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STANDARD FORM C

FINAL REPORT

Cruise Name/Number:	F2016-013 Bluefin Tuna Ecology and Coral Reef Ecosystem Research
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Authorizations:

Coastal State	Authorization Document Number	National Participant(s)
Anguilla	UK Foreign & Commonwealth Office 71/2016 dated 6 June 2016	None
The Bahamas	Department of Marine Resources 037/16 dated 01 March 2016	None
British Virgin Islands	UK Foreign & Commonwealth Office 73/2016 dated 26 May 2016	None
Cayman Islands	UK Foreign & Commonwealth Office 65/2016 dated 20 May 2016	None
Dominican Republic	Ministerio de Relaciones Exteriores 008061 response date 01 April 2016	Omar Reynoso
Haiti	Ministère des Affaires Etrangères JUR/16/0476 dated 23 May 2016	None
Jamaica	Jamaican Foreign Service 358/505/209 dated 10 May 2016	None
Turks and Caicos Islands	UK Foreign & Commonwealth Office approval confirmed 2 August 2016	None

Scientist in charge of reporting:

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NOTE: US Department of State research cruise # F2016-013 has a concurrent National Oceanic and Atmospheric Administration cruise identifier: NF-16-02/03.

In the following materials, cruise # NF-16-02/03 is synonymous with F2016-013.

Bluefin Tuna Ecology and Coral Reef Ecosystem Research (2016) FINAL REPORT

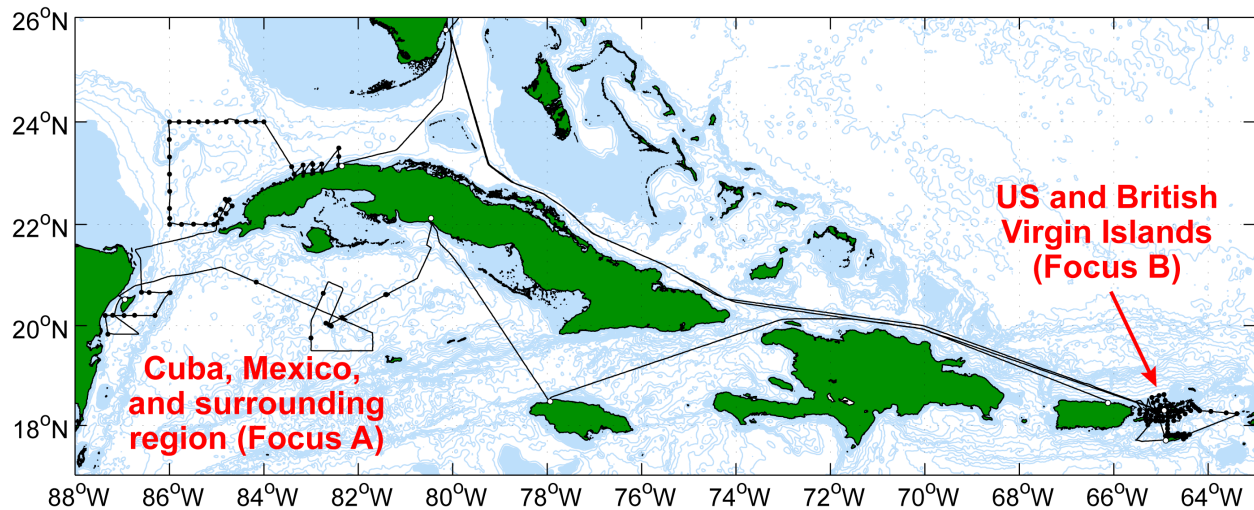
CRUISE PERIOD (see Appendices 1 and 2 for more information on scientific operations conducted on each leg listed below)

28 April 2016 through 25 June 2016 (NF-16-02/03)

- 28 April 2016Depart from San Juan, Puerto Rico (begin leg I, transit only)
- 02 May 2016Arrive at Miami, Florida (end leg I, transit only)
- 07 May 2016Depart from Miami, Florida (begin leg II, transit only)
- 08 May 2016Arrive at Havana, Cuba (end leg II, transit only)
- 10 May 2016 Depart from Havana, Cuba (begin leg III)**
- 19 May 2016 Arrive at San Miguel, Cozumel, Mexico (end leg III)**
- 23 May 2016 Depart from San Miguel, Cozumel, Mexico (begin leg IV)**
- 30 May 2016 Arrive at Cienfuegos, Cuba (end leg IV)**
- 02 June 2016Depart from Cienfuegos, Cuba (begin leg V, transit only)
- 03 June 2016Arrive at / Depart from Montego Bay, Jamaica
(small boat personnel transfer only)
- 06 June 2016Arrive at Charlotte Amalie, St. Thomas, USVI (end leg V, transit only)
- 08 June 2016..... Depart from Charlotte Amalie, St. Thomas, USVI (begin leg VI)**
- 16 June 2016..... Arrive at / Depart from Charlotte Amalie, St. Thomas, USVI
(small boat personnel transfer only)**
- 17 June 2016..... Arrive at Frederiksted, St. Croix, USVI (end leg VI)**
- 19 June 2016Depart from Frederiksted, St. Croix, USVI (begin leg VII, transit only)
- 24 June 2016Arrive at / Depart from Miami, Florida
(small boat personnel transfer only)
- 25 June 2016Arrive at Charleston, South Carolina (end leg VII)

NOTE: Discrete oceanographic/biological station measurements were only collected on legs 3, 4, and 6.

