UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

MAR 20, 2015

MEMORANDUM FOR: Lieutenant Commander Jeffrey Shoup, NOAA
Commanding Officer, NOAA Ship *Nancy Foster*

FROM: Captain Anne K. Lynch, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for NF-15-02 and NF-15-03
Coral Reef Ecosystem Research Survey and NF-15-03 Bluefin Tuna Ecology Survey

Attached is the final Project Instruction for NF-15-02 Coral Reef Ecosystem Research Survey and NF-15-03 Bluefin Tuna Ecology Survey, which is scheduled aboard NOAA Ship *Nancy Foster* during the period of 11 April to 03 June, 2015. Of the 47 DAS scheduled for this project, 47 days are funded by Line Office Allocation. This project is estimated to exhibit a Medium Operational Tempo.

The Department of Commerce's Export Administration Regulations (EAR) apply to *Nancy Foster* and almost all items onboard the vessel and would prohibit the vessel from entering Cuban waters. NOAA's export control team and the Office of General Counsel are currently pursuing a license or a license exception for *Nancy Foster* to operate near Cuba. We will keep you informed of our progress.

Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Attachment

cc:
MOA1

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FINAL CRUISE INSTRUCTIONS

Date Submitted: 21 March 2015

Platform: NOAA Ship *Nancy Foster*

Cruise Number(s): NF-15-02 and NF-15-03 (NF-15-02/03)

Project Title: Coral Reef Ecosystem Research and Bluefin Tuna Ecology (CRER & BTE)

Cruise Dates: 11 April 2015 – 03 June 2015

Prepared by: _____ Dated: 3/17/2015
Mr. Ryan H. Smith
Chief Scientist (NF-15-02)
NOAA/OAR/AOML/PhOD

Prepared by: _____ Dated: 3/17/2015
Ms. Estrella Malca
Chief Scientist (NF-15-03)
NOAA/NMFS/SEFSC/ELH

Approved by: _____ Dated: 3/17/2015
Dr. Robert M. Atlas
Director
NOAA/OAR/AOML

Approved by: _____ Dated: 03/17/2015
Dr. Bonnie Ponwith
Director
NOAA/NMFS/SEFSC

Approved by: _____ CAPT NOAA Dated: 3/20/2015
Captain Anne K. Lynch, NOAA
Commanding Officer
NOAA/OMAO/MOC – Atlantic

I. Overview

A. Brief Summary and Project Period

FOCUS 1. Coral Reef Ecosystem Research (CRER)

Background and Scientific Objectives

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 US 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 Marine Protected Area (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, National Oceanic and Atmospheric Administration (NOAA) scientists from the Southeast Fisheries Science Center (SEFSC) and the Atlantic Oceanographic and Meteorological Laboratory (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 NOAA Ship *Nancy Foster* (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 US 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 US waters, but also the surrounding region.

During FOCUS 1 of our 2015 research cruise aboard NF, we plan on sampling water properties, currents, and dispersal and transport of settlement-stage larvae in the VI and neighboring regions. Results from the survey should provide a better understanding of regional spatial variation in the supply of settlement-stage fishes between managed and non-managed areas, as well as insights into the relative importance of Grammanik Bank as a source of juvenile fishes recruiting to the waters of the VI.

FOCUS 2. Bluefin Tuna Ecology (BTE)

Background and Scientific Objectives

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.

During FOCUS 2 of our 2015 research cruise aboard NF, we will extend our larval survey to the western Caribbean and southeastern Gulf of Mexico in an effort to determine the extent of ABT spawning in this region, and to use adaptive sampling methods to further develop a larval habitat model.

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. Our collaborators include scientists from El Colegio de la Frontera Sur (ECOSUR) and the Instituto Nacional de Pesca (INAPESCA) in Mexico, and the University of the West Indies (UWI) in Jamaica. 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.

The survey work associated with the two project components (areas of focus) outlined above will include shipboard neuston, mini-bongo, and Multiple Opening and Closing Net Environmental Sensing System (MOCNESS) trawl tows, as well as Conductivity-Temperature-Depth (CTD) casts measuring, temperature, salinity, dissolved oxygen, chlorophyll, colored dissolved organic matter (CDOM), and water velocity. Continuous surface measurements of temperature, salinity, light transmission, chlorophyll, CDOM, and water velocity will also be collected via the ship's flow-through system and hull-mounted acoustic Doppler current profiler (ADCP). Ten satellite-tracked, Lagrangian surface drifters will also be deployed to study the regional circulation. Bathymetric data will be collected from the ship's depth sounders. Satellite imagery of sea surface temperature, altimetry, and ocean color will be used to aid in the interpretation of shipboard and drifter observations.

The following cruise instructions outline operations to be conducted aboard the NOAA Ship *Nancy Foster* (NF) between 11 April 2015 and 03 June 2015 (NF-15-02/03).

B. Days at Sea (DAS)

Of the 47 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 47 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are Other Agency funded. This project is estimated to exhibit a Medium Operational Tempo.

