**UNITED STATES DEPARTMENT OF COMMERCE**
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
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April 7, 2017

MEMORANDUM FOR: Captain Donn Pratt, NOAA
Master, NOAA Ship *Nancy Foster*

FROM: Captain Scott M. Sirois, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for NF-17-03/04
Coral Reef Ecosystem Research (CRER) and Bluefin Tuna Ecology

Attached is the final Project Instruction for NF-17-03/04, Coral Reef Ecosystem Research (CRER) and Bluefin Tuna Ecology, which is scheduled aboard NOAA Ship *Nancy Foster* during the period of April 13 to June 8, 2017. Of the 46 DAS scheduled for this project, 46 days are funded by a Line Office Allocation. This project is estimated to exhibit a Medium Operational Tempo. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

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# FINAL PROJECT INSTRUCTIONS

**Date Submitted:** April 8, 2017

**Platform:** NOAA Ship *Nancy Foster*

**Project Number(s):** NF-17-03 and NF-17-04 (NF-17-03/04)

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

**Project Dates:** April 13, 2017 to June 08, 2017

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# I. Overview

## A. Brief Summary and Project Period

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, will be collaborating on two joint projects this year aboard the NOAA Ship *Nancy Foster* (NF). This collaboration will serve to maximize data collection and minimize costs. These project instructions will serve as a guide for both missions named Coral Reef Ecosystem Research (FOCUS 1) and Bluefin Tuna Ecology (FOCUS 2). The numbers are attributed to the chronological order of the missions and do not imply any hierarchy. An overview of each project is given below.

### *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 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 1 of our 2017 research project aboard NF, we plan on sampling water properties, currents, dispersal and transport of fish larvae in the VI and neighboring regions. Results from the survey can enhance our understanding of regional spatial variation and determine the levels of exchange of offshore waters onto the shelf break (e.g. between St. Croix and the islands on the shelf) and the biological supply (fish larvae) 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.

Concurrent with FOCUS 1, we will carry out a couple of supplementary operations. At the start of FOCUS 1, we will deploy a mooring anchor system, in collaboration with the University of the Virgin Islands (UVI). The installation of this EPSCoR CARICOOS oceanographic buoy will be completed by UVI. This instrument will aid coral reef ecosystem dynamics, oceanographic research, marine circulation and condition forecasting. The mooring will be deployed before any CTD hydrography and biological sampling has begun, en route to the small boat pick up of scientists in Brewers Bay, St. Thomas.

At the end of FOCUS 1, we will recover a United States Geological Survey (USGS) Honjo Mooring located in the CRER work area. This operation will take place once CRER FOCUS 1 CTD hydrography and biological sampling has concluded.

## *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 the majority of the product going to Japanese markets. Management of the ABT fishery in the Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea is carried out in accordance with agreements by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the National Marine Fisheries Service (NMFS). In U.S. 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, its 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 in the U.S. Exclusive Economic Zone (EEZ). NOAA and ICCAT scientists use the results from these ichthyoplankton surveys to calculate larval indices of spawning stock biomass using abundance data from the northern Gulf of Mexico. Initial 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 these observed 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 extended regional spawning that are potentially unaccounted sources of ABT larvae.

Currently, variability in the ICCAT ABT larval index is very high and it is likely that environmental factors contribute to this variance, but relationships between the distribution of ABT larvae and environmental conditions are currently not well known. Effective management of western ABT depends on understanding larval survival rates and the stock-recruitment relationship (SRR) in their main spawning grounds in the (GoM). In the most recent ICCAT assessment, however, uncertainties in environmental constraints on the SRR for ABT have led to differing "low" and "high" recruitment scenarios, with highly divergent implications for setting goals in fishing pressure and stock recovery potential. The question of ABT recruitment variability in the GoM is complicated by the complex circulation and mesoscale activity driven by the Loop Current (LC). The northern extension of the LC can separate, forming large anticyclonic rings that propagate westward at around 4 km/day with lifetimes of a year or more. Upwelling associated with these mesoscale features can increase trophic web dynamics

relating to both primary and secondary productivity, and/or concentrate prey in areas of convergent flow.

During FOCUS 2 of our 2017 research survey aboard NF, we will continue our study of the distribution and abundance of ABT and other tuna larvae in the Gulf of Mexico. However, this project's ship time will also support the RESTORE Act Science program. RESTORE goals will focus on the impacts of nitrogen in the Gulf of Mexico and explore linkages between ecosystem biogeochemistry (δ15N of nitrate and exported material; nutrient uptake rates), phytoplankton (biomass, composition, taxon-specific growth and grazing rates), zooplankton (biomass, composition and grazing rates; trophic position by stable isotopic analyses, SI), and larval tuna (abundance, size, growth rate, gut contents, and trophic position with SI). Our collaborators in this research include scientists from University of Miami, Scripps Institution of Oceanography at University of California San Diego, Florida State University, University of Hawaii, Instituto Español de Oceanografía (IEO) in Spain, El Colegio de la Frontera Sur (ECOSUR) and the Instituto Nacional de Pesca (INAPESCA) in Mexico.

During FOCUS 2 (BTE), the ship will sample in the boundaries of mesoscale features (i.e. anticyclonic eddies) and target ABT larvae to assess relationships to new production nitrogen sources, food-web interactions that lead to preferred ABT prey, and variability of larval trophic position. In addition, the 2017 survey will apply similar adaptive sampling methodology used in past NF expeditions in both predicted larval ABT and other tuna habitats, as well as incorporate new techniques in areas that are key to understanding larval transport and retention across the region. Satellite imagery (sea surface temperature, altimetry, and ocean color), satellite-tracked instrumentation, and ocean modeling forecasts will be used to guide the sampling (adaptive sampling).

The survey work associated with the two project components (areas of focus) outlined above will include shipboard bongos, neuston, and Multiple Opening and Closing Net Environmental Sensing System (MOCNESS) oblique tows, as well as Conductivity-Temperature-Depth (CTD) casts measuring temperature, salinity, dissolved oxygen, chlorophyll, colored dissolved organic matter (CDOM), photosynthetically active radiation (PAR), and water turbidity. Two satellite-tracked arrays will be deployed and sampled for nitrogen measurements. Continuous surface measurements of temperature, salinity, chlorophyll, CDOM, and water velocity will also be collected via the ship's flow-through system and hull-mounted acoustic Doppler current profiler (ADCP). Multiple XBT (eXpendable BathyThermographs) casts will provide high resolution temperature profiles of the upper ocean. Approximately 16 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.

**The following project instructions outline operations to be conducted aboard the NOAA Ship *Nancy Foster* (NF) between 13 April 2017 and 08 June 2017 (NF-17-03 and NF-17-04, collectively NF-17-03/04).**

## B. Days at Sea (DAS)

Of the 46 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 46 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.