GEOGRAPHIC COVERAGE AREA



The completed cruise track for NF-16-02/03 is shown above. Detailed tracks and station activities are shown/listed in the Appendices.

PROJECT OBJECTIVES

FOCUS A. Bluefin Tuna Ecology (BTE)

Atlantic bluefin tuna (ABT) is the highest-valued Atlantic tuna species on the market today. The species is an important export for American fishermen, with a majority of the product going to Japanese markets. The United States also imports ABT for consumption from a number of nations. Management of the ABT is carried out in accordance with agreements by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the U.S. National Marine Fisheries Service (NMFS) covering the (i) Atlantic Ocean, (ii) Gulf of Mexico, and (iii) US Caribbean. In US waters, ABT are subject to two regulations: the Magnuson-Stevens Fishery Conservation and Management Act and the Atlantic Tunas Convention Act. Given the highly migratory behavior of this species, fisheries management is a complex, international concern. ABT are overfished throughout their range in the Atlantic Ocean, and current population levels are at an historic low. Plankton surveys targeting larval ABT have been completed by NMFS annually in the northern Gulf of Mexico since 1977 using a fixed-grid of stations. However, this current ichthyoplankton sampling strategy is limited to the US EEZ. In an effort to improve our understanding of ABT spawning activity and the environmental conditions affecting the western Atlantic stock, we propose to sample areas adjacent to confirmed spawning grounds (the Gulf of Mexico) in the US EEZ.

Larval abundance data from the northern Gulf of Mexico surveys are used to calculate a larval index of spawning stock biomass by NOAA and ICCAT scientists. Variability in the current larval index is high: up to 100% of the mean, and larger. It is likely that physical oceanographic factors contribute to this variance, but relationships between the distribution of ABT larvae and environmental conditions are currently not well known. In addition, little is known about ABT spawning outside the US EEZ. Recent analyses of larval ABT abundances from 1977 to the present indicate that while larvae are found across the Gulf of Mexico between late April and early June, it is not clear what effect, if any, mesoscale features have on larval distributions. This uncertainty is partially an artifact of the design of the fixed-grid surveys, as the distance between sampled stations is large enough to preclude reliable correlations between ABT larvae and

environmental gradients. Also, the current index does not take into account multiple sources of larvae and the possibility of extended regional spawning.

ABT are known to spawn in areas outside the Gulf of Mexico, but the numbers of spawning individuals and the geographic extent of spawning are unknown. As these areas have not been included in the standard larval surveys, it is critical to define possible alternative spawning sites. Previous results suggest ABT spawning north of the Bahamas and north of Cozumel, Mexico. Additionally, preliminary results from collections taken in 2015 south of Cuba suggest there may be limited ABT spawning in this region as well. Results from the 2015 survey have provided evidence that larval transport via the Yucatan current, and persistent eddy translation south of Cuba may be important mechanisms for maintaining regional population connectivity. Our 2016 survey extended the larval survey into the relatively unexplored regions of the western Caribbean to determine the extent of ABT spawning and use adaptive sampling methods to further develop a larval habitat model for this species. Additionally, results should increase our understanding of larval transport, the role of eddies in larval retention, trophic ecology, and other mechanisms by which larvae are either exported or retained.

Identifying the relationships between ABT larvae and physical oceanographic gradients will greatly enhance current understanding of the early life history dynamics of this species. This work will also provide useful information on larval bluefin abundance and distribution for the entire Gulf of Mexico and western Caribbean. We anticipate that this work will reduce the variance in the calculation of the ABT larval index, which should lead to improved stock assessments across the region.

During FOCUS A of our 2016 research survey aboard NF, we continued our study of the distribution and abundance of ABT and other tuna larvae in the Gulf of Mexico and western Caribbean Sea. The 2016 survey builds upon the data collected from our 2015 expedition to Cuba and Mexico by applying adaptive sampling methods in both predicted larval ABT and other tuna habitats, as well as in areas that are key to understanding larval transport and retention across the region. The collected data will help to further develop a larval habitat model for ABT, reduce the variance in the calculation of the ABT larval index (which will improve regional stock assessments), and increase our knowledge of the role that ocean circulation features play in maintaining regional ABT stocks and the associated trophic ecology.

In addition to pelagic tuna larvae, the 2016 survey also targeted other ecologically and commercially important larval species found near regional coastal reefs. These species included larval snapper, grouper, parrotfish, lionfish, and spiny lobster, and were sampled concurrently during the search for ABT larvae. Understanding population connectivity across this portion of the Intra-Americas Sea (IAS) and the role that the major current systems play in the dispersal/retention of these species is critical for developing adaptive management strategies for regional Marine Protected Areas (MPA). Our collection strategy serves to help identify possible spawning locations, examine growth and survival of larvae, and increase our understanding of species recruitment to benthic habitats. In this light, additional information should also be gained from a high-resolution multi-beam bathymetric survey of Cuba's Banco de San Antonio conducted during the research cruise.

