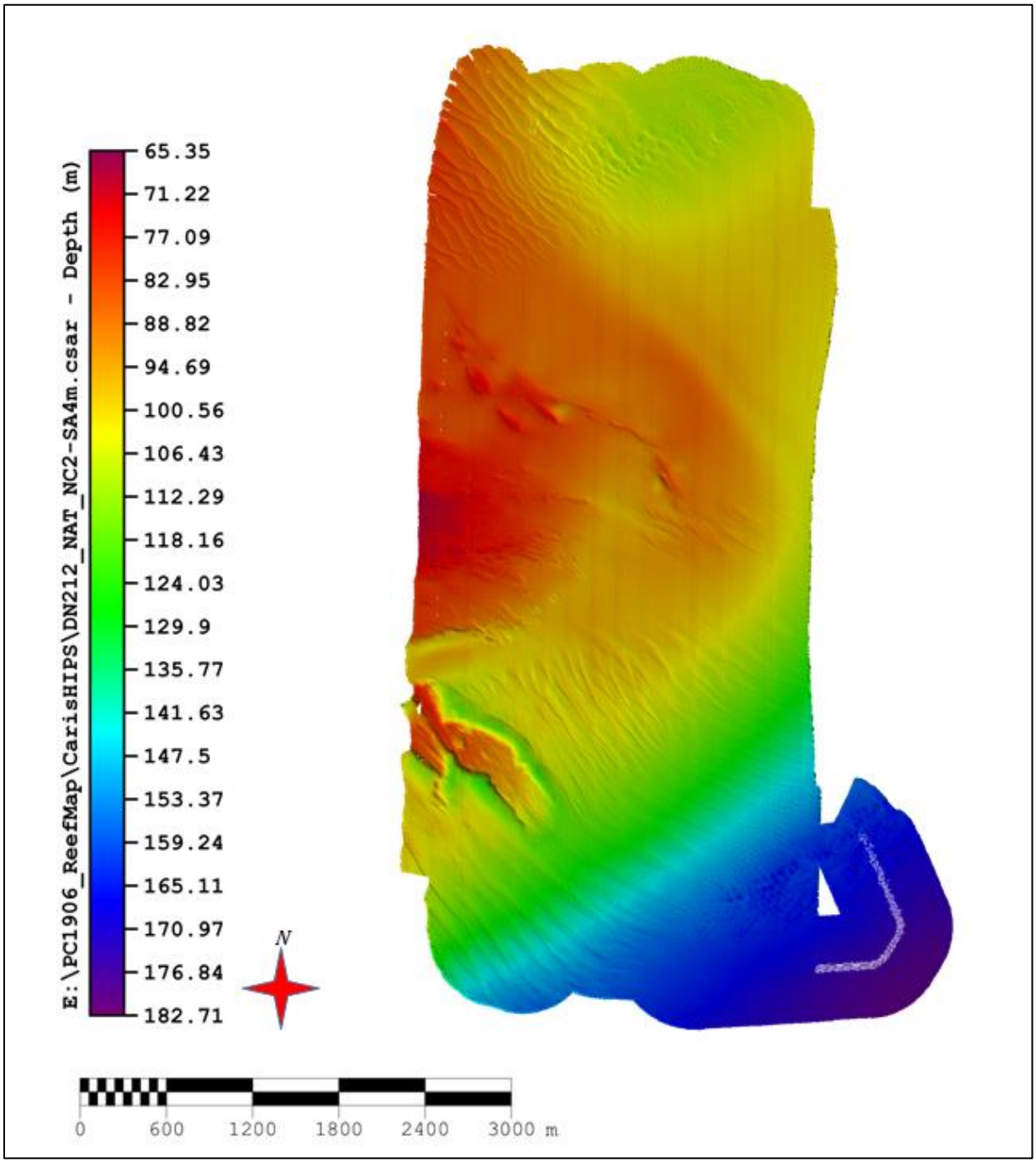


Figure 3. Multibeam bathymetric map of the adaptive mapping conducted on a small ridge offshore of Jacksonville, FL. The feature runs southwest to northeast and has approximately 3-5 m of vertical relief.