**PROJECT PERIOD: 13 April 2017 through 08 June 2017 (NF-17-03/04)**

| | |
|---|---|
| 13 April 2017 | Depart from San Juan, Puerto Rico<br>(begin NF-17-03 Leg I) |
| 25 April 2017 | Arrive at St. Croix, USVI<br>(end NF-17-03 Leg I) |
| 29 April 2017 | Depart from St. Croix, USVI<br>(begin NF-17-03 Leg II) |
| 03 May 2017 | Arrive at Key West, Florida<br>(end NF-17-03 Leg II) |
| 07 May 2017 | Depart from Key West, Florida<br>(begin NF-17-04 Leg I) |
| 19 May 2017 | Arrive at Progreso, Mexico (pending clearance)<br>(end NF-17-04 Leg I) |
| 22 May 2017 | Depart from Progreso, Mexico (pending clearance)<br>(begin NF-17-04 Leg II) |
| 02 June 2017 | Arrive at Miami, Florida (end NF-17-04 Leg II) |
| 03 June 2017 | Depart from Miami, Florida<br>(begin NF-17-04 Leg III, transit) |
| 08 June 2017 | Arrive at Charleston, South Carolina<br>(end NF-17-04 Leg III) |

## C. Operating Area

24-hour survey operations are scheduled to begin on Leg I of NF-17-03. Gear and equipment for NF-17-03/04 will be loaded prior to departure from Charleston, SC. Personnel for NF-17-03 will be loaded in San Juan, Puerto Rico and in St. Thomas, US Virgin Islands. Gear trials will be conducted during this leg followed by the start of intensive sampling.

The sampling effort during NF-17-03/04 will utilize an adaptive sampling methodology relying heavily on model outputs. Particularly during Focus 2, sampling will take place along specific oceanographic features to define larval ABT habitat. The use of satellite imagery, as well as larval ABT habitat models, will be used to determine sampling locations where the probability of collecting species of interest is the highest. Furthermore, *in situ* observations provided by the ship's flow through and hull-mounted sensors will further designate physical features of interest (as current boundaries or eddy features). Once identified, intensive sampling across the feature will be performed.

The adaptive sampling procedures described above preclude knowing exact sampling locations (stations) more than a week or two before departure. Therefore, in lieu of providing a complete station list with the final project instructions, general sampling areas of interest will be highlighted. One week prior to the start of each leg, a tentative track line and station list will be provided to the bridge. The stations provided will be used as a guide and may change throughout the survey with station additions and omissions as determined by environmental conditions.

The primary operational area for NF-17-03 is shown in Figure 1. Once NF departs San Juan on Leg I (NF-17-03), the ship will steam to the deployment site of the UVI mooring anchor system. After deployment, the ship will complete a small boat transfer in St. Thomas for UVI scientific personnel in Brewer's Bay near the university. Immediately following, scientific sampling efforts will commence along the transect lines in Figure 1 from the west end of Isla de Vieques along the ridge contour south of the USVI. After sampling is completed, a small boat transfer will be conducted for UVI scientists to disembark in St. Thomas. The ship will then retrieve a USGS mooring south of St. Thomas, before continuing to Frederiksted, St Croix. Leg II of NF-17-03 (Frederiksted to Key West), is a transit leg and no scientists are scheduled to be aboard.

Leg I (NF-17-04) will begin with scientific sampling in the Gulf of Mexico (Figure 2) using an adapting sampling method. NF will proceed into Mexican jurisdictional waters no sooner than May 12$^{th}$, 2017 to continue operations *(pending clearance)*. Leg I (NF-17-04) will conclude in Progreso, Yucatan, Mexico.

Scientific sampling will continue on Leg II (NF-17-04), following NF departure from Progreso. During this leg, the ship will initially work in Mexican waters and will continue into the Gulf of Mexico based on oceanographic and satellite data acquired. Leg II (NF-17-04) will conclude in Miami, FL. Figure 2 shows tentative stations for Legs I and II of NF-17-04.

All AOML and SEFSC scientists will disembark NF in Miami following NF-17-04 Leg II. All NF-17-03/04 gear will be unloaded from the ship while it is in Miami. Following this port stop, NF will transit to Charleston, SC (Leg III of NF-17-04) which will mark the conclusion of this year's project.

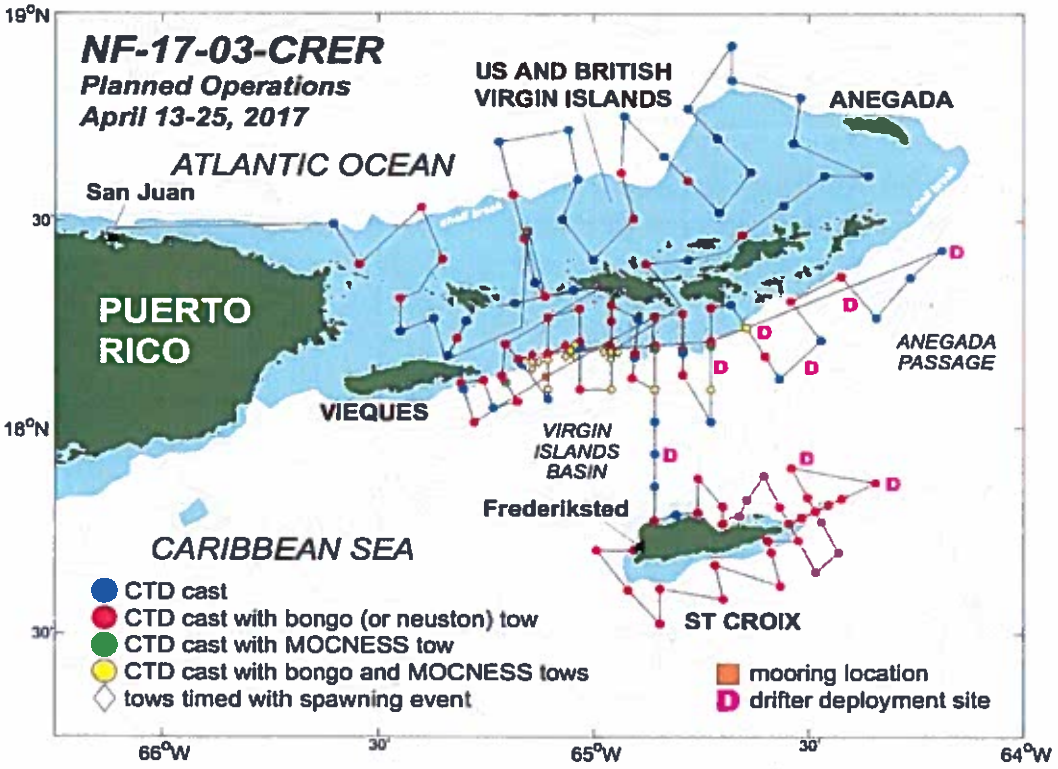


**Figure 1**. Overview of sampling and operational area for NF-17-03. Tentative trackline (black line) and station locations (colored dots) for Leg I of NF-17-03 are shown above. Departure (San Juan) and arrival (Frederiksted) ports of call are shown as black dots.