FOCUS B. Coral Reef Ecosystem Research (CRER)

The United States Virgin Islands' (USVI) Grammanik Bank, located to the south of St. Thomas, is the site of a multi-species spawning aggregation for economically important fish including yellowfin grouper, Nassau grouper, tiger grouper, and dog snapper. Fishing pressure at this suspected source of larval recruits prompted the U.S. Caribbean Fishery Management Council (CFMC) in 2005 to close the bank yearly from February to April. A series of banks south of St. Thomas and St.

John, around St. Croix, and south of the British Virgin Islands (BVI) provides similar habitats and spawning aggregation sites. Prior to the inception of this study, the biological and physical processes which drive production on these banks, and the circulation connecting these areas, had not been quantified. As the 2005 management decisions were made in the absence of these data, regional MPA designations and temporary closures are presently based on professional judgment rather than quantifiable, defensible scientific information. In addition, meeting new annual catch limit (ACL) requirements of the Magnuson-Stevens reauthorization has become a priority of the CFMC. However, data limitations preclude comprehensive stock assessments for most fisheries in the region.

To address these data gaps, NOAA scientists from SEFSC and AOML in Miami, Florida, working with scientists from the University of the Virgin Islands (UVI) and Department of Planning and Natural Resources (DPNR) in St. Thomas, are presently conducting a multi-year, interdisciplinary research project utilizing the NF to conduct biological and physical oceanographic surveys of the Virgin Islands (VI) bank ecosystems and surrounding regional waters. The long-term sustainability of fisheries in the VI and surrounding regions will depend on a comprehensive understanding of regional spawning aggregations, larval transport, and overall larval recruitment in the study area.

Data collected from this program will not only provide information on a data-poor region, but have the potential to address two additional specific needs. First, should economically important species of grouper, snapper, and parrotfish be delineated from individual island groups (e.g. Puerto Rico, St. Thomas/St. John, and St. Croix), from the U.S. Caribbean, or from the broader Caribbean region? This interdisciplinary effort will provide information on the interconnectivity of fish populations and assist in this stock delineation. Secondly, indices of abundance have been identified as a critical component of the length-based assessment methods currently employed in the Caribbean. However, regional indices are lacking, or in some cases nonexistent. This research will serve to improve existing and generate new indices of abundance for the study area, including not only U.S. waters, but also the surrounding regions.

During FOCUS B of our 2016 research project aboard NF, we measured/sampled water properties, currents, and dispersal and transport of fish larvae in the VI and neighboring regions. This year a special emphasis was placed on the search for larval parrotfish (an economically important species for the region). Additional genetics and isotope sampling from collected larvae and zooplankton aim to provide definitive biological linkages and trophic structure comparisons between populations of larval parrotfish found near St. Croix, St. Thomas, St. John, and the British Virgin Islands. These data will be used to examine patterns in selective mortality (in terms of growth and genetic selection) for parrotfishes. In general, results from the survey should enhance our understanding of regional spatial variation in the supply of fish larvae between managed and non-managed areas, as well as offer insights into the relative importance of Grammanik Bank as a source of juvenile fishes recruiting to the waters of the VI.

The shipboard survey work associated with the two project components (focus areas A and B) outlined above included plankton tows using a Neuston net (towed at various depths: standard, s10, s20, and s25), a 60cm-bongo net, a mini-bongo net, and a Multiple Opening and Closing Net Environmental Sensing System (MOCNESS). Conductivity-Temperature-Depth (CTD) casts measuring temperature, salinity, dissolved oxygen, chlorophyll, colored dissolved organic matter (CDOM), and water velocity were also performed. Continuous surface measurements of temperature, salinity, chlorophyll, CDOM, and water velocity were collected via the ship's flow-through system and hull-mounted acoustic Doppler current profiler (ADCP). 100 expendable Bathy Thermograph (XBT) probes and 13 satellite-tracked, Lagrangian surface drifters were also deployed. Finally, a high-resolution multi-beam bathymetric survey of Cuba's Banco de San

Antonio was conducted using the vessel's Reson 7125 SV2, dual frequency shallow water system during the FOCUS A portion of the research cruise.

DISSEMINATION OF PROJECT DATA

Update on anticipated dates for delivery of final results:

Metadata:	January 2018
Raw Data:	Furnished upon request after 2018
Processed Data:	January 2018
Data Analysis:	January 2018
WODC Data Registration (if applicable):	N/A
Data Distribution Method:	This final report and a link to the final data collected during this research cruise will be sent to each coastal state through diplomatic channels. An identical data set will also be made available for public ftp download by the coastal states.

PROCESSED PROJECT DATA ARE PUBLICLY AVAILABLE AT THE FOLLOWING FTP SITE:

ftp://ftp.aoml.noaa.gov/phod/pub/rsmith/CRER/data/NF1602_State_Dept_DVD

HTTP MIRROR SITE:

https://www.aoml.noaa.gov/ftp/pub/phod/rsmith/CRER/data/NF1602_State_Dept_DVD/

The completed NF-16-02/03 (F2016-013) cruise track and station locations are illustrated in the figures presented in Appendix 1 (attached).