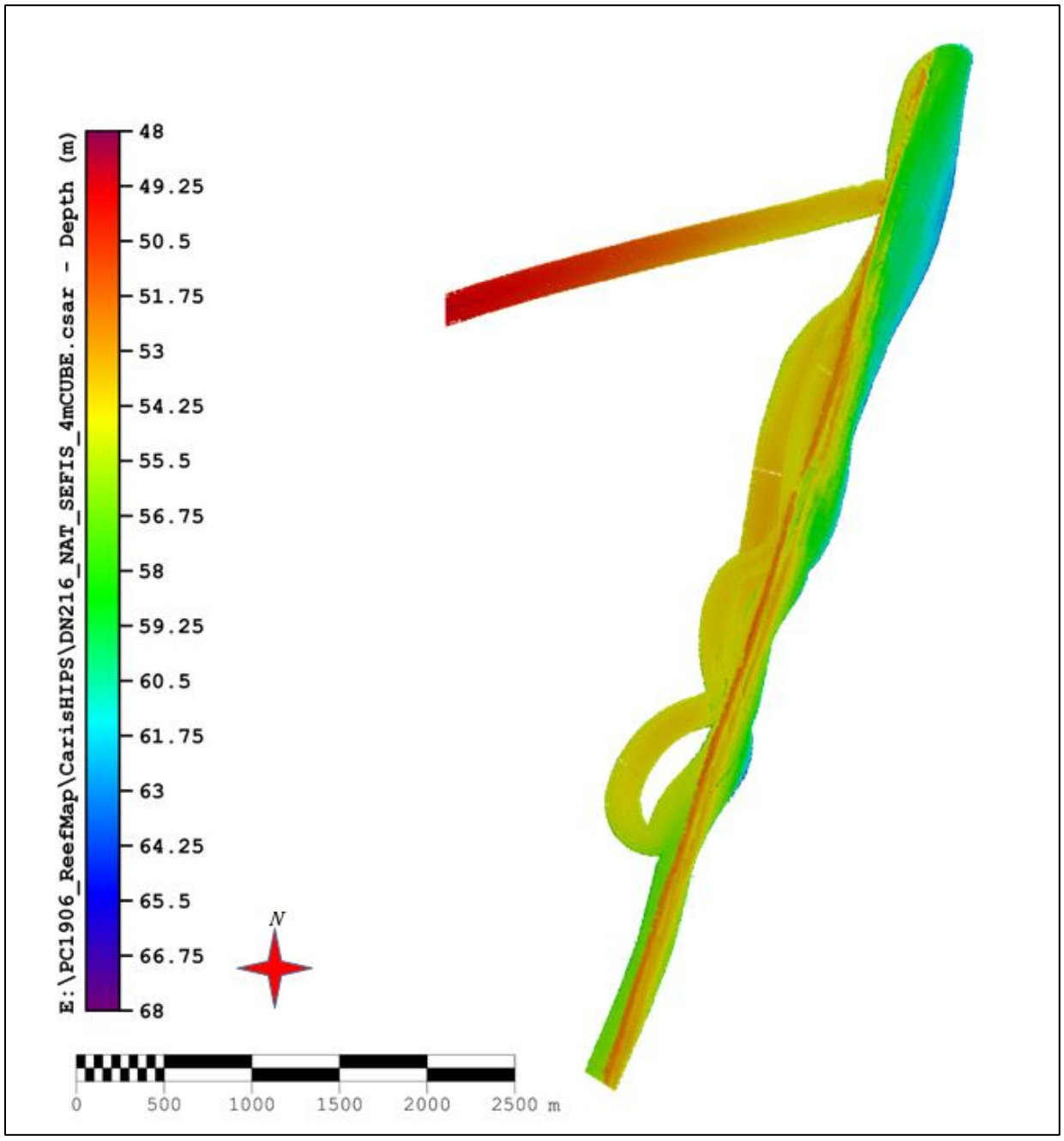


Figure 4. Multibeam bathymetric map of the southern portion of a region known as 'The Sticky Grounds' by fisherman local to the Central Florida coast. This region showed many prominent high-relief features (2-6 m) of unknown origin. These could be large boulders or remnant coral heads from a period of time when the sea level was lower. Targets located in this region will be moved into the SEAMAP-RFV sampling universe as soon as possible (e.g. 2020-2021).