CRUISE PERIOD (tentative dates as of 21 March 2015)

11 April 2015 through 03 June 2015 (NF-15-02/03)

11 April 2015	Depart from Charlotte Amalie, St. Thomas, USVI (begin NF-15-02 leg I)
22 April 2015	Arrive at Montego Bay, Jamaica (end NF-15-02 leg I)
26 April 2015	Depart from Montego Bay, Jamaica (begin NF-15-02 leg II)
05 May 2015	Arrive at Cozumel, Mexico (end NF-15-02 leg II)
09 May 2015	Depart from Cozumel, Mexico (begin NF-15-03 leg I)
20 May 2015	Arrive at Cozumel, Mexico (end NF-15-03 leg I)
22 May 2015	Depart from Cozumel, Mexico (begin NF-15-03 leg II)
03 June 2015	Arrive at Key West, Florida (end NF-15-03 leg II)

C. Operating Area

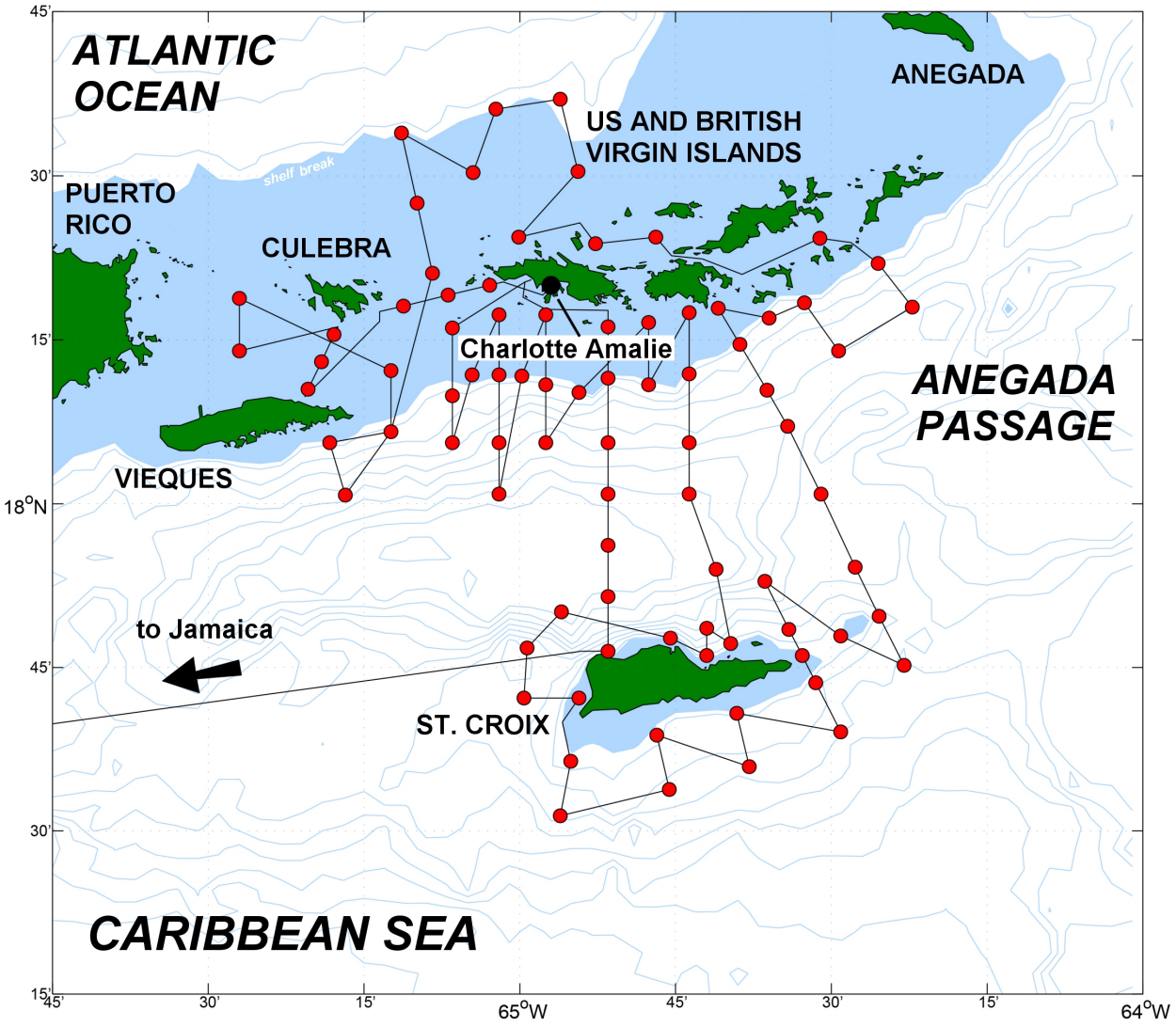

Figure 1. NF-15-02/03 will initially depart from Charlotte Amalie, St. Thomas, USVI and survey portions of the US Caribbean and surrounding region shown above. Red markers indicate historical station locations where net tows and/or $CTDO_2$/LADCP casts will be conducted. The black line represents the associated cruise track. Once sampling in this region has been completed, NF will transit to Montego Bay, Jamaica (Fig. 2).