A complete listing of all NF-16-02/03 (F2016-013) station locations, station occupation times, and station operations are detailed in the table found in Appendix 2 (attached).

Appendix 1

NF-16-02/03 (F2016-013) Completed Cruise Track and Station Locations (CHARTLETS)

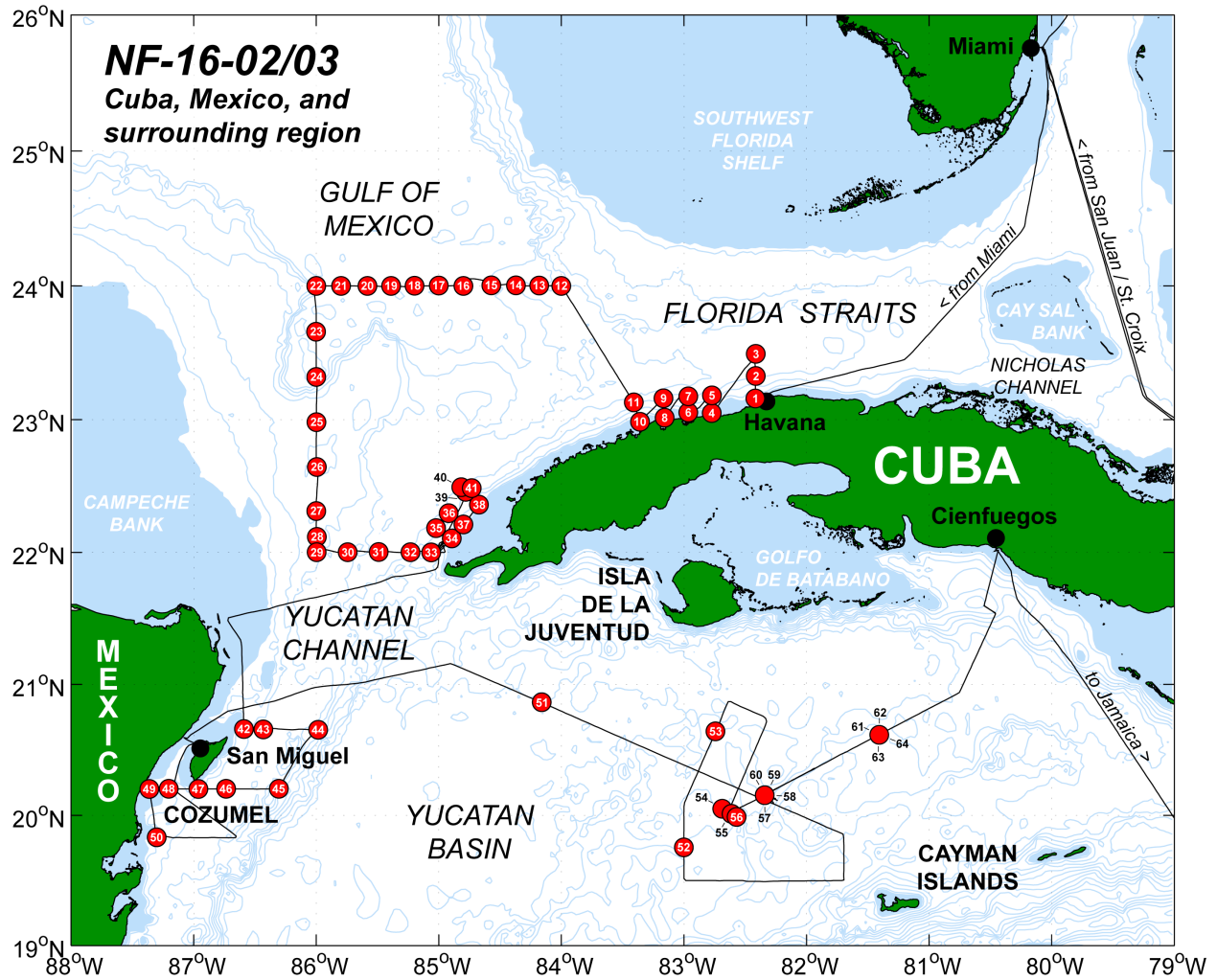


Figure 1. The completed cruise track (black line) and station locations (red markers) for the FOCUS A region of research cruise NF-16-02/03 (F2016-013) are shown above. Station markers are numbered in the order in which they were conducted. For a detailed description of station activities at each marker location see Appendix 2.