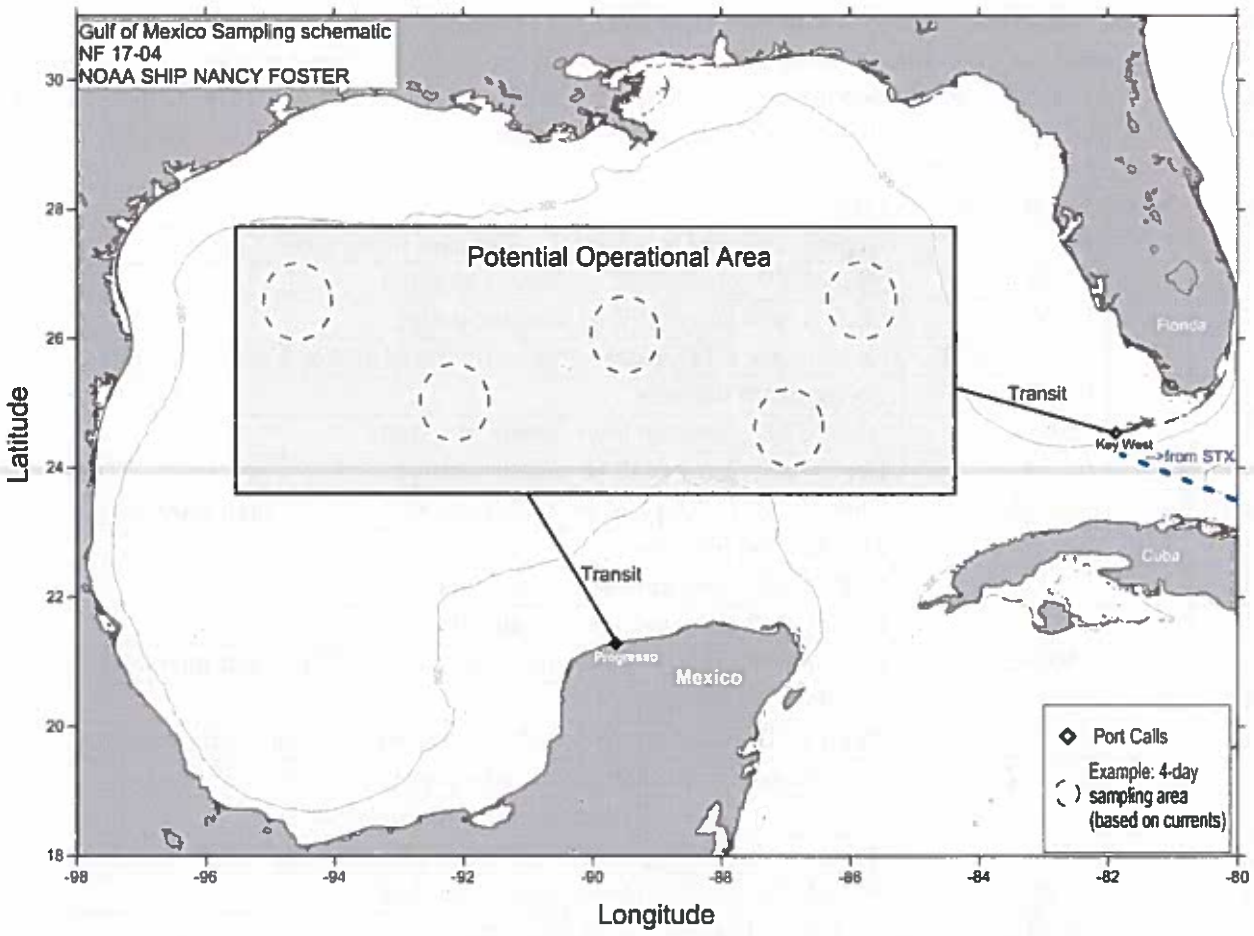


**Figure 2.** Potential sampling ranges for Legs I and II of NF-17-04 are shown (pending clearance). Each circle represents 4-day segments based on ocean conditions across the sampling area. These stations will be determined based on the most updated satellite and TSG data. Departure (Key West) and arrival (Progreso) ports of call are also shown.

**Table 1**: BTE table of planned daily operations and times for selected transects. Typically, transects are 20-30 nm in length with plankton and CTD stations spaced along the way. Approximately 3-4 experiments are planned during each leg of BTE. Times are given in local time, but may need to adjust accordingly. *These are estimated times and durations to provide an example of the tempo of the survey. All operations are likely to adapt to the oceanographic conditions, and model outputs.

| Exp | Day | Local time* | OPS* |
|---|---|---|---|
| 1 | 1 | 00:00 | Deploy sediment trap array (will remain floating for 3-days) |
| 1 | 1 | 02:00 | 500m CTD, plankton tows: bongo, neuston |
| 1 | 1 | 04:30 | Deploy drift array (will be sampled daily) |
| 1 | 1 | 06:00 -23:00 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 1 | 2 | 00:00 | Zooplankton biomass |
| 1 | 2 | 02:00 | 500m CTD, plankton tows: bongo, neuston |
| 1 | 2 | 04:30 | Deploy drift array (will be sampled daily) |
| 1 | 2 | 0600-23:00 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 1 | 3 | 00:00 | Zooplankton biomass |
| 1 | 3 | 02:00 | 500m CTD, plankton tows: bongo, neuston |
| 1 | 3 | 04:30 | Deploy drift array (will be sampled daily) |
| 1 | 3 | 0600-23:00 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 1 | 4 | 00:00 | Zooplankton biomass |
| 1 | 4 | 01:30 | 500m CTD, plankton tows, transit to recover drift and sediment arrays |
| 1 | 4 | 07:30-2300 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| | | | *Transit to next experiment area* |
| 2 | 5 | 00:00 | Deploy sediment trap array (will remain floating for 3-days) |
| 2 | 5 | 02:00 | 500m CTD, plankton tows: bongo, neuston |
| 2 | 5 | 04:30 | Deploy drift array (will be sampled daily) |
| 2 | 5 | 06:00 -23:00 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 2 | 6 | 00:00 | Zooplankton biomass |
| 2 | 6 | 02:00 | 500m CTD, plankton tows: bongo, neuston |
| 2 | 6 | 04:30 | Deploy drift array (will be sampled daily) |
| 2 | 6 | 0600-23:00 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 2 | 7 | 00:00 | Zooplankton biomass |
| 2 | 7 | 02:00 | 500m CTD, plankton tows: bongo, neuston |
| 2 | 7 | 04:30 | Deploy drift array (will be sampled daily) |
| 2 | 7 | 0600-23:00 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 2 | 8 | 00:00 | Zooplankton biomass |
| 2 | 8 | 01:30 | 500m CTD, plankton tows, transit to recover drift and sediment arrays |
| 2 | 8 | 07:30-2300 | Continuous: CTD, plankton tows (repeated at 2 or 4 hour intervals) |
| 3 | 9 | .... | ..... repeats |