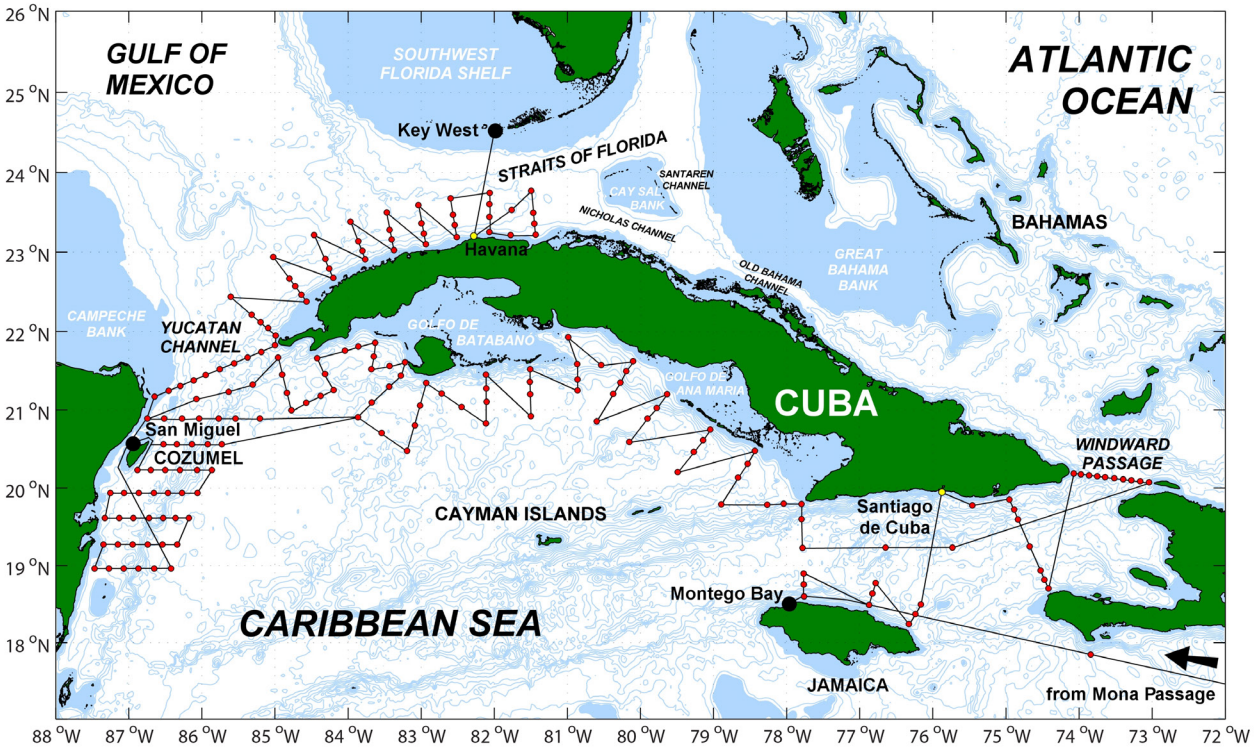

Figure 2. Leg I of NF-15-02/03 will conclude in Montego Bay, Jamaica. Following this port stop work will continue across the region shown above. During this period, two additional port calls will be made in San Miguel, Cozumel. Red markers indicate planned station locations (net tows and/or $CTDO_2$/LADCP casts), and the black line represents the associated cruise track. The research survey will terminate in Key West, Florida. Yellow markers indicate NOAA small-boat personnel transfer sites.

D. Summary of Objectives

1) Collect physical and biological data from 100% of all planned project $CTDO_2$/LADCP cast and net tow stations located throughout the survey area.

2) Collect a single merged (complete and continuous) sea surface flow-through data set (SST, SSS, chl_a, and CDOM) for the entire cruise period devoid of time, position, or data dropouts.

3) Collect a complete and continuous TRDI VMDas 150 kHz hull-mounted ADCP data set, interfaced with directional GPS heading input (POSMV), for the entire cruise period devoid of time, position, or data dropouts.

4) Install a TRDI 300 kHz ADCP in the ship's moon pool and collect a complete and continuous hull-mounted ADCP data set from the instrument (using UHDAS or VMDAS), interfaced with directional GPS heading input (POSMV), at selected shallow transects throughout the survey area, devoid of time, position, or data dropouts.

5) Deploy ~30 satellite-tracked SVP Lagrangian drifting buoys and 6 ARGO floats.

6) Collect a complete and continuous bathymetric time-series (ascii) from the ship's Knudsen depth sounder for the entire cruise period (with time, position, and quality flag) devoid of time, position, or data dropouts.

7) Conduct directed sampling targeting potential ABT (*Thunnus thynnus*) and other tuna species spawning areas in the Caribbean Sea including Cuban and Mexican waters.

8) Assess the occurrence, abundance, and geographical distribution of the early life stages of spring spawning fishes, especially ABT, in support of annual stock assessments through the use of sub-surface Neuston net (S10) tows.

9) Measure the vertical distribution of fish larvae by sampling at discrete depths in the water column at selected locations using a 1 m Multiple Opening and Closing Net Environmental Sensing System (MOCNESS).

10) Evaluate trophic pathways relative to the early life dynamic primarily of ABT larvae with the use of stable isotope analysis of samples collected using a mini-bongo net.

E. Participating Institutions

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National Oceanic and Atmospheric Administration
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United States Department of Commerce
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Participating Institutions (continued)