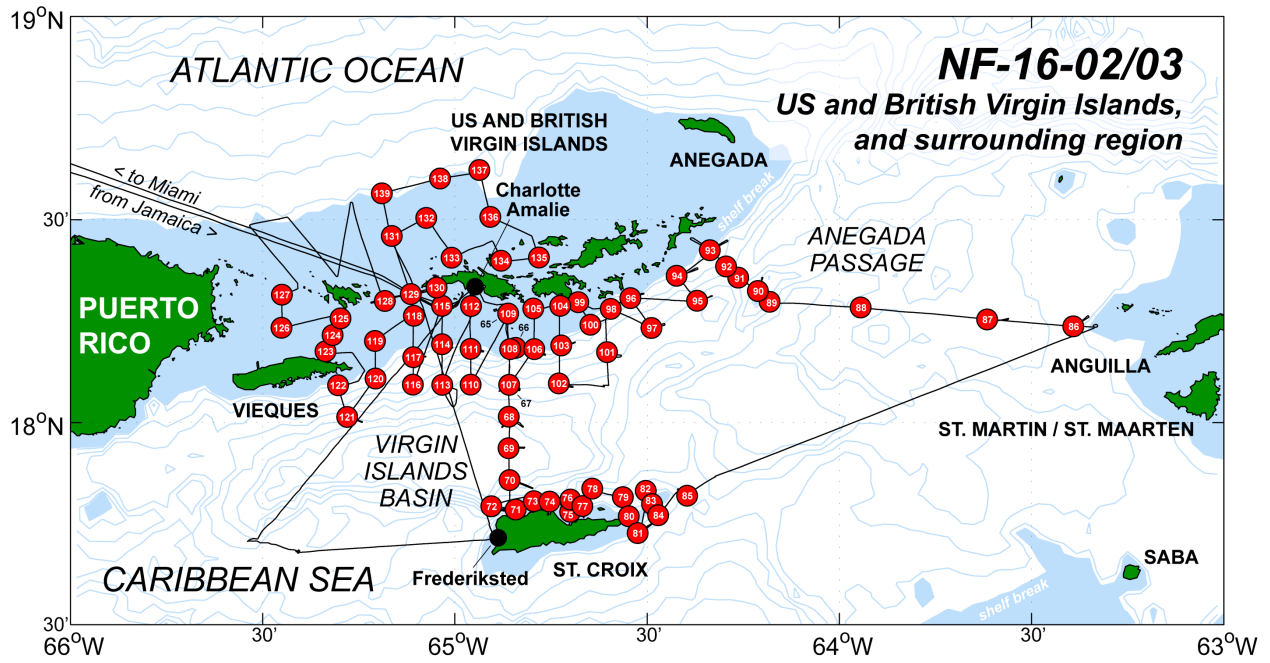


Figure 2. The completed cruise track (black line) and station locations (red markers) for the FOCUS B region of research cruise NF-16-02/03 (F2016-013) are shown above. Station markers are numbered in the order in which they were conducted. For a detailed description of station activities at each marker location see Appendix 2.

Appendix 2

NF-16-02/03 Completed Station Positions, Occupation Times, and Activities

Station #	Leg #	Latitude	Longitude	Date/Time	Operations Completed
001	3	23°09.54'N	082°25.03'W	10-May-2016, 22:21z	CTD cast, s10 tow
002	3	23°19.60'N	082°24.89'W	11-May-2016, 01:04z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
003	3	23°29.55'N	082°24.83'W	11-May-2016, 03:52z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
004	3	23°02.95'N	082°46.37'W	11-May-2016, 07:49z	CTD cast
005	3	23°10.94'N	082°46.34'W	11-May-2016, 09:17z	CTD cast
006	3	23°03.23'N	082°57.85'W	11-May-2016, 11:19z	CTD cast
007	3	23°10.45'N	082°57.86'W	11-May-2016, 12:32z	CTD cast
008	3	23°00.87'N	083°09.47'W	11-May-2016, 16:16z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
009	3	23°09.62'N	083°10.07'W	11-May-2016, 18:30z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
010	3	22°59.06'N	083°21.50'W	11-May-2016, 21:52z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
011	3	23°07.75'N	083°24.58'W	12-May-2016, 00:31z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
012	3	23°59.99'N	084°00.01'W	12-May-2016, 07:40z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
013	3	24°00.17'N	084°10.90'W	12-May-2016, 10:42z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
014	3	24°00.24'N	084°22.21'W	12-May-2016, 13:03z	CTD cast, s10 and 60cm-bongo tows
015	3	24°00.24'N	084°34.34'W	12-May-2016, 15:39z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
016	3	24°00.00'N	084°47.93'W	12-May-2016, 19:03z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
017	3	24°00.12'N	084°59.97'W	12-May-2016, 21:49z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
018	3	24°00.03'N	085°11.91'W	13-May-2016, 00:53z	CTD cast, s10 and 60cm-bongo tows
019	3	23°59.96'N	085°23.35'W	13-May-2016, 03:03z	CTD cast, s10 tow
020	3	23°59.95'N	085°34.98'W	13-May-2016, 05:49z	CTD cast, s10 and 60cm-bongo tows
021	3	23°59.95'N	085°47.87'W	13-May-2016, 08:19z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
022	3	24°00.00'N	086°00.04'W	13-May-2016, 10:30z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
023	3	23°39.46'N	086°00.10'W	13-May-2016, 14:28z	CTD cast, s10 and 60cm-bongo tows
024	3	23°19.19'N	085°59.99'W	13-May-2016, 17:22z	CTD cast, s10 and 60cm-bongo tows
025	3	22°58.91'N	085°59.94'W	13-May-2016, 20:56z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
026	3	22°38.69'N	085°59.72'W	14-May-2016, 00:08z	CTD cast, s10 and 60cm-bongo tows
027	3	22°18.78'N	085°59.95'W	14-May-2016, 03:35z	CTD cast, s10 and 60cm-bongo tows
028	3	22°07.09'N	085°59.69'W	14-May-2016, 05:48z	CTD cast, s10 and 60cm-bongo tows
029	3	22°00.13'N	085°59.78'W	14-May-2016, 07:10z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
030	3	22°00.13'N	085°44.60'W	14-May-2016, 10:49z	CTD cast, s10 and 60cm-bongo tows
031	3	22°00.20'N	085°29.42'W	14-May-2016, 13:24z	CTD cast, s10 and 60cm-bongo tows
032	3	22°00.09'N	085°13.89'W	14-May-2016, 15:50z	CTD cast, s10 and 60cm-bongo tows
033	3	22°00.01'N	085°03.72'W	14-May-2016, 17:47z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
034	3	22°06.34'N	084°53.64'W	16-May-2016, 02:35z	CTD cast, s10 and 60cm-bongo tows