**Summary of Objectives**

1) Collect physical and biological data from 100% of all planned project $CTDO_2$ casts and net tow stations located throughout the survey area. During BTE only, surface irradiance will also be measured with a PAR sensor on the CTD package.
2) Collect a single merged (complete and continuous) sea surface flow-through data set (SST, SSS, chl_a, and CDOM) for the entire project period devoid of time, position, or data dropouts.
3) Collect a complete and continuous UHDAS 150 kHz hull-mounted ADCP data set, interfaced with directional GPS heading input (POSMV), for the entire project period devoid of time, position, or data dropouts.
4) Deploy ~16 satellite-tracked Lagrangian surface drifting buoys and ~24 expendable bathythermograph (XBT) probes.
5) Collect a complete and continuous bathymetric time-series (ascii) from the ship's Knudsen depth sounder for the entire project period (with time, position, and quality flag) devoid of time, position, or data dropouts.
6) Collect physical and biological data in Grammanik Bank on April 16-19th to target post-full moon spawning by yellowfin grouper at a specific reported spawning site.
7) 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).
8) Deploy UVI mooring anchor system located northwest of St. Thomas.
9) Recover USGS Honjo mooring located south of St. Thomas.
10) Conduct directed sampling targeting ABT (*Thunnus thynnus*) and other tuna species spawning areas in the Gulf of Mexico including Mexican waters and Caribbean Sea for validating the Domingues ABT larval index model, population genetics, gut content analysis, growth and food web dynamics studies (Bongo and Neuston net tows) (NF1704).
11) Assess the occurrence, abundance, and geographical distribution of the early life stages of spring spawning fishes, especially ABT, in mesoscale features in support of annual stock assessments.
12) Evaluate trophic pathways relative to the early life dynamic primarily of ABT larvae with the use of stable isotope analysis of samples collected using plankton nets (NF1704).
13) Deploy a satellite-tracked sediment trap array (1x3-m drogue at 15-m depth) at three depths for a duration of 3-days targeting the euphotic zone to measure the quantity and composition of settling material 4 to 5 times (NF1704).
14) Deploy a satellite-tracked sediment trap array (1x3-m drogue at 15-m depth) at three depths daily
15) Measurements of nutrients, NO3- $\delta$ 15N, particulate C and N, $\delta$15N of size-fractionated POM, microbial plankton community assessments by flow cytometry, microscopy and pigments, and to collect water for incubation experiments (NF1704).

**Participating Institutions**

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## Scientific Personnel NF-17-03/04

| NF-17-03 Leg I | | | | | | |
|---|---|---|---|---|---|---|
| **Name (Last, First)** | **Title** | **Date Aboard** | **Date Disembark** | **Gender** | **Affiliation** | **Nationality** |
| Ewen, Kristen* | Student | 13-Apr | 24-Apr | F | UVI | USA |
| Gerard, Trika** | Fisheries Biologist | 11-Apr | 21-Apr | F | NOAA-SEFSC | USA |
| Habtes, Sennai | Fisheries Biologist | 11-Apr | 25-Apr | M | UVI | USA |
| Heidmann, Sarah* | MS Student | 13-Apr | 24-Apr | F | UVI | USA |
| Norton, Nikita | Fisheries Biologist | 11-Apr | 25-Apr | F | NOAA-Corps | USA |
| Otis, Daniel | Fisheries Biologist | 11-Apr | 25-Apr | M | USF | USA |
| Privoznik, Sarah | Chief Scientist | 11-Apr | 25-Apr | F | UM-CIMAS | USA |
| Rawson, Grant | Oceanographer | 11-Apr | 25-Apr | M | UM-CIMAS | USA |
| Sabine, Alexis* | Fisheries Biologist | 13-Apr | 24-Apr | F | DPNR-USVI | USA |
| Scicchigno, Jessica | Student | 11-Apr | 25-Apr | F | CUNY | USA |
| Seijo Ellis, Giovanni | Student | 11-Apr | 25-Apr | M | UPR | USA |
| Vasyleva, Tetiana | Student | 11-Apr | 25-Apr | F | CUNY | USA |
| McKague, Vanessa | Fisheries Biologist | 11-Apr | 25-Apr | F | UVI | USA |
| * Personnel to be transferred onboard via small boat in St. Thomas after departure from San Juan and ashore prior to arrival in St. Croix. | | | | | | |
| **Personnel to be transferred ashore via small boat in St. Thomas prior to the vessel's arrival in St. Croix | | | | | | |
| All other scientist will depart *Nancy Foster* within 24 hours of arrival in Saint Croix. | | | | | | |

| NF-17-04 Legs I and II | | | | | | |
|---|---|---|---|---|---|---|
| **Name (Last, First)** | **Title** | **Date Aboard** | **Date Disembark** | **Gender** | **Affiliation** | **Nationality** |
| Beatty, Jennifer | Student | 5-May | 2-Jun | F | SIO-UCSD | USA |
| Kelly, Thomas | Student | 5-May | 2-Jun | M | FSU | Mexico |
| Landry, Michael | Oceanographer | 5-May | 2-Jun | M | SIO-UCSD | USA |
| Malca, Estrella | Chief Scientist | 5-May | 2-Jun | F | UM-CIMAS | USA |
| Mostowy, Jason | Student | 5-May | 2-Jun | M | UM-RSMAS | USA |
| Norton, Nikita | Fisheries Biologist | 5-May | 2-Jun | F | NOAA-Corps | USA |
| Quackenbush, Cameron | Student | 5-May | 2-Jun | M | UW | USA |
| Selph, Karen | Oceanographer | 5-May | 2-Jun | F | UH | USA |
| Shiroza, Aki | Taxonomist | 5-May | 2-Jun | M | UM-CIMAS | Japan |
| Thomas, Rachel | Oceanographer | 5-May | 2-Jun | F | FSU | USA |
| Ford, Kiana | Student | 5-May | 19-May | F | UM-RSMAS | USA |
| Harned, Sydney | Student | 5-May | 19-May | F | UM-RSMAS | USA |
| Privoznik, Sarah | Taxonomist | 5-May | 19-May | F | UM-CIMAS | USA |
| Stukel, Mike | Oceanographer | 5-May | 19-May | M | FSU | USA |
| Vasquez, Lourdes | Taxonomist | 5-May | 19-May | F | Mx-ECOSUR | Mexico |
| Carrillo, Laura | Oceanographer | 22-May | 2-Jun | F | Mx-ECOSUR | Mexico |
| Gerard, Trika | Fisheries Biologist | 22-May | 2-Jun | F | NOAA-SEFSC | USA |
| Fitzgerald, Lucy | Student | 22-May | 2-Jun | F | Eckerd College | USA |

| | | | | | | |
|---|---|---|---|---|---|---|
| Lamkin, John | Fisheries Biologist | 22-May | 2-Jun | M | NOAA-SEFSC | USA |
| Morrow, Rebecca | Student | 22-May | 2-Jun | F | FSU | USA |
| Quintanilla, Jose | Fisheries Biologist | 22-May | 2-Jun | M | Spain-IEO | EU Spain |

## E. Administrative

### 1. *Points of Contact*

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*Alternate Point of Contact:* LCDR Justin Kibbey

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Justin.Kibbey@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)
*granted* Bahamas
*pending* British Virgin Islands including Anegada (UK)
*pending* Dominican Republic
*pending* Mexico
*pending* Turks and Caicos Islands (UK)

*3. Licenses and Permits*

Not Applicable

## II. Operations

### A. Project Itinerary:

| | | |
|---|---|---|
| 13 April 2017 | Depart: | San Juan, Puerto Rico *begin NF-17-03*** |
| 25 April 2017 | Arrive: | St. Croix, USVI |
| 29 April 2017 | Depart: | St. Croix, USVI |
| 03 May 2017 | Arrive: | Key West, FL *end NF-17-03 (destage USGS mooring)* |
| 07 May 2017 | Depart: | Key West, FL *begin NF-17-04* |
| 19 May 2017 | Arrive: | Progreso, Mexico |
| 22 May 2017 | Depart: | Progreso, Mexico |
| 02 June 2017 | Arrive: | Miami, FL *destaging* |
| 03 June 2017 | Depart: | Miami, FL *transit for NF* |
| 08 June 2017 | Arrive: | Charleston, SC *end NF-17-04* |

** A personnel transfer via small boat will take place to embark/disembark visiting scientists from St. Thomas. The transfer should take place following the vessel's departure from San Juan, PR. A second personnel/sample transfer will take place prior to arrival in St. Croix. On this second transfer, visiting scientists from St. Thomas will disembark.

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, as needed throughout the project, 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.

Outreach events for students and personnel from collaborating institutions in the form of ship tours are tentatively planned for the St. Croix, Key West, and Progreso port stops. Details of the events will be coordinated with NF OPS as the survey approaches.

## B. Staging and Destaging:

- The majority of scientific gear for NF-17-03/04 was loaded aboard NF in Charleston, SC, between 08 and 10 March 2017, prior to the ship's departure on NF-17-02.
- The UVI mooring base anchor will be loaded in San Juan prior to NF-17-03.
- Additional scientific gear only for NF-17-04 will be loaded aboard NF in Key West, FL between 04 May and 06 May, 2017.
- 180L dewar of liquid nitrogen will be loaded and refilled in Key West, FL.
- The recovered USGS Honjo mooring will be unloaded in Key West, Florida on or about 04 May 2017.
- Lab van container will be loaded in Key West, FL between 04 May and 06 May 2017. Van dimensions: 8'x8'x20'; weight: 8,500lbs; power requirement: 208, 240, or 480 Vac. Crane for loading and unloading of container will be arranged by science party.
- All AOML/SEFSC scientific gear will be unloaded from NF on 02 June 2017 in Miami, FL, following the ship's completion of NF-17-04 Leg II.

## C. Operations to be Conducted:

1. Approximately 300 $CTDO_2$ profiles (up to full depth profiles).
2. Approximately 335 net tows: (150 bongo, 50 Neuston/, 95 MOCNESS).
3. Continuous hull-mounted ADCP survey.
4. Continuous flow-through TSG/chl_a/CDOM survey.
5. Continuous bathymetric survey.
6. Drifter deployments.
7. XBT deployments.

8. UVI mooring anchor system deployment.
9. USGS mooring recovery.
10. Approximately 8 sediment trap array deployments and recoveries (BTE only).
11. Daily drifter array deployment and recovery (BTE only).

*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. A detailed set of instructions regarding all operations will be discussed by all parties (command, deck, scientific) prior to commencing any new operation. Any equipment or small boat stored on the main deck must not interfere with J-Frame or A-Frame operations ($CTDO_2$ casts, Neuston/S10, mini-bongo, or MOCNESS tows).

**$CTDO_2$ Operations**: $CTDO_2$ casts will include the ship's CTD frame, the ship's CTD instrument, 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. During selected $CTDO_2$ casts, XBT deployments will be performed off of the ship's fantail (using hand launchers) for simultaneous data comparison with collected $CTDO_2$ data.

**Net / Trawl Operations**: Operations will vary, utilizing either bongos (mini-bongo, and bongo-90), Neuston, or 1-m MOCNESS rigs. Trawl type and location will depend on the work area and scientific results yielded during the course of the project. Approximately 335 tows will be conducted (~50 Neuston, ~150 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. Bongo and Neuston/S10 tows will be performed using the ship's "Little" DT winch and the J-Frame. This winch should be spooled with .322 conducting cable and terminated with an electrical connection compatible with an SBE 39 temperature/pressure recorder and a SBE 19 CTD. The associated block (non-metered) must have a shiv diameter large enough as to not damage the wire as it passes through the block under tension (this block should be mounted aft of the metered CTD block). The SBE 39 temperature/pressure recorder will be furnished by the science party (the ship's SBE 19 will serve as a backup for this instrument).

**Mooring Anchor System Deployment Operations:** The UVI mooring anchor system will be loaded onto the ship in San Juan, PR. After departure, and before the small boat operation to retrieve visiting scientists from St. Thomas, the ship shall approach the deployment site northwest of St. Thomas at position 18.47609 N, 65.15682 W. A temporary float will be attached to the safety chain, and stream aft. We will fake the remaining chain on deck with looped line stops below swivels, and hang the sinker with quick release. The ship will steam to the site, releasing stops en route and finally the sinker on site. Accuracy to 200m is adequate. A detailed set of instructions regarding the mooring deployment will be discussed by all parties (command, deck, scientific) prior to commencing the mooring deployment.

**Mooring Recovery Operations:** Prior to the completion of Leg I of NF-17-03, the ship shall approach the USGC Honjo mooring site south of St. Thomas. The ship will secure running gear and set up to drift across the mooring site while a 12 kHz transducer is lowered over the side to communicate with the mooring's acoustic releases. Once release commands are issued, the ship will stand by and wait for the mooring to surface. Once on the surface, the ship will approach the mooring and the floating components

will be captured and recovered via the fantail. During the recovery, the ship's running gear will be secured. A detailed set of instructions regarding the mooring recovery will be discussed by all parties (command, deck, scientific) prior to commencing the mooring recovery. Once recovered, the mooring will be secured on deck and offloaded in Key West, Florida.

**Nitrogen sampling**: Two satellite tracked arrays will be deployed measuring 1x3-m drogue at 15-m depth in the mixed layer with a surface float, a tethered float for satellite telemetry, a 3-m x 1-m holey-sock drogue centered at 15-m depth. The first array "experimental array" is used for daily experimental incubations and is recovered and redeployed each day. Net bags with bottles are attached to the loops by long-line clips at the top of the bag and carabiners at the bottom of the bag, and a small weight (~5-10 lbs) attached to the bottom (~100 m). Samples are incubated for 24-h (while they drift at sea) and then the experimental array is recovered by the ship, the mesh bags with samples are removed, replaced with a new set of incubations and redeployed. The second array, or the "sediment trap array" has a 75 lb weight at the bottom (approx. 200 m depth) and a connected line of 8-10 surface floats for buoyancy, and a small (~8") tethered surface float for satellite telemetry. The surface lines of ~ 20 m length are polypropylene (float). The subsurface line below the drogue is ~3/8" VLS polyester rope. Crosses fabricated from gray PVC attach to the line at 3 depths. Each cross structure holds up to 12 replicate (VERTEX-style) sediment trap tubes. The sediment trap array is deployed at the beginning of the 3-day experiment (generally ~ midnight) and recovered at the end of the experiment typically using the A-frame and capstan.

*Underway Operations*

The ship shall continuously collect position (GPS), hull-mounted ADCP, fisheries acoustic, meteorological, thermosalinograph (TSG), chl_a and UV/CDOM fluorometer, and bathymetric data while underway (UV/CDOM 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. During transits on legs (NF-17-03 Leg II and NF-16-04 Leg II), the ship's ADCP shall be run continuously. In addition to on-station XBT deployments, XBT deployments will also be conducted periodically throughout the survey while the ship is underway. Approximately 16 satellite-tracked Lagrangian surface drifters will be deployed by hand at predetermined coordinates while the ship is underway.

*Small Boat Operations*

Small boats will be required as needed throughout the project to facilitate personnel

transfers.

*Dive Operations*

No dive operations are planned for NF-17-03/04.

**D. Dive Plan**

Dives are not planned for this project.

**E. Applicable Restrictions**

None.

## III. Equipment

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

**ITEMS SHOWN IN RED ARE NF-17-03/04 MISSION CRITICAL!**

The following NF communications devices should be on board, in working order, and available for use during NF-17-03/04:

1) INMARSAT-B
2) HF SSB/DSC transceiver
3) cellular telephone
4) Iridium Telephone**
5) Network internet/Wi-fi**
6) VHF Radios
7) 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-17-03/04:

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-17-03/04:

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 departure.
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 departure. 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.
12) Underway CTD

The following NF deck equipment should be on board, in working order, and available for use during NF-17-03/04:

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 ("HB" 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) Deck cranes, as needed
9) Portable deck cleats as needed
10) Quick-release 55-gallon drum storage on 01 deck for up to two drums of ethanol (plus deck storage for additional drums) 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-17-03/04:

1) At least one NF small boat should be aboard and available for use in survey operations and gear/personnel transfers during the course of the project.
2) ANY SMALL BOAT STORED ON THE MAIN DECK MUST NOT INTERFERE WITH A-FRAME OR J-FRAME OPERATIONS (CTDO2/LADCP CASTS, NEUSTON/S10, MINI-BONGO, OR MOCNESS TOWS).

**Multidisciplinary and multi-institutional cruises such as this require timely and consistent communications with shore. Data transfers between institutions and satellite oceanographers ashore and the scientific party on the ship are *mission critical*. Communication will strongly impact our ability to meet our objectives as stated in the cruise instructions. This includes access to download satellite images and model outputs from web portals and e-mail. Diel access to models from the following links will be crucial to conduct daily operations:

1. Modeled habitat outputs from the "BFT_index" for the Gulf of Mexico: http://www.aoml.noaa.gov/phod/research/ecosystems/fisheries/bft_tseries.php
2. Maps of the distribution of BFT_Index for the Gulf of Mexico are also computed on a daily basis, and distributed in real-time during the spring (starting March 20): http://www.aoml.noaa.gov/phod/research/ecosystems/fisheries/bft_maps.php
3. Ocean modeling and OSSE Center (OMOC) outputs for the Gulf of Mexico: http://coastalmodeling.rsmas.miami.edu/Models/View/FORECAST_GULF_OF_MEXICO_high_resolution
4. Altimetry data from AOML website: http://www.aoml.noaa.gov/phod/dataphod/work/trinanes/INTERFACE/
5. HYCOM outputs: https://www7320.nrlssc.navy.mil/hycomGOM2/glfmex.html
6. Satellite imagery: http://optics.marine.usf.edu/cgibin/optics_data?roi=SECOORA&current=1

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:

16 Surface drifting buoys [35 lbs each]

2 wire baskets for mooring floats [75 lbs each]
1 fluorometer spares box (yellow pelican case) [15 lbs]
1 chl_a sampling box (gray plastic, flip-top case) [20 lbs]
1 computer supplies "COMP TOOLS" storage case (roll-on case) [30lbs]
1 USF water sampling supplies case (tan plastic, roll-on case) [30 lbs]
1 tool bag (red/black canvas, roll-on tool bag/case) [30 lbs]
4 .322 wire grips (for CTD and MOCNESS) [5 lbs]
1 empty dewar (tan with black top) [40 lbs]
1 amsteel rope (orange spool) [10 lbs]
2 folding D-containers (black plastic) [60 lbs]
1 office/lab supplies (black plastic, roll-on cases) [50 lbs]
1 empty, vented manifold waste water carboy (clear plastic carboy) [3 lbs]
1 180 L dewar filled with liquid nitrogen (HAZMAT)
1 25 L dewar (empty) for Liquid Nitrogen
10 boxes of XBT probes [35 lbs each]
3 XBT hand-launcher and XBT data acquisition computer [50 lbs each]
1 90cm bongo frame 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
1 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 with equipment
1 1 m MOCNESS frame and associated electronics*
4 crates - Mocness electronics*
2 FORCES microscopes
2 FORCES science computers
1 10% Formalin 500 mL (HAZMAT)
1 500 mL container RNAlater (HAZMAT)
1 gray box spare CTD sensors [20 lbs]
1 wooden fish boxes moored instrumentation [75 lbs each]
2 acoustic deck boxes for communicating with moored acoustic releases [20lbs each]

1 1 mooring anchor system [2500 lbs]**

**These items will be removed in Key West, FL prior to departing NF-07-04*
***The mooring anchor will be brought on board as a recovery at the end of NF-17-03*

**The items below will be loaded in Key West, FL prior to departing on NF-17-04**

1 UV-vis spectrophotometer
3 coolers with water collecting gear
1 action packer container with sample bottles for sampling
1 15-N Ammonium Chloride 1 g (HAZMAT)
2 15-N Dinitrogen gas 1 L (HAZMAT)
1 15-N Potassium Nitrate 1 g (HAZMAT)
1 4',6-diamidino-2-phenylindole (DAPI) 400 mL (HAZMAT)
1 8% Paraformaldehyde 1 L (HAZMAT)
1 Acetone 8 L (HAZMAT)
1 Acid Lugol's solution 1 L (HAZMAT)
1 Alkaline Lugol's solution 150 mL (HAZMAT)
1 Ammonium Chloride 100 mL (HAZMAT)
1 Ammonium formate 2 L (HAZMAT)
4 Ammonium Hydroxide 500mL (HAZMAT)
1 Bleach (Sodium Hypochlorite) 1 gal (HAZMAT)
1 Formaldehyde (37%) 8 L (HAZMAT)
1 Hydrochloric acid 4 L (HAZMAT)
1 Hydrochloric acid 2.5 L (HAZMAT)
1 Liquid Nitrogen 90 L (HAZMAT)
1 Manganese Chloride 100 mL (HAZMAT)
1 Mercuric Chloride 100 mL (HAZMAT)
1 N-1-naphthylethylenediamine dihydrochloride 0.5 g (HAZMAT)
1 Nitric Acid 2 L (HAZMAT)
1 Potassium Permanganate 100 mL (HAZMAT)
1 Proflavine 400 mL (HAZMAT)
1 Sodium Chloride (NaCl) 10 kg (HAZMAT)
1 Sodium Nitrate 1 L (HAZMAT)
1 Sodium Nitrate 100 mL (HAZMAT)
1 Sodium Thiosulfate 500 mL (HAZMAT)
1 Sulfanilamide 10 g (HAZMAT)
1 Vanadium chloride in diluted HCl 1 L (HAZMAT)
1 13-C Bicarbonate 5 g
1 Sodium Phosphate 100 mL

3 Sediment Trap Crosspieces
1 Sediment Trap Line
2 Sediment Trap Float lines (4 attached floats)
1 Sediment Trap weights
1 Sediment Filtration Rack
36 Dark Polycarbonate bottles
1 Sediment Trap filtration Supplies
1 Peristaltic Pump
24 4-L Polyetheylene bottles
1 Thorium Filtration Rack
1 Thorium Filtration Supplies
1 Incubator
24 4-L polycarbonate bottles
48 2.5-L polycarbonate bottles
1 15N Incubation Rack
1 15N Filtration Supplies
6 Vacuum pump
6 Vacuum Carboy
4 20-L milli-q water
2 surface floats
3 1-m drogues
4 1/4" coated wire lines (drifter assembly)
4 telemetry floats
2 1-m ring nets
1 40L dewar
6 Action packers - cruise supplies for sampling, filtration, experiments
2 filtration racks
1 deck incubator
4 zooplankton sample bottles (12/case)
1 125-mL sample bottles (150)
36 2.7L polycarbonate experimental bottles
12 2-L poylethylene bottles
4 20-L carboys
6 small stools
1 Flow Cytometer Power Supply
1 Flow Cytometer Analyzer, spares
1 Computer, Power strip, Manuals for flow cytometer
1 Computer monitor, computer accessories, flow cytometer cables
1 crate with tools, misc supplies for flow cytometer
3 Dry Shippers for LN (empty)

1 PAR sensor
1 1 Liter 8% Paraformaldehyde (HAZMAT)
1 1 gal bleach, Sodium Hypochlorite (HAZMAT)
3 10 L Liquid Nitrogen (HAZMAT)
1 white CTD/LADCP frame configured with:
24 niskin bottles, 1 SBE carousel, 1 SBE 9plus, 2 RDI WH300 ADCPs,
1 LADCP external battery pack, 1 Kongsberg altimeter, 2 WetLabs fluorometers
1 Dry lab van (8'x8'x20') [8,500lbs] *pending availability*
1 -80 degree freezer, 21.9"W 25.4"D 36.8"H. [110 lbs]

*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 Scientists are 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 addition to the USGS Honjo mooring recovery, *in situ* CTD 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 of the survey 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 project.

### B. Responsibilities

*Reserved*

## VII. Meetings, Vessel Familiarization, and Project Evaluations.

### A. Pre-Project Meeting

The Chief Scientists 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 Scientists 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 shortcomings 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 Scientists, 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 https://sites.google.com/a/noaa.gov/omao-intranet-dev/operations/marine/customer-satisfaction-survey and provides a "Submit" button at the end of the form. It is also located at

https://docs.google.com/a/noaa.gov/forms/d/1a5hCCkgIwaSII4DmrHPudAehQ9HqhRqY3J_FXqbJp9g/viewform. 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 project 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 Scientists 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 Scientists to ensure members of the scientific party report aboard with the proper attire.

## D. Communications

A progress report on operations prepared by the Chief Scientists may be relayed to the program office. Sometimes it is necessary for the Chief Scientists to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientists. 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)
425-876-5889 (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:

541-867-8915

Program contacts:

| | |
|---|---|
| ryan.smith@noaa.gov | 305-361-4328 |
| estrella.malca@noaa.gov | 305-361-4295 |
| sarah.privoznik@noaa.gov | 305-361-4246 |
| john.lamkin@noaa.gov | 305-361-4226 |
| libby.johns@noaa.gov | 305-361-4360 |
| nikita.b.norton@noaa.gov | 305-361-4573 |
| justin.kibbey@noaa.gov | 305-361-4421 |

## 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.

Completion of the above requirements prior to boarding the ship is required.