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F. Scientific Personnel

Name (Last, First)	Title	Embark / Disembark		M/F	Affiliation	Nationality
Alemany Llordà, Francisco	Fisheries Expert	9-May	20-May	M	IEO	EU/Spain
Brown, Jonathan	Fisheries Manager	9-Apr	22-Apr	M	VI-DPNR	USA
Carillo Bibriezca, Laura	Oceanographer	TBD	TBD	F	ECOSUR	Mexico
Dale, Katherine	Student	9-Apr	22-Apr	F	UM-CIMAS	USA
Doering, Kathryn	Fisheries Expert	9-Apr	22-Apr	F	UM-CIMAS	USA
Ender, Alexandra	Fisheries Expert	9-May	3-Jun	F	UM-CIMAS	USA
Europe, James	NOAA Corps Officer	9-Apr	22-Apr	M	NOAA-SEFSC	USA
Gerard, Trika	Fisheries Expert	9-Apr	5-May	F	NOAA-SEFSC	USA
Guyah, Nasheika	Taxonomist	26-Apr	5-May	F	UWI	Jamaica
Johns, Libby	Oceanographer	26-Apr	5-May	F	NOAA-AOML	USA
Laiz Carrion, Raul	Fisheries Expert	26-Apr	20-May	M	IEO	EU/Spain
Lamkin, John	Chief Scientist	9-Apr	3-Jun	M	UM-CIMAS	USA
Malca, Estrella	Watch Chief	9-May	3-Jun	F	UM-CIMAS	USA
Millan Lugo, Josue	Grad Student	9-Apr	22-Apr	M	UPR	USA
Miller, Shana	Visiting Scientist	22-May	3-Jun	F	PEW	USA
Morales, Selene	Taxonomist	9-May	20-May	F	ECOSUR	Mexico
Otis, Daniel	Optics Tech	9-Apr	22-Apr	M	USF	USA
Privoznik, Sarah	Watch Chief	9-Apr	20-May	F	UM-CIMAS	USA
Rasmuson, Leif	Postdoctoral Student	22-May	3-Jun	M	UO	USA
Rawson, Grant	Oceanographer	9-Apr	5-May	M	UM-CIMAS	USA
Shiroza, Akihiro	Fisheries Expert	26-Apr	3-Jun	M	UM-CIMAS	Japan
Smith, Ryan	Chief Scientist	9-Apr	5-May	M	NOAA-AOML	USA
Sosa Cordero, Felipe	Fisheries Expert	22-May	3-Jun	M	ECOSUR	Mexico
Suca, Justin	Student	26-Apr	20-May	M	UM-CIMAS	USA
Vasquez Yeomans, Lourdes	Taxonomist	22-May	3-Jun	F	ECOSUR	Mexico
Wright, Vanessa	Oceanography Tech	9-Apr	22-Apr	F	UVI	USA
Zygas, Aras	NOAA Corps Officer	9-Apr	3-Jun	M	NOAA-SEFSC	USA
TBD	Visiting Scientist	26-Apr	3-Jun	M	CUBA	Cuba
TBD	Visiting Scientist	26-Apr	3-Jun	F	CUBA	Cuba
TBD	Visiting Scientist	26-Apr	3-Jun	M	INAPESCA	Mexico

G. Administrative

1. Points of Contact

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Alternate Point of Contact: CDR Steve Meador
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Stephen.Meador@noaa.gov

2. *Diplomatic Clearances*

This project involves Marine Scientific Research in waters under the jurisdiction of the countries listed below. Diplomatic clearance has been requested.

pending Anguilla (UK)
pending Bahamas (UK)
pending British Virgin Islands including Anegada (UK)
pending Cayman Islands (UK)
granted Cuba
pending Dominican Republic
pending Haiti
pending Jamaica
pending Mexico
granted Turks and Caicos (UK)

3. *Licenses and Permits*

This project will be conducted under the Atlantic Highly Migratory Species (HMS) Exempted Fishing Permit (EFP) issued by the United Stated National Marine Fisheries Service from April 11, 2015 to June 05, 2015. The permit has been requested.

II. Operations

A. Project Itinerary:

11 April 2015*	Depart:	Charlotte Amalie, St. Thomas (1000) *begin NF-15-02*
22 April 2015	Arrive:	Montego Bay, Jamaica (1600)
26 April 2015	Depart:	Montego Bay, Jamaica (0900)
27 April 2015**	Arrive:	Santiago de Cuba, Cuba (0600) *NOAA small-boat ops.*
27 April 2015	Depart:	Santiago de Cuba, Cuba (1000)
05 May 2015	Arrive:	Cozumel, Mexico (1600) *end NF-15-02*
09 May 2015	Depart:	Cozumel, Mexico (1000) *begin NF-15-03*
20 May 2015	Arrive:	Cozumel, Mexico (1600)
22 May 2015	Depart:	Cozumel, Mexico (1000)
02 June 2015***	Arrive:	Havana, Cuba (0800) *NOAA small-boat ops.*
02 June 2015	Depart:	Havana, Cuba (1000)
03 June 2015	Arrive:	Key West, Florida (1600) *end NF-15-03*

* The scientific party will meet the ship in Charlotte Amalie, St. Thomas on 09 April 2015 (two days prior to sailing).

** A transfer of Cuban scientists/observers, via NOAA small-boat, is expected at Santiago de Cuba prior to conducting work in Cuban waters. The exact date and time of this transfer is yet to be determined. Cuban foreign nationals will remain aboard the ship until disembarked via small boat at Havana (Cubans will remain with NF during port calls in Cozumel).

*** A transfer of Cuban scientists/observers, via NOAA small-boat, is expected at Havana prior to the ship's return to CONUS on 03 June 2015. The exact date and time of this transfer is yet to be determined.

While underway, scientific operations will be conducted on a 24 hour basis. Scientific personnel will stand 12 hour watch schedules set by the Chief Scientists. Scientific shifts will run from 0000 to 1200 and from 1200 to 0000.

The Chief Scientists are authorized to alter the project instructions and station plan, following a consultation with the Commanding Officer, preferably routed through the Operations Officer or Watch Officer, as needed throughout the cruise, to focus scientific investigation and to maximize data collection. Additionally, the Chief Scientists and/or Watch Leaders may alter sampling protocol in order to optimize the scientific survey effort. A copy of all foreign clearance documents will be provided to the Commanding Officer at least one week prior to sailing.

B. Staging and Destaging:

A majority of the required scientific gear was loaded aboard NF in Charleston, SC on 17 March 2015, prior to the ship's CONUS departure.