Station #	Leg #	Latitude	Longitude	Date/Time	Operations Completed
035	3	22°11.03'N	085°01.31'W	16-May-2016, 04:47z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
036	3	22°17.82'N	084°55.13'W	16-May-2016, 06:53z	CTD cast, s10 and 60cm-bongo tows
037	3	22°12.70'N	084°47.95'W	16-May-2016, 09:21z	CTD cast, s10, 60cm-bongo, and mini-bongo (10m depth) tows
038	3	22°21.63'N	084°40.39'W	16-May-2016, 12:25z	CTD cast, s10 and 60cm-bongo tows
039	3	22°27.41'N	084°46.82'W	16-May-2016, 14:59z	CTD cast, 2 s10, 60cm-bongo, and mini-bongo (10m depth) tows
040	3	22°29.54'N	084°49.05'W	16-May-2016, 15:49z	s20 tow
041	3	22°29.15'N	084°43.92'W	16-May-2016, 16:33z	s20 tow
042	3	20°39.62'N	086°35.39'W	17-May-2016, 14:53z	CTD cast, s10, 60cm-bongo, mini-bongo (10m depth), and MOCNESS (100m depth) tows
043	3	20°39.38'N	086°25.86'W	17-May-2016, 18:39z	CTD cast, s10 and 60cm-bongo tows
044	3	20°39.22'N	085°59.06'W	18-May-2016, 01:04z	CTD cast, s10, 60cm-bongo, mini-bongo (10m depth), and MOCNESS (100m depth) tows
045	3	20°12.17'N	086°18.31'W	18-May-2016, 05:46z	CTD cast, s10, 60cm-bongo, mini-bongo (10m depth), and MOCNESS (100m depth) tows
046	3	20°12.23'N	086°44.09'W	18-May-2016, 10:55z	CTD cast, s10 and 60cm-bongo tows
047	3	20°12.11'N	086°57.72'W	18-May-2016, 13:29z	CTD cast, s10 and 60cm-bongo tows
048	3	20°12.18'N	087°12.17'W	18-May-2016, 16:06z	CTD cast, s10, 60cm-bongo, mini-bongo (10m depth), and MOCNESS (100m depth) tows
049	3	20°12.09'N	087°21.67'W	18-May-2016, 19:59z	CTD cast
050	3	19°49.88'N	087°18.12'W	19-May-2016, 01:23z	CTD cast, 60cm-bongo, mini-bongo (10m depth), and MOCNESS (100m depth) tows
051	4	20°51.81'N	084°09.66'W	24-May-2016, 06:53z	CTD/LADCP cast
052	4	19°45.27'N	083°00.03'W	25-May-2016, 10:26z	CTD/LADCP cast
053	4	20°38.53'N	082°44.56'W	25-May-2016, 17:10z	CTD/LADCP cast
054	4	20°02.98'N	082°41.24'W	26-May-2016, 03:37z	CTD/LADCP cast, 3 neuston and 4 MOCNESS (80m depth) tows
055	4	20°00.74'N	082°36.69'W	26-May-2016, 14:56z	CTD/LADCP cast, mini-bongo (10m depth) and MOCNESS (80m depth) tows
056	4	19°59.32'N	082°34.21'W	26-May-2016, 18:02z	CTD/LADCP cast, 2 neuston, mini-bongo (10m depth), and 4 MOCNESS (80m depth) tows
057	4	20°09.28'N	082°20.53'W	27-May-2016, 11:51z	CTD/LADCP cast
058	4	20°09.74'N	082°20.54'W	27-May-2016, 13:23z	CTD/LADCP cast, neuston, mini-bongo (10m depth), and MOCNESS (80m depth) tows
059	4	20°09.09'N	082°20.66'W	27-May-2016, 17:29z	CTD/LADCP cast, 2 neuston, mini-bongo (10m depth), and 4 MOCNESS (80m depth) tows
060	4	20°09.39'N	082°20.47'W	28-May-2016, 03:30z	CTD/LADCP cast, 3 neuston and 4 MOCNESS (80m depth) tows
061	4	20°36.86'N	081°24.48'W	28-May-2016, 20:01z	CTD/LADCP cast, 2 neuston and 3 MOCNESS (80m depth) tows
062	4	20°37.08'N	081°25.36'W	29-May-2016, 03:31z	CTD/LADCP cast, 3 neuston and 4 MOCNESS (80m depth) tows
063	4	20°36.96'N	081°24.48'W	29-May-2016, 13:55z	CTD/LADCP cast, neuston, mini-bongo (10m depth) and MOCNESS (80m depth) tows
064	4	20°37.00'N	081°24.55'W	29-May-2016, 17:54z	CTD/LADCP cast, mini-bongo (10m depth) and MOCNESS (80m depth) tows
065	6	18°16.12'N	064°51.67'W	08-Jun-2016, 19:50z	CTD/LADCP cast, s25 and mini-bongo (25m depth) tows
066	6	18°11.06'N	064°50.53'W	08-Jun-2016, 23:04z	CTD/LADCP cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
067	6	18°05.61'N	064°51.70'W	09-Jun-2016, 01:53z	CTD/LADCP cast, s25 and mini-bongo (25m depth) tows
068	6	18°00.87'N	064°51.58'W	09-Jun-2016, 06:43z	CTD/LADCP cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
069	6	17°56.20'N	064°51.61'W	09-Jun-2016, 13:26z	CTD/LADCP cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
070	6	17°51.48'N	064°51.47'W	09-Jun-2016, 19:40z	CTD/LADCP cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows

Station #	Leg #	Latitude	Longitude	Date/Time	Operations Completed
071	6	17°47.12'N	064°50.50'W	10-Jun-2016, 01:51z	CTD/LADCP cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
072	6	17°47.60'N	064°54.30'W	10-Jun-2016, 05:03z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
073	6	17°48.33'N	064°47.67'W	10-Jun-2016, 08:36z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
074	6	17°48.27'N	064°45.22'W	10-Jun-2016, 11:50z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
075	6	17°46.78'N	064°41.99'W	10-Jun-2016, 14:34z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
076	6	17°48.59'N	064°41.98'W	10-Jun-2016, 16:55z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
077	6	17°47.63'N	064°40.10'W	10-Jun-2016, 19:25z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
078	6	17°50.20'N	064°38.57'W	10-Jun-2016, 21:57z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
079	6	17°48.93'N	064°33.78'W	11-Jun-2016, 00:15z	CTD cast, s25 and MOCNESS (100m depth) tows
080	6	17°46.11'N	064°32.87'W	11-Jun-2016, 02:49z	CTD cast, s25 and mini-bongo (25m depth) tows
081	6	17°43.60'N	064°31.47'W	11-Jun-2016, 03:54z	CTD cast, s25 and MOCNESS (100m depth) tows
082	6	17°49.89'N	064°30.22'W	11-Jun-2016, 06:22z	CTD cast
083	6	17°47.91'N	064°29.24'W	11-Jun-2016, 07:31z	CTD cast, s25 and mini-bongo (25m depth) tows
084	6	17°46.25'N	064°28.29'W	11-Jun-2016, 07:57z	CTD cast
085	6	17°49.14'N	064°23.76'W	11-Jun-2016, 09:32z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
086	6	18°14.25'N	063°23.48'W	11-Jun-2016, 18:24z	CTD cast, s25 and MOCNESS (100m depth) tows
087	6	18°15.26'N	063°36.93'W	11-Jun-2016, 21:46z	CTD cast, MOCNESS (100m depth) tow
088	6	18°17.02'N	063°56.67'W	12-Jun-2016, 02:06z	CTD cast, MOCNESS (100m depth) tow
089	6	18°17.89'N	064°10.89'W	12-Jun-2016, 06:09z	CTD cast
090	6	18°19.47'N	064°12.72'W	12-Jun-2016, 08:42z	CTD cast, s25 and MOCNESS (100m depth) tows
091	6	18°21.46'N	064°15.78'W	12-Jun-2016, 11:17z	CTD cast, MOCNESS (100m depth) tow
092	6	18°23.11'N	064°17.69'W	12-Jun-2016, 16:01z	CTD cast
093	6	18°25.50'N	064°20.20'W	12-Jun-2016, 17:55z	CTD cast, s25 and MOCNESS (100m depth) tows
094	6	18°21.73'N	064°25.39'W	12-Jun-2016, 23:44z	CTD cast, s25 and MOCNESS (100m depth) tows
095	6	18°18.02'N	064°22.19'W	13-Jun-2016, 01:00z	CTD cast, MOCNESS (100m depth) tow
096	6	18°18.41'N	064°32.62'W	13-Jun-2016, 05:07z	CTD cast, s25 and MOCNESS (100m depth) tows
097	6	18°14.00'N	064°29.32'W	13-Jun-2016, 06:32z	CTD cast, MOCNESS (100m depth) tow
098	6	18°16.82'N	064°35.68'W	13-Jun-2016, 09:26z	CTD cast, s25 and MOCNESS (100m depth) tows
099	6	18°17.83'N	064°40.75'W	13-Jun-2016, 12:31z	CTD cast, s25 tow
100	6	18°14.49'N	064°38.85'W	13-Jun-2016, 13:14z	s25 and MOCNESS (100m depth) tows
101	6	18°10.43'N	064°36.24'W	13-Jun-2016, 17:34z	CTD cast, MOCNESS (100m depth) tow
102	6	18°05.79'N	064°43.77'W	13-Jun-2016, 21:27z	CTD cast, MOCNESS (100m depth) tow
103	6	18°11.43'N	064°43.39'W	13-Jun-2016, 23:06z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
104	6	18°17.27'N	064°43.56'W	14-Jun-2016, 01:36z	CTD cast, s25 and mini-bongo (25m depth) tows
105	6	18°16.88'N	064°47.76'W	14-Jun-2016, 02:52z	CTD cast, s25 and mini-bongo (25m depth) tows
106	6	18°10.88'N	064°47.60'W	14-Jun-2016, 04:53z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows

Station #	Leg #	Latitude	Longitude	Date/Time	Operations Completed
107	6	18°05.59'N	064°51.53'W	14-Jun-2016, 07:39z	CTD cast, mini-bongo (25m depth) and MOCNESS (100m depth) tows
108	6	18°10.87'N	064°51.38'W	14-Jun-2016, 10:32z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
109	6	18°16.19'N	064°51.50'W	14-Jun-2016, 13:21z	CTD cast, s25 and mini-bongo (25m depth) tows
110	6	18°05.62'N	064°57.55'W	14-Jun-2016, 14:42z	CTD cast, MOCNESS (100m depth) tow
111	6	18°10.92'N	064°57.53'W	14-Jun-2016, 17:17z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
112	6	18°17.24'N	064°57.47'W	14-Jun-2016, 20:11z	CTD cast, s25 and mini-bongo (25m depth) tows
113	6	18°05.58'N	065°01.98'W	14-Jun-2016, 22:21z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
114	6	18°11.59'N	065°01.99'W	15-Jun-2016, 01:52z	CTD cast, s25, mini-bongo (25m depth), and MOCNESS (100m depth) tows
115	6	18°17.28'N	065°01.99'W	15-Jun-2016, 04:41z	CTD cast, s25 and mini-bongo (25m depth) tows
116	6	18°05.60'N	065°06.54'W	15-Jun-2016, 06:21z	CTD cast, MOCNESS (100m depth) tow
117	6	18°09.68'N	065°06.48'W	15-Jun-2016, 08:53z	CTD cast, s25 and MOCNESS (100m depth) tows
118	6	18°15.79'N	065°06.41'W	15-Jun-2016, 11:04z	CTD cast, s25 tow
119	6	18°12.07'N	065°12.47'W	15-Jun-2016, 12:37z	CTD cast, s25 tow
120	6	18°06.53'N	065°12.39'W	15-Jun-2016, 14:37z	CTD cast, s25 and MOCNESS (100m depth) tows
121	6	18°00.82'N	065°16.80'W	15-Jun-2016, 16:42z	CTD cast, MOCNESS (100m depth) tow
122	6	18°05.52'N	065°18.24'W	15-Jun-2016, 19:22z	CTD cast, s25 and MOCNESS (100m depth) tows
123	6	18°10.54'N	065°20.19'W	15-Jun-2016, 22:26z	CTD cast, s25 tow
124	6	18°12.96'N	065°19.09'W	15-Jun-2016, 23:43z	CTD cast, s25 and mini-bongo (25m depth) tows
125	6	18°15.41'N	065°17.84'W	16-Jun-2016, 00:45z	s25 tow
126	6	18°14.04'N	065°27.06'W	16-Jun-2016, 02:11z	s25 and mini-bongo (25m depth) tows
127	6	18°18.94'N	065°27.00'W	16-Jun-2016, 03:14z	s25 tow
128	6	18°18.01'N	065°10.92'W	16-Jun-2016, 09:38z	s25 tow
129	6	18°19.02'N	065°06.86'W	16-Jun-2016, 10:33z	s25 and mini-bongo (25m depth) tows
130	6	18°19.98'N	065°02.84'W	16-Jun-2016, 11:55z	s25 and mini-bongo (25m depth) tows
131	6	18°27.61'N	065°09.84'W	16-Jun-2016, 20:12z	s25 tow
132	6	18°30.26'N	065°04.45'W	16-Jun-2016, 21:18z	s25 tow
133	6	18°24.40'N	065°00.51'W	16-Jun-2016, 22:22z	s25 and mini-bongo (25m depth) tows
134	6	18°23.94'N	064°52.78'W	16-Jun-2016, 23:56z	s25 and mini-bongo (25m depth) tows
135	6	18°24.41'N	064°46.88'W	17-Jun-2016, 01:01z	s25 and mini-bongo (25m depth) tows
136	6	18°30.42'N	064°54.48'W	17-Jun-2016, 02:31z	s25 tow
137	6	18°37.36'N	064°56.18'W	17-Jun-2016, 03:35z	s25 tow
138	6	18°36.10'N	065°02.33'W	17-Jun-2016, 04:28z	s25 tow
139	6	18°33.90'N	065°11.38'W	17-Jun-2016, 05:40z	s25 tow