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 Scientists:

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 Scientists are 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 Scientists 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 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 Scientists 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 Scientists

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 Scientists 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 Scientists 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

# IX. Appendices

## APPENDIX A. HAZARDOUS MATERIALS

### List of Hazardous Materials

| Common Name of Material | Quantity | Notes | Trained Individual(s) | Spill Control |
|---|---|---|---|---|
| 10% Formalin | 500 mL | Flammable | Estrella Malca, Sarah Privoznik | See Below |
| 15-N Ammonium Chloride | 1 g | Irritant | Mike Stukel | A |
| 15-N Dinitrogen gas | 2 L | Compressed Gas | Mike Stukel | See Below |
| 15-N Potassium Nitrate | 1 g | Irritant, Lung | Mike Stukel | B |
| 4',6-diamidino-2-phenylindole (DAPI) | 3,200 mL | Irritant, carcinogen | Mike Landry | A |
| 8% Paraformaldehyde | 1 L | Flammable | Karen Selph | See Below |
| Acetone | 16 L | Flammable | Mike Landry | See Below |
| Acid Lugol's solution | 1 L | Caustic | Mike Landry | C |
| Alkaline Lugol's solution | 450 mL | Irritant | Mike Landry | C |
| Ammonium Chloride | 100 mL | Irritant | Mike Landry | A |
| Ammonium formate | 2 L | Irritant | Mike Landry | A |
| Ammonium Hydroxide | 8 mL | Caustic | Mike Stukel | See Below |
| Bleach (Sodium Hypochlorite) | 1 gal | Irritant | Karen Selph | See Below |
| Ethyl Alcohol | 165 gal | Highly Flammable | Estrella Malca, Sarah Privoznik | See Below |

| | | | | |
|---|---|---|---|---|
| Formaldehyde (37%) | 16 L | Carcinogen /flammable | Mike Stukel, Mike Landry | See Below |
| Hydrochloric acid | 10.5 L | Caustic, Irritant, corrosive, toxic | Mike Landry, Rachel Thomas | See Below |
| Liquid Nitrogen | 550 L | Caustic | Mike Landry, Estrella Malca, Sarah Privoznik | See Below |
| Manganese Chloride | 100 mL | Mildly caustic | Mike Stukel | See Below |
| Mercuric Chloride | 100 mL | Caustic | Grant Rawson | See Below |
| N-1-naphthylethylenediamine dihydrochloride | 6.0 g | Irritant | Mike Landry | A |
| Nitric Acid | 2 L | Caustic | Estrella Malca, Sarah Privoznik | See Below |
| Potassium Permanganate | 100 mL | Mildly caustic | Mike Stukel | B |
| Proflavine | 3, 200 mL | Irritant | Mike Landry | A |
| RNA later | 500 mL | Caustic | Estrella Malca, Sarah Privoznik | C |
| Sodium Chloride (NaCl) | 20 kg | Irritant | Mike Stukel | See Below |
| Sodium Nitrate | 1.1 L | Irritant, Oxidizer | Rachel Thomas, Knapp, Mike Landry | B |
| Sodium Thiosulfate | 100 mL | Mild Irritant | Mike Landry | C |
| Sulfanilamide | 120 g | Irritant | Rachel Thomas | A |
| Vanadium chloride in diluted HCl | 1 L | Irritant, Corrosive | Rachel Thomas | A |

**Chemical Safety and Spill Response Procedures**

Group "A"

15-N Ammonium Chloride
4',6-diamidino-2-phenylindole (DAPI)
Ammonium Chloride
Ammonium formate
N-1-naphthylethylenediamine dihydrochloride
Proflavine
Sulfanilamide
Vanadium chloride in diluted HCl

- Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
- Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal

Group "B"

15-N Potassium Nitrate
Potassium Permanganate
Sodium Nitrate

- Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
- Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations. Keep in suitable, closed containers for disposal.

Group "C"

Acid Lugol's solution
Alkaline Lugol's solution
RNA later
Sodium Thiosulfate

- Avoid breathing vapors, mist or gas. Ensure adequate ventilation.
- Keep in suitable closed container for disposal

10% Formalin

- Wear appropriate protective equipment. Ventilate the area.
- Dilute with water and mop, or absorb with inert dry material and place in an appropriate waste disposal container. Use D-Formalizer® pads or F.C.G.® Formaldehyde Control Granules to reduce formaldehyde exposure.

15-N Dinitrogen gas

- Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe

areas.
- Clean up promptly by sweeping or vacuum.

8% Paraformaldehyde
- Ensure adequate ventilation.
- Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Acetone
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away. Ventilate closed spaces before entering them. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep upwind.
- Take precautionary measures against static discharges. Stop leak if possible without any risk. Use only non-sparking tools. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Ammonium Hydroxide
- Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures
- Cover drains. Collect, bind, and pump off spills. Take up with liquid-absorbent and neutralizing material (e.g. Chemizorb® $OH^-$, Art. No. 101596). Dispose of properly. Clean up affected area

Bleach (Sodium Hypochlorite)
- Ventilate area
- Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

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
- 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

Formaldehyde (37%)
- Wear respiratory protection. Avoid breathing 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

- Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal. Keep in suitable, closed containers for disposal

Hydrochloric acid

- Cleanup personnel need personal protection from inhalation and skin/eye contact. Evacuate and ventilate the area. Prevent spillage from entering drains.
- Cautiously add water to spill, taking care to avoid splashing and spattering. Neutralize diluted spill with soda ash or lime. Absorb neutralized spill with vermiculite or other inert absorbent material, then place in a suitable container for disposal.
- Clean surfaces thoroughly with water to remove residual contamination. Any release to the environment may be subject to federal/national or local reporting requirements. Dispose of all waste or cleanup materials in accordance with local regulations. Containers, even when empty, will retain residue and vapors.

Liquid Nitrogen

- Do not touch or walk through spilled material. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment
- Immediately contact emergency personnel. Stop leak if without risk

Manganese Chloride

- Ensure adequate ventilation
- Pick up and arrange disposal without creating dust. Sweep up and containerize for disposal.

Nitric Acid

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Use personal protective equipment
- Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Keep combustibles (wood, paper, oil, etc.) away from spilled material. Stop leak if possible without any risk. Do not absorb in sawdust or other combustible materials. Absorb spill with vermiculite or other inert material. Collect in a non-combustible container for prompt disposal. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Sodium Chloride (NaCl)

- Wear protective equipment. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Use respiratory protective device against the effects of fumes/dust/aerosol. Ensure adequate ventilation.
- Keep away from ignition sources, protect from heat; stop the spill by diking or using inert absorbent. Transfer to a recovery container. Collect liquids using vacuum or by use of absorbents. Avoid dispersal of dust in the air.
- Dust deposits should not be allowed to accumulate on surfaces as these may form an explosive

mixture if released into the atmosphere in sufficient concentration.

### Inventory of Spill Kit supplies

| Product Name | Amount | Amount it can clean up |
|---|---|---|
| Pro Sorb Granular Absorbent | 70 lb | 95 gal. |
| Spilltech HazMat Sorbents | 144 ft roll | 60 gal. |

## APPENDIX B. PROJECT WAYPOINTS AND STATION LOCATIONS

Prior to each leg of NF-17-03/04, a preliminary list of waypoints for the next leg (outlining a planned track and station locations) will be provided to the ship. Though the general work area will remain the same, tracklines and station locations/activities may change based on environmental conditions and our adaptive sampling methodology.