One 180L capacity dewar of liquid nitrogen, loaded aboard the ship in Charleston, SC, will be refilled during the port stop in Montego Bay, Jamaica (dewar dimensions are dia: 20", height: 65").

A 300 kHz TRDI ADCP (loaded aboard NF in March), will be installed in the ship's moon pool at the dock in Charlotte Amalie, St. Thomas on the morning of 10 April 2015. A visual verification of instrument orientation, performed by ship's divers will be required at that time.

Six ARGO floats will be loaded aboard NF while in Charlotte Amalie, St. Thomas on the morning of 10 April 2015. These floats will be stored under a tarp on the 01 deck and deployed while the ship is in transit during leg II.

All scientific gear will be unloaded on 03 June 2015, following the ship's arrival in Key West, FL.

C. Operations to be Conducted:

1. Approximately 300 $CTDO_2$/LADCP profiles (up to full depth profiles).
2. Approximately 335 net tows (100 mini-bongo, 140 Neuston/S10, 95 MOCNESS).
3. Continuous hull-mounted ADCP survey.
4. Continuous flow-through TSG/chl_a/CDOM survey.
5. Continuous bathymetric survey.
6. Drifter and ARGO float deployments.
7. Recover glider east of St. Croix on 19 April 2015 (glider deployed on NF-15-01)

Station Operations

Prior to conducting any station operations, the NF will act in accordance with the ***Mitigation Measures for Protected Species*** formalized **"Move-On"** Rule:

If any marine mammals, sea turtles or other protected species are sighted around the vessel before setting the gear, the vessel may be moved away from the animals to a different section of the sampling area if the animals appear to be at risk of interaction with the gear at the discretion of the Chief Scientist and Scientific Watch Leader. In most cases, fishing gear is not deployed if marine mammals or sea turtles have been sighted near the ship unless those animals do not appear to be in danger of interactions with the gear, as determined by the judgment of the Chief Scientist and Scientific Watch Leader.

AOML and SEFSC will initiate a process for its Chief Scientists, Scientific Watch Leaders, and vessel officers to communicate with each other about their experiences with protected species interactions during research work with the goal of improving decision-making regarding avoidance of adverse interactions. As noted in the Status Quo Alternative description of mitigation measures, there are many situations where professional judgment is used to decide the best course of action for avoiding protected species interactions before and during the time research gear is in the water.

The intent of this mitigation measure would be to draw on the collective experience of people who have been making those decisions, provide a forum for the exchange of information about what went right and what went wrong, and try to determine if there are any rules-of-thumb or key factors to consider that would help in future decisions regarding avoidance practices. AOML and SEFSC would coordinate not only among its staff but also with those from other fisheries science centers with similar experience.

Station operations will utilize the majority of the main deck. Any small boat stored on the main deck must not interfere with J-Frame ($CTDO_2$/LADCP casts, Neuston/S10, mini-bongo, or MOCNESS tows) operations.

$CTDO_2$/LADCP Operations: $CTDO_2$ casts will include either the ship's or AOML's CTD frame, the ship's CTD instrument, AOML's Lowered ADCP instruments (on some casts), and the ship's Rosette sampler. Approximately 300 casts will be conducted. Many will be conducted to full water column depth. These casts will be performed using the ship's Markey winch (spooled with .322 conducting cable) in conjunction with the ship's J-Frame boom and a metered block.

Net / Trawl Operations: Operations will vary, using either mini-bongo, Neuston/S10, or 1-m MOCNESS rigs. Trawl type and location will depend on the work area and scientific results yielded during the course of the cruise. Approximately 335 tows will be conducted (~140 Neuston/S10, ~100 mini-bongos, ~95 MOCNESS). MOCNESS tows will be performed using the ship's DT Marine winch (spooled with .322 conducting cable), A-Frame boom, and a metered block. Mini-bongo and Neuston/S10 tows will be performed using the ship's "Little" DT winch (spooled with .322 conducting cable, with a pressure gauge installed at the mechanical termination), J-Frame, and a non-metered block (this block should be mounted aft of the metered CTD block). An SBE 39 temperature/pressure recorder (furnished by the science party) will be installed between the cable termination and the net (the ship's SBE 19 will serve as a backup for this instrument). NOTE: the block shiv should be of large enough diameter as to not damage the wire (either .322 conducting cable or hydrowire) as it passes through the block under tension.

Underway Operations

The ship shall continuously collect position (GPS), hull-mounted ADCP, meteorological, thermosalinograph (TSG), chl_a and UV/CDOM fluorometer, and bathymetric data while underway (flow-through fluorometers will be provided by the science party). Directional GPS information from the ship's POSMV GPS should be properly interfaced with the ship's hull mounted ADCP and SCS system. To augment the ship's existing TSG, a self-contained optical instrumentation suite may be added to the ship's flow-through system downstream of existing equipment.

Drifting buoy deployments will be conducted periodically throughout the cruise. Approximately 30 satellite-tracked SVP Lagrangian surface drifters will be deployed by hand at predetermined coordinates while the ship is underway.

Mooring and Dive Operations

No mooring operations are planned. NF NOAA divers will be required to visually inspect installation of 300 kHz pole-mounted ADCP in moon pool, dockside in Charlotte Amalie, St. Thomas on the morning of 10 April 2015.

Small Boat Operations

Small boat operations will be required as needed throughout the cruise.

D. Dive Plan

A dive plan will be provided, if required, for the dockside operation described above.

E. Applicable Restrictions

None.

III. Equipment

A. Equipment and Capabilities provided by the ship (itemized)

ITEMS SHOWN IN RED ARE NF-15-02/03 MISSION CRITICAL!

The following NF communications devices should be on board, in working order, and available for use during NF-15-02/03:

1) INMARSAT-B
2) HF SSB/DSC transceiver
3) cellular telephone
4) Iridium Telephone
5) VHF Radios
6) handheld NOAA radios for ship-to-launch and deck communications

The following NF navigational devices should be on board, in working order, and available for use during NF-15-02/03:

1) 200 kHz and 50 kHz single beam transducer with Furuno FE-700 echo sounder
2) Transas ES2 and ECDIS, software Navi-Sailor 2400
3) Transas ES2 for transiting, operations, and video feed from lab
4) RADAR: S-band/X-band w/ ARPA
5) Dynamic Positioning Displays: forward and aft console

6) Furuno Universal AIS FA-100
7) gyrocompass: 2 Meridian Surveyors and 9 repeaters
8) NAVTEX
9) Young Wind Tracker

The following NF scientific gear should be on board, in working order, and available for use during NF-15-02/03:

1) 200 kHz single beam transducer with Knudsen echo sounder for shallow water surveying
2) 150 kHz Ocean Surveyor hull-mounted ADCP
3) 12 kHz transducer with Knudsen echo sounder for deep water surveying (~5000 m depth)
4) Kongsburg-Simrad EM 710 MultiBeam system
5) Applanix POS M/V
6) SBE 45 MicroTSG
7) SBE 21 TSG
8) SBE 19 CTD. Instrument should be calibrated prior to cruise.
9) SBE 9/11+ CTD and deck unit system configured with a 12-bottle rosette sampler and 12 Niskin bottles. Data acquisition via SeaSave v7 or later version. All sensors should be calibrated prior to cruise. SPARE CABLES; COND, TEMP, AND O2 SENSORS; AND SPARE PUMP MUST ALSO BE AVAILABLE FOR USE WITH THIS GEAR!
10) SCS with real-time file access
11) Headset or handheld communication devices (either VHF, NOAA, or telephone) for simultaneous communications between winch operator, dry lab, and bridge.

The following NF deck equipment should be on board, in working order, and available for use during NF-15-02/03:

1) A-Frame – for net tows off of the stern
2) J-Frame – for net tows and CTD casts off of the port side
3) Hydrographic Winch #1 (Markey) – spooled with ~5000 m of .322 conductor cable (wire rope) and configured for use with the ship's J-Frame (winch should be able to pay-out / haul-in cable at 60 meters per minute)
4) Hydrographic Winch #2 (DT Marine) – spooled with ~3000 m of .322 conductor cable (wire rope) and configured for use with the ship's A-Frame (winch should be able to pay-out / haul-in cable at 45 meters per minute)
5) Hydrographic Winch #3 ("Little" DT Marine) spooled with ~ 300 m of .322 conductor cable (wire rope) and configured for use with the ship's J-Frame (winch should be able to pay-out / haul-in cable at 30 meters per minute)
6) Two metered blocks (one spare) for use with the Markey and DT Marine winches
7) Two non-metered blocks (one spare) for use with tow operations

8) Air-tuggers, as needed
9) Deck cranes, as needed
10) Portable deck cleats as needed
11) Quick-release 55-gallon drum storage on 01 deck for at least two drums of ethanol to be used in the preparation of scientific samples.

The following NF small boats should be on board, in working order, and available for use during NF-15-02/03:

1) At least one NF small boat should be aboard and available for use in gear/personnel transfers during the course of the cruise.
2) ANY SMALL BOAT STORED ON THE MAIN DECK MUST NOT INTERFERE WITH A-FRAME OR J-FRAME OPERATIONS ($CTDO_2$/LADCP CASTS, NEUSTON/S10, MINI-BONGO, OR MOCNESS TOWS).

B. Equipment and Capabilities provided by the scientists (itemized)

In addition to the suite of oceanographic and meteorological instruments on board the NF, the science party will load the following scientific gear on board:

1 fluorometer spares box (yellow pelican case)
1 chl_a sampling box (gray plastic, flip-top case)
1 SBE 9plus (CTD) storage case (black plastic, roll-on case)
1 SBE 11plus (deck unit) storage case (black plastic, roll-on case)
1 ADCP spares "ADCP1" storage case (black plastic, roll-on case)
1 electrical spares "ELECT SUPPLIES CASE" storage case (black plastic case)
1 CTD parts "SBE/INT PARTS 1" storage case (black plastic, roll-on case)
1 computer supplies "COMP TOOLS" storage case (black plastic, roll-on case)
1 USF water sampling supplies case (tan plastic, roll-on case)
1 tool bag (red/black canvas, roll-on tool bag/case)
1 CTD spare sensors case (gray plastic case)
4 .322 wire grips (for CTD and MOCNESS)
1 white CTD/LADCP frame configured with:
21 niskin bottles, 1 SBE carousel, 1 SBE 9plus, 2 RDI WH300 ADCPs,
1 LADCP external battery pack, 1 Kongsberg altimeter, 2 WetLabs fluorometers
1 shop rags box
1 computer monitor (cardboard box)
2 oxygen sampling supplies boxes (red, flip-top plastic boxes)
1 oxygen analysis computer (cardboard box)
1 oxygen sampling supplies box (clear, flip-top plastic box)
1 oxygen sampling supplies box (blue, flip-top plastic box)
1 oxygen reagents box (blue, flip-top plastic box) containing:
1 liter, sodium iodide **(HAZMAT)**

1 oxygen reagents box (cardboard box) containing:
1 liter, manganese chloride **(HAZMAT)**
1 oxygen repipettes (gray Rubbermaid container)
6 oxygen sample bottle cases (green, flip-top plastic boxes)
8 CO2 sample bottle cases (gray, flip-top plastic boxes)
1 CO2 sampling supplies box (gray pelican case) containing:
100 ml Mercuric Chloride **(HAZMAT)**
1 spare ADCP (gray plastic, roll-on case)
14 drogueless drifters (plastic spheres)
6 salinity sample bottle cases (blue plastic boxes w/ clear snap-top lids)
1 empty dewar (tan with black top)
2 DI water (plastic carboy)
3 aluminum SADCP extension poles
1 amsteel rope (orange spool)
1 SADCP battery bank (black pelican case)
2 SADCP supplies and equipment box (white plastic boxes)
2 folding D-containers (black plastic)
2 office/lab supplies (black plastic, roll-on cases)
2 sterile water (clear plastic containers)
1 empty, vented manifold waste water carboy (clear plastic carboy)
1 microbiology supplies with manifold (blue/gray Rubbermaid container)
1 Cuba charts (white cardboard tube)
1 180L dewar of liquid nitrogen **(HAZMAT)**
4 20-50 liter liquid nitrogen dewars **(HAZMAT)**
16 SVP drifting buoys
6 ARGO floats
2 mini-bongo frames with nets
2 neuston frames
4 boxes/crates with three neuston and 9 MOCNESS nets
2 styrofoam shipping coolers
1 45 kg weight for Bongo frame w/ cable line already attached
7 buckets for sample collection
1 wooden table, w/ top and white sink
50 boxes of 12 units each of 16 oz. EMPTY glass jars w/ lids
15 boxes of 12 units each of 32 oz. EMPTY glass jars w/ lids
3 55 gallon drums of ethanol **(HAZMAT)**
3 Overpacks for 55 gallon ethanol drums (with spill response kit)
1 empty 55 gal. drum for disposal of waste ethanol
2 plastic 5 gal. EMPTY carboy
2 black plastic trunk with gear (3'x3'x5'), can be strapped on deck
5 Rubbermaid bins
1 1 m MOCNESS frame and associated electronics
2 ELH microscopes

2 ELH science computers
1 500 mL container 10% formalin **(HAZMAT)**

All **HAZMAT** *items listed will be stored aboard the NF in accordance with NOAA ship regulations and safe handling procedures outlined in each HAZMAT MSDS.*

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per OMAO procedure, the scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents
- Chemical safety and spill response procedures, such as excerpts of the program's Chemical Hygiene Plan or SOPs relevant for shipboard laboratories
- For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, notify ship's Operations Officer regarding quantity, packaging and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material

- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program
- Confirmation that chemical safety and spill response procedures were brought aboard

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

See attached Appendix A.

C. Chemical safety and spill response procedures

See attached Appendix A.

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") Projects

In situ optical profiles, TSG and CTD chl_a, CTD CDOM, and all associated samples will be utilized to improve algorithms and ground-truth remotely-sensed (satellite) ocean color data.

B. NOAA Fleet Ancillary Projects

Any additional work will be subordinate to the primary project and will be accomplished only with the concurrence of the Commanding Officer and the Chief Scientists.

The following projects will be conducted by ship's personnel in accordance with the general instructions contained in the MOC Directives, and conducted on a not-to-interfere basis with the primary project:

1) SEAS Data Collection and Transmission
2) Marine Mammal Reporting
3) Bathymetric Trackline
4) Weather Forecast Monitoring
5) Sea Turtle Observations
6) Automated Sounding Aerological Program

VI. Disposition of Data and Reports

A. Data Classifications

The Chief Scientists and Co-Principal Investigators will be responsible for the disposition, feedback on data quality, and archiving of data collected on board the ship for the primary project. They will also be responsible for the dissemination of copies of these data to participants in the cruise and to any other requesters based on the timelines outlined in the project's original DOS research clearance request. The ship may assist in copying data and reports insofar as facilities allow.

The Chief Scientists will receive all original data gathered by the ship for the primary project, and this data transfer will be documented on NOAA Form 61-29 "Letter Transmitting Data". The Chief Scientists in turn will furnish the ship a complete inventory listing all data gathered by the scientific party detailing types and quantities of data.

The Commanding Officer is responsible for all data collected for ancillary projects until those data have been transferred to the project's Principal Investigators or their designees. Data transfers will be documented on NOAA Form 61-29. Copies of ancillary project data will be provided to the Chief Scientists when requested.

Either the ship's Survey Technician (ST) or Electronics Technician (ET) will translate the data from the SCS to an ASCII format and provide the data to the science party as required throughout the course of the cruise.

B. Responsibilities

Reserved

VII. Meetings, Vessel Familiarization, and Project Evaluations.

A. Pre-Project Meeting

The Chief Scientist and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Chief Scientist in arranging this meeting.

B. Vessel Familiarization Meeting

The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting

The Commanding Officer is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's Commanding Officer the Chief Scientist, and the Operations Officer.

D. Project Evaluation Report

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at: http://www.omao.noaa.gov/fleeteval.html and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships', specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the project.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientists. The Chief Scientists and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientists are responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientists are also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the cruise and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientists will ensure that all non NOAA or non-Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientists to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 17, 2000, which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website:
http://www.corporateservices.noaa.gov/noaaforms/eforms/nf57-10-01.pdf.
All NHSQs submitted after March 1, 2014 must be accompanied by NOAA Form (NF) 57-10-02 - Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).
The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than 4 weeks prior to the start of the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance:
(http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).
The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:

Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone: 757.441.6320
Fax: 757.441.3760
E-mail: MOA.Health.Services@noaa.gov

Prior to departure, the Chief Scientists must provide a listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: name, address, relationship to member, and telephone number.

C. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via email and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged through the ship's Commanding Officer at least 30 days in advance.

OTHER MEANS OF CONTACT:

NANCY FOSTER (WTER)

IN PORT

Home Port (Charleston, SC):
843-529-0731, 0855 (Voice)
843-991-6326 (Fax, *note: call first*)
Cellular (*note: primary home port means of contact*):

843-991-6326 (Ship)
843-697-0584 (CO)
843-697-0901 (OOD)

NANCY FOSTER (WTER)

AT SEA

Inmarsat B:

011-870-336-991-210 (Voice)
011-870-336-991-212 (Data)
011-870-336-991-213 (Telex)
011-870-391-031-069 (HSD)

Iridium:

011-8816-7632-5653
808-434-5653 (*note: from land, dial this number*)

VoIP:

301-713-7780

Program contacts:

ryan.smith@noaa.gov	305-361-4328
estrella.malca@noaa.gov	305-361-4295
john.lamkin@noaa.gov	305-361-4226
libby.johns@noaa.gov	305-361-4360
aras.j.zygas@noaa.gov	305-361-4573
stephen.meador@noaa.gov	305-361-4544

E. IT Security

Any computer that will be hooked into the ship's network must comply with the *OMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

1. Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
2. Installation of the latest critical operating system security patches.
3. No external public Internet Service Provider (ISP) connections.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). National Marine Fisheries Service personnel will use the Foreign National Registration System (FNRS) to submit requests for access to NOAA facilities and ships. The Departmental Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated Line Office Deemed Export point of contact to assist with the process.

Foreign National access must be sought not only for access to the ship involved in the project but also for any Federal Facility access (NOAA Marine Operations Centers, NOAA port offices, USCG Bases) that foreign nationals might have to traverse to gain access to and from the ship. The following are basic requirements.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the email generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this email will be transmitted by FNRS.) This email will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.
2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.

3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.
4. Export Control - Ensure that approved controls are in place for any technologies that are subject to Export Administration Regulations (EAR).

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the Chief Scientist or the DSN of the FNRS or Servicing Security Office email granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.
7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.

2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

VIII. Appendices

APPENDIX A. HAZARDOUS MATERIALS

List of Hazardous Materials

Common Name of Material	Quantity	Notes	Trained Individual(s)	Spill Control
Manganese Chloride	1 Liter, (600 g/L)	Solution	Ryan Smith, Grant Rawson	MC
Alkaline Sodium Iodide	1 Liter, (320g Sodium Hydroxide + 600 g Sodium Iodide)	Solution	Ryan Smith, Grant Rawson	S
Ethyl Alcohol	165 gal (3 drums)	Solution	Estrella Malca, Sarah Privoznik	E
Mercuric Chloride	100 mL	Solution	Ryan Smith, Grant Rawson	M
Liquid Nitrogen	180 L	Liquid gas	Estrella Malca, Sarah Privoznik	L
10% Formalin	500 mL	Solution	Estrella Malca, Sarah Privoznik	F

Chemical Safety and Spill Response Procedures

E: ETHYL ALCOHOL

- Do not inhale vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
- Stop leak / contain spill if possible and safe to do so. Prevent product from entering drains.
- Highly flammable liquid. Eliminate all sources of ignition. All equipment used when handling this product must be grounded.
- A vapor suppressing foam may be used to reduce vapors. Do not touch or walk through spilled material.
- Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.
- Use clean non-sparking tools to collect absorbed material.

F: FORMALIN

- Ventilate area of spill.
- Eliminate all sources of ignition.
- Remove all non-essential personnel from area.
- Clean-up personnel should wear proper protective equipment and clothing.
- Absorb material with suitable absorbent and containerize for disposal.

L: LIQUID NITROGEN

- Use personal protection (full face shield, safety glasses, loose fitting thermal insulated or leather gloves, safety shoes, long sleeve shirts and trousers without cuffs).
- Evacuate all personnel from the affected area.
- Ventilate area or remove containers to a well ventilated location.
- To increase rate of vaporization, spray large amounts of water onto the spill from an upwind position.

M: MERCURIC CHLORIDE

- Use proper personal protective equipment.
- Absorb spills with absorbent (vermiculite, sand, fuller's earth) and place in suitable containers labeled for later disposal.
- Keep out of sewers and drains.

MC: MANGANESE CHLORIDE

- Use personal protective equipment.
- Avoid breathing vapors, mist or gas.
- Ensure adequate ventilation.
- Prevent further leakage or spillage if safe to do so.
- Do not let product enter drains.
- Discharge into the environment must be avoided.
- Soak up with inert absorbent material and dispose of as hazardous waste.
- Keep in suitable, closed containers for disposal.

S: ALKALINE SODIUM IODIDE

- Use personal protective equipment.
- Avoid breathing vapors, mist or gas. Ensure adequate ventilation.
- Do not let product enter drains.
- Soak up with inert absorbent material and dispose of as hazardous waste.
- Keep in suitable, closed containers for disposal.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
Pro Sorb Granular Absorbent	70 lb	F, E, M, S, MC	95 gal.
Spilltech HazMat Sorbents	144 ft roll	F, E, M, S, MC	60 gal.

APPENDIX B. CRUISE WAYPOINTS AND STATION LOCATIONS

A complete list of NF-15-02/03 cruise track waypoints and station locations will be provided to the ship prior to sailing.