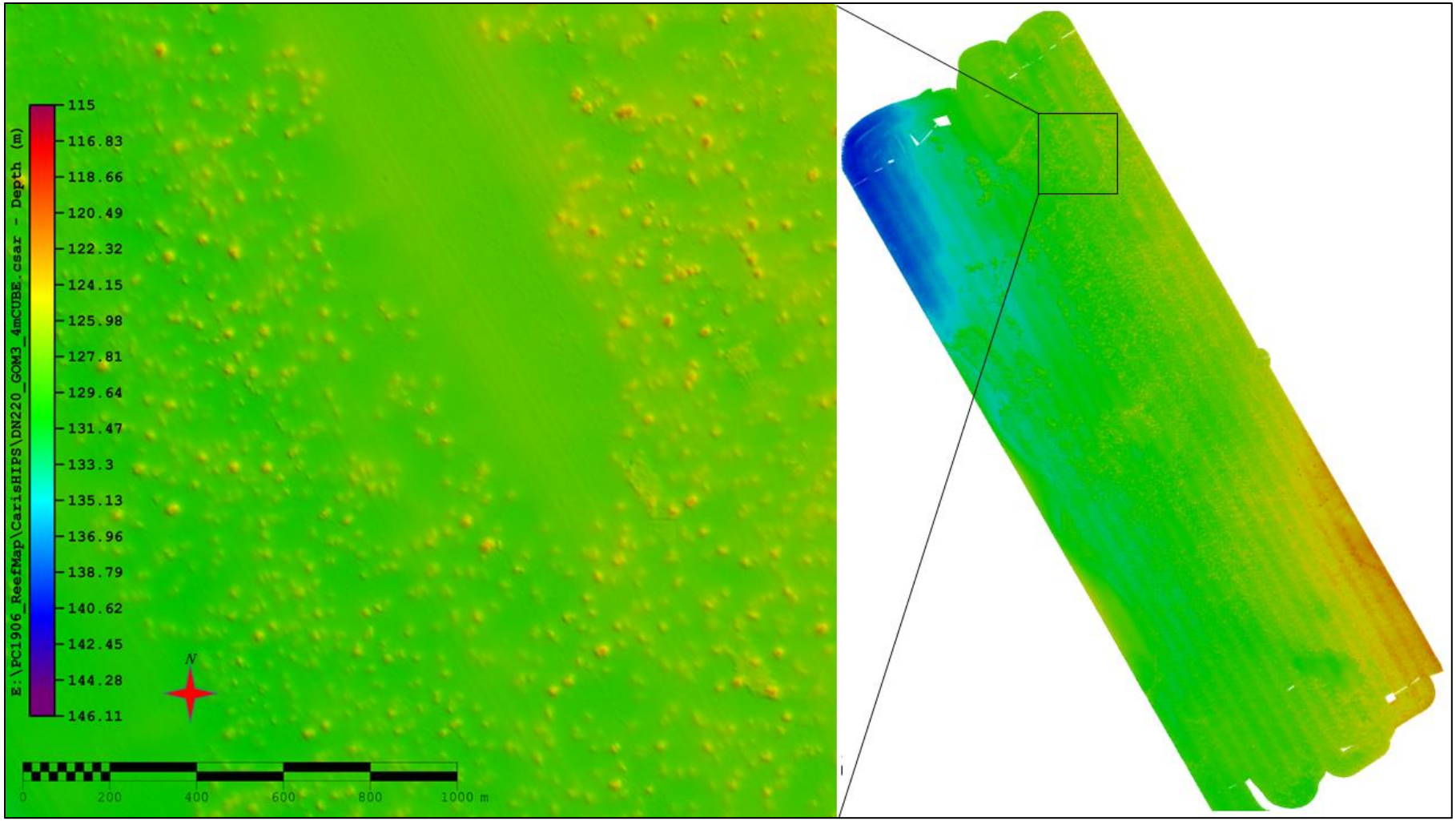


Figure 5. Multibeam bathymetric map of the northern portion of a region known as ‘The Sticky Grounds’ by fisherman local to the Central Florida coast. This region showed many prominent high-relief features (2-8 m) of unknown origin. These could be large boulders or remnant coral heads from a period of time when the sea level was lower. Targets located in this region will be moved into the SEAMAP-RFV sampling universe as soon as possible (e.g. 2020-